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Modelling Participation in Virtual Environments

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by

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Abstract

This thesis argues that design for virtual environments must attend to the ways that the technological infrastructure is transformed by, and in turn transforms, human communicative organisation. We present evidence from a user-contributed talker environment TCZ (The Chatting Zone), whose infrastructure and community of users have evolved over a ten-year period. TCZ is a text-based environment built on a spatial metaphor that is incorporated both into the structure of the environment and into the operation of commands.

The first question the thesis addresses is; "Do text-based virtual environments exhibit different forms of participation from those of face-to-face interactions?"

To answer this question, the thesis describes an empirical study of participation in TCZ, including a comparison of the communicative organisation of the virtual interactions in TCZ with those typical of informal face-to-face conversations. The thesis highlights the limitations of the spatial metaphor as an organising architecture for online communities and identifies participatory differences with face-to-face interactions. The results show that users exploit the flexibility of the online environment in order to overcome the constraints that spatial organisation normally places on the configuration of their communicative interactions.

The second question the thesis addresses is; "What is the right concept of participation for virtual environments?" The empirical evidence suggests that participation in virtual environments should be conceived primarily as a set of multiple group interactions, centered around the control and manipulation of multiple and distinct 'conversations'. Although there was evidence for some usage of TCZ's space, the vast majority of these group interactions were initiated from home locations, and as such highlighted the minor influence the environment's spatial metaphor had on participation.

The third question the thesis addresses is; "How can this revised understanding of participation be formulated in a way that makes it accessible to, or useful for design?"

As the thesis also argues that current models of participation are unable to adequately express such phenomena, the third question is addressed by the proposal of a more appropriate model of participation that can not only be used for virtual environments but also for other computer-mediated technologies.

Acknowledgements

"And among His Signs is the creation of the heavens and the earth, and the variations in your languages and your colours: verily in that are Signs for those who know" Quran 30:22.

The author would like to take this opportunity to thank the following people who have assisted me in my doctorate. I have been extremely fortunate to have had the excellent supervisor Dr Pat Healey, with whom to study such an interesting topic. His professionalism, guidance and knowledge have made it a most stimulating area of research.

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Chapter 1

Introduction

> "TCZ has grown from a group of university students talking together on the Internet and making new 'virtual' friends, to becoming a real-life community that spans continents. Both virtual and real life mix and combine to make the TCZ community. Events and relationships that happen in both real and virtual life shape the way in which people communicate. TCZ has many cases where people's lives have been drastically changed from how they would have turned out if they had not had the interactive communication with other people in the online community. TCZ has spurred phone calls, individual meetings, group meetings and parties, long-lasting friendship, relationships, marriages and families for many many people." ('Ratty' - TCZ User)

TCZ or 'The Chatting Zone' (TCZ, 2004) is an example of a text-based virtual environment or TBVE. A TBVE is a 'lightweight' technology, one that does not support the rich visual and aural strands of other media such as video-mediated communication. However, with growing numbers[1] and genres of such virtual environments available, this technology appears to be both popular and attractive.

As well as providing connectivity, TBVEs can also create novel social spaces for interaction (see Rheingold, 2000; Preece, 2000). However, designs for such systems have had varying

[1] Popular Web portals have lists exceeding 1800 environments (Mudconnector, 2003).

emphasis. Kollock (1998) reports on some of the ways to create successful and ongoing social interactions through design; moving the emphasis away from just technology and interface issues, and more towards supporting interaction and sustainability. Brown et al.(1999) raise questions regarding support for multi-user, multi-lingual systems that provide varying cultural communities with ways to interact. Mynatt et al. (1997) describe design issues that are central to supporting collaboration in network communities, such as the relationship between space and organisation, identity and representation and flexible coupling between technical and social elements.

This thesis proposes that the design of such systems could benefit from a clearer understanding of the differences between face-to-face and virtual participation. Building systems that provide effective support for virtual participatory practices is a real challenge. Therefore understanding how participation changes when moving from the actual to the virtual, and what the implications are for design, is important.

1.1 Research Questions

The first question the thesis addresses is; "Do text-based virtual environments exhibit different forms of participation from those of face-to-face interactions?"

To answer this question, the thesis will investigate whether a spatial organisation constrains participation, in other words, whether a TBVE's 'space' is a factor in organising its users' interactions. Along with many other TBVEs, TCZ is based on a spatial metaphor. This means the environment is made up of many 'locations' or 'rooms' that users can 'inhabit' and 'move between'. The spatial metaphor is intended to provide a real-world structure to help users organise their interactions. In some systems the spatial metaphor is rigorously enforced (see Chat Circles, 2003 & Habbo Hotel, 2003 for examples). Just like face-to-face, spatial constraints are imported into the system; a user cannot speak to or hear another user unless they move 'physically' closer to them. In such types of systems, 'space' becomes

a central factor in organising interaction. The thesis will also investigate the changes that occur when moving from the 'actual' to the 'virtual' through a comparison of participatory phenomena between a virtual environment and a corpus of face-to-face interactions.

The second question the thesis addresses is; "What is the right concept of participation for virtual environments?" If virtual participation is different from face-to-face, then it needs to be conceived in a in a more appropriate manner, based on the empirical evidence from the study. This will subsequently influence the third question, "How can this revised understanding of participation be formulated in a way that makes it accessible to, or useful for design?"

This question arises for two reasons. Firstly, the thesis argues that current models of participation are not appropriate candidates to model virtual participation. Secondly, as we have already highlighted some varying design directions of previous work, we propose that design for TBVEs can benefit from a clearer understanding of virtual participatory practices. This question will be addressed through the proposal of a model that can not only adequately express virtual participation, but also raise a range of participatory related issues for designers of such systems to consider.

The main theoretical methodology used to address these questions, is the conceptualisation of levels of interaction, both virtual and face-to-face, through the notion of participation. As we shall see in Chapter 2, the notion of participation has already been used in varying forms, to account for and model face-to-face interaction. However, with regard to computer-mediated interaction, this type of analysis is relatively new.

1.2 Overview of Results

Chapter 2 details how representations in existing models of participation were primarily developed to overcome the inadequacies of the dyadic model in representing face-to-face

interaction. The chapter goes on to highlight how current approaches to modelling participation are not appropriate as candidates for analysing TBVEs, due to their expressive limitation, explanatory inadequacy, unaddressed participatory phenomena and the implicit incorporation of face-to-face constraints.

Chapter 3 shows that the result of the creation of TBVEs is the support, in principle, of the construction of different kinds of participation.

In Chapter 4, the data suggests that TBVEs do afford different forms of participation, and that moving from the actual to the virtual gives users opportunities to exploit an environment where normal face-to-face constraints do not apply. The environment's 'space' is not a strong factor in organising users' interactions, unlike the maintenance of multiple, concurrent interactions and group messaging.

Finally, Chapter 5 details a model of participation that overcomes the inadequacies of existing models, adequately expresses virtual participation and provides designers with a tool for studying and thinking about participatory-based design issues.

1.3 Scope

This thesis is concerned with the analysis of participation in a text-based virtual environment, the comparison of participatory structures between the virtual environment with those of face-to-face, and finally the proposal of a new model of participation for such technologies. There are two intended audiences of this work. The first audience is the research disciplines of CMC (Computer Mediated Communication), CSCW (Computer Supported Cooperative Work) and C & T (Communities & Technologies). This is due to a TBVE being a popular example of a CMC technology, one that has been utilised within CSCW, and also a technology that attracts and aims to support a community of users. The second audience, although similar to the first, are the producers and designers of what may be termed more commercial products, for example systems such as Habbo Hotel (2003).

Here both a clearer understanding of virtual participation in relation to spatiality and an alternative participatory based design model can influence both the direction and structure of future commercial systems.

1.4 Contributions

This thesis has three main contributions to make. Firstly, an addition to knowledge through an empirical analysis of participation in a text-based virtual environment. Secondly, a comparison of participatory components with those from a corpus of face-to-face interactions. Finally, the development of a new model that articulates the distinctive participatory structures that text-based virtual environments display.

1.5 Structure

The remainder of this thesis is organised as follows.

Chapter 2 presents a detailed account of the existing representations of participation from a theoretical perspective, through a review of the literature. It begins by outlining the constraints that face-to-face interactions have on participation. It discusses how much these analyses focus on face-to-face conversations and incorporate the spatial and temporal constraints associated with them. It highlights some of the limitations of current models and summarises the current state of research in this area.

Chapter 3 presents an account of how participation has been conceived, implicitly and explicitly, in some example technologies. The chapter will compare example technologies and investigate which of them has the greatest opportunity for new forms of participation.

Chapter 4 presents an understanding of participation in a text-based virtual environment. This will be achieved through an empirical study of an environment, further supported by a detailed questionnaire of the environment's participants. It also details a comparison between participatory practices of a virtual environment with those of face-to-face interactions.

This will be achieved by a comparative analysis of participatory components between TCZ and a corpus of demographic (or dynamic balance of population), face-to-face conversations from the British National Corpus (BNC).

Chapter 5 outlines the production of a new model that not only articulates the distinctive participatory structures found in text- based virtual environments, but can also be used in other technologies.

Finally, Chapter 6 presents the thesis' conclusions, a summary of contributions and offers suggestions for further research.

1.6 Publications

Some of the ideas and chapters presented in this thesis have been published in the following;

Utilisation of Participatory Status for Modelling Interaction in Mobile Domains
Healey, P. & Reeves, A.J. Mobility & Participatory Status in *Proceedings of the 'Mobilize' Workshop, Digital World Research Centre, University of Surrey*, 2001.

Proposal for Modelling Participation in Virtual Environments
Reeves, A.J. A Framework for Participation in Virtual Environments for the *Doctoral Consortium, Conference Supplement, CSCW 2002, New Orleans, USA*, p.45, 2002.

Chapter 4
(in press) Reeves, A.J & Healey, P Participation in Community Systems: Indications for Design in Bellesar, P & Koizumi, S eds: *Proc. Digital Cities 3 (6th-9th Sep; Amsterdam, Netherlands); Springer-Verlag, Lecture Notes in Computer Science, LNCS*, 2004.

Chapter 2

Literature Review of Modelling Participation

2.1 Introduction

'Participation'

1: the act of participating

2: the state of being related to a larger whole

Idioms: to be a party to, to be in on, to have to do with (Merriam-Webster Dictionary)

This chapter reviews literature relating to the analysis of participation from a variety of domains, and discusses their relevance according to the following questions. Firstly, exactly what types of analysis are the authors providing? And secondly, how much have these analyses incorporated constraints associated with face-to-face interaction? These questions will help to highlight the extent to which current models have centred upon face-to-face interaction, and also their viability as a basis for modelling interactions that are not bound by such constraints. The criteria for the selection of material in this chapter is as follows. Firstly, a review of literature that presents participation in terms of a dyadic relationship. Secondly, literature that presents accounts of the rich forms of participation, but does so only in descriptive terms. Thirdly, literature that presents formal models of participation

that aim to abstract away from time and place. And finally, some experimental work that builds upon some of the previous formal models. This material is presented in order to provide a review of participation that highlights theoretical background, rather than how participation has been explicitly or implicitly conceptualised in electronic media. This will be covered in detail in chapter three. As such, chapter two presents a review of modelling participation that each discipline outlined in the scope of the thesis can draw upon. Because the focus of this section is in relation to co-participation between the participants themselves, we have not included descriptive accounts that deal with, say, participation in relation to documents. For examples of these, see Luff, Heath & Greatbach, 1992, and Luff, Kuzuoka, Heath, Yamashita & Yamazaki, 2004.

To begin, section 2.2 outlines the constraints of face-to-face participation in order to provide criteria by which the literature will be analysed. Section 2.3 reviews models of participation in detail. Section 2.4 presents example experimental work where some of the models from section 2.3 have been utilised. Finally, section 2.5 provides a discussion and comparison between the various models, with section 2.6 presenting the chapter's conclusions.

2.2 Constraints on Face-to-Face Interaction

This section is intended to outline the constraints of face-to-face interaction, in order to develop some criteria to compare with the participation models that follow. We begin by presenting some constraints of face-to-face conversation (Clark & Brennan, 1991):

1. *Co-presence* The participants share the same physical environment.
2. *Visibility* The participants can see each other.
3. *Audibility* The participants can hear each other.
4. *Instantaniety* The participants perceive each other's actions at no perceptible delay.
5. *Evanescence* The medium is evanescent - it fades quickly.
6. *Recordlessness* The participants' actions leave no record or artefact.
7. *Simultaneity* The participants can produce and receive at once simultaneously.

8. *Extemporaneity* The participants formulate and execute their actions in real time.

9. *Self-determination* The participants determine for themselves what actions to take and when.

10. *Self-expression* The participants take actions as themselves.

Items one to four deal with the immediacy of face-to-face interaction. Because of their co-presence, participants hold a relationship in physical space that provides them with sight of each other, the ability to hear one another, and have virtually immediate perception of each others' words or actions. Items five through to seven reflect the medium itself. The nature of the medium used, either voice, gesture or even posture, leaves no record or trace other than in the memory of the participants themselves. Finally, items eight through to ten deal with control of individual's actions.

Given this, any other medium for communication where some of these features are missing will require different skills in order to make it effective. The more constraints that are missing, the more specialised those skills will become. Many of these constraints only apply due to the fact that the participants are co-located in geographical space at the same time. We will now look at the constraint of co-presence both in terms of its spatial and temporal aspects.

2.2.1 Spatial and Temporal Constraints on Co-Presence

Face-to-face interaction takes place within a geographic location of some sort, and involves a spatial distribution amongst the participants. Each participant has a spatial relationship with the others, with movement in the space altering that relationship. In order to elicit some of the structural units of space in face-to-face interaction, we will briefly summarise a system of spatial-orientational behaviour called F-formations (Kendon, 1990).

Definition of an F-formation

Activity is always located, and we can imagine a space extending in front of an individual, within which that activity takes place. Kendon defines this space as an individual's *transac-*

tional segment. When two or more individuals meet to carry out an activity, their segments overlap to create a *joint transactional space*. The space between individuals who 'agree' to maintain and control it is defined as *o-space*. When an *o-space* is created, then so is an F-formation. Kendon points out that an F-formation should be considered at the interactional level and not the individual level, as participants may leave and join an F-formation without it being affected or changed.

Formation Arrangements

There are a variety of spatial arrangements that can form an F-formation. For example, a circular arrangement is common, so is a face-to-face orientation, or even an L-shaped or side-by-side pattern. Each type of arrangement is dependent on the number of participants, for example a side-by-side pattern is less likely where there are three or more participants. The layout of the location itself will also affect the choice of arrangements available to participants.

Kendon also refers to suggestions regarding the relationship between distance and the types of interaction required by the participants (cf. Hall 1964, 1966, 1968). So, for example, at close distance touch is available, at middle distances hearing and vision become more important and at greater distances the ability to monitor each others' behaviour becomes more difficult. In other words, there is a relationship between physical distance and the types of interactions available.

Maintenance of the Formation

The role of a participant in a group has a relationship with their spatial position in an F-formation. Kendon suggests that,

> "The distribution of speaking rights in a group are reflected in the arrangement maintained. Thus in circular arrangement these rights tend to be equal, whereas in arrangements where one individual is spatially differentiated from the others, as in a rectangular arrangement where there is a 'head' position or as in the arrangement maintained in a lecture where one individual faces the audience that

> is arranged in rows facing him, the individual who occupies this spatially differentiated position has the right to do more speaking (which he usually exercises, it seems) than do the others." (Kendon 1990, p.215)

In other words, the orientation of the participants to each other affects the range of possible roles they can take.

Changes in Participants

F-formation systems can continue with the leaving and joining of participants. Members of current systems rearrange themselves to accommodate any new participants and likewise rearrange themselves when someone leaves. This rearrangement may depend upon factors such as whether the new participant was called over by one of the existing participants, or where the leaving participant intends to re-join the arrangement after a brief interval. In order to be considered as a member of an F-formation, a person's transactional segment must fall over the o-space, and must take part in the adjustments and spacing by which that o-space is maintained.

Kendon also mentions another 'level' of participants, whom he terms 'associates'. Associates are people who are perhaps waiting to talk to someone or are watching some activity being carried out. They may adjust their spatial position relative to the F-formation if it changes, but they do not contribute to the maintenance of the o-space itself. Finally, they do not have to follow the procedures for joining and leaving a formation, for example by cooperative action between themselves and a member of the formation. In other words, associates do not meet the same criteria of a participant in a F-formation system.

Domain of an F-formation

The final part of the F-formation is its *domains* in relation to the space it exists in. Figure 2.1 depicts the inter-relationship of these domains. First is the previously mentioned o-space, surrounded by a narrower field that Kendon terms *p-space*, i.e. the space utilised by the bodies of the participants themselves. The final outlying area is termed *r-space* (after Scheflen, 1977). R-space could be thought of as a buffer-zone between separate F-formations,

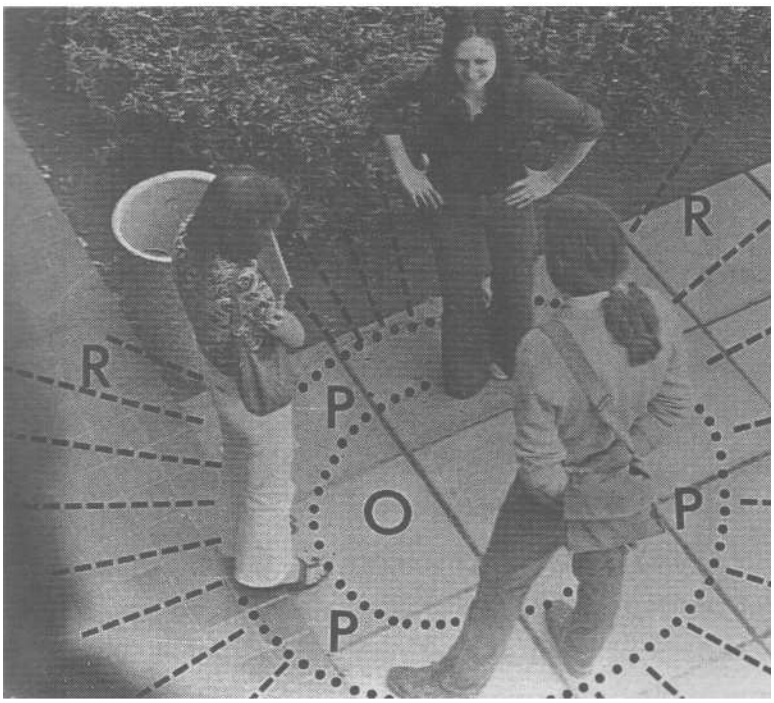

Figure 2.1: Domains of the F-formation

and the size of this zone will depend on the overall space the F-formations are occupying and the types of interactions taking place within them. R-space also, as Kendon notes, acts as a:

> "front hall or reception room in which visitors may be dealt with or newcomers greeted before they are fully incorporated into the system itself." (Kendon, 1990, p.235)

In summary, F-formations are a means of expressing the relationship between participants with regard to their orientation, how that orientation affects the roles available to them, and how participants can leave and join a formation. Physical space is the stage upon which all of this activity occurs.

Having discussed some spatial aspects of face-to-face interaction, we turn our attention to the temporal constraint. By definition, face-to-face interaction occurs where participants are simultaneously co-located. This stands in contrast to some technologically-mediated interactions were temporal constraints may not hold. We can summarise some possibilities, with example technologies in table 2.1 below. The temporal nature of face-to-face affects the ways in which people interact, one example being the relevance of turns, either maintained or managed by temporal ordering. Another example is in expected response times.

Table 2.1: Example Temporal Constraints

Technology	Place	Time
Face to Face	Same	Same
Video Conferencing	Different	Same
Shared Workspace	Same	Different
E-Mail	Different	Different

Summary

The constraints of co-presence and time are central aspects of face-to-face interaction. Face-to-face has the constraints of immediacy, recordlessness and self-expression. We have seen

how physical orientation can affect both with whom and in what manner a participant interacts. We have also seen an example of how physical distance affects the type of interaction available. Finally, physical placement in space determines whether a participant is a 'member' of a formation or an 'associate' i.e. a non-member. In other words, the physical space correlates with the level or degree of participation. The extent to which current theoretical analyses of participation have incorporated such constraints is considered next.

2.3 Models of Participation

2.3.1 The Dyadic Model of Participation

> "Long traditional in our culture is the threefold division between speaker, hearer, and something spoken about. It has been elaborated in information theory, linguistics, semiotics, literary criticism, and sociology in various ways. All such schemes appear to agree either in taking the standpoint of an individual speaker or in postulating a dyad, speaker-hearer (or source-destination, sender-receiver, addressor-addressee). Even if such a scheme is intended to be a model, for descriptive work it cannot be." (Hymes, 1972, p.58)

The first model we will address is the dyadic model of interaction. The description above, given by Dell Hymes, highlights its usage within various domains. In information theory, dyads are used to construct compound operators, in linguistics and literary criticism there is, for example, the father-son or mother-daughter dyad, and in semiotics there is De Saussure's dyad.

A similar picture arises within early studies of communication theory, summarised in table 2.2 (taken from Reynolds, 1998).

All of the theorists above outline that communication involves some sort of 'sender' and 'receiver' and the artifacts that are used to send information between the two. According to Hymes, the dyadic model's limitation in descriptive terms is that:

> "The common dyadic model of speaker-hearer specifies sometimes too many, sometimes too few, sometimes the wrong participants" (Hymes 1974, p.54)

as some rules of speaking require one participant, some two and some three or more. For

Table 2.2: Communication Theorists Compared

Theorist(s)	Sender	Receiver
Jakobson	Addresser	Addressee
Mitchell & Taylor	Writer	Audience
Corbett	Writer	Audience
Ede & Lunsford	Writer	Audience Addressed
Ede & Lunsford	Personal	Audience Invoked
Coney	Author	Reader
Coney	Implied Author	Mock Reader
Winograd	Speaker	Listener

example, people constantly tailor their remarks according to whether their are overhearers; e.g. adults talking in front of children or patients talking to doctors.

Hymes points out that in contrast to the schemes mentioned above, ethnographic work shows that it is the universal dimension of participant that needs to be understood. As we will discuss, theorists such as Williams, Levinson, Goffman and others argue that talk is properly analysed only in the context of the participation status of each person present in the encounter,

> "The study of behaviour while speaking and the study of behaviour of those who are present to each other but not engaged in talk cannot be analytically separated" (Williams, 1980, p.216).

Goffman criticised the dyadic model, saying that a "re-analysis of the primitive notion of speaker and hearer" (Goffman, 1981, pp.128-9) is required and that the dyadic model "is too gross to provide us with much of a beginning. It takes global folk categories (like speaker and hearer) for granted instead of decomposing them into smaller, analytically coherent elements" (ibid. p.129). As Goffman says, however common two-person encounters are, they are not the only kind. With three or more ratified participants and a further number of unratified ones, things become more complicated, and therefore a more appropriate way of modelling and conceptualising such interactions is required. In other words, talk can only

be properly analysed when all participants are considered, those who are speaking and those who are not, even if they are not addressees of that speech.

Summary

The dyadic approach has limitations in its expressive power. In essence, the dyadic model is an oversimplified version of participatory status. The development of participatory status has been pursued because of the potential it holds for analysing communication and understanding. With regard to roles, participatory status takes account of all the participants in an interaction as they are deemed either to be playing a role in that interaction or having some effect upon it. It also influences the phenomena of overhearing, understanding, utterance formulation and delivery. With this point accepted, it is also by definition accepted that interactions are more complex, in that the dyadic terms of 'speaker' and 'hearer' hide much more complexity and diversity of roles along with the fact that there are degrees of peripherality. Given that this complexity exists, there must be a need to define or categorise it in some form, and so there appears to be a need for some form of decomposition. The dyadic model has limitations in fully expressing the mechanisms of participation. The next section presents descriptive accounts of participation to illustrate this.

2.3.2 Descriptive Accounts of Participation

This section presents some descriptive accounts of participation from the social domain, a Yucatan Shamanic ceremony, a Xaxaar 'insult poetry' performance, children's tactical use of stories and participation within museum visits.

Participation and Social Context

Hanks's (1996) domain for his study centres upon an intensive investigation of Shamanic practices of the Mani-Oxkutzcab region of Yukatan. Shamanic performances in Mayan communities revolve around the use of highly specialised knowledge that Hanks likens to

Western society examples such as courtroom proceedings. It provides examples of the social distribution of 'frame-spaces', described by Hanks as,

> "the controlled access of recognised authorities to participation frameworks distinct from (though obviously related to) those of everyday interaction among non specialists." (ibid, p.171).

These frameworks afford role possibilities characterised by differences in knowledge, rights of enquiry and responsibility. Hanks points out that although these practices may seem 'exotic', they are in fact very similar to some of the problems faced by our own society. Hanks outlines three main areas of consideration.

The Social Thread

Hanks claims that in order to ease the process of understanding participation roles, they should be viewed in relation to their social contexts. This, he proposes, means that the descriptive content can be carried by those roles and other elements of the social context as well as by "the socially governed ways in which the roles combine". In other words, Hanks proposes that you can have fewer role categories if you describe how they interact with each other and relate to the social context.

Hanks maintains that it may be more appropriate to analyse these frameworks from the perspective of a controlling unit such as a *genre* of practice. This, he claims, may provide a less abstract view of utterance production as they are situated in social context and not merely a way of expressing thoughts. In this light, Hanks continues by making some default assumptions regarding interactants in face-to-face contexts with regard to events.

1) He assumes that the speaker, physically present, is the source of all words and sentiments expressed.

2) Gaze, posture, gesture and speech are assumed to be deployed in a mutually reinforcing fashion.

3) The actor bodily present to whom an utterance is addressed is the intended target.

4) Participants should be able to reference the same identified object so that verbal references to that object are successful.

One of the most important contextual facets comes from the idea of 'space'. In the Shamanic performance, 'space', as it relates to the performance, can be viewed in three dimensions, as shown in figure 2.2.

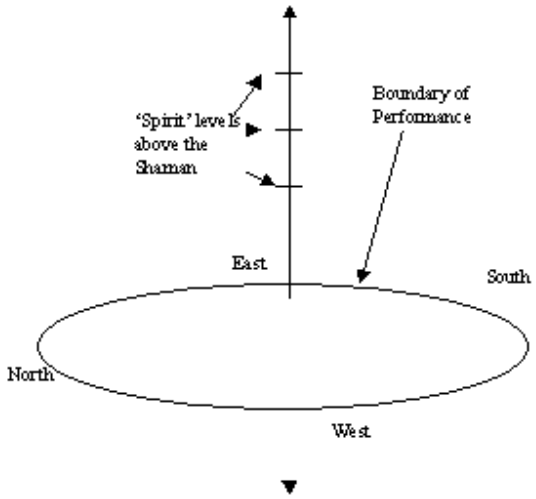

Figure 2.2: Boundary Space of a Shamanic Performance

Figure 2.3 below shows 'subspaces' existing within the boundary of the performance. These 'subspaces' could contain the Shaman himself and the patient, or the Shaman and the altar, or the patient and the altar. Depending upon the subspace selected, different participant structures appear, so for example when the 'subspace' of Shaman and patient is in use then the Shaman could be thought of as having a particular participant role. But at a different section of the prayer where the altar takes a central role, the patient takes over the Shaman's role and vice versa. (The subspaces do not seem relevant purely in terms of their dimensions, rather in terms of the objects and people they contain and what this implies in relation to the ceremony. For a comparison between types of space see section 3 on page 79.)

The Historical Thread

Having outlined the importance of the social context, Hanks outlines another thread in

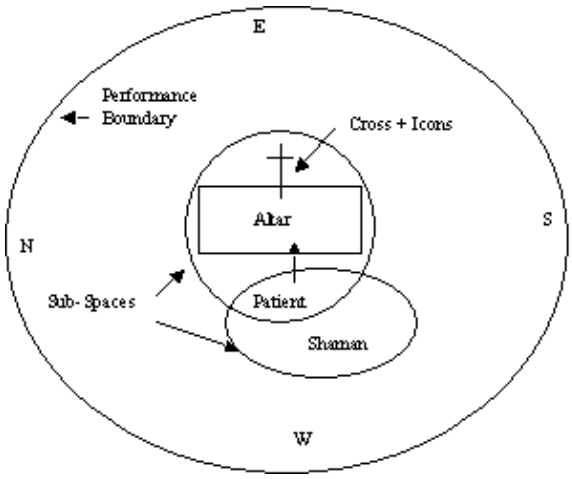

Figure 2.3: Boundary Space From Above

his argument, that is from an historical perspective. Just as social contexts are rooted in historical settings, conversation also has a pattern of time-related structure. Therefore Hanks argues,

> "participant relations can be seen to emerge out of prior conditions and to prepare the way for subsequent ones" (Hanks, 1996 p.169).

Hanks refers to this notion as the 'diachrony of performance'. No description of such a religious performance is possible without including an account of its unfolding over time. The performance itself inscribes the positions of the actors and their respective orientations, and with the spatial arrangements builds a structured and ordered arrangement. Therefore, at any one time, the participant structure has a relationship with the preceding activity and the activity to follow.

The Embedding Thread

The third of Hanks's areas of consideration regards an attempt to simplify the attribution of participant roles in a way that does not lose their social context. He proposes that by 'embedding', the social context of role assignment will be maintained. Using the Shamanic ceremony as an example, Hanks considers the role of the Shaman himself.

He is not a speaker in that he is only repeating what was taught to him by his previous Shaman teacher and what he has learnt throughout his religious life. Neither is he an 'animator' of his teachings, as he has reworked them into his own style and character over his lifetime. There is also the mixture of standard religious talk, quotes that all Shamans use, and individualised text. Added to this is the fact that some of the spirits he is summoning (therefore addressees in a sense) are also the putative authors and targets (i.e. intended recipients, but not explicitly addressed) of some or most of the words he is going to speak. Hanks argues that instead of trying to force all of these complexities into a complex role assignment, it might be better to consider them in an historical context, rather than the purely synchronous perspective that:

> "risks producing a description that is involuted in terms of categories and empty in terms of social-historical content" (ibid. p.175).

Finally, Hanks considers the problem of defining a participant by outlining some basic features of participation. Firstly, a participant must be capable of engaging in interaction. This may involve reciprocation of an address in some form (not necessarily speech); in other words a participant is at least the focus of attention of one other participant at least some of the time (if the other participant also meets this requirement). Therefore, it is possible to restrict roles to actors of whom at least one of the participants is aware. (Of course, being non-aware does not necessarily deny roles to others, e.g. overhearers.)

Overall, Hanks's position is that participant roles should be viewed in the larger social framework of interaction, rather than as instances isolated from social mechanisms. However, Hanks deals with highly scripted encounters where people's expectations have been schooled (cf. Clark, 1996 for a description of prescriptive settings). Ritualistic matters normally involve specific places, times, positions and processes. Participation in other situations maybe more ambiguous and negotiable.

Participation and Historical Context

The second descriptive account of participation involves the study of a form of insult poetry called Xaxaar (also known as 'Wolof Insult Poems') which is performed at weddings as

the bride (the one being insulted) moves into her new husband's house, within the rural community of Senegal (Irvine, 1996). A poetry session is initiated by any of the husband's other co-wives or other female members of his family, and usually lasts for a period of two hours. Although the poetry is 'composed' or 'authored' by these women, they are deemed socially to be too high-ranking for the actual performance, which is therefore done by lower ranking community females known as 'griots'. Therefore, a few days prior to a wedding these women group together - sometimes in private; sometimes openly - in order to prepare the poetry, and by utilising this grouping technique prevent any particular poem once read at a wedding from being attributed to any one individual. As some of these poems are particularly offensive, specific, hurtful and intricately worded, the griote women are able to claim that they are merely transmitters of the poetry and not the authors. Also the higher-ranking females can claim they are just the sponsors of the general poetry session and not of any particular nastiness of any particular poem.

Within this domain then, is a dispersal of responsibility across several parties and also a dispersal of parties on the receiving end of an insult. Participant roles become distributed across multiple individuals.

A Xaxaar poem could be envisaged as having several historical episodes, in that its conception is one frame, its presentation another and future recitations yet more. Within these frames are the lines of the actual poetry themselves which also presume earlier moments and envision later ones. Table 2.3 outlines the divisions between parties with regard to 'production' and 'reception' personnel.

A local griot woman, whom Irvine had asked to record the local items of news and interest, presented the following poem to Irvine. It is without title or authorship, and was read by the griot to Irvine along with a discussion of its history and meaning. Irvine's argument is that complex participatory roles can be derived by looking at the relationship between intersecting and proceeding 'frames' or 'episodes'. The contextualisation is presented in the translation.

This Xaxaar (insult poem) was addressed to Khadi N-, the village leader's wife, when her daughter got married: (ibid. p.153)

Table 2.3: Personnel at a 'Wolof Xaxaar'

Production Personnel	Location of Person(s)	Reception Personnel
Soloist	Foreground centre	Bride
Chorus (inner)	Inner circle	
Drummers		
Chorus (outer)	Outer circle	Invited audience
Sponsoring co-wives	Background	Bride's family
Groom	Background	
Formulator (unknown)	Absent	Bride's other relatives

1 *Mbaa Khadi N - dikkul?* Hasn't Khadi N - arrived?

2 *Khadi mii takk tubeey te du goor.* This Khadi ties on trousers and isn't a man.

3 *te loo nas mu nocci.* And whatever you thread your needle with she lifts off. (that is, she steals your men).

4 *Moo! Khadi N- yow ba ngga daje ak* Well! Khadi N, you, when you meet with

5 *Moo! M-, moo loo ci jile? Mor M-*, well! What do you take away?

6 *Beqta wu rey, rangoon yu ne mbacc* A big load of snot (pun for love), tears openly flowing.

7 *ku ne' ber-ub kelem?* (because) each (of you) has to have separate plate (i.e. they can't eat together or have sex as they are not married or Khadi may claim a higher rank as the leader's wife).

8 *Yaa di burr bu sol manto-* You are the king wearing the royal mantle.

9 *jittali dagam* Lead us in pursuit of him.

10 *Ne leen ko "nyaala gaaynago"* Tell them, "The Greatest Person" (i.e. instruct your followers to praise you accordingly).

11 *looloo di ag peyam* That will be his reward.

12 *Awu leen ko: mu riir-a-riir* Repeat after me: "She goes rumble

13 *te rijaax te tallali* thump and clatter" (i.e. the repeat is done by the chorus at the wedding).

14 *ni g rirandol gu and aki sabar* Thus sounds the rirandol (earth drum) accompanying the sabar (dance drums).

15 *Yaai doju dennu* You (Khadi) are thunderstones,

16 *Ku la soq njel di na yex a reer* whoever pounds your daily millet will be late for supper.

17 *Yaai doju dennu* You (Khadi) are thunderstones.

This poem was performed eight months previously and accuses Khadi of "getting above herself" or claiming a higher rank for herself than she is deemed to be worth holding. Her alleged angry reaction to the poem gives the poem more force and proves its point in that her reaction 'showed' that she had gossip-worthy behaviour, that she had previously claimed to be absent from her life. Irvine then discusses the participation frames within this poem and its diachronic history. The griot presented the text to Irvine as a recording done by her sister, who recorded the events, as the griot was not present herself. Although the poem was 'addressed to' Khadi, she herself was not present. Therefore,

1) In lines 4,5,8,10,15,16 and 17 second-person forms refer to her (Khadi) as if she were present. Khadi = absent target, Addressee = Khadi's daughter, the bride to be

2) Lines 3 and 12 refer to the chorus and audience, Khadi = third-person form

There are several parties of speaker included too: -

The performer herself, S- N-, Khadi implicated in lines 10-11, the chorus, the chorus as co-speakers in lines 12-14 when ordered to repeat by the performer.

These shifts amongst participant role structures also encompass the griot that read the poem to Irvine as a 'transmitter' relaying her sister's words, yet refraining from taking responsibility for their meaning or effect. She was therefore 'tuning' her participation carefully in order to strip her reading of any personal involvement. As she read the poem to Irvine, another of Khadi's relatives was within earshot and thus an extra addressee for the griot, who could subsequently tune it even more finely for her benefit. Finally the griot also contemplated future audiences when the notebook was taken back to the United States by Irvine to be studied by future audiences.

Irvine concludes that the historical sense of text makes it a transferable object from a Xaxaar poem, to an edited version, to a re-read version added to by later authors and poets, carrying

their history and contextualisation with them into other countries. Like Hanks's domain, Irvine's work is based on a highly scripted encounter.

Tactical Uses of Stories

The first example is the use of participation frameworks to express changes in participation of girls' and boys' disputes (Goodwin, 1993). Goodwin analyses how the participation frameworks that stories provide allow children to 'construct and reconstruct their social organisation on an ongoing basis' (ibid, p110). She describes how stories are used as tools for completing social activities, in the domain of argumentative sequences of children.
In comparing boys' and girls' stories, she notes that,

- The principle topic is offences of another participant
- One of the characters in the story is a present participant
- With boys the 'offender' is a present participant, with girls it deals with 'reported deeds of absent parties'

Taking a boys' dispute as an example, we can see the changing participation framework unfolding. Two boys, Tony and Chopper, are disputing through a sequence of reciprocal encounters; a two-turn sequence in which an initial challenge is countered by the other boy. After an initial number of challenges and counters, one of the boys, Chopper, begins a story, and this has the following effects,

1. Tony was the specific *addressee*
2. This made him; not others; more relevant in any future encounter
3. All the other boys present are positioned as *onlookers* to the dispute
4. The moment Chopper begins his story, he denies Tony the chance to respond to his challenge
5. Chopper is also signalling that he has a multi-utterance unit to complete, thus he is going to hold *speaker* status for a number of turns

6. The sequence of reciprocal counters has been brought to an end
7. A new participation framework has been invoked
8. The story is now addressed to all present, they become the *audience* to the story
9. Tony, who was the *addressee* is now referred to in the third person in the story, and thus becomes a *referent*
10. The other boys in the audience now have a right to participate in the story telling in distinctive ways.

In other words, Chopper's tactic of switching to a narrative story about Tony, rather than arguing directly with him, creates a new participation framework in which the rest of the boys are given the opportunity to get involved with their interpretation of events. So Chopper has, in effect, changed the status of the other boys from *overhearers* to *audience*, and thus it becomes easier for them to contribute.
Goodwin's examples show how participation frameworks provide a way of expressing how participants manage their social organisations through the use of stories.

Participation in Museums and Galleries

Our last examples in this section deal with forms of participation and interaction between visitors and visitors and artefacts within museums and galleries. When discussing how people interact with and through aesthetic objects, Heath, Luff, Von Lehn, Hindmarsh and Cleverly (2002) highlight some interesting participatory phenomena. Firstly, they note that early painters and sculptors were sensitive to the positioning of their work in relation not only to other artefacts but also to the multiple possible viewpoints of the visitors. As such, they comment upon those 'spectators' who enjoy artefacts with those who are with them and, by quoting Goffman 'within perceptual range of the event' (cf. Goffman, 1981). Here is an example of the physical constraints of face-to-face interaction influencing which participants are 'counted' as being part of the interaction with the artefact. Heath et al go on to provide examples where visitors "engender particular forms of co-participation, and to

enable others to see and experience what you have seen in the ways that you saw it" (ibid, p.17). They note how the experience of viewing and interacting with exhibits is a inevitably a social experience, and that the design of many artefacts embody the assumption that only one person will interact or view it at any one time. By looking for, and detailing examples of multi-party interactions with artefacts, they are presenting an analysis of participation (for museum visits at least) that goes beyond the dyadic 'person-artefact' relationship.

A second similar example comes from a report on participation with and through a piece of interactive artwork (Hindmarsh, Heath, vom Lehn & Cleverly, 2002). Here the authors describe visitors participation in terms of their collaboration by not only informing others of something they have noticed about the piece in question, but also for them to co-participate by watching a repeat performance of some action, and then becoming an onlooker to another participant trying the same thing. As such, participant relationships are formed and dissolved in direct relation to the artefact being viewed, and have direct correlations to the physical space and co-location of each person.

(Other work by these some of these authors (Luff & Heath, 1998) that deals with participatory phenomena such as mutual monitoring and overhearing are dealt with in the section on awareness on page 83 of chapter three.)

Both these examples provide highly detailed and descriptive accounts of participation in museum or artwork settings, yet like our previous examples do not offer more formal models or abstractions that can be generalised to other places and times.

Summary

The examples given in this section are good descriptive accounts, but do not in themselves explicitly articulate models that address the inadequacies of the dyadic model. What they do, however, is to display the richness of participation phenomena, the 'space' in which participation occurs, multiple participants both active and overhearing, and the intricacies of managing the attribution of status to particular participants. The dyadic model previously outlined would not be able to articulate or express such phenomena, and the next section will present more detailed attempts to address this problem.

2.3.3 Explanatory Models of Participation

The 'Interaction Order'

One of the most influential analysts of interaction was Erving Goffman. Goffman's first interest in studying face-to-face interaction came in his Ph.D. dissertation (Goffman, 1953). This included a discussion on the nature of participation in social encounters, versus the studied inattention in unfocused encounters, the ratification of participants, and the different kinds of participation that interactants recognise (cf. Williams, 1980, Goodwin, 1981: ch.1). His subject domain for his dissertation was the community island of Shetland, and he focussed upon the communicative conduct of its inhabitants. He went on to publish many pieces on diverse social occasions (see Goffman, 1963, 1967, 1971 for examples).

The central purpose of Goffman's work was to try to produce an encompassing set of norms that governed all circumstances where people communicate with one another. By attempting to abstract from the diversities of interaction, Goffman proposed that he could derive these norms that would hold for all forms of interaction. This methodology would lead to an 'interaction order' that would operate in all circumstances of co-presence, even when talk was not featured.

As Goffman's work is very broad, we are going to focus on some distinct participatory features of his work. This process will help to clarify to what extent Goffman's methodology incorporates a relationship to face-to-face constraints, and the kind of analysis he is providing.

As a result of his criticism of the dyadic model (cf. page 27), Goffman proposed a re-analysis of the notions of 'hearer' and 'speaker'. He begins by categorising types of 'hearer'.

The 'hearer' may or may not be listening to what is being produced by the 'speaker'. So, for example, a ratified participant (i.e. a participant recognised by both addressee and speaker as a full member of the conversation) in an interaction may not be listening to what is being said, even though this is normally expected from the 'speaker', and a non-ratified participant (i.e. a participant *not* recognised by both addressee and speaker as a full member of the conversation) may in fact be listening. Where interactions take place between primary participants (i.e the speaker and hearer), but in the visual and/or aural

range of non-ratified participants, these non-ratified participants could be referred to as 'bystanders' and are perceived by the primary participants. They could be also thought of as 'overhearers' catching parts of the interaction or conversation as it develops. If this process takes place without the knowledge of the primary participants then these parties could be thought of as 'eavesdroppers'. Goffman delineates between categories of 'hearers', distinguishing between an addressee (a ratified hearer), and an overhearer (a non-ratified hearer, e.g. a bystander or eavesdropper). This delineation is summarised in table 2.4 below.

Table 2.4: Goffman's Typologies of Talk and Participation

type of talk	**focus**	**participation**	**example**
dominating communication	focal activity	ratified participants	a professor is giving a lecture to a group of students in a lecture theatre
subordinate communication	non focal activity (by play)	ratified participants	two students on sixth row hold a "private" conversation
subordinate communication	non focal activity (side play)	non-ratified participants	two students who happen to pass by appear in the door of the lecture theatre and exchange comments
subordinate communication	non focal activity (cross play)	a ratified and a non-ratified participant	the bystander in the door addresses a student in the lecture theatre

Goffman proposes that with this new categorisation, new levels of communication can occur, namely 'dominating communication' and 'subordinate communication'. The dominating communication could be thought of as that which is taking place between the main participants, the 'speaker' the 'addressee' and such like. The subordinate communication could be thought of as constituted of a 'limited interference' to the dominant conversation. This subordinate communication could also be quite explicit in that no effort is made to

either hide or conceal its occurrence, or in fact its content. This layering of communication between multiple participants adds to the complexity of the overall interaction. Goffman continues to outline how this subordinate layer could be divided into subsets, for example:

- 'By-play' - subordinate communication of a subset of the ratified participants
- 'Cross-play' - communication between the ratified participants and bystanders across the dominant communication
- 'Side-play' - hushed words spoken amongst the bystanders

Table 2.4 above gives examples of this layer, utilising a lecture-based scenario. If effort is made to conceal the communication within these subsets, Goffman terms this 'collusion', which produces new subsets, for example

- 'Collusive by-play' - within the boundaries of an interaction
- 'Collusive cross-play' - across these boundaries
- 'Collusive side-play' - entirely outside the encounter.

Therefore, he has decomposed the dyadic notion of 'hearer' into varying categories according to their inter-relationship and level of ratification.

Goffman then turns his attention to the notion of 'speaker'. He replaces the word 'speaker' with 'production format', a notion that has three components:

- Animator - a body involved in acoustical production
- Author - one who selected the sentiments expressed and words used to indicate those sentiments
- Principal - someone whose position is established by the words she or he speaks. This involves social identity, role, and often uses the plural 'we'.

These distinctions help to explain some of the differences between interactant roles such as actors, spokespeople and reporters. Again, Goffman is decomposing the dyadic notion of 'speaker' into finer, more distinct roles.

The principle of this is that the significance of the 'production format' has to take account of the 'embedding' function that takes place in much talk. 'Embedding' means to convey words that are not our own, with each additional layering being closer to or further from the literal, with each carrying a change in, what Goffman terms 'footing'. The notion of 'footing', (Goffman, 1979), comes from Goffman's ideas based upon the work done by Gumperz on code switching (see Gumperz, 1976). Code switching could be defined as alignments of participants with respect to; shifts in tone, stance, dialect, language, or accent that indicate:

- direct or reported speech
- selection of recipient
- interjections or repetitions
- personal direction or involvement
- new and old information
- emphasis
- separation of topic and subject
- discourse type, e.g. lecture and discussion.(ibid. p.127)

Code switching can take place between adults or children, and can even be mimicked without a code switch at all. Gumperz gives a nice example of a teacher addressing a class of third-graders:

1) "Now listen everybody,"
2) "At ten o'clock we'll have assembly. We'll go out together and go to the auditorium and sit in the first two rows. Mr. Dock, the principal, is going to speak to us. When he comes in, sit quietly and listen carefully."
3) "Don't wiggle your legs. Pay attention to what I'm saying." (ibid. p.79)

These statements are ordered by numbers to show that three different stances were involved. The first is a claim on the children's behaviour, the second is a synopsis of the behaviour

to come and the third is a remark to a particular child. Without access to the tone of voice or bodily orientation of the teacher, these statements could be read as one continuous text and miss the fact that subtle change in the alignment between speaker and hearers were occurring.

Another example is when there is a shift from saying something ourselves to reporting what others have said. These 'embedded' shifts can alter the participation framework. As shown in the notion of 'embedding', Goffman notes that a change in footing,

> "implies a change in the alignment we take up to ourselves and the others present as expressed in the way we manage the production or reception of an utterance" (ibid. p.128).

This relates to the point that participants can change their footing during an interaction and these changes are a part of natural discourse. Goffman's work was aimed at trying to analyse the underlying structure of these changes.

In addition, it is relevant to consider the daily routine of interactants who hold multiple conversations. Goffman considers these possibilities with variations in tone of voice and also the giving up of the 'floor' to another speaker waiting for its return in exactly the same place as it was left upon the same footing. This 'in-stream', 'out-of-stream' communication can be seen readily in examples such as auctioneers holding multiple layered conversations with multiple parties at the same time. Another example given is of a nurse or consultant who holds multiple conversations with patients, their relatives, and other staff, all revolving around one interaction, with multiple changes in footing and more interestingly, multiple participatory statuses being interleaved.

These changes in footing are directly linked to the participation framework within which they occur. As Goffman notes, speakers formulate, and determine the footing of their utterances in relation to the framework within which they are to be received. He therefore saw the need to elaborate the dyadic model into a 'participation framework'.

> "For a given speech act taken at a cross-sectional instantaneous view, it is possible to describe the role or function of all of the members of that gathering (whether they be ratified participants or not). Therefore, the relation of any

> one such member to that particular utterance is his or her 'participatory status' relative to it, and for all members of the gathering the 'participation framework' for that moment of speech. Therefore, this speech act does not fall under the dyadic model, rather a varied number of possibilities arise that form the participation framework within which the speaker forms his delivery." (Goffman, 1981, p.137).

This move towards recognising the presence and the effect of other participants is important. Notice that Goffman used the words 'forms his delivery'; in other words, the presence of other participants affects how speakers construct and present their utterances.

Summary

Goffman discusses issues of context and historical factors within which participatory statuses are born. He claims the analysis of interactions can only take place in the context of the participatory status of all those present at a particular interaction. These two together provide a basis for the analysis of changes in footing. Goffman's primary interest in footing has also highlighted other subtle communicative structures worthy of consideration, such as embedding and dominating/subordinate communication. The fragmentation of the roles of 'hearer' and 'speaker' provided the idea of a 'participation framework' within which interaction takes place. This reveals a much more complex structure than the original dyadic one. Goffman's push beyond the dyadic approach recognises that an analysis of interaction needs to account for all of the participants present, and he provides an initial framework to do this.

A Linguistic Analysis

Following Goffman's broader analysis, we now focus in on a finer-grained treatment of participation, based on the analysis of language (Levinson, 1988). Levinson's approach is the study and usage of various languages through an analysis of grammar and linguistic structures, deixis and pragmatics. By examining evidence from the structure of language,

he is aiming to highlight different genres of participant roles. His purpose in this work is to look at Goffman's exposition from a purely linguistic perspective. For Levinson, it is Goffman's contribution to the study of social interaction that will have the greatest impact in linguistics. Levinson points out that as, in his opinion, Goffman's approach is not systematically empirical, he intends to bring different kinds of evidence to bear on Goffman's notion of 'footing'. 'Footing' or 'participant role' as Levinson prefers to call it, is at the heart of deixis, that is, the way in which utterances are linked to a situation and how certain attributes are referenced by parameters of the speech event. Such parameters could be social, participant role, spatial or temporal. Linguists have up until now, he argues, used unanalysed concepts of the first and second person. If these are shown to be decomposable, then that is a fundamental contribution to the understanding of this phenomenon.

Levinson outlines two kinds of evidence that he could bring to bear on the subject. Firstly, an examination of the grammatical distinctions made by different languages, and secondly, an analysis of actual language use. His strategy is to look for a universal set of categories that emerge in cross linguistic distinctions. By elaborating a set of structures for participant roles, it could be possible to show that some of them are well motivated by grammatical facts, and also through the study of language use, motivation for the finer distinctions in participant role. He also outlines some benefits of studying participatory roles for linguistics. Firstly participant roles are central to the understanding of the context-dependence of meaning, something highly central to pragmatics. Secondly, as there appears to be a lack of proper investigative techniques for multi-party interactions, a move away from the bias of dyadic interaction is more likely to provide distinctions between participant roles, which may prove useful not only to the study of speaking but also to the description of speech events.

To begin, Levinson has, in effect, three main areas of contention with Goffman's analysis. Firstly, he claims Goffman's categories, albeit an advancement on previous schemes, are insufficient. Secondly, they remain, in essence, ill-defined; there is not enough characterisation to make them clear. And thirdly, he claims that Goffman consistently fails to make the distinction between *utterance-event* and *speech-event* applications of his terms, and in doing so suggests their applicability to only one kind of activity. We will address Levinson's proposed corrections in turn.

Linguistic Examples

In addressing the limitations of dyadic model, Levinson looks at some alternatives. He begins by outlining some earlier schemes, beginning with the 'Traditional' Scheme (table 2.5), which takes the grammatical distinctions of first, second and third person and then identifies special cases i.e. presence or absence from the speech event.

(present) *speaker*	(present) *addressee*
(absent) *source*	(absent) *target*
Third Parties (present) *audience*	(absent)(not part of speech event)

Table 2.5: 'Traditional' Scheme

This could cover examples such as those who speak for themselves versus those who speak for others (spokesperson), addressees who are the intended recipients versus those who are a vehicle for the message to others (i.e. messengers). This could be further simplified into a communication theory model that separates the sender from the transmitter and destination from the receiver, as shown in figure 2.4.

$$sender \longrightarrow transmitter \longrightarrow (via - channel) \longrightarrow receiver \longrightarrow destination$$

Figure 2.4: Communication Theory Model

Levinson argues that simple schemes of this sort will not capture the types of roles actually used in speech events. A new set of categories, he argues, is therefore required.

A Systematic Set of Relevant Categories

Levinson states there are two ways to develop a set of categories, the first of which is to build a set of primitive roles and then derive more complex ones from those primitives. Levinson

reforms Goffman's terminology thus: production format = production roles, participation framework = reception roles. This, Levinson notes, leaves the term 'participation' free for both the production *and* reception role set. An example is given below.

Basic Categories

Source = informational/illocutionary origin of message

Target = informational/illocutionary destination of message

Speaker = utterer

Addressee = proximate destination

Participant = a party with a ratified channel-link to other parties

Derived Categories

Producers = sources or speakers

Recipients = addressees or targets

Author = source and speaker

Relayer = speaker who is not the source

Goal = an addressee who is the target

Intermediary = an addressee who is not the target etc.

Although this scheme may appear adequate for general usage, Levinson's aim is to attempt to break down the basic concepts into their defining features and then build more complex categories when required. The proposition (see table 2.6), utilises many phonological terms and includes the notions of:

- TRANSMISSION - property that utterers or transmitters have
- MESSAGE ORIGIN - property of originating the message, subdivided into MOTIVE - the desire to communicate, and FORM - devising the format of the message. (The + sign indicates having that attribute, the - sign indicates its absence.)

Term	**Participant**	**Transmitter**	**Motive**	**Form**	**Examples**
a) Participant producer roles					
author	+	+	+	+	ordinary speaker
'ghostee'	+	+	+	-	ghosted speaker
spokesman	+	+	-	+	barrister
relayer	+	+	-	-	reader of statement
deviser	+	-	+	+	statement maker
sponsor	+	-	+	-	defendant in court
'ghostor'	+	-	-	+	copresent ghost writer
b) Non-participant producer roles					
ultimate source	-	-	+	+	source of military command
principal	-	-	+	-	delegate's constituents
formulator	-	-	-	+	absent ghost writer

Table 2.6: Levinson's Production Categorisations

On the reception side (table 2.7), we have the following features,

- ADDRESS - whether the message picks out the recipient
- RECIPIENTSHIP - who a message is for
- PARTICIPANT - linked to being in a 'ratified role'
- CHANNEL-LINKAGE - presupposes ability to receive the message

Characterisation

What is also interesting is his discussion of analysing participant roles based upon the notion

Term	**Address**	**Recipient**	**Participant**	**Channel Link**	**Examples**
a) Participant reception roles					
interlocutor	+	+	+	+	ordinary addressee
indirect target	-	+	+	-	
intermediary	+	-	-	+	committee chairman
audience	-	-	+	+	
b) Non-participant reception roles					
overhearer	-	-	-	+	bystanders
targetted overhearer	-	+	-	+	Barbadian 'butt'
ultimate destination	-	+	-	-	

Table 2.7: Levinson's Reception Categorisations

of turn-taking in conversation. Turn-taking itself is based upon the premise that it organises two speakers at a time, 'current' and 'next', and is not directed at looking at the range of choices of participants from which the next speaker may be selected. Levinson considers that although the turn taking system is clearly related to participant roles, it cannot be directly used for its analysis. For example, the turn taking system provides participants with a procedure of whose turn to speak it currently is, and therefore who is in the reciprocal set of non-speakers, i.e. non addressees, overhearers, and bystanders. Therefore, the turn taking system appears to work at a higher conceptual level, assuming two roles only, now and next without distinguishing the many possible compositions of each of those particular

categories. Levinson concludes by saying that having a set of participant roles is one thing, but calculating who stands in which at which time is quite another - and more complex - task.

Levinson goes on to outline in great detail both the grammatical and interactional motivations for these categories, but for the purposes of this section, we will look instead at some problematic aspects of the process and attribution of roles.

Levinson's Problematic Aspects

Source Problems

Levinson's example source problem is taken from a case of spirit possession in Tamilnadu. As we have already seen from Hank's Shaman example, the assignment of roles in these cases can be very problematic, and we will not re-cover this ground here.

Reception Problems

1) 'Out-louds' - comments for which there does not seem to be a clear addressee (cf. Heath & Luff, section 2.4 on page 56)

E.g. "I don't believe this," when something untoward happens. (Arguably there are recipients but are they intended recipients or casual ones, i.e. the recipients could be classed as overhearers)

2) Indirect targets - said to one, meant for another

E.g. "I like to put in extra hours," said to colleague in presence of supervisor.

3) Future-oriented utterance events

E.g. "last one to leave the room switch off the light," implies that a person may turn off the light upon exiting the room, but that person may not actually be in the room yet. Thus it presupposes a future utterance event.

4) Lectures or military commands - multiple or undefined people for an utterance

E.g. a military command can be spoken on behalf of the person and also on behalf of the chain of command. Another example may occur in lectures or addresses where either the

entire audience or a subset of it is the addressee or intended recipient.

5) Participation through medium of communication, TV, radio etc

E.g. a television interview, the intended addressee may be the interviewer and the broadcast audience the recipient.

These examples highlight the difficulty of analysing role assignment, as there are probably other more complex examples for which even more intricate and new participant roles need to be considered (as seen in the descriptive accounts). However, Levinson is not interested in how participant roles are assigned, rather he focuses on what kinds of categories are required to capture such assignments.

Indeed, studies on the applicability of Levinson's framework for electronic rather than face-to-face interaction (Pemberton, 1996) show two things. Firstly, that the types of interaction possible electronically can provide new participant roles; in Pemberton's study it was the reception roles in e-mail that showed a marked difference to face-to-face.

Utterance-event and Speech-event

Finally, Levinson argues that Goffman fails to make clear the distinction between the utterance-event and speech-event application of these terms. Goffman he suggests, is saying that his categories only apply in one activity; conversation. Other activities such as 'podium talk' would require different categories, for example 'actor' *versus* 'audience'. That, Levinson notes, would make each set of categories activity-specific and culturally relative, thus making it difficult to use them in comparing studies of speaking.

Summary

Levinson's methodology is a formal one, aiming to produce a grammar of participant roles from which more complex roles and rules can be produced; in other words, he is aiming to produce a rule set. His approach is to survey the interactional and grammatical evidence for participant roles. In other words, his idea is that it is possible to index aspects of social structure (such as possible forms of participation) by looking at the range of distinctions

made in language(s) with regard to that structure.

Levinson's perspective has come from a desire to find examples of formal linguistic distinctions and of particular language use reflecting those distinctions. This could strengthen the case for the participant roles that are supported by such grammatical evidence. Levinson's idea therefore is to derive a useful and universal set of personal categories to replace the dyadic model and the use of the terms 'speaker' and 'hearer'. He has tried to achieve this by breaking down these roles into some of their defining features and then rebuilding a group of possible roles from these features. By creating basic and derived categories, Levinson attempts to integrate linguistic and grammatical evidence across a range of languages and cultures.

Participation and Mutual Obligation

Following the analyses of Goffman and Levinson, we come to a more focussed view of participation, one that deals not only with the participants themselves but also attempts to formulate the relationship *between* participants. Clark (1996) presents a theory of language use in action, with reference to speech-act theory and theories of social interaction (as we have already seen with Goffman and Levinson). The central aspect of this work is that "language use is really a form of joint action" (ibid. p.3) i.e. the coordination of the content and process by which an activity is carried forward. The source of this coordination is *common ground*, a shared set of knowledge and beliefs that the participants use to affect the understanding of what a speaker means and what a hearer understands.

An example of the use of Clark's theory of joint action is in the study of air traffic control (ATC) (Fairburn, Wright and Fields, 1999). Fairburn et al. use Clark's notion of joint action to show how problems in ATC can be attributed to coordination, and also subjected to coordinated repair if required. For the purposes of this section however, we will focus on the use of Clark's configuration of participants and overhearing.

The data for the study comes from a section where controllers of a sector of airspace, route an airliner (aircraft 1) through the sector before being handed over to Tower Control for landing. The controller notices that aircraft 1's route has diverted from the intended one; in other words he suspects aircraft 1 of taking a short cut. He confirms this supposition

with the captain of aircraft 1, who confirms that was his intention. The controller reminds aircraft 1 of the standard approach and aircraft one accepts this heading change and returns to the normal approach.

Following this successful repair of their 'joint project', a second airliner (aircraft 2) contacts the controller to query the route, after having overheard the previous exchange between the controller and aircraft 1. The controller reassures aircraft 2 of the correct approach, which satisfies the air-crew's query.

Fairburn et al. note that aircraft 2 could be considered a side-participant; i.e. having a responsibility towards understanding each utterance, rather than an overhearer who has no rights or responsibilities to the current exchange.

Due to the broadcast nature of the radio system in use, the common ground shared between the controller and aircraft 1 is also shared with aircraft 2. Therefore, as a side-participant, aircraft 2 was able to hear the repair to the routing of aircraft 1 and subsequently initiate its own repair to its 'joint project' of flying though the controller's air space.

The author's comment that Clark's notions of joint action and participatory status have been useful descriptive tools. Of specific interest were the ways in which overhearing and transitions in participatory status play a part during repair sequences, especially important in air traffic control work.

The rest of this section will focus on two main points. Firstly, Clark's exposition of participants in interaction, and secondly his notion of 'layers' as a way of dealing with some more complex participant roles.

Figure 2.5 shows Clark's levels of participation, moving from the main interlocutors (the speaker and addressee) to a side-participant, then to a bystander and finally an unknown eavesdropper. A side participant is described as a 'ratified participant' (Goffman, 1976) i.e. a participant recognised by both addressee and speaker as a full member of the conversation. A bystander is not a ratified participant, but the speaker is aware that he or she can overhear. An eavesdropper is an overhearer that the speaker is unaware of. The speaker's obligation towards the addressee is one of monitoring their understanding; looking for evidence of trouble and then offering repair. The addressee has similar obligations, i.e. to try to understand and signal problems. However, the speaker's obligation towards the

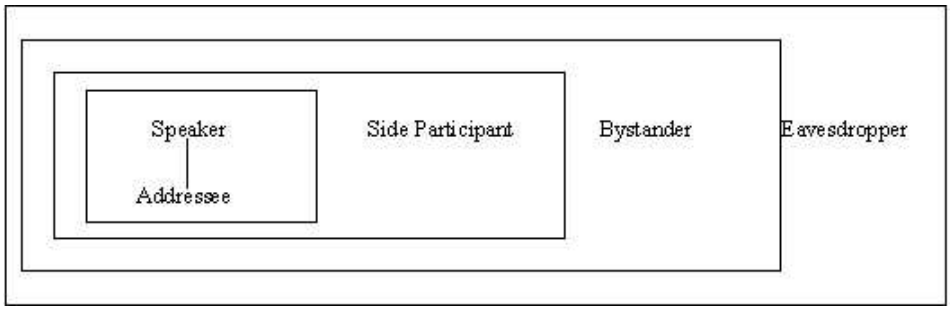

Figure 2.5: Clark's Model of Participants

side participant is weaker, in that although they must understand in order to join the conversation at a later stage, their obligations and rights are less than those of the addressee. A speaker's obligation to a bystander is further reduced, with speakers having no obligations to an eavesdropper, as by definition they are oblivious to their listening in to the conversation. Therefore, like Goffman, Clark concludes that side-participants and overhearers influence how speakers and addressees act towards each other.

Clark's definition of a bystander requires more attention. Clark defines the 'bystander' category as a non-ratified participant (as compared to a ratified participant, i.e. someone recognised by both speaker and addressee as a full member of the interaction). Also, a speaker's obligation towards a bystander is much less than say towards a side-participant or an addressee. What is interesting to discuss with regard to bystanders is the paradox that they can be a participant of sorts yet not participate; a sort of non-participating participant. Now this obviously depends upon one's definition of a 'participant' and Hanks defines one thus:

> "A participant must be capable of engaging in interaction, at whatever level. This implies the capacity for oriented focus of attention, and usually implies the ability to reciprocate address with a communicative address of some kind. In the clearest cases, a participant is the unmediated object of attention of at least one other participant, at least intermittently. It is probably best to restrict participant roles to actors of whom at least one participant is aware" (Hanks, 1996, p.177).

By Hanks's definition, Clark's bystander is indeed a participant (although non-ratified). They are capable of interaction, can reciprocate when required and one of the other participants is aware them through whatever means. So although a bystander may not speak, because they can overhear, the speaker must take them into consideration when formulating his or her utterance.

'Layers'

Having described a basic set of participant roles, Clark proposes the notion of 'layers' to deal with more complex assignments. Layers are a means of distinguishing between actual people doing actual things (layer 1) and other hypothetical roles (layer 2) that are built on top. For example, a person telling a joke to a friend would have two layers, the first layer being the actual people telling the joke (who exist in space and are real), and the second layer being the subjects mentioned in the joke itself (who do not exist in reality). Other participant roles such as actor, spokesperson and the like would each need varying layers to adequately describe their relative positions to one another. We will subsequently discuss an example of layers in section 2.4.1.

Summary

Clark's analysis is more explanatory than either Goffman's or Levinson's in that he offers some formal explanation as to how participants relate to one another. He does this by providing not only the decomposition of roles, but more importantly a relationship between participants based upon their mutual obligations and understanding.

2.4 Experimental Studies

The previous sections detailed varying models of participation, with the intention of highlighting the type and mode of analysis that the authors were providing. This section is intended to show how some of those models have been used in experimental studies of participation in interaction. The experimental nature of these studies also introduces how each model or approach has relevance to technology and the constraints that technology places

upon participation.

2.4.1 Overhearing and Video-Mediated Communication

Monk (1999) describes why participatory status is an important conversational resource. The research carried out by Monk has shown the importance and value of overhearing. This value is derived from participants receiving communicative benefit from overhearing the communication of primary participants. This communication also embodies the monitoring of other people's behaviour. Monk quotes Hutchins (1994) and his work on distributed cognition. Hutchins argues that the resources available to individuals in a team include their utterances as well as things such as instruments, displays and documents. In other words, speech is just another external representation. This is an important point in that it shows the central role that communication plays in work and that it is a vital and fluid resource.

The Importance of Overhearing

An example of overhearing is provided by Heath and Luff (1996), where operators working for London Underground line control monitor each other's behaviour and communication. For example, the announcer was seen to make an announcement to the public regarding a delay after overhearing another controller's conversation with a train driver. There had been no direct communication between the two operators. Similarly, Watts and Monk (1999) identify the importance of overhearing in a tele-medicine consultation. Here a consultant gives a remote consultation to a young girl in the presence of her GP, with her mother and a nurse being peripheral participants. Initially the consultant talks to the patient on a telephone, and then switches to a hands free connection. On this change, the consultant realises that the others can hear and therefore reiterates that the patient had said she had been eating well. On overhearing this, the mother contests her daughter's assertion, saying she doesn't eat at all well. The consultant, upon hearing this new information, revises his diagnosis.

Monk utilises Clark's theory of language to illustrate the possibility of predicting the effects

of technology on participatory status.

Linking Participatory Status and Conversational Status

In order to link together participatory status with Clark's conversational levels, Monk operationalises participation in terms of the length of time each participant, whoever they may be, has a particular conversational status. For example, consider a primary participant in some work. It is natural to expect them to be speaker, addressee or side participant for equal proportions during that interaction. In contrast, should the participant be more peripheral, then he/she would be mostly side participant, bystander or eavesdropper. This allows Monk to consider degrees of peripherality. Note however that Monk distinguishes between participatory status and Clark's conversational status. He claims that participatory status has a much larger granularity and could be thought of at the level of the work task. In contrast, conversational status could be thought of at a moment to moment level of an utterance. So although an utterance may only take a few seconds, a work task may take minutes or hours. From this observation it is clear that a participant's conversational status is going to change much more rapidly than their participatory status for a given period. A participant, whilst performing a specific task, may have changed conversational status many times, from speaker, to addressee to side participant, but at the same time always held primary or peripheral participatory status.

Monk proposes that there are 'degrees of peripherality', as illustrated in the figure 2.6.

He argues that systems need to be designed to facilitate mobility of participatory status, and cites the example of the mother in the tele-medicine consultation mentioned earlier. The mother was able to change her participatory status from peripheral to primary in order to make a valid addition to the interaction. If the design of the system had prevented or hindered this mobility, then the interaction would have been less productive. Mobility of participatory status, Monk claims, allows for "more effective co-ordination and communication". Of course it could also be argued that mobility of status might be undesirable in certain circumstances, e.g. to prevent constant interruption, or giving control over who can move from peripheral to primary status could be exploited, for example by keeping certain participants peripheral at convenient times and keeping others primary for more of the time.

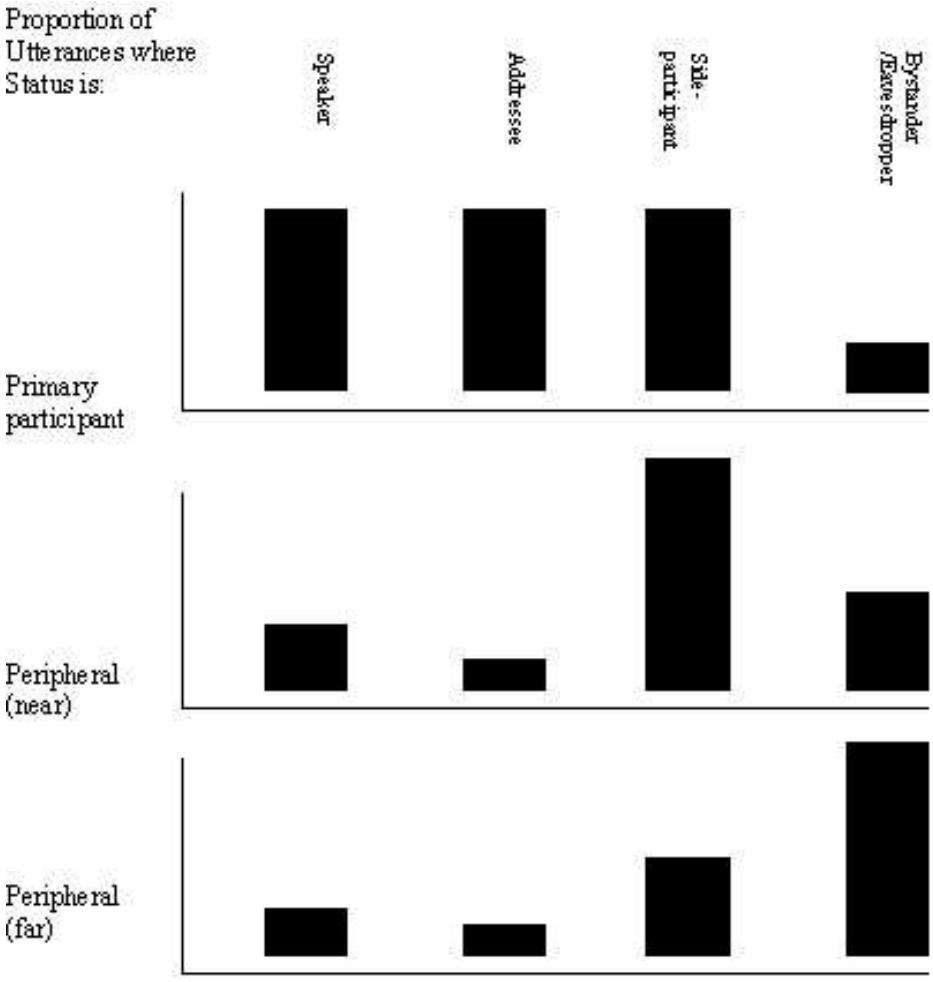

Figure 2.6: Schematic Illustration of the Relationship between Participatory Status and Conversational Status

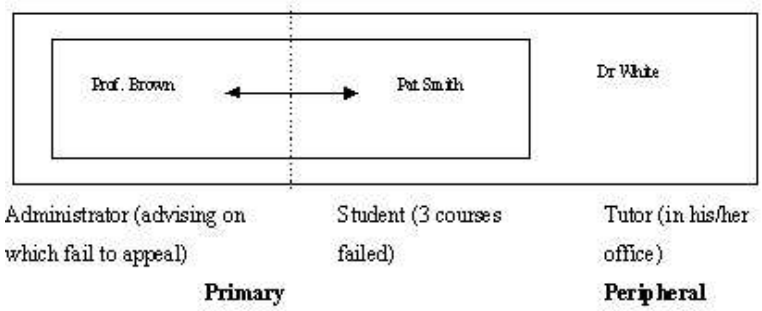

Figure 2.7: Experimental Outline for Peripheral and Primary Participants.

Clark's Levels of Joint Action

Monk goes on to describe in detail how Clark's levels of joint action could be used to model the effects of manipulating the available communication facilities on the degree of peripherality experienced by a particular peripheral participant. He proposes that it is possible to predict how a subtle change in the communication technology, for example making someone visible or hearable, should change the degree of peripherality of a particular peripheral participant. This manipulation is described in more detail below.

Video-Mediated Communication

Subsequent research by Monk and Watts (2000) involved two experiments to consider the effects of manipulating the participatory status of subjects in a role-playing task. Its aim was to show that not only was it possible to operationalise the differences between primary and peripheral participants, it also displayed the effects on remote primary participants' awareness of the peripheral participant.

The Experiments

Figure 2.7 sets the scene for the experiments in which groups of students were asked to act in role-playing scenarios. (Note: the dashed line indicates that the administrator was in a different room to the other two roles.) Communication between the participants was

Role	**Status**	**Can See**	**Can Hear**
Admin,Primary	Student, *Tutor*	Student	
Student	Primary	Admin, Tutor	Admin, Tutor
Tutor	Peripheral	*Admin*, Student	Admin, Student

Figure 2.8: Participatory Relationship of Experiment

achieved through an audio-video link. The scenario consisted of a student discussing his or her case with a remote primary participant, the administrator, with a peripheral tutor in the same room as the student. In experiment one, the groups were divided into two, a high visibility group and a low visibility group, as shown in the figure 2.8.[1]

In this experiment the participants were first briefed regarding the task they were to perform, then introduced to the other participants and the agenda laid out, then a discussion took place between the participants as per the briefing and finally there was a post-session rating and recall test.

Their results showed that the two main participants are highly aware of each other, but much less aware of another person who was legitimately present but unable to join the conversation. Recorded levels of gaze direction provided supporting evidence. Also shown was the fact that the peripheral participant is also highly aware of the main participants and that he or she can still recall much of the interaction to the same level as the primary participants. (For Clark this might indicate that they were 'really' primary). Added to this was the fact that being a primary participant was shown to be more important than actually being in the same location or room. As such, the authors claim this experiment successfully operationalised the distinction between primary and peripheral participation.

In a subsequent experiment the visibility of the peripheral participant was manipulated so that the primary participant over the video-link was not able to see them. This was done in order to test Clark's theory of language use, in that a speaker has weaker obligations towards peripheral participants than to primary participants. By looking at factors such as ratings of interpersonal awareness, their recollection of the interaction and records of attempts by

[1] The italics depict the low visibility condition in which the tutor was not visible to the administrator nor the administrator to the student.

peripheral participants to join the interaction, it is possible to see how manipulating the visibility of the peripheral participant affected the ratings of interpersonal awareness. This was shown to have an effect on the remote primary participant's interpersonal awareness of the peripheral participant.

Monk and Watts have shown how manipulating certain constraints under certain circumstances has a subtle effect on the ability of the participants (whatever their status may be), to perform a particular set of tasks. Although these effects cannot be generalised for all design issues, it does display how particular task demands combined with certain constraints can affect how participants communicate. Which participants can hear others, can see others, face others and how they are physically located all have an effect. As the authors say,

> "All-in-all, the technology-centered viewpoint, that supporting effective communication is simply a matter of providing sufficient bandwidth or 'quality of service', is a most misleading simplification" (Monk and Watts, 2000, p.956).

2.4.2 Grounding Experiments

We have seen previously how the work of Goffman and Levinson outlined the importance of the participant roles inside an interaction, and reviewed approaches to assigning structures to these roles in many forms. The process of understanding between some of these participants also interacts with participatory status. This is illustrated by experimental studies of Schober and Clark (1989).

Clark (1996) points out that speakers must pay close attention to the distinctions between participants in formulating what they are saying, for example distinguishing between addressees and side participants, yet at the same time making sure the side participants understand that they are directing their contribution towards the addressee. Therefore, side participants and overhearers affect how speakers formulate their utterances and how they act towards one another. In addition, addressees and overhearers go about the process of listening and understanding by different means, and Schober and Clark revealed some of

these differences. (For a look at how understanding is affected by *multiple* hearers, see Novick, Walton and Ward (1996).)

Schober and Clark noted that addressees can actively collaborate with the speaker, whereas overhearers cannot. They furthered that speakers compose their utterances to their addressees on the basis of their common ground, including, amongst other things, experience, culture and dialect. This gives addressees an advantage over overhearers in the process of understanding.

Schober and Clark used experiments involving arranging complex figures as a means of distinguishing what kinds of contribution people could make, according to their participatory status and the impact of differences in participatory status on understanding. Their first experiment used ten pairs of students who were assigned different roles, the director who gave instructions and the matcher who had the task of arranging the Tangram figures as directed. Each pair repeated this trial six times. The second part of the experiment involved playing back recordings of the first part to forty overhearers who had to arrange the figures just as the matchers had done previously. Half of the overhearers also had the ability to stop and rewind the tape, as they deemed necessary, with the principle measures of understanding being accuracy and time of placement of the correct figure. In a second experiment, a video camera recorded the interaction, with the overhearers listening to the conversations live. This was done to overcome two problems of the first experiment, difficulties in listening to a taped recording and providing more accurate data regarding the timing of the placement of cards.

Results

Overall they found:

1) Overhearers who did not witness the build-up of common ground between the main participants understood fewer references than the participants themselves.

2) This fact did not change when overhearers *did* witness the build-up

3) Controlling the pace of the conversation through pausing the tape did not help this process.

4) Social process of interacting in conversation plays a central role in the cognitive role of

understanding, therefore listener's understanding is different from overhearer's. Addressees, therefore, understand faster and more accurately.

5) The grounding process is not available to overhearers, i.e. they can only reach the belief that they have understood as well as they could, *not* as well as he or she wants. They also have to carry out repairs by conjecture, not by speech.

6) Understanding is only guaranteed for listeners who actively participate in establishing perspectives through grounding.

7) Wherever grounding occurs, addressees have an advantage over overhearers.

8) Overhearers' perspective is what is given to them, *not* what they might need.

In addition, being able to listen to the conversation live did not help the overhearers in the experiment, and this offers evidence against the autonomous view of understanding in conversation[2]. It was also claimed that the matchers collaborated actively, therefore doing more than the autonomous actions to make sure what is said is also understood. Collaboration takes more processes and can therefore require extra steps in conversation. Therefore they conclude that the process of understanding is very different for addressees and overhearers.

Summary of Experimental Studies

Monk and Watts propose that their findings have implications for the configuration of an audio-visual link in terms of the nature of the task, the number of participants and their visual accessibility. Schober and Clark have shown that the process of understanding is different for addressees and overhearers in relation to the ability to collaborate, the criteria for understanding and the relative perspectives of the participants.

2.5 Discussion

The introduction to this chapter set out two questions. Firstly, exactly what types of analysis are previous accounts providing? Secondly, how much have these analyses incorporated

[2]In other words, listeners can understand on their own without having to rely on practices such as grounding.

constraints associated with face-to-face interaction?

2.5.1 Types of Analysis

Goffman's analysis recognises the complexities of interaction, and provides an initial framework to explain the relationship between varying participant roles and an utterance. His analysis subsumes (and pre-dates) Hanks's and Irvine's work in that he acknowledges the importance of social 'space' and the historical thread within participation structures. However, in contrast to Hanks and Irvine, he does proceed to present a more detailed model with the notion of a 'participation framework' and 'production format'.

Levinson's analysis aims to derive participant roles from linguistic evidence; in other words the 'linguistically instantiated' distinctions in levels of participation. This abstracts away from the details of mode and location and looks instead for abstract universal categories of participation.

Clark's analysis attempts to analyse the relationship *between* participants, and in doing so, offers a way of modelling participant inter-relationship. His participatory levels are more simplified than Goffman's and much more simplified than Levinson's. However, Clark's intention is not to decompose participant roles into a finite number. Rather, Clark is interested in outlining the communicative obligations with regard to conversation that these participants have towards one another. So for example a speaker's responsibility towards an addressee is much higher than towards a side-participant or bystander. So, in effect, Clark is characterising mechanisms that are reflected in participatory status distinctions, as opposed to defining roles. In contrast, Goffman and Levinson do not directly consider the relationship between participants. Table 2.8 below provides a comparative summary.

Author	Subjects	Relationship
Goffman	All Participants	To Utterance
Levinson	All Participants	Language-based Distinctions
Clark	All-Co-Located Participants	To Each Other

Table 2.8: Comparison of Analyses

2.5.2 Incorporation of Face-to-Face Constraints

In order to highlight how these approaches have incorporated (either implicitly or explicitly) some of the constraints of face-to-face interaction, we present a comparison between them with regard to their ability to capture some of the participatory phenomena highlighted by the descriptive accounts. The phenomena we will compare are role assignment and referencing of present and non-present participants.

Goffman

In order to provide a comparative example for the problem of role assignment, we return to Hanks's Shaman. From Goffman's exposition, we can suggest that the Shaman would have a role from the 'production format' that Goffman uses to replace the dyadic notion of 'speaker'. Production format has three components, animator, author and principal. The Shaman, according to Hanks, sometimes utters his own words and sometimes those of the spirits. Thus, according to Goffman he is both 'animator' and 'author'. The Shaman's position is also established by the words he speaks, so he therefore has the component of 'principal' as well. As such, Goffman's production format seems to capture all of the Shaman's participant roles.

Our second phenomenon deals with the referring of present and non-present participants (Goodwin, 1993) and involves the use of alternative ways of referencing participants in relation to argumentative sequences. In these cases, the 'offender' is never the speaker, is always present in boys' stories and absent in girls' stories. Added to this is the fact that at least one of the characters in the story is a present participant. For Goffman, the 'offender' (present in the case of boys) would be a non-ratified participant i.e. a bystander or overhearer, and as such physically present. In the case of girls, the 'offender' (not present) has no role according to his decomposition of hearer, but could possibly be captured through his notion of embedding, i.e. the reported speech of others.

Limitations of Goffman's Model

From the phenomena above, we can see that Goffman's role set is limited to those participants who are co-present and his analysis has been framed by the physical constraints of

face-to-face interactions, which include both visual contact and co-presence. For example, he defines non-ratified participants as being in "the visual and aural range of the primary participants" (Goffman 1981, p.132). He also, in criticising the emphasis on sound that the terms speaker and hearer imply, states, "It is obvious that sight is organizationally very significant too, sometimes even touch" (ibid, p.129), and that "for the effective conduct of talk, speaker and hearer had best be in a position to watch each other" (ibid, p.130). In relation to accessibility to an interaction, Goffman suggests that "both its participants and its bystanders will rely heavily on sight, not sound, providing another reason why our initial two party paradigm is inadequate" (ibid, p.132).

Goffman makes many references to the visual nature of turn-taking in his exposition, discussing the "visual attention" paid to the addressee, the "encompassing of all a speaker's hearers in his glance" and that "this structurally important distinction between official recipients is often accomplished exclusively through visual cues, although vocatives are available for managing it through audible ones" (ibid, p.133).

A further example is in Goffman's comments regarding the structure and composition of a 'talk', i.e. the sum of interaction between the moment when two or more individuals begin dealing with one another, until such time as this activity is closed. Goffman frames the openings of such encounters in physical, spatial terms:

> "The opening will typically be marked by the participants turning from their several disjointed orientations, moving together and bodily addressing one another; the closing by their departing in some physical way from the prior immediacy of co-presence" (ibid, p.130).

In terms of categorisations, Goffman's distinctions comprise a relatively small set of roles that have face-to-face connotations in terms of their linguistic roots, e.g. 'bystander' and 'eavesdropper' ('beneath the place where the eaves drip') and have also been described in spatial terms.

Levinson

Applying the Shaman example once more, Levinson's 'production categorisation' could concurrently assign the roles of author, 'ghostee' and spokesman. (As previously noted, Levin-

son is not interested in how participant roles are assigned, rather in what categories are required to capture such assignments). These are much akin to Goffman's, the only difference being between 'principal' and 'ghostee'. As such, Levinson's categorisations capture the Shaman's role much in the same way as Goffman. Hanks himself critiques Goffman and Levinson's approach and proposes that you can have fewer role categories if you describe how they interact with each other and relate to the social context:

> "By attempting to analyze participant roles from a purely synchronous perspective and using only the methods developed by Goffman and Levinson, we risk producing a description that is involuted in terms of categories and empty in terms of sociohistorical content." (Hanks, 1996, p.174).

For Levinson, the 'offender' (present in the case of boys) would be perhaps a 'targetted overhearer' and in the case of girls, the 'offender' (not present) might be characterised as the 'ultimate source'.

Limitations of Levinson's Model

Although Levinson's distinctions are more generalisable, it could be argued that his model is based on an analysis of linguistic devices that evolved to deal with face-to-face interaction. He himself states when discussing the interactional motivations for the categories that,

> "I shall attempt to illustrate the general scope and importance of participant role assignment to the analysis of verbal interaction..." (Levinson 1988, p.192)

and in concluding he notes that,

> "having the proper distinctions between different kinds of participant role is essential to the ethnography of speaking and the comparative description of speech events" (ibid, p.222).

Along with his focus on verbal interactions, is the co-present based evidence he brings to bear on participant roles including gaze (ibid, p.180), physical position and orientation (ibid, p.178) and the fact that all of the transcripts he uses as evidence are from verbal exchanges. As such, his distinctions may not be as applicable to media, where participants cannot use

an auditory channel. Evidence for this comes from Pemberton (1996) involving the analysis of Levinson's categorisations with regard to e-mail exchanges. Pemberton notes that with regard to production roles in e-mail:

> "It is clear that the production roles which are useful in an analysis of speech events fit less naturally into a description of paper-based, written communication and even less naturally when communication is electronically mediated. The sources of the 'bad fit' are to be found in the concepts of transmission and presence, which are problematic in the electronic context" (ibid, p.160).

In other words, examples such as a person sending an e-mail message from a colleague's machine, and therefore having the attribute of 'transmission' (and as such become a participant according to Levinson). Yet this leaves the role of the owner of the machine unclarified, as the message has their name affixed. As such, Pemberton claims there appears to be a need for a finer analysis of some roles (suggesting distinguishing actual and apparent transmitter in this case) into Levinson's matrix.
With regard to reception roles, Pemberton concludes that:

> "Other aspects of the feature matrix need to be re-defined if it is to deal with reception roles in e-mail. The overwhelming need is for a finer set of distinctions within the addressee category, to account for the effects demonstrated by the use of cc and bcc mechanisms" (ibid, p.160).

Pemberton notes that by manipulating the technological possibilities, users can distribute the addressee role across multiple recipients, categorising them as either direct addressees, acknowledged receivers of copies or un-acknowledged receivers of copies.
In summary, we have argued that Levinson's analysis is based upon the evidence from verbal exchanges (and no examples are clearly from non face-to-face settings). His distinctions, although less etymologically rooted in spatial terms than either Goffman's or Clark's, clearly present problems when applied to electronic contexts.

Clark

In contrast to Goffman and Levinson, Clark's participant set would only have the role of 'speaker' to assign to the Shaman. The important point in relation to role assignment is its possible complexity and varying views on how far the decomposition of the dyadic notion of speaker and hearer should extend. For each of the explanatory accounts, they all 'capture' the Shaman's role, but do so in three conflicting ways.

In contrast to the diverse ways of 'capturing' the Shaman's status, Hanks, Goffman and Clark propose unique solutions to account for this complexity. Hanks and Goffman discuss the notion of 'embedding' as a way of simplifying complex role assignment, and for Clark it is through the comparable notion of 'layers'. So for Goffman, the Shaman would be embedding by not conveying his own words and thus involve a change in footing. For Clark, the Shaman's roles could be captured by three layers. Hanks describes how the Shaman is:

1. Not a speaker in the true sense, as he is only repeating what was taught to him by his previous Shaman teacher and what he has learnt throughout his religious life.

2. Neither is he an 'animator' of his teachings, as he has reworked them into his own style and character over his lifetime.

3. Some of the spirits he is summoning (therefore addressees by normal conventions) are also the authors and targets (i.e. intended recipients) of some or most of the words he is going to speak.

Therefore we could envisage:

- Layer 1. The Shaman himself, the patient and the audience, in Yucatan, conducting an exorcism.

- Layer 2. The Shaman targeting the spirits in his own words what he was taught by his teacher from the spirits.

- Layer 3. The spirits receive the Shaman's version of the words they taught the Shaman's teacher.

So the end product is not a single assignment of a participatory role that Hanks proposes would be "involuted in terms of categories and empty in terms of social-historical content".

Rather, we see a sketch of the activity taking place that has some, at least, social and historical references. Therefore, although his primary participant set would limit the Shaman to the role of 'speaker', Clark's notion of 'layers' attempts to specify a way in which complex role assignments can be adequately expressed, regardless of place or time. However, how such a mechanism might be operationalised in other media is not clear.

In terms of the second phenomenon, for Clark, the 'offender' (present in the case of boys) would be a bystander, and in the case of girls, the 'offender' (not present) would have no status. As such, it is once more co-presence that influences whether a person is a participant or not.

Limitations of Clark's Model

Unlike Levinson, Clark has used 'Goffmanesque' terminology for his categorisations, such as side-participant and bystander[3], that as we have already noted, have underlying spatial connotations.

With regard to his primary role set, Clark states that,

> "The roles we have met so far, from speaker to eavesdropper, may each enter into a primary setting with *a single place, time and set of participants.*" (my italics)(Clark, 1996, p.15)

His primary categorisations (fig 2.5) therefore, to some extent rely on the co-present, temporal constraints of face-to-face. It is only through the notion of 'layers' that non-present, non-temporal roles are introduced, e.g. author, translator etc, and for these there is no clear explanation of an inter-participant relationship such as 'grounding'.

Clark notes that the basic setting for language use is face-to-face conversation, and any extra domain, or layer of activity, will be specified with a possible distinct set of participants in their separate time and place.

Furthermore, Clark's primary categorisations incorporate the assumption that participatory statuses are symmetric. Figure 2.5 implies that if someone is a side-participant to a speaker, they will automatically (and always be) the same side-participant to an addressee.

[3]Something that Levinson seems to avoid

An example of a non-symmetrical relationship would be where a speaker is aware of a side-participant by say, looking over the shoulder of an addressee, but that addressee is not aware of the side-participant's presence. To a certain extent, his model imports constraints that apply to face-to-face but not necessarily to other modalities. However, not all of Clark's model depends on co-presence. His discussion on the monitoring of understanding between participants is equally applicable in other settings.

Unaddressed Participatory Phenomena

Apart from the limitations of existing models discussed above, there are also other possible participatory phenomena that these models have not addressed. 'Mobility' of participatory status allows an individual to adjust their level of involvement in an interaction according to their, and their partner's, purposes. 'Mobility' of status can happen rapidly, even in short interactions. A number of questions arise in this respect. For example, in exactly what ways can a participant move from, say, being a side-participant to being an addressee? What cues do the participants use to assess levels of participation? What signals are used to propose, and agree, changes in level of participation? How are conflicts about participatory status managed? Even in face-to-face interaction, little is known of the dynamics of how and under what conditions changes in participation are actually achieved. Although we do not intend to address these specific questions in this thesis, we will be looking at the *effects* of movement between statuses.

Secondly, the management of levels of participation in multiple interactions also needs to be addressed. Precisely because they have the potential to break down spatial and temporal constraints, we can ask; Do digital technologies create communication spaces in which people can engage in multiple, interleaved interactions? In addition to the problems associated with managing interruptions and topic changes, this raises questions about the extent to which people can manage simultaneous, distinct, levels of participation.

And thirdly, the need for new ways to define ratification, perhaps, as Pemberton suggests, through acknowledgment instead of presence and a finer distinction of reception roles. The point here is that both categorisations and participant relationships in models that incorporate face-to-face constraints may not be well suited to interactions where such constraints

do not apply.

2.6 Conclusions

In conclusion, it has been argued that the types of representation of participant structure employed in existing work have incorporated to some extent the constraints of face-to-face interaction and have left some participatory phenomena unaddressed. A more sophisticated model will be required to analyse the types of large scale, multi-modal, social interactions that are possible in technologies such as TBVEs. A model that is both free of face-to-face constraints and able to express any new forms of participatory phenomena will give designers the flexibility to see how their designs will affect important communicative functions of users' interactions. In order to move towards such a model, the next stage is to gain a clearer understanding of how different technologies create different opportunities for participation.

Chapter 3

Participation in Mediated Communication

3.1 Introduction

The previous chapter identified the limitations of not only the dyadic model but also of some more recent theoretical models of participation. This chapter will focus on how participation has been explicitly or implicitly conceptualised in some example electronic media. Participatory status isn't something that designers of communications technologies have explicitly considered in most cases, but their designs inevitably incorporate a stance towards it. For example, the telephone was initially designed to be used by two persons, speaker and addressee. Its technological and design limitation made it difficult for more than one person to use the same handset concurrently. Today however, we have answering machines, speakerphones and conference calls. The point is that the development of technologies creates new opportunities for interaction, not only with respect to face-to-face but also within each technology's own developmental history. New types of interaction also bring opportunities for new forms of participation, and it is on this that we will be focussing.

3.2 Participation Structures

Empirical analyses of participation have generally been limited to synchronous face-to-face interactions (for example exceptions, see section 2.4 on page 55). However, the scope of participation phenomena has been increased by the addition of varieties of more loosely-coupled types of interactions found in computer-mediated communication systems. Therefore, this chapter is intended to compare and contrast the concepts of participation embodied, either implicitly or explicitly, in examples of such systems. This process entails the addressing of the following questions. Firstly, what are the technological limitations (or the implicit effects) of a technology on participation? Secondly, what are the design limitations? And finally, how do technologies deviate from some of the face-to-face constraints outlined in chapter two?

Three example media are reviewed, namely: VMC (video-mediated communication), VR (virtual reality, for this chapter we focus on avatar-based VR systems) and finally text-based systems, which include examples of MUDs (Multiple User Dungeon, or also known as a TBVE (Text-Based Virtual Environment)) and Instant Messaging (IM) studies. These media have been chosen for two reasons. Firstly, they represent a set of example media across the target audiences of CMC, CSCW and C&T. As such they are relevant to the practitioners within these domains, and provide an opportunity to look at these media from a participation perspective. Secondly, they contrast different interactional cues and their usage of 'space'. For example, VMC supports visual and aural interactional cues and links real spaces, VR offers graphical cues and presents a 'virtual space' and text-based systems offer linguistic cues and, in the case of a TBVE, present a spatial metaphor. IM offers no notion of space. As such, they offer an opportunity to contrast different design approaches that aim to support participation, either explicitly or implicitly.[1]

To begin with, a brief history of their development is presented in order to highlight the motivation for their creation and also to describe the main contributions to each type of system. This is followed by a look at the types of space that such systems either configure between or present to users. Then sections highlighting some technological and design

[1] Other domain based studies that deal with more specific contexts are not covered here. For examples, see Pycock & Bowers, 1996 (fashion industry) and Martin, Bowers & Wastell, 1997 (ambulance control).

constraints and deviations from face-to-face constraints are presented. Finally, we discuss the opportunities that these technologies provide for new forms of participation.

3.3 History and Development

Video-mediated communication (VMC) was initially developed in the mid-sixties in order to support remote collaboration (see Falk, 1973), and subsequent generations of systems support and technology have led to desktop conferencing (audio and video connections between desktop PCs) using both analog and digital technology. With the increase in available network bandwidth and improved compression standards, producers of video technology are pushing it into every desktop machine. VMC technology has developed from AT&T's Picturephone in 1956, through to technologies such as CU-SeeMe and NetMeeting in the 1990s, to the emergance of 3G video cell phones in 2003. The cost of VMC systems has also dropped dramatically in the last twenty years. For example, in 1982, Compression Labs were selling $250,000 systems with $1,000-an-hour connection lines. Today, with the availability of affordable desktop camera systems and ease of access to the Internet, VMC has become available to increasing numbers of people.

The concept of virtual reality (VR) is of an electronic 'world', built and maintained by computer systems and networks, within which users and objects, distributed or otherwise, can 'inhabit' and interact. The notion of virtual reality was first described by Sutherland (1965) who when writing about an 'Ultimate Display' envisaged an 'illusion generated by a computer' presented to the user's senses at such a resolution that they could not tell that the projected world was not real. The actual term itself wasn't used until much later by Jaron Lanier (Lanier, 1989), designer of the EyePhone, a VR head-mounted display that gave 140 degrees of vision in a virtual reality setting. Of course not all VR systems involve complete 'immersion' into a virtual world through the use of head-mounted displays. Some environments involve the manipulation of an electronic version of the self, or 'avatar' in a virtual place displayed on a standard desktop display with input from a standard keyboard and mouse. More recently, the development of VR systems has been based mainly upon the

development and the cost of appropriate technology. For example, by the end of 1995 high specification desktop machines with enhanced graphic cards could deliver 3D performance at 10% of the cost of a similar output in 1990. Researchers, for example in the scientific community, weren't able to afford and develop VR systems until the appearance of mid-range workstations with high graphical capabilities, and the fall in cost of VR displays post-1993 due to expansion within the computer games market (Wann and Mon-Williams, 1996, p.829).

The development of VR systems has been due to many factors, one of which has been the need to display certain types of information in three dimensions instead of two. Wann et al. (1996) argue that in answering the question "why do we need VR at all?" one needs to look at the inability of the 2D interface prevalent in most Windows' driven desktop machines to support the 3D graphical needs of the scientific community. Displaying and viewing objects such as complex data sets, DNA representations, or the simulations necessary for the design of aircraft and motor vehicles, created a greater need to move within three dimensions (ibid, p.830).

Another motivating factor, along with information visualisation, has been the need to develop certain types of applications that benefit from VR, such as engineering design, aviation and medical applications. Stapleton and Costello (1997) in their survey of VR research in the UK found that 81% of VR research was done in universities, the vast majority under academic funding with the focus of work either being applications development or human/computer interaction. Again, these applications were mainly concerned with information visualisation, education and training.[2]. The survey also asked what the perceived main benefits of VR were. The answers once more centred upon better visualisation of information, applications development and the use of 'natural skills' when interfacing with the computer.

From a participation perspective, a more interesting motivation for the development of VR systems has been the increase in geographically-distributed staff in sectors of the workplace and the desire to build systems to support such work, commonly known as 'virtual organisations'. For example, DeSanctis and Monge (1998) outlined their views of such organisations on two main premises. Firstly, that technology, organisational structure and

[2]Only once was CSCW (Computer-Supported Co-operative Work) or communication mentioned

communication patterns are all closely related, and secondly, that the form of organisations and their communication systems co-evolved, meaning a "study of one requires an accounting of the other" (Koza and Lewin, 1998). Some other concrete examples include 'MASSIVE' or 'Model, Architecture and System for Spatial Interaction in Virtual Environments' (Greenhalgh & Benford, 1995), a distributed virtual reality system to support user interaction and co-operation via many media types, based on a spatial model of interaction. A similar example is 'PAVE' (Adams, Toomey and Churchill, 1999) a tool designed to support geographically-separated group members by extending a 2D graphical 'MOO' (MUD Object Oriented) to support synchronous and asynchronous interactions. A final example is 'DIVE' (Anderson, Carlsson, Hagsand and Stahl, 1993) a toolkit for building distributed VR applications in a heterogeneous network environment.

MUDs (Multiple User Dungeons/Dimensions) are examples of TBVEs (text-based virtual environments) that provide users with a platform for a variety of activities, ranging from adventure games to community activities and communication forums. They are frequently based on a spatial metaphor, and in contrast to more graphical VR systems, offer purely textual forms of interaction. MUDs normally contain some or all of the following aspects:

- All interaction takes place in text, not pictures or sounds
- The MUD is made up of 'locations' or 'rooms', and users can create their own room and visit each other or gather in 'public spaces' to talk and interact
- Users can navigate between locations by a variety of means
- Users have the option to talk with people in one of the many public rooms, hide away in one of their own private rooms, join a channel for discussion, or chat with a specific group of friends.
- Each MUD differs in theme, size (anywhere from 30 to 15,000 residents), and can have specialised features such as ranks, chat channels and mock currency.
- Users can have numerous privileges including friendlists, puppets, news and mail capability, building skills and the ability to manipulate aspects of their descriptions.

MUDs have gone through several development stages from their inception in the early seventies (Mud History, 2003). Their development began when interactive games were written for some early computers such as the DEC PDP-10 and early Apple 2 microcomputers. In 1978, Roy Trubshaw created the first MUD to support multiple users. In the late eighties, TinyMUD was developed at Carnegie Mellon University, and had a more social focus, running on a wide variety of Unix systems which boosted its popularity and growth. In the late nineties, Pavel Curtis developed a MOO (MUD, Object-Oriented) that contained a built in object-oriented language.
Currently, there are over 1900 MUDs of various types accessible on the Internet (MudConnector, 2003). New acronyms and programming approaches have spawned MUSH (Multi-User Shared Hallucination), MUSE (Multi-User Simulated Environment), DUM (Depend Upon Mud (forever)), MAGE (Multi-Actor Gaming Environment) and MUCK (Multi-User C Kernel).

In contrast to MUDs, Instant Messaging (IM) technology is a more recent development. Four people who started a company called Mirabilis, first developed IM in 1996. They realised that millions of users were connected to the Internet but were not interconnected themselves. They created a technology called ICQ (I seek you), and had 850,000 registered users within six months. Their company was acquired by AOL in 1998 for $287 million. All IM software contains four main subparts:

- Contact List Management. Users can create lists of friends or colleagues and organize them into groups, in order to manage their presence information and contact them.

- Personal communication is achieved through sending and receiving instant messages. Messages can also be sent to off-line users. Most software can save received messages (i.e. a form of conversational thread) and ICQ displays the preceding messages as communication takes place.

- Presence Management. See whether someone is online or offline, available for a chat or busy. Some software supports 'invisible' mode, i.e. appearing online only for people in their contact lists and appearing 'offline' for all others.

- User database search. Users can search through a directory to find others according to interests and profile or search by name, nickname, e-mail or other IM-specific identity.

3.4 Types of Space

Different media offer different kinds of space within which to interact, and subsequently present different opportunities in terms of type and mode of participation within them. VMC for example, offers a form of space commonly referred to as a 'hybrid space', or a compromise between physical and virtual space. A pertinent comparison of space created by VMC and VR is made by Harrison & Dourish (1996):

> "In a media space, while the 'space' (the connection between two people) is virtual, the projections are not. What I project into a media space connection is a view of me (the real me) and my office (a physical space). My actions and behaviour in my real space are visible in the media space; but in the virtual system, I act only by remotely manipulating my representation.
>
> The reason that this distinction between projection and representation works is that the media space connection reaches out to encompass everything in front of the camera. So there's more in the connection than simply the 'virtual space' of the two monitors. When two offices are linked together in a media space, then a hybrid space is created; it involves not only the virtual space of the media connection, but also the real physical space of the two offices." (ibid, p.6)

Harrison and Dourish's distinction between projection and representation has interesting participatory consequences. The view presented of the physical space determines the number of participants and type of participation available. In VR systems however, the graphical representation of space (depending on scale) offers more scope with regard to the number of participants than VMC. However, the type of participation, as we shall see, may be more limited.

In contrast to VMC and VR, TBVEs (Text-Based Virtual Environments) offer a purely textual description of space. A user is presented with a sometimes quite vivid description of their location and surroundings and any objects or other users who are 'co-present'. Users normally interact within this spatial metaphor, having locations or 'rooms' to inhabit and move between. Within this lightweight - and to an extent open-ended - form of 'space', it is possible for larger numbers of participants to be present and interact with each other. This offers more interesting possibilities for the types and modes of interaction available.

3.5 Technological Limitations

In the introduction, we gave the simple example of early telephone technology as a way of illustrating how the technological aspects of a medium affect the types of participation which they can support. The 'hardware' aspects of technologies are worthy of consideration and can be thought of as the 'foundations' with which designers are presented. In terms of participation, we can consider:
1) Number of identities - increased opportunities for multiple, distinct interactions
2) Number of possible participants to interact with
3) Awareness of other participants
4) Other participatory phenomena such as overhearing or 'lurking'.
With regard to VMC, some of the effects of the technological limitations on participation include:

- A single representation. A camera image is the same, regardless of how many pieces of software it is displayed in. It is physically impossible to maintain distinct identities within a single interaction.
- Limited number of participants. Physical constraints such as bandwidth and quality of service can affect turn-taking mechanisms, and therefore limit how many users can co-participate concurrently.
- Limited awareness. As will be discussed later, the depth of view presented to a remote

user in a video link will determine who is available for participation. For example, compare a head and shoulders view of a single person with a birds' eye view of people in an office space.

- Limited opportunities for overhearing or 'lurking'. Normally all participants in VMC systems are visible and aware of each other's presence.

The technological limitations of VR are somewhat different:

- Identity is hidden. Users cannot see the real person or hear each other's voices.
- The number of possible concurrent participants is arguably higher than in VMC, but constrained by:

  a) processing power, as graphical interfaces are resource-hungry

  b) bandwidth, with regard to quality of interaction

  c) turn-taking delays in maintaining movement and orientation towards distinct users
- Awareness of others may be affected by the location of a virtual representation in the graphical environment's 'space'.
- Again, limited opportunities for overhearing or 'lurking'. Normally all participants (or their avatar representations) in VR systems are visible and aware of each other's presence.

With regard to TBVEs,

- Again, users cannot see or hear each other and therefore have no certain knowledge of the true identity, gender or age of other users, or even in fact if multiple identities are distinct users.
- Many participants can co-connect due to the lightweight resources required and the small effect on quality of service.
- Awareness is dependant on whether other participants choose to make themselves available or not. Potentially a higher number of participants are available for interaction.

- More opportunities for overhearing and lurking with easier control over visibility.

With regard to IM, we can see that:

- Users cannot see or hear each other
- The number of possible recipients is only limited by the number of subscribers.
- Awareness is limited to those who wish to be visible to searches
- No opportunity for overhearing or lurking, as presence is announced upon joining a conversation

Even from these simple yet pertinent observations, we have highlighted how the technological limitations are greater in some media than others.

3.6 Design Limitations

Having looked at some technological limitations, we now turn our attention to some design limitations. Here we are interested in how aspects of participation have been affected in the explicit or implicit design constraints of technologies. We will look at three areas, namely:
1) Aspects of co-presence and awareness: How much do systems make a user feel part of an interaction and who can they participate with?
2) Turn-taking mechanisms: How easy is it to move between participatory statuses?
3) Conversational thread management: Ease of managing concurrent threads and statuses, e.g. being a speaker in one thread and an addressee in another.

3.6.1 Co-Presence and Awareness

In face-to-face interactions, participants have a strong feeling of co-presence and are mutually aware of each other's actions and gestures. Co-presence and awareness are important

participatory factors in that they offer not only awareness of other possible participants but also a sense of being a party to an interaction.[3]

Intuitively, VMC is supposed to reproduce the benefits of face-to-face interactions remotely. However, evidence against this proposition was provided by Boyle, Anderson and Newlands (1994), who studied interaction by comparing participants in video-mediated versus audio-only interaction. Users had a computer-based map task to complete in settings where eye-contact was possible, not possible and finally audio-only connections. They found that users used more words and turns where eye-contact was possible than in the other conditions. They also found that there were more interruptions in the video-mediated conditions, regardless of eye contact. They suggest that, for these conditions at least, VMC is less efficient and less effective than either audio-only or face-to-face communication.

Another aspect of awareness is the attentional status of a user in an interaction. Watts, Monk and Daly-Jones (1996) describe an experiment involving comparisons of an audio-only versus video in order to complete a negotiation task. The experiment was designed to measure participants' perceived sensitivity to the attentional status of their partners in the experiment. Instead of task outcome, they incorporated measures of conversational fluency and interpersonal awareness. They utilised a large, high quality image of the head and upper torso of the participants, and also provided a high quality audio link. They found that in the video condition, conversation was more fluent when there were more than two discussants. However, in dyadic settings, the audio-only condition seemed sufficient. They also found indications that the video condition provided similar ratings in terms of awareness and presence as those of co-located discussants. It appears therefore that there are contrasting benefits to VMC that are dependant upon image size, quality of audio and the criteria by which any benefits are measured.

A final example of awareness comes from studies of interaction on the London Underground (Luff & Heath, 1998). Here, underground staff who are normally located in the station

[3]This relates to the dictionary definition in chapter two of participation as being 'related to a larger whole'.

operations centre face problems of maintaining awareness of the current situation with regard to passenger numbers and trains on the varying platforms when they are mobile for some reason. As such, they have to rely on audio only communication to keep up-to-date on the current status of a situation. Luff & Heath argue that design for such mobile workers should consider these types of issues along with those within other roles such as doctors, engineers and control staff.

The notion of presence with regard to VR systems has been the subject of much debate regarding not only its definition, but also what is needed to support it once it is defined. Because presence is entwined in the nature of human experience, its definition is dependent upon the expectation and actual experience of any person using such a system (see Tromp, 1995). Wann et al. (1996) define systems that provide presence as those that display changing 3D representations in relation to the viewpoint of the user, and engagement with physical objects and their manipulation without the need for direct use of any interface. They claim such systems also give a sense of immersion.[4]

Awareness plays an important role in informing participants of who is available for interaction and at what level and mode such interaction could take place. In the 'MASSIVE' system (Greenhalgh & Benford, 1995) awareness is supported through three concepts: aura, focus and nimbus. Aura, for each object (object here can describe a person or an item) in the virtual environment, is a description of to what extent interaction is possible (through each possible medium, e.g. graphics, audio or text) expressed through a function of object position (in 'space') and other object attributes. Focus describes the observer's allocation of attention, and nimbus describes the observed object's manifestation of observability. So an object's overall awareness of another object is a combination of the observed nimbus and the observer's focus. Thus awareness, the authors claim, can be manipulated in one of three ways; either implicitly through spatial actions such as moving or turning, explicitly by selecting different degrees of focus or via 'adapter objects' such as conference tables which may constrain the communication that takes place between objects surrounding it.

If we were to map these terms onto face-to-face interactions, then aura could be considered as a person's set of participation privileges, i.e. a set of rules to determine whom, when,

[4]It should be noted, however, that there is a distinction between immersion and presence.

under what circumstances, and how another person may interact with them. Focus could be considered as the attention of a person in viewing other people for interaction, and nimbus could be thought of as the availability of others for interaction. Participation privileges are interesting in that they both control the possible flow of incoming interactions from other participants and also the person's perceived availability for interaction with others.

Presence, in relation to TBVEs, could be described as a feeling of 'being there'. Actually measuring presence, however, is a complex issue. Towell and Towell (1997) note that studies of presence focus more on immersive environments that entail users' sensory experiences, rather than the verbal descriptions within textual communication (cf. Held and Durlach, 1992, Slater and Usoh, 1993). Their study of presence in TNVEs (Text-Based, Networked Virtual Environments) involved a survey of over 200 users from 6 different user groups. They found that 69% of these users felt a sense of presence, in that they had a sense of being in the same room with others when connected to the system. Their concept of presence was of 'social presence' and in fact no-one commented on the spatial metaphor of the system as a contributory factor. 'Social presence' was defined slightly differently for certain groups, for some it was the people they were with and for others (a group of scientists) it was the topic they were discussing. Dillenbourg, Montandon and Traum (1997) also argue that the spatial metaphor of text-based virtual systems is perceived as a social concept rather than a physical or geographical concept.

An interesting example that highlights both co-presence and awareness is from Churchill and Bly (1999), who carried out a study of a purely textual environment, observing the use of a MUD within a division of a national laboratory for a period of three years. Their main finding was that social co-presence was derived from conversations around a common theme, and that maintaining collaborative relationships did not necessarily require a richer, more visually-orientated medium. A MUD differs from other textual conversational tools such as IRC and instant messaging in that it utilises a 'spatial' metaphor, with users able to join, navigate through and record interactions in electronic 'rooms' that not only contain fellow workers but also descriptions of that 'room' and also objects. MUDs are also lightweight technologically, requiring less bandwidth and simpler integration than VMC or VR systems. Let us examine some participatory issues that arise from Churchill and Bly's study and

interviews with the users of this system.

Firstly, they reported that the users felt a sense of 'co-presence' with other workers, in that as long as they were logged in they felt some state of awareness existed. This could have been through either just seeing text scrolling by in the MUD window, indicating some activity, or a more recent addition of an auditory cue for attention. Unlike video or audio-based interactions, textual interactions are not constrained by immediate response, therefore users felt that they could make strategic use of delay in responding, for example by waiting to see if others answered open questions before formulating an appropriate response. Indeed, this text-based system was actually seen as a way of providing privacy of a kind as others could not see background surroundings or hear background noises and possibly conversations. This was deemed useful for participants who utilised the system from home.[5]

Awareness was provided in a number of ways. Primarily, it was through having a MUD window open on the desktop machine at all times, and if busy with some other task, involved waiting for a user name to appear to indicate a request for interaction. In another sense, participants reported that 'lurking' was very common, in that people would log into a room and not speak to any others, but just monitor the conversations to become aware of what others were doing. Churchill and Bly concluded that for that particular organisation it was not a rich visual and auditory environment that was central to collaboration, rather it was the fluid, informal conversations and the social relationships they supported.

Nardi, Whittaker and Bradner (2000) report on a study of Instant Messaging (IM) in a workplace setting. Instant Messaging provides a near synchronous one-on-one communication in the form of a text message that appears on a user's screen. IM systems provide awareness of other users through a 'buddy list', a list of users who are online and able to receive incoming messages. This provides an advantage over the telephone in that users have some predetermined information that a person is present, they will also know whom the message is from and have the option of not having to reply immediately, in contrast to a telephone call. Such denial of presence suggests an advantage over face-to-face interactions. Figure 3.1 shows awareness of the availability of other users in IM software.

[5]This appears to be a side-benefit of TBVEs, not an explicit design feature.

Figure 3.1: Awareness of other IM Users' Availability.

3.6.2 Turn Taking Mechanisms

A second design limitation is that of supporting turn-taking mechanisms. For example, VMC has been shown to display problems with turn-taking and attention (Tang and Issacs, 1993, Issacs and Tang, 1994) Issacs and Tang's studies of collaboration through video conferencing technology showed difficulties in negotiating turn taking, directing participants' attention, less frequent changes of turn, longer turns and less back-channels. With face to face interactions displaying shorter and more frequent turns than video, this enhances the ability of participants to reach mutual understanding. They also found that it was difficult to control the floor through body position or gaze, or have side conversations. With regard to gesture, Heath and Luff (1991) report on the relationship between asymmetry and collaboration in VMC during their study of video-mediated interactions at EuroPARC. They suggest that although video supports the user's ability to monitor others' behaviour and remain sensitive to their visual conduct, any exaggeration is a symptom of the failure of visual clues in this context. This asymmetry, they suggest, is not found in face-to-face or other technologies such as telephone-based communication.

These findings suggest that orientation, gesture and gaze tend to be exaggerated in VMC,

something proposed by O'Malley, Langton, Anderson, Doherty-Sneddon and Bruce (1996). Their experiments involved the 'map task' in which pairs of participants carried out a collaborative task communicating in both video and audio or audio only configurations. They found that users of the video link produced longer and more interrupted dialogue. Performance, they found, was only affected by the decrease of bandwidth, resulting in transmission delays. They also found that although users used visual cues in video the same way as in face-to-face, video failed to provide the shorter and less interrupted dialogue, and in the video setup, users gazed for longer than in face-to-face. This, they suggested, showed that users of VMC were less confident they had mutual understanding (grounding) and therefore had to overcompensate.

With regard to TBVEs, turn-taking can be related to the ability to have multiple conversations in distinct locations (Belloti et al, 1999). Certain locations had restricted rights of access, therefore implicitly applying a set of participation privileges. This led to an interesting feature of the MUD, in that it gave users the ability to have a certain identity in one of these locations and another identity in a separate one. As the MUD was also used for social as well as work-related communication, participants could have multiple statuses overall and even within the same location. Embedded within the multiple status issue was the ability of participants to have private conversations with others by 'whispering' to them, in other words having a private conversation unseen by all of the other participants. These multiple conversations sometimes reached two or three per person, therefore it seems that when one looks at a MUD conversation taking place, one is actually only seeing possibly half of the total number of interactions. Turn taking then becomes interleaved across multiple locations, conversations and identities.

Another participatory status issue related to turn taking occurred when questions were raised, but in the form of having no explicit addressee. So for example, a participant would log on and ask a question to 'the room' and wait for an answer. Similarly the technical support team used the MUD to make announcements to the 'staff' here as the intended addressee, but they found that for important messages, there needed to be a critical mass of users in order for the technical announcement to take effect. In an audio-based interaction if someone is not listening, then a certain sentence or point may have to be repeated. In the

textual MUD, participants had access to a permanent record, so even if they weren't being attentive to the MUD window, the message still got through and could be re-read many times.

However, turn-taking in text-based systems can also be problematic. Jikorta, Luff and Gilbert (1991) report on an experiment that highlights how users are required to orient themselves between two models, conversation and text. They suggest that by utilising the notion of feedback with a refined view of the relationship between speaker and hearer, users can organise their turn-taking more effectively. They suggest that Goffman's participation frameworks and production formats can provide a basis for doing this, however they do not work this notion through in detail.

IM is virtually dyadic, in that users communicate with a single individual, although they may communicate with many users concurrently. Generally speaking, there is therefore a simpler turn-taking structure in IM systems, although some new versions have the ability to address the same message to multiple recipients. IM also seems to provide more rapid informal communication, thus displaying shorter turn lengths in exchanges. IM users also have the ability to 'block' other users from messaging them, thus giving them a way in which to restrict possible participants to either all, a subset or none at all. Such blocking could also occur in between turns.

3.6.3 Conversational Thread Management

An important mechanism for managing participation is the organisation of conversational threads, a prime example medium being e-mail. Including the context within a reply is a way of reminding subsequent recipients of the conversational and subject history of the discourse. In e-mail, a common way of managing this is through the use of 're:' prior to a subject. Whittaker and Sidner (1996) found that 12% of all e-mails in their study were prefixed with 're:' and a common form of annoyance to recipients was the leaving out of the previous context so that they had to guess at what the mail was referring to.

In VMC systems, thread management is normally a simple process, with a single conversation occurring at a time.

In VR systems, the ability to converse with other participants can be supported by real-

time audio connections, but is more likely to be in the form of a textual interaction. The 'PAVE' system described by Adams et al. (1999) although not supporting real-time audio conversations, does support event capture, including text chat, artifact creation and document sharing. In a real-time interaction, a scrollable text log of all previous conversations is available. So even if a participant joins a virtual meeting session half way through, they are still able to scroll through the conversational history to get up to speed. The entire session, including all speech, avatars and documents, is then stored and can be played back and annotated by other geographically-distributed team workers.

With so many concurrent conversations occurring in parallel, thread management seems to offer a form of organisation where you know not only what the conversation is about, but also where to go to join in. Roddy and Epelman-Wang (1998) claim that one flaw of text-based chat rooms is their poor design in handling multiple concurrent conversations, especially when larger numbers of users are involved. They propose the solution of basing the thread displayed to the user on his or her spatial proximity to another user. However, this has the limitation that users and their conversations are in separate windows, and they spend most of their time trying to move into areas to hear things they are interested in. They subsequently proposed an alternative solution based on dividing the screen into threads denoted by colour. In terms of participatory status, therefore, it appears that the users wanted the ability to overhear other conversations.

In terms of IM, Nardi et al (2000) noted in their study that there was no system by which users could manage the threads of conversations, and one employee actually refused to use the system, as she felt that she needed a permanent record of her conversations for them to be of any use to her. The basic one thread structure of IM meant it was popular amongst users because of its simplicity, and it could be left and returned to if another work task was more important.

3.7 Deviations from Face-to-Face Constraints

Having looked at both some physical and design constraints, we can begin to summarise how these example media have deviated from face-to-face constraints overall. Firstly, they

are compared against the list produced in chapter two in table 3.1 below.

Table 3.1: Comparison of Media and Face-to-Face Constraints

—	VMC	VR	TBVE	IM
Co-presence	no	no	no	no
Visibility	yes	no	no	no
Audibility	yes	no	no	no
Instantaniety	yes (depending on bandwidth)	yes	yes	yes
Evanescence	yes	yes	no	no
Recordlessness	yes	yes	no	no
Simultaneity	yes	yes	yes	yes
Extemporaneity	yes	yes	yes	yes
Self-determination	yes	yes	yes	yes
Self-expression	yes	no	no	yes

In terms of the properties of face-to-face, we can suggest the following approximate ordering:

Closest to f-f.....VMC $\rightarrow VR \rightarrow TBVE \rightarrow IM$.....**Furthest from f-f**

However in terms of participatory structure, the picture would be different:

More Dyadic.....IM $\rightarrow VMC \rightarrow VR \rightarrow TBVE$.....**Less Dyadic**

The interesting point here is that we saw in chapter two how face-to-face interactions were not necessarily dyadic in their nature, but here we have examples of technologies that still reinforce that type of interaction, e.g. Instant Messaging. These types of technologies are hugely popular, but do not provide good opportunities for different kinds of participation and subsequently new kinds of participatory status.

3.8 Discussion

Whether VR systems were developed for information visualisation, application development or supporting types of virtual organisations, an important motivation for their creation appears to be for the support of different types of work practices. From a participation perspective, we can ask: what types of participation problems are such systems aiming to solve? With regard to information visualisation, the participation structure appears to be a dyadic one, with the user manipulating a representation of a data set of some form.

With regard to some types of applications, for example remote medical programs, and the 'virtual organisation', the problem has been to allow the participation of geographically distributed workers, in other words different systems will have different levels of participation. Therefore, technological development has a relation to the types of participation and the numbers of participants that can take part. In other words, we can focus not only on how virtual environments can support types of participation, but also on the types of 'virtual tasks' people can participate in. DeSanctis and Monge (1998) claim that the only consistent result from empirical research in relation to task and media is that groups are more effective in divergent thinking tasks when communicating electronically rather than face-to-face.

Systems such as 'MASSIVE' and 'DIVE' mentioned previously are envisaged as being able to support hundreds if not thousands of individual connections, greatly increasing the scope of participation[6].

Bowers, Pycock and O'Brien (1996) make the point that users (here meaning avatar representations of people) of their CVE had adapted and moulded their normal apparatus of conversation and co-ordination of body movement into the constraints of the environment. Structures such as turn-taking, co-ordination of body movement and talk implied that the users were required to become 'face-engaged', in other words trying to a degree to assimilate face-to-face interactions within the limitations of the system they were using. Bowers et al. note that the design of such virtual systems should concentrate on how social actions are afforded and the kinds of objects inserted into the 'world', in order to aid such social interaction, such as tables and other 'meeting furniture' which can support turn-taking through sequencing. Indeed, design and evaluation techniques of VR systems shouldn't look to face-

[6] Although the author has seen no evidence that they actually do.

to-face interactions as the only standard to copy. VR systems tend use space in a way that is comparable to face-to-face interaction: distance between avatars establishes availability for interaction.

In technological terms, VR systems are constrained to a degree by the processing power of the machines in use and also have limited opportunities for phenomena such as overhearing or lurking. In design terms, there have been a variety of approaches to support awareness, and the notion of 'presence' has been subjective to each user. Conversational management has been supported through various means, with turn-taking mechanisms subject to further research, as previously mentioned.

In terms of VMC, the problem for participation is that it seems just as hard to participate or interact using video as it is with audio only: once again there appears to be little benefit in trying to assimilate face to face interactions. The subtleties of face to face interactions still seems to be missing with a video link, even under near perfect conditions. This indicates that it is mutual orientation to the shared environment that matters. There is also the limitation that the higher the number of participants who can co-participate successfully, the greater the strain on bandwidth, quality of service and the management of turn-taking. Video also limits the ways in which individuals can represent themselves, making it extremely difficult to maintain two distinct representations within the same camera view. Finally, changing participatory status is difficult with the restricted access to side sequences and the need for clearer markers such as name usage in addressing other participants. In some respects, VMC and VR try to replicate face-to-face interactions and they fail in doing so, as the technologies themselves compromise the interactions in various ways.

In technological terms, VMC systems are constrained by users having a single identity, a limited number of participants and awareness of others, with very limited opportunities for phenomena such as overhearing or lurking. In design terms, awareness and presence are subject to available bandwidth. Conversational management is relatively easy as there is normally only one current conversation, but turn-taking mechanisms have been shown to be problematic.

IM systems were primarily designed for sporadic message exchange, and in terms of participation are restricted to supporting dyadic interactions. IM systems also tend to restrict users

to a single representation of themselves, and although anonymity is possible, overhearing other interactions online is not. In technological terms, IM systems are constrained in terms of the opportunities for phenomena such as overhearing or lurking. In design terms, there is limited support for awareness with no notion of presence. Conversational management is relatively simple, and turn-taking mechanisms normally follow a dyadic structure.

Unlike IM, and in technological terms, TBVEs support multiple co-connected participation, with the possibility of users participating in several simultaneous and distinct interactions. Users can also have multiple representations of themselves, participate secretly (also known as 'lurking') and such systems seem to be able to support, according to Churchill and Bly (1999), forms of social interaction without the rich visual or auditory environment that VMC and VR offer. In design terms, there have been a variety of approaches to support awareness, plus the notion of presence, at least in the studies mentioned in this chapter, has been felt by the systems users. Conversational management, due to the participatory possibilities within such systems, has been subject to research with techniques such as colour being used to support it. Turn-taking mechanisms in TBVEs are more complex, offering users the ability of users to participate in multiple, distinct conversations.

3.9 Conclusions

VR systems were designed to solve two types of participation problem: -

1) Visualisation of complex data sets (a more dyadic interaction)

2) Support for geographically distributed people, for example in 'virtual organisations' to work on 'virtual tasks'.

Users normally have one representation of themselves and interact under the design-placed constraint of assimilating face-to-face interactions.

VMC systems were also designed in order to allow geographically-distributed people to work together anytime, anyplace in order to replace the need for same time, same place face-to-face meetings. Like VR, VMC is also constrained by the drive to mimic face-to-face interactions, and there are limitations on the number of participants that can co-participate (due to bandwidth), while users are also limited to a single representation of themselves.

Like VR, VMC generally restricts participatory status distinctions, being mostly in the form of a dyad.

Of the text-based systems, IM was designed to support sporadic, dyadic message exchanges between parties. Again, it is limited in that multiple participation is not feasible and users again have a single identity (or if they choose to have more than one, they can only use *one* at a time). TBVEs, however, present a different picture. Unlike the F-formation description, TBVEs provide users with the ability to participate in a version of 'space' where distance, orientation or relative proximity do not affect the type or level of interactions available. Given that these technically-resource and media-lightweight systems are more flexible and configurable, we can ask: 'What new forms of participation do TBVEs display?' in that they provide opportunities for:

- Multiple distinct and simultaneous interactions
- Multiple representations
- Lurking and overhearing

The result of the creation of TBVEs is the support, in principle, of the construction of new kinds of participation. In order to gain an understanding of how users might exploit this opportunity, the next chapter will detail an in-depth study and analysis of participation in an example of this medium, a TBVE called 'TCZ' or 'The Chatting Zone'.

Chapter 4

Empirical Study

4.1 Introduction

In Chapter 3, the flexibility of text-based virtual environments (TBVEs) was shown to support, in principle, the construction of new kinds of participation. Therefore, this chapter investigates whether this is in fact the case. The empirical study (in relation to the first thesis question) was formed into two parts. Firstly, an analysis of participation in TCZ in relation to its spatial metaphor; does a spatial organisation constrain participation? Secondly, a comparison of participatory phenomena between a corpus of face-to-face interactions and TCZ; what difference does moving from the actual to the virtual make to participation? What changes?

This chapter is divided into the following sections. Firstly, the specific questions are addressed. Secondly, the methodology is presented, including an introduction to the TBVE used in the study TCZ, with the data collection methods and procedures. Thirdly, the results for each part of the research question are presented. The final section provides a discussion and implications of the results, followed by the chapter conclusions.

4.2 Study Questions

4.2.1 Participation and 'Space'

The first part of the research question was; does a spatial organisation constrain participation? With regards to TCZ, the study needed to investigate two areas.

Question 1. What evidence is there for users utilising virtual 'space' as a means of managing their participation in interactions?

The first question looked at whether TCZ's 'space' was influential in organising the interactions of its users. We investigated the patterns of movement users display, and secondly, what patterns of inhabitation were present. The first part would indicate the level of movement across the TCZ's 'space' and also how much of that 'space' they are actually utilising. The patterns of inhabitation were important to see which locations users were gathering in, and from this we could determine possible reasons for those parts of 'space' being more utilised than others.

Question 2. To what extent will messages go to the same location and to only one recipient?

The second question investigated how TCZ's 'space' affects the ways in which users participate with one another. Firstly, it examined whether the recipients of messages were in the same or different locations to the senders. In other words, to what extent are users sensitive to being co-located? Secondly, it examined the number of recipients that each message was sent to. This is interesting because it indicates whether residents' communication is mostly dyadic (each message goes to only one recipient) or multi-party (each message goes to more than one recipient); in other words does a TBVE's spatial metaphor constrain participation in terms of the numbers of participants in an interaction?

Question 3. What evidence is there that greater user expertise will lead to less usage of virtual 'space'?

As previously mentioned, users of TCZ have a level that determines the availability of cer-

tain commands and messages. A user's level could be used as an index of their expertise, as it denotes the length of time they have been using TCZ and the types of responsibilities they may have had. It is therefore possible that if the majority of users were of a higher level, and therefore had a significant level of expertise, they may become more efficient in communicating without, say, having to move, and only less experienced residents would deem it necessary to move in order to talk to one another. Therefore, determining the average user level would indicate whether this was a contributory factor towards any results.

Question 4. What evidence is there that dyadic groups will receive the most messages and longest message length?

The final part was to investigate the frequency distribution of messages received by the number of recipients, and also the average number of words received per turn by the number of recipients. This would give an indication of relative group sizes and whether different group sizes received messages of different lengths.

4.2.2 Comparison Between Face-to-Face and Virtual Participation

As detailed in Chapter 2, current models of participation have centered on and been designed to model face-to-face participation. They have either explicitly or implicitly incorporated some constraints of such participation. This comparison is intended to highlight if and how virtual participation differs from face-to-face and what subsequent implications this might have for models of participation. The second part of the study entailed the investigation of any differences or similarities, in terms of participation, when moving from the actual (face-to-face) to the virtual (TBVE).

Question 5. Will users be peripheral more frequently (and therefore primary less frequently) in TCZ than BNC, due to the increased 'competition' for the floor?

The first area of investigation regards the distribution of types of status in the two domains, given the number of other participants. On average, there are twice as many participants

per interaction in TCZ than in BNC.

Question 6. What evidence is there that users of TCZ will make fewer transitions between peripheral and primary status than BNC?

Following on from this, our next question investigates that if there is less 'competition' for the floor in BNC, we should expect individuals to make more transitions between peripheral and primary status in BNC than in TCZ.

Question 7. To what extent will users of TCZ produce fewer words per turn as speaker than BNC?

In face-to-face, participants should on average produce more words as speaker (and subsequently receive more as addressees and other statuses) due to the lower 'production costs' (cf. Clark & Brennan, 1991) of speaking compared to articulating or typing the message in TCZ. Added to this are the effects of the different aspects of interaction when comparing face-to-face with virtual interaction as TBVEs have no co-presence, visibility, audibility, instantaniety and the possibility of multiple representations of the self (cf. Table 3.1).

The types of phenomena under consideration, therefore, were:

- Frequencies of various participatory statuses
- Mobility of participatory status
- Number of words received by users in each participatory status
- Occurrences of users maintaining multiple statuses
- Numbers of 'conversations'

Question 8. To what extent will users of TCZ will have a higher occurrence of holding multiple simultaneous statuses than BNC?

In chapter three it was also proposed that it was possible for virtual environments to ease the maintenance of holding multiple concurrent statuses, so the final two phenomena regarding multiple statuses and numbers of 'conversations' were also deemed important points for

investigation.

Question 9. What evidence is there that users of TCZ will have more frequent 'conversations' than BNC?

Given the possibility of holding multiple statuses and conversations, analysing the relationship between the traced individuals and the other participants could determine how user participation is organised with regard to both isolated and interleaved conversations. Defining a 'conversation' in participatory terms is, therefore, an important task.

Operational Definition of a 'Conversation'

Intuitively, a single conversation can include more than one topic, and given this, we are aiming to capture a unit of analysis that is larger than 'topic'. Therefore, the definition below aims to allow for topic change and some, specified, changes in participant structure, without necessarily entailing a change in conversation.

A single conversation can be conducted on one or more 'channels', defined as a connection between at least two identities, and within which contributions are made. Contributions are not limited to one modality, rather they could be verbal, textual, visual or graphical. For each new contribution to an interaction, a new conversation is initiated if:

a) **Participant Structure**: there is a change in the set of primary participants who are mutually aware of each other.

b) **Grounding Equivalence**: the contribution is designed to ensure that not all the primary participants ground the contribution to the same level.

c) **Addressability**: the new contribution cannot, in principle, be directly addressed by the next contribution.

Conversations continue until there are no new contributions which are not captured by (a)-(c).

Clause (a) is introduced to allow for the fact that although one primary participant may be aware of the others, the reverse may not always be true. Therefore a change in primary

participants where one of the primary participants is not aware of the other is counted as a change in conversation. The constraint is introduced to only count a change in conversation from peripheral participants who have not so far held primary status in that conversation. Without this there would be a change in conversation every time there was an interjection from someone who had already spoken.

Clause (b) is introduced in order to capture instances where grounding asymmetry occurs even when the rule of mutual awareness is satisfied. In other words, contributions must be produced in a way that is not designed to produce different levels of understanding by the primary participants. For example, grounding asymmetry could occur in face-to-face if the primary participants resorted to code-switching (i.e. using a second language) or virtually through the use of say a 'whisper' command. Note that this clause interacts with Clark's idea that the difference between different participants statuses (speaker, addressee, overhearer and bystander) is to do with asymmetries in the obligations between them, not the particular level of understanding they all reach. For example, what "weather" means to people who don't speak English is different from what it means to people who do. But, in both cases we could distinguish between speaker/addressee/overhearer if they used the word without referring to their level of understanding. These participatory status distinctions would only depend on the relative strength of their grounding obligations to each other.

Clause (c) is introduced as a conditional relevance. The contributions in a single conversation are linked together by a sequence of local relevance relations that allow, for example, local turn-taking rules to operate. So for example, imagine three people talking in two chatrooms; in room 1 they are talking about computers, in room 2 they are talking about the housing market. Clause a) does not distinguish between contributions to the 'computer room' and the 'housing room' as each has the same set of people, all mutually-aware of each other in both cases. Clause (b) does not distinguish between them if there are no instances of grounding asymmetry. Clause (c) however accounts for instances where it is improbable to coherently answer a computer question by responding to it in the housing room.

4.3 Methodology

4.3.1 Selection and Introduction of a TBVE 'TCZ'

TCZ ('The Chatting Zone'[1]) went on-line for the first time in 1994. Within a year it had its first peak of over 100 simultaneously-connected residents. By 1996 there were half a million connections to TCZ, with over 35,000 characters created since 1995 when statistics were recorded for the first time. By 1997 the number of connections had passed one million. In May 2000, after six years of running privately, TCZ was shut down due to disputes between residents that had possible legal implications. It was re-opened in 2001 as a free, non-commercial tool provided for the purpose of communication research by the Interaction, Media and Communication Research Group in the Department of Computer Science at Queen Mary, University of London, UK. TCZ still had a high critical mass of users and would ensure sufficient data for the analysis. Being hosted at Queen Mary meant complete access to both the system and the log files, the willingness of the environment's users for their system to be researched, and the ease of processing and accessing data stored in the same department. For these reasons, TCZ was selected as the TBVE to be used in the empirical analysis.

What is TCZ?

TCZ is an international, text-based virtual environment set in a virtual neighbourhood. TCZ is used as a social interaction tool for users to talk about a wide variety of subjects, form intimate relationships and utilise the programmable aspects to build not only their surroundings but also the rules by which they interact with each other. TCZ does not involve role-playing like some other MUDs, nor is it just straight talk like Internet Relay Chat (IRC). Users have more control over their individual environments. A user may choose to talk with people in one of the many public rooms, hide away in one of their own private rooms, or chat with a specific group of friends. As of January 2004 there were 1028 registered users. On average, 354 users connect per day, with 5 new users created per day. The average daily peak is 24 simultaneously-connected users.

[1] http://www.tcz.net

TCZ's Spatial Metaphor

TCZ is based on a spatial metaphor. This is made up of two factors, its structure and the means to traverse that structure.

TCZ's Structure

The original design sketch for the topology of TCZ is given below in figure 4.1. The environment is made up of 'locations' which are divided into two types. Firstly there are public spaces that everyone can enter and interact within, and secondly there are private locations or 'homes' that users can 'build' for themselves using TCZ's internal programming language. Other users normally need the owner's permission before entering such private spaces. Most locations have 'exits' that lead either to other locations or to other public areas or 'streets'. Examples of public spaces would be 'The Swan Pub' (see example below), and 'The Bank' where users can withdrawal TCZ 'currency' from their account to purchase items for their home locations. There are currently over four and a half thousand unique locations in TCZ.

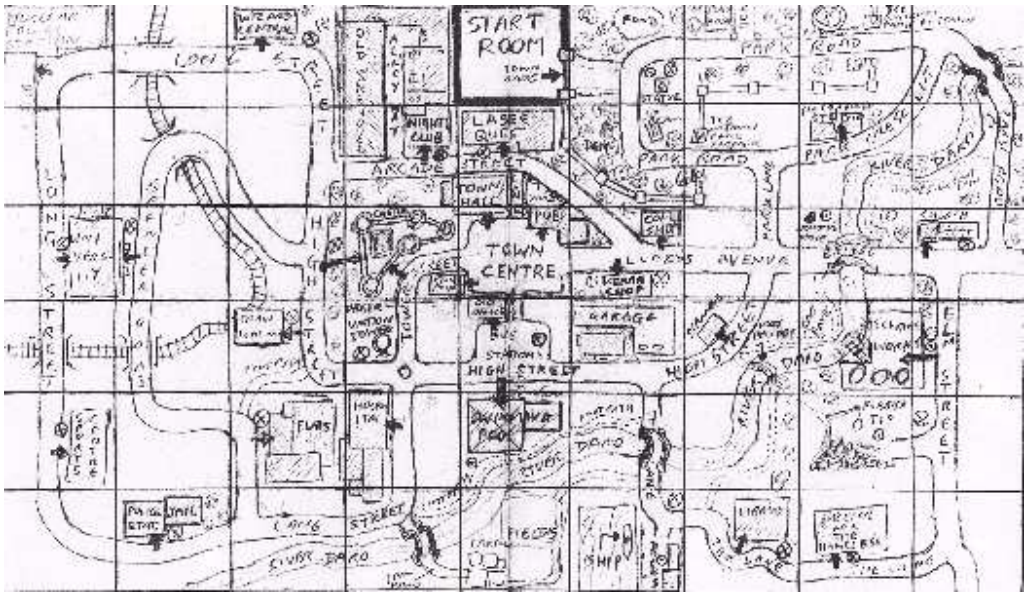

Figure 4.1: Map Depicting Some of TCZ's Locations

Traversing TCZ's Structure

When users initially log into TCZ, they automatically 'arrive' at their home location and then have the opportunity to traverse the virtual space or 'neighbourhood' by moving between locations. Users have a variety of ways to do this, taking the form of commands that the user types into the command line. To illustrate this, an example is given of a user in a location called 'The Swan Pub'.

In order to find out what is in the location, the user types the command 'look' and is presented with the following information.

```
The Swan Pub
You are sitting at the bar of a busy, crowded town pub.  This is the local, where
everyone on TCZ meets for a chat and a pint.  From an adjacent room, you can
hear the beeps and bleeps of video games.
Obvious exits:
Front entrance leading back onto the street (Out)
Back door leading to the back yard (Back)
The Chatting Zone BBS (BBS)
'Staff Only' door (Staff)
The Games Room (Games)
Public Toilet (Toilet)
Contents:
Fred Bloggs
Joe Bloggs
Kate
Cigarette machine
A Jukebox
Bar
```

The first part is the name of the location ('The Swan Pub'). This is followed by that location's description; i.e. what the room looks like and what normally goes on inside it.

The second part details any available exits to the user (there may be locations with no explicit exits). One way users can move to a different location is by typing the short name displayed in brackets after the exit's name, e.g. typing 'games' will take the user into 'The Swan Pub Games Room'.

Other ways to traverse TCZ are the commands 'to (#)' that takes you directly to the room with identity number #, and 'go (name)', that will take a user directly to the location that the user 'name' is in, provided they have given you permission. A final example is the command 'warp' that takes a user to a randomly selected location. These examples illustrate how TCZ provides the possibility for users to circumvent normal spatial methods of movement via exits and doors.

The final part of the description 'Contents:' only appears when the room actually contains something, e.g., other users or objects. Objects can be picked up by typing 'get OBJECT' and dropped again by typing 'drop OBJECT'. Both objects and users in the same room as you can be looked at by typing 'look [at] NAME' or 'look [at] OBJECT', e.g: 'look Fred' or 'look jukebox' for more detailed information.

Communicating with Other Users

Communication between TCZ users is carried out through the use of various commands. These commands allow users to send textual messages to one another in different formats. Figure 4.2 below shows TCZ's Web interface with a short example interaction between two users.

This example shows two co-located (i.e. in the same TCZ location) users having a conversation. The 'info broadcast' message at the bottom of the screen is informing the users that for every hour they spend online, the TCZ 'Bank' will pay 25 credits into their account. Commands are typed into the command box at the bottom of the screen, with other options available such as help facilities, an ability to recall the last command typed and to see a list of all connected users.

The communicative commands could be grouped under three main headings; local, global and direct, which will be explained in the following three sections.

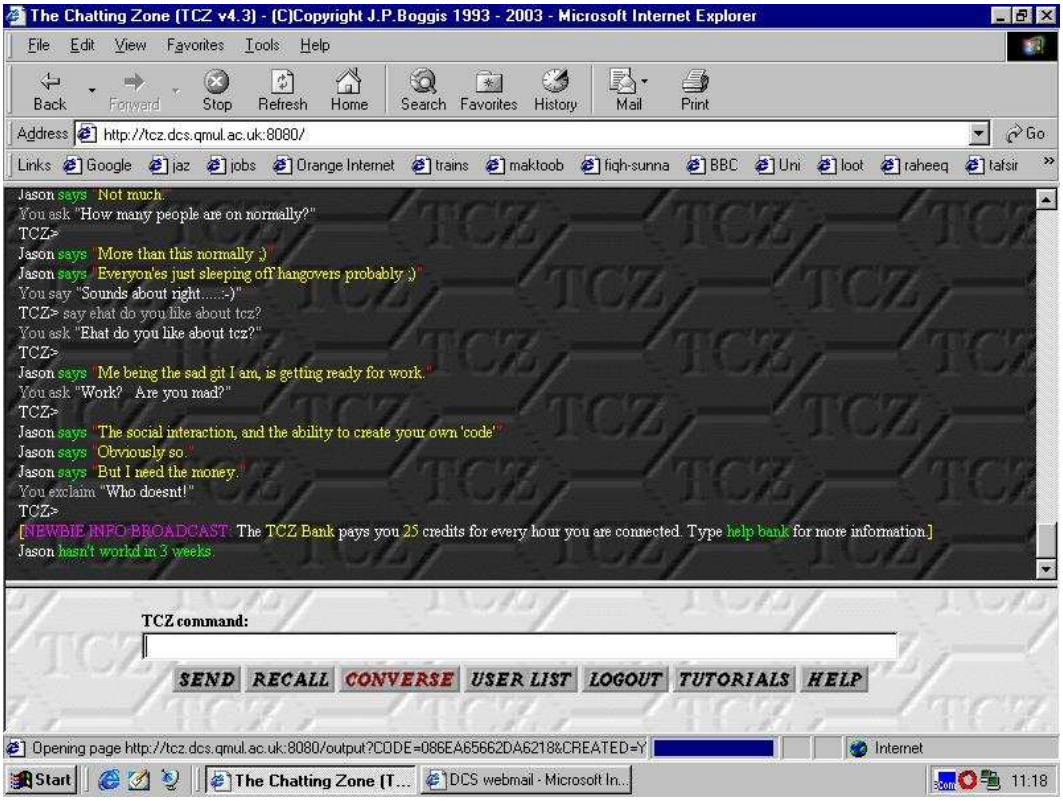

Figure 4.2: Sample TCZ Interaction & Web Interface

Local Commands

Local commands are only used when the two users are co-located. For example, the local command 'say' makes you say "MESSAGE" to person(s) in the same room as you, that other co-located users can also see.

e.g. if a user Fred types the following: **say hello**
the outcome would be:

Sender Sees	Recipient(s) See	Others in Same Location See
`Fred says hello`	`Fred says hello`	`Fred says hello`

A second example is the whisper command. E.g. if Bill types: **whisper Fred = hello**
the outcome would be:

Sender Sees	Recipient(s) See	Others in Same Location See
`You whisper hello to Fred`	`Bill whispers hello to you`	`Bill whispers something to Fred`

With the 'whisper' command, other co-located users cannot see the actual message, only that users were whispering to each other. Other examples of local commands are 'think' that allows you to think a thought that all co-present users can see, and 'ask' that allows you to ask everyone in the room a question or make a remark.

Global Commands

Global commands can be used to communicate to all connected users, i.e. all people connected to TCZ regardless of their location within the system. An example of this type of command is the yell command. E.g. if Fred types: **yell hi there!**

the outcome would be:

Sender Sees	Recipient(s) See	Others in Same Location See
`hi there!`	`hi there!`	N/A as all users are addressed

Direct Commands

Direct commands can be used to send private messages to one specific individual or a group of users either in a distinct location or in the same location. Three example commands are 'emote', 'tell' and 'page'.

The 'emote' command sends a message to all those present in the same room in the form of an action. (It can also be used to 'emote' a message to a user in a distinct location.) E.g. if Fred types: **:runs around and waves**[2]

the outcome would be:

Sender Sees	Recipient(s) See	Others in Same Location See
`you run around and wave`	`Fred runs around and waves`	N/A as all users are addressed

The 'tell' command can be used to send a message to a single user or group of users either in the same room or in other locations. If all of the characters are in the same room as you, everyone else will hear what you say to them. If one or more recipients aren't in the same room as you, only the recipients will receive your message. E.g. if Fred types: **tell Bill = hello?** to Bill, and Bill is in the same location then the outcome would be:

Sender Sees	Recipient(s) See	Others in Same Location See
`You say hello?`	`Fred says hello? to you`	`Fred says hello? to Bill`

[2]The : is shorthand for 'emote'

However, if Bill was in a distinct location to Fred, the outcome would be:

Sender Sees	Recipient(s) See	Others in Same Location See
`You say hello?`	`Fred says hello?` to you	nothing

The last example in this group is the 'page' command. It works in exactly the same way as the 'tell' command, apart from the following distinctions. Firstly, if recipients are in the same location as the sender, other co-located users will not see that message. Secondly, the location of the sender is sent as part of the message, so for example if Bill was in the Swan Pub and typed: **page Fred = hello** the outcome would be:

Sender Sees	Recipient(s) See	Others in Same Location See
`Message sent to Fred`	`Paging from the Pub: Bill says 'Hello'` (if no message added then '`Bill is trying to contact you`')	nothing

TCZ's communicative commands allow users to message single or groups of others, and to do so openly or in private both in co-located and distinct locations. The previous examples have all included a single addressee. If a user wished to address a group of users then they have two choices. They can either type the names of the individuals into the command line e.g.
tell Fred; Bill; Harry = hello

or they can utilise their 'friendslist'. A 'friendslist' is a list of all of a user's friends added via the 'fadd' or friends add command. So for example, if I meet John and I wish to add him to my list I simply type 'fadd John'. I am then able to send a message to all of my connected

friends via the 'tf' or tell friends command, e.g., "tf = hello". So if a user Fred typed "tf = hello", all the users on the list who are currently connected will receive the following message:

```
[To you and his friends] Fred says "hello"
```

A variation of the 'tf' command is a directed 'tf'. In this case the same message is sent to all users on the list but specifically directed to one. For example, if Bill types, "tf Fred = you're so cool!", all the users on the list currently connected will receive the following message;

```
[To you and his friends] Bill says you're so cool!  [to Fred]
```

Apart from moving and communicating, other commands fall into categories such as,

- **Availability** - used to see who else is online, e.g. the command 'who' presents the user with a list of all connected users
- **Identity** - used to check another user's details, e.g. the command 'scan' gives details of a user's name and description
- **Location** - used to locate other users, e.g. the command 'where' will give the locations of all connected users.

User Levels

Users of TCZ are assigned levels according to their experience and abilities. All new users are automatically given the level of 'mortal', who has basic abilities. As users spend more time on TCZ, they can ask the TCZ administration or 'admin' (see below) to be considered for promotion to a higher level, and this would accord them greater privileges, such as being able to remove other users, change user details and have greater access to TCZ's data files. Any promotion is normally dependent on both good behaviour and a willingness to help other users and maintain or develop TCZ. Likewise, bad or abusive behaviour results in demotion to a lower level. Each level is described below (with 0 being the highest).

- 0 - Supreme Being. Single most powerful being, has unlimited access over all in TCZ.[3]
- 1 - Deity. Possesses almost unlimited privileges within TCZ.
- 2 - Wizard. Possesses major privileges.
- 3 - Druid. The main administrators. Has three sub-ranks: Assistant, Standard and Elder, with increasing levels of access to TCZ data. Druids are involved with the social aspect of TCZ and Elders with building issues.
- 4 - Builder. Those with the privileges to create things.
- 5 - Assistant. Mortal with responsibility to help new players but few additional powers.
- 6 - Mortal. All new users start out as mortals. They have only the basic abilities.
- 7 - Moron. Reserved for abusive players. They possess negative privileges.

With regard to the communicative commands, users of level 0 to 3 are deemed to be members of TCZ's administration or 'admin'. This gives them access to a messaging channel called 'nat' that other users of a lower level do not have access to. The 'nat' channel can be used to send and receive admin messages regardless of location, and is used by members of the administration as a private channel.

4.3.2 Data Collection

TCZ's log files are stored in XML (Extensible Markup Language) format. The server's logging mechanism (written in C) captures all messages that are sent on TCZ and sends them to the XML conversion daemon to be written to file. The XML format includes details such as the sender and their location, recipient(s) and their location(s), the users' levels and the basic types of command used to send the message. When users initially log into TCZ, they have to agree, as a condition of use, that the logs would be read and used for the purposes of research by the university. All user names and locations are anonymised by

[3]This person did not use TCZ during the logging period and is therefore not included in the subsequent analysis

the logging mechanism by replacing them with reference numbers. These numbers remain consistent throughout the log.

For the purposes of the first study question regarding 'space', a seven day period of interaction was selected. This period was selected for two reasons. Firstly, we needed a sample of sufficient length in order to capture participatory phenomena and to show it was not transient. Secondly, due to the amount of time and processing power required to analyse the log, anything over this length would have been impractical given the time-frame of the research and the hardware that was at our disposal. The sample related to approximately 140Mb of XML log, incorporating nearly 1/4 of a million messages. To ease the task of processing such a large data set, the log was split into 7 smaller files equivalent to one day's interaction each. In the period that the log files covered, there was an average of 158 unique connections to TCZ per day, with residents occupying an average of 189 distinct locations.

User Questionnaire

The first part of the study was also supplemented by a user questionnaire (see Appendix B), which covered the following areas:

- Locations used and movement
- Command usage
- Occurrences and control of any multiple concurrent interactions
- Control of user availability

This information was useful not only in confirming the findings from the log analysis, but also in providing some context for interpreting TCZ's logs of command use and other behaviours.

The British National Corpus (BNC)

For the purposes of the second study question, comparing virtual and face-to-face interactions, The British National Corpus (BNC, 2003) was selected to compare with TCZ. The

BNC is a collection of both written and spoken material, with the spoken part consisting of over 4 million words of spontaneous conversational English. The spoken part of the corpus was based on a demographic sampling format, with representativeness achieved by sampling a spread of language producers in terms of age, gender, social group, and region, and recording their language output over a set period of time. The selected individuals used portable tape recorders to record their own and their friends' speech over a period of up to a week. Individuals were selected from various age groups (age 15 plus), equal numbers of males and females, and equal numbers from four social classes. Individuals were able to record their conversations on a variety of days including weekends in order to get a variety of interactions in various locations. All conversations were recorded as unobtrusively as possible, so that the material gathered approximated closely to natural, spontaneous speech. Usually, the only person aware that the conversation was being taped was the person with the recorder. The guarantee of confidentiality and complete anonymity was given, with all references to full names and addresses removed from the corpus and the log. For each conversational exchange, the person carrying the recorder told all participants they had been recorded, and explained why. Whenever possible this happened after the conversation had taken place. If any participant was unhappy about being recorded the recording was erased. In order for the results of the comparison to be acceptable, certain criteria between the two samples had to be as similar as possible. This is summarised in table 4.1.

4.3.3 Design and Procedures

In terms of considering an appropriate design for the empirical study, there were several options. The first option was to construct some experimental setting in order to monitor the participation of users, but this was deemed as an artificial condition to the normal TCZ structure within which users interact. A second alternative was either a structured survey or form of social network analysis. Here the problem comes from the fact that users normally inform on what they think they did rather than what they actually did. A third alternative was a form of qualitative analysis based upon the investigator's personal experience within the environment. This however, would not have taken advantage of the potential for exploiting the large data set, and would not have provided strong evidence for the questions that dealt with the overall usage of space, messaging patterns and distributions

Table 4.1: Sample Characteristics for BNC and TCZ

—	BNC	TCZ
Total number of participants in sample	70	132
Number of participants sampled	25	25
Length of sample	2-7 days	7 days (both = weekdays & weekends)
Anonymised	yes	yes
Age Range	15-60	10-40
Demographic Area	UK	UK & USA
Male Vs Female	50%(M),50%(F)	64%(M), 36%(F)

of participatory statuses. The solution therefore was to devise a design that provided a 'panoptic' view of all of the interactions of all of the environments users for a given time period. The panoptic view would also be more appropriate in relation to the large data set that the log files presented, totaling nearly a quarter of a million speech acts. This approach would also provide a clearer picture of the relationship between participation within the environment and its' spatial metaphor. And it was these concerns that the research question was addressing. Therefore, a combination of procedures were devised in order to produce this panoptic view. The first procedure was based on a need to retrieve corresponding and meaningful data from the large XML log file. In terms of speed and accuracy, this required a programming solution. In contrast, the second procedure had to compare and contrast participatory phenomena between two distinct corpora of conversations. Given the format of the data and the qualitative nature of the enquiry, there was no automated solution possible, and as such required a non-automated approach. The combination of both technical and non-technical approaches was deemed the most appropriate way to address the research question. The next two sections describe each of these procedures in more detail.

Procedure 1: Participation and 'Space'

In order to answer this part of the research question, it was necessary to retrieve specific and meaningful information from the sample log. This was achieved through the procedure of parsing the logs with specific 'stylesheets', or programs that represent a particular query, written in a language called XSLT (Extensible Stylesheet Language Transformation). XSLT is a language used for parsing XML files according to a specification, and then producing an output in a desired format. For example, an HTML table format could be selected as the output if the specification was for conversational threads, or plain text could be selected in order to collate data for other scripts to count certain items of interest. The particular XSLT parser used in the study was Saxon v6.0. In order to illustrate how XSLT works, an example XSLT stylesheet and XML snippet are shown below. Suppose that we wished to extract from the log all the messages sent by one specific user. If we had an XML file such as:

```
<LOG>
    <LOCAL>
      <COMMUNICATION_TYPE> SAY </COMMUNICATION_TYPE>
      <CHARACTER_ID> 11467 </CHARACTER_ID>
      <CHARACTER_STATUS> 6 </CHARACTER_STATUS>
      <LOCATION_ID> 1002 </LOCATION_ID>
      <MESSAGE> Hello Fred </MESSAGE>
      <TIME> 'Mon, 26 Nov 2001 15:43:34 +0000' </TIME>
   </LOCAL>
   <GLOBAL>
      <COMMUNICATION_TYPE> YELL </COMMUNICATION_TYPE>
      <CHARACTER_ID> 6477 </CHARACTER_ID>
      <CHARACTER_STATUS> 3 </CHARACTER_STATUS>
      <LOCATION_ID> 6533 </LOCATION_ID>
      <MESSAGE> Hello Everyone! </MESSAGE>
      <TIME> 'Mon, 26 Nov 2001 15:48:12 +0000' </TIME>
   </LOCAL>
```

```
   <DIRECT>
      <COMMUNICATION_TYPE> PAGE </COMMUNICATION_TYPE>
      <CHARACTER_ID> 11467 </CHARACTER_ID>
      <CHARACTER_STATUS> 6 </CHARACTER_STATUS>
      <LOCATION_ID> 1002 </LOCATION_ID>
      <TARGET_CHARACTER_ID> 18735 </TARGET_CHARACTER_ID>
      <TARGET_CHARACTER_STATUS> 6 </TARGET_CHARACTER_STATUS>
      <TARGET_CHARACTER_LOCATION_ID> 24488 </TARGET_CHARACTER_LOCATION_ID>
      <MESSAGE> Hey Mike, what's up? </MESSAGE>
      <TIME> 'Mon, 26 Nov 2001 15:43:34 +0000' </TIME>
   </DIRECT>
</LOG>
```

and we wished to only retrieve messages sent by user 11467, an XSLT stylesheet that would do this is given below.

```
<xsl:stylesheet
        xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
        version="1.0">
 <xsl:output method="html"/>

 <xsl:template match="LOG/*">
        <xsl:apply-templates select="CHARACTER_ID"/>
 </xsl:template>

 <xsl:template match ="CHARACTER_ID">
    <xsl:if test=".=11467">
     <xsl:apply-templates select="../MESSAGE"/>
    </xsl:if>
 </xsl:template>

 <xsl:template name="MESSAGE">
```

```
  <html>
    <body>
      <h1>
        <xsl:value-of select="."/>
      </h1>
    </body>
 </html>
 </xsl:template>
</xsl:stylesheet>
```

The stylesheet has some basic header information, with the 'output method' set to html format. Then a series of 'templates', akin to routines, parse the XML file starting at the root LOG tag and visiting each of its child nodes (indicated by the /* after LOG). So in our XML file it would visit the LOCAL, GLOBAL and DIRECT child nodes. For each one it would call the template 'CHARACTER_ID' and see if it matches the required user, 11467. If not it carries on down the tree, but if it does find a match then it calls the template 'MESSAGE', which extracts the message and outputs it inside html tags to produce the required html output. The output from this example would be:

Hello Fred
Hey Mike, what's up?

For each of the study questions, a unique XSLT stylesheet was written that would parse the log and produce output files from which the relevant data could be collated. With regard to the patterns of inhabitation, this was defined as a user entering and leaving a location, in order to differentiate between users entering their home locations upon logging into TCZ and distinct visits to other locations. It should be noted that due to the format and structure of the XML log, it was not possible to determine the patterns of users *simultaneously* using the same location. Therefore determining exactly how many locations each user 'inhabited' in total was an alternative. Listings of each XSLT stylesheet and examples of their output files are given in Appendix A.

The user questionnaire was placed online, and a notification of it posted in TCZ's bulletin board (BBS News). In total, 56 questionnaires were returned. A blank questionnaire and sample responses are given in Appendix B.

Procedure 2: Comparing Virtual and Face-to-Face Participation

For the second part of the research question, the procedure involved randomly selecting 25 subjects from both the BNC corpus and the TCZ logs (therefore giving 50 subjects in total). These subjects were taken from an even spread of the data to ensure that either the time of day or the day itself could not bias the results. Transcripts of interactions from each subject were analysed over fifty conversational turns against the previously discussed criteria. Example transcripts from both corpora are given in Appendix C.

The articulation of the participant statuses of interactants, and the patterns of change in roles that unfold during interaction, provides a systematic basis to contrast aspects of communicative function between face-to-face and virtual communication. In order then to discern any contrasts, a set of participatory statuses had to be selected. For methodological ease (in terms of simplicity and ease of comparison), Clark's set of statuses was selected as a basis for the task, namely; speaker, addressee, side-participant, bystander and eavesdropper. Primary participants are, according to Clark, speaker and addressee, with peripheral participants being side-participant, bystander and eavesdropper.

Although we have used Clark's statuses, we have not utilised his definitions of them. Clark's definitions are based on levels of relative responsibility. Alternatively, Monk uses the proportion of time that each participant has a particular conversational status, as an index of their overall level of participation. He uses this intuition to motivate an operational distinction between primary and peripheral participants. For the purposes of this study, we utilise a definition based upon mutual knowledge and contribution. This basis is highlighted in the operational definition of a 'conversation' previously given.

4.4 Results

4.4.1 Participation and 'Space'

Question 1. What evidence is there for users utilising virtual 'space' as a means of managing their participation in interactions?

The results show that only 33% of residents ever moved from their home location, and when they did move it was on average only twice per session (mode 2.1).

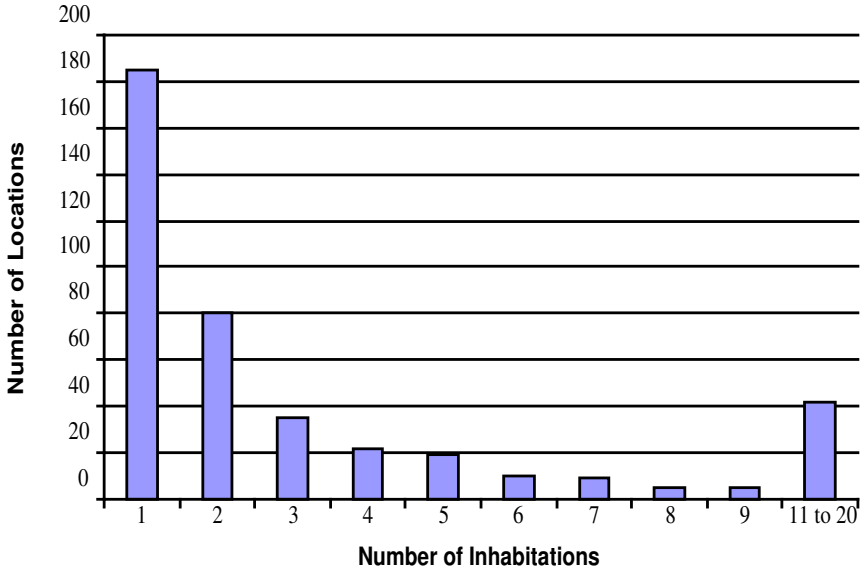

Figure 4.3: Patterns of Inhabitation

Figure 4.3 above shows that the vast majority of locations had only one inhabitation (For a definition of an inhabitation, see section 4.3.3 on page 118). However, there was a small anomaly in that forty-two of the locations had between eleven and twenty inhabitations, thus going against the general downward trend. It was previously mentioned that both the user identities and locations in the XML logs had been anonymised. However, in this instance where the actual location (and not its number) was of significance to the context of the research, the actual location was determined. This was possible by cross-checking the

TCZ code.[4] These locations were:

1. The Swan Pub
2. The Bridge Room
3. TCZ Awards Room
4. The Bulletin Board
5. The Scrabble Table
6. The Boggle Room
7. Scrabble Table No 3
8. Rob's Studio of Music and Sound
9. Unknown
10. The Lounge

The reason for most of these locations being more popular were clarified by the questionnaire (see below).

Question 2. To what extent will messages go to the same location and to only one recipient?

The results show that 72.49% of messages went to a different location to that of the sender, and 66.44% of messages were sent to multiple recipients. The breakdown for each is given below, starting with the distribution of commands in general.

1) The distribution of TCZ's communicative commands is given in table 4.2.[5]

2) Messages sent to the same or distinct location are given in table 4.3.

3) Messages sent to an individual or a group are given in table 4.4.

[4] No cross checking of user identities was done in this way.

[5] From a total of 219,355 messages sent. AFK = 'Away From Keyboard', meaning the user is not attending to TCZ and busy with some real world activity

Table 4.2: Distribution of Communicative Commands

Tell	164,572 (75.02 %)
Emote	34,211 (15.59%)
Say	15,952 (7.27%)
Page	2071 (0.94%)
Think	1351 (0.61%)
Nat	712 (0.32%)
Yell	264 (0.12%)
AFK	149 (0.06%)
Whisper	58 (0.02%)
Ask	15 (0.006%)

Table 4.3: Same or Distinct Location

Command	Same Location	Distinct Location
Page	1026 (49.54%)	1045 (50.59%)
Tell	7717 (4.69%)	156,855 (95.31%)
Whisper	58	0
Ask	15	0
Say	15,952	0
Emote	34,211	0
Think	1351	0
Yell	0	264
AFK	0	149
Nat	0	712
Total	60,330 (27.51%)	159,025 (72.49%)

Table 4.4: Individual or Group

Command	Individual	Group
Page	1604 (77.5%)	467 (22.5%)
Tell	20,255 (12.3%)	144,317 (87.7%)
Whisper	58	0
Ask	15	0
Say	15,952	0
Emote	34,211	0
Think	1351	0
Yell	0	264
AFK	149	0
Nat	0	712
Total	73,595 (33.56%)	145,760 (66.44%)

Question 3. What evidence is there that greater user expertise will lead to less usage of virtual 'space'?

The results show that within TCZ's 7 status levels, 76% of residents were status 5 or 6 (i.e. of average experience). The breakdown is given in figure 4.4 below.

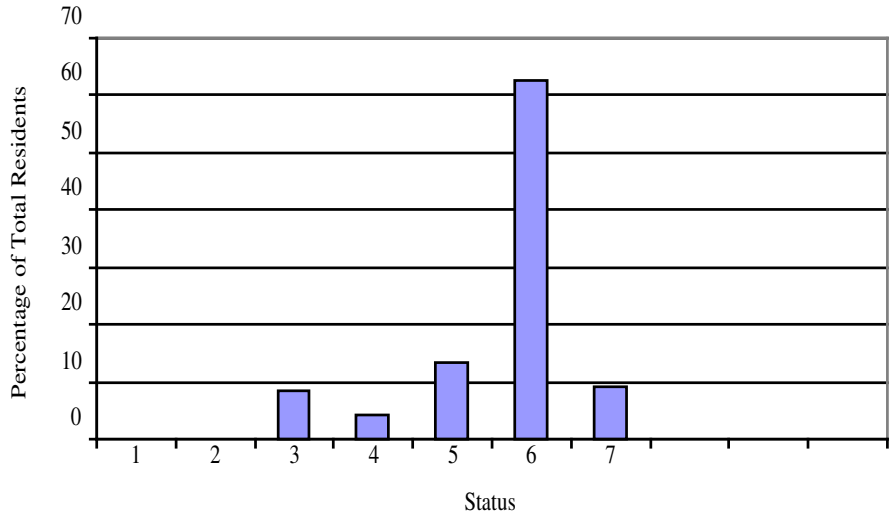

Figure 4.4: Levels of Expertise

Question 4. What evidence is there that dyadic groups will receive the most messages and longest message length?

Although most messages went to dyadic groups, there was no clear difference in terms of word length. Figure 4.5 shows that dyadic message exchanges were on average just over seven words per turn. Non-dyadic messaging ranged from a low of just under four words per turn at group size 18 to nearly nine words per turn at group size 10. Figure 4.6 shows that in terms of group sizes, the most popular was group size two i.e. dyadic messaging followed by an even distribution from group size two to eleven. (Note the scale on the left 'Number of Instances' of messages received is in logarithmic form). Finally, the number of instances tails of after size eleven. There are two interesting points here.

Firstly, the previous results found that the majority of messages were sent to groups (66%). This is due to the distinct ways in which the messages can be counted. In the first set of

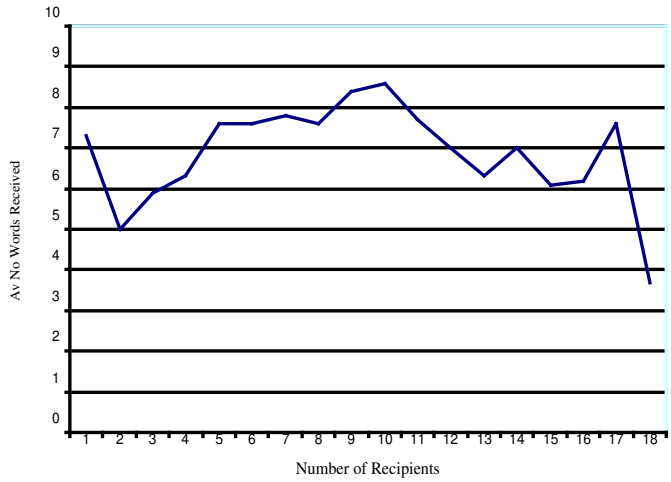

Figure 4.5: Average Number of Words Received per Turn By Number of Recipients

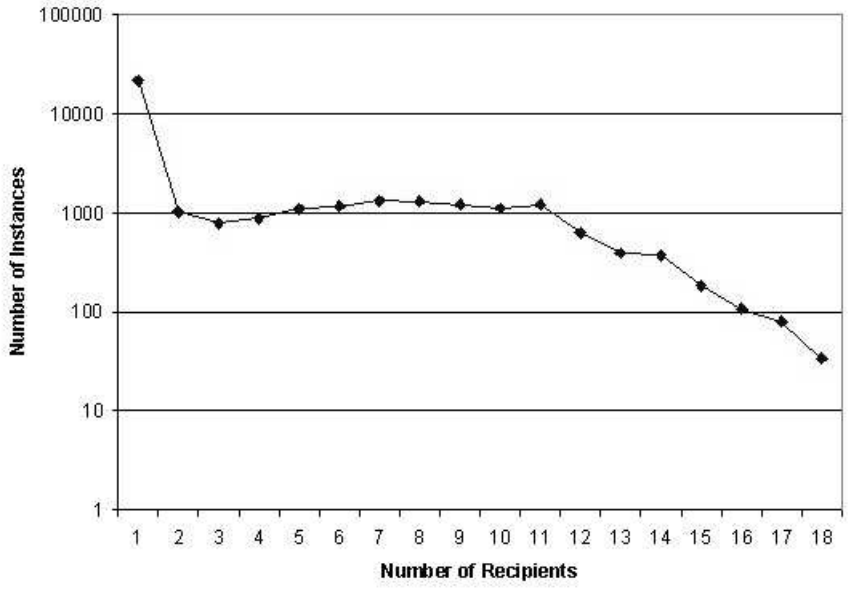

Figure 4.6: Frequency Distribution of Messages Received by Number of Recipients

results each individual message is counted as either being sent to an individual or a group. In the second set of results, (figure 4.6) it is instances of messages going to varying group

sizes. So for example, in group size two there were 1021 instances of messages going to that group. This adds up to 2041 actual messages. If this multiplication process is carried out for the rest of the group sizes, it reaches the same level as the first set of results.

A real-life example might be Fred walking into a room and saying 'hello' to its occupants, Bill and John. Does that count as one message to both or two messages, i.e. one to each occupant? With TCZ, the XML logging mechanism records the same message for every other user it is sent to. Both methods of counting are informative and both are needed to get an accurate picture. The second interesting point is regarding the possible reasons for the graph tailing off after group size eleven in figure 4.6. An original possibility was that friends lists were on average in that range, and that it becomes more difficult to maintain coherent exchanges in groups larger than this. However, the average friends list size for the traced individuals was actually 120. Messages sent to friend lists only go to those users actually connected, so it appears upon this evidence that the group size was determined by the number of co-connected users during the period of investigation.

As previously mentioned, the first part of the study was supplemented by a questionnaire which is detailed below.

The TCZ Questionnaire

The first part of the questionnaire was regarding locations and movement. In this part, users were able to respond with as many answers as they wished. This was to enable them to list all of the locations they spent most of their time in and gave a better overall picture of how TCZ's 'space' was being utilised. There were, therefore, more than 56 responses for this and subsequent questions. 52% of respondents said they spent most of their time in their own room. 26% stated the Swan Pub; with only four other locations being mentioned, namely: friends' rooms, game rooms, the Awards room and the Bank. It should be noted that with regard to game rooms (scrabble, chess etc), the Awards room (where users vote for each other) and the Bank (where users can withdraw TCZ 'currency' from their account) the commands for these activities only work when the user is in that room, and cannot be utilised remotely.[6]. This explains the anomaly previously shown in figure 4.3, where certain

[6]Another example being the 'Jukebox' in the Pub which can only be used in that location

locations contained activities that could only be carried out by co-located participants.
Overall, movement is rare and where it does occur it is often prompted by practical rather than communicative motivations. Additional evidence for this comes from the responses to the question: "where else might you visit?" Only five locations made up 90% of the 108 responses namely the Awards room, the Swan Pub, friends' rooms, game rooms and the Bulletin Board.
In relation to how residents actually carry out the movement, the final question in this section asked, "how do you normally move about TCZ?" 28% used the method of typing the room name to automatically go to that location, 22% 'teleported', another automatic method and only 7% actually used the exits from each room. This also indicates that residents ignored the 'real-life' means to traverse TCZ's 'spatial' metaphor, via doors and exits.
The second part of the questionnaire regarded command usage. Users were asked to list the top ten commands they normally used. These were:

1. Who = 43
2. Tell = 41
3. BBS = 38
4. FWho = 29
5. Scan = 28
6. Quit = 26
7. Say / Profile / Tell friends (tf) = 23
8. Page = 18.

It should be noted that a sub-question asked users to list the first five things they do when they logged into TCZ. The general response to this question was to see who was logged in, say hello to friends, read the bulletin board, see which close friends were available and then start talking. It appears that the results above are a reflection of the salience of these initial actions in memory (roughly the order in which they occur) rather than real frequency of

use. It should therefore be noted that these answers are not an accurate reflection of what they actually use. For the actual usage statistics, see table 4.2 on page 122.

The third part of the questionnaire addressed occurrences and control of multiple concurrent interactions. 97% of sessions involved the maintenance of distinct, concurrent interactions. There are two aspects to this, namely how these interactions were controlled and managed, and secondly, why they were controlled and managed in that way.

36% of respondents said they used purely mental agility and typing skills to control these conversations. This 'cognitive time sharing' was utilised so that other messages were sent whilst utilising the delay for a reply being typed by another user. Residents mentioned the ability to scroll back as being important, as they had a permanent record of ongoing conversations to refer back to. Some residents commented that you "had to get used to it", or that "it was a skill soon picked up". The use of colour to differentiate messages, along with prefixes to denote resident's statuses probably aided this mental process. 54% of respondents used single or a combination of commands to control their concurrent conversations. One example would be combining the 'say' and 'page' commands concurrently. Users would have one interaction via 'say' (visible to all co-located users) and a second, private, concurrent interaction with one of the same co-located users via 'page' (which would not be visible). Another example would be the same two interactions as before, but with the addition of a third interaction on the administrators' chat channel, and a fourth interaction via the 'tell' command with a user in a separate location.

Finally, the questionnaire looked at control of user availability. When asked if they ever deliberately avoided communicating with other people on TCZ, 91% said they did. With regard to how they did this, the most popular replies were "just ignoring their messages" and avoiding a location they were in.

4.4.2 Results of Comparison between TCZ and BNC

Question 5. Will users be peripheral more frequently (and therefore primary less frequently) in TCZ than BNC, due to the increased 'competition' for the floor?

Figure 4.7 shows the frequencies of participatory status between BNC and TCZ.

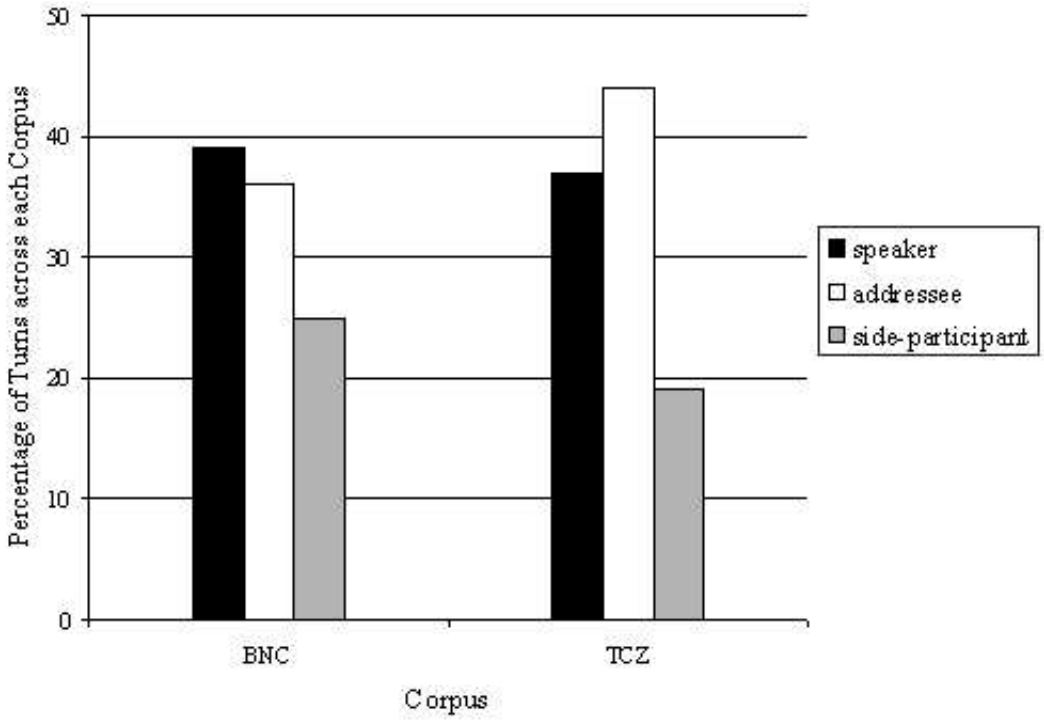

Figure 4.7: Frequencies of Statuses

The categories of speaker, addressee and side-participant all have the same definitions as previously outlined in Clark's model. It should also be noted that the bystander and eavesdropper categories are undetectable in the BNC corpus, and hence are not included on the graph.

In order to determine whether the frequency of peripheral statuses in TCZ was reliably different from the BNC, a chi-square test was applied to the data. The test revealed that there was a significant difference between the two (X^2 =102, p > .005). In other words, these findings indicate that online users hold primary statuses more than face-to-face, and face-to-face users hold peripheral statuses more than those online.

Question 6. What evidence is there that users of TCZ will make fewer transitions between peripheral and primary status than BNC?

Mobility of participatory status is the process of moving from peripheral to primary participation and vice-versa. In this data sample, we counted a move regardless of the interaction it took place in. So even though a user may stay peripheral for the duration of one interaction, they may move to primary and back to peripheral in other interactions. In order not to bias the result, the number of moves for each traced individual was divided by the average number of participants in all traces for each corpus. This was necessary as the traced individuals in TCZ had access to more interactants and would therefore have had more opportunity for status mobility.

Table 4.5: Total Number of Moves between Primary and Peripheral Participation & Vice-Versa

BNC	TCZ
75	46

Table 4.5 shows the total number of moves between both forms of participation. In order to determine whether the number of moves between primary and peripheral statuses in TCZ was reliably different from the BNC, a Mann-Whitney test was applied to the data. The test revealed that there was no significant difference between the two (Mann-Whitney, U= 281, p=0.55 (the full breakdown for each subject is given in Appendix D)). The results therefore

highlight no difference in the number of moves between peripheral and primary status in the TCZ and BNC subjects.

Question 7. To what extent will users of TCZ produce fewer words per turn as speaker than BNC?

Table 4.6: Average Number of Words per Status per Turn

—	BNC	TCZ
Speaker	7.88	6.4
Addressee	6.12	6.4
Side-Participant	3.9	5.99
Primary	7	6.4
Peripheral	3.9	5.99

In order to determine whether, on average, the number of words per turn as speaker in TCZ was reliably different from the BNC, a further Mann-Whitney test was applied to the data. The test revealed that there was no significant difference between the two (Speaker TCZ & Speaker BNC Mann-Whitney, U=280, p=0.55, Addressee TCZ & Addressee BNC Mann-Whitney, U=245.5, p=0.19). A further Wilcoxon test showed that there was no significant difference across the same subjects in both primary statuses (Speaker BNC & Addressee BNC Wilcoxon, W= 80, z=1.07, p=0.28, Speaker TCZ & Addressee TCZ Wicoxon, W= 1, z=0.01, p=0.99), and across the same subjects between primary and peripheral (Addressee BNC & Side-Participant BNC Wilcoxon, W= 114, z=1.53, p=0.12, Addressee TCZ & Side-Participant TCZ Wilcoxon, W=46, z=0.61, p=0.54). The full breakdown for each subject is given in Appendix E.

In order to test whether there was a significant difference between the average number of words received per turn in peripheral status, a Mann-Whitney test was carried out. It showed a significant difference between the two (Side-Participant TCZ & Side-Participant BNC U=102, $p > .005$). This suggests that although side-participants in face-to-face are not different from addressees, they are different from side-participants in online interactions.

Question 8. To what extent will users of TCZ will have a higher occurrence of holding multiple simultaneous statuses than BNC?

Table 4.5 indicates that in virtual communities, the technology makes the holding of multiple simultaneous statuses more possible and more frequent.

Table 4.7: Instances of Multiple Participatory Statuses

Number of Statuses	BNC	TCZ
Two	2	8
Three	0	4
Four	0	1
Five	0	1

Question 9. What evidence is there that users of TCZ will have more frequent 'conversations' than BNC?

The results show that in TCZ, the average number of 'conversations' per subject (according to the previous definition) was 2.96, in BNC the average was only 1.

4.5 Discussion

The first part of the study looked at whether the spatial organisation of TCZ constrained user participation. In other words, was 'space' an organising factor of users' interactions, and how did such virtual space affect users' patterns of participation?

TCZ incorporates a strong spatial metaphor into the structure and organisation of the online environment. With regard to the question: does such a spatial organisation constrain participation? the data presented here suggests not. With minimal user movement, and as alluded to in the questionnaire, patterns of congregation based on practical rather than communicative reasons, both TCZ's spaciality and the means to traverse it are routinely ignored. This also means that only a small proportion of TCZ's space is ever used regularly. User expertise was found not to be a contributing factor towards this. More than half of all messages go to distinct locations from their senders, and multiparty (non-dyadic) messaging is common. There appears to be no clear advantage to being co-located. TCZ's 'space' does

not seem to constrain the number of participants in an interaction, in fact the opposite is true with the level of group messaging.

The TCZ command language is sufficiently flexible to allow users to deviate from the underlying spatial model. The data presented in this chapter shows that in practice users routinely take advantage of this possibility. Normal face-to-face interaction is, by definition, located in physical space. This imposes constraints on participation, i.e. it limits who can talk to whom and when. Users of TCZ exploit the fact that these constraints need not apply to online interactions. They conduct multiple, concurrent conversations with people who are typically in a variety of different locations. Concurrent interactions are almost impossible to maintain in face-to-face. This suggests that the spatial metaphor does not constrain their interactions.

However, although we have stated that virtual space is not a major factor in organising users interactions, it should be noted that under certain circumstances, the virtual space does play an important role. For example, the results show that certain TCZ locations have more inhabitations than others. These locations were primarily games rooms, where the software code required users to be co-located. As such, these parts of TCZ's space were central in mediated interactions and the commands utilised for them. Although the results show that less than 10% of TCZ's space was actually utilised, certain factors such as a sense of 'place' (e.g. the Swan Pub) where interactions are placed within a description of a social background were still valued. This fact is also highlighted by some evidence from the command usage results (see table 4.3) that show a small difference to communicative practice in relation to location.

TCZ's design does not support the management of multiparty interactions, and users have to adapt the resources they do have to try to manage it. The questionnaire highlighted this point, with resources such as message colouring or name prefixing being utilised. Thus, the typical, but not the only, situation of use in TCZ is that people remain alone in a location and interact with individuals who are in several other locations, and that they are willing to work quite hard in order to do this.

Relative to face-to-face conversation, interaction in TCZ can be glossed as having a 'flatter' participant structure than face-to-face interaction. There is more group-based interaction

and peripheral participation is less common. These differences seem to be the result of strategic adaptations of the technology to re-configure the communicative organisation of their interactions. Users take advantage of the ability to control who can overhear their conversations. They also take advantage of their ability to selectively bar some individuals from contacting them. This kind of control is difficult to achieve in face-to-face interaction. The main means of control available in the physical world is to move in and out of earshot; control of participation through displacement in space. Although users in TCZ could also use location in 'virtual' space to manage the participant structure of their interactions, they prefer to exploit the possibilities that the technology offers for more direct and flexible means of control.

The second part of the study looked at what difference does moving from the actual to the virtual make; what changes?

We questioned whether users would be peripheral more (and therefore primary less) in TCZ than BNC due to the increased 'competition' for speaker status. (On average there are twice as many participants per interaction in TCZ than in BNC.) The data suggests that the opposite was true in that users were primary more in TCZ and peripheral less than predicted. This is consistent with the idea that there is more group-based interaction in TCZ.

We also investigated whether, due to less 'competition' for speaker status in the BNC, we should expect more transitions between status and fewer in TCZ per subject. The results indicate no significant difference between the number of transitions between primary and peripheral statuses in both domains. The previous point regarding group-based interaction is further supported by the fact that even though there are more people in TCZ, there is no difference in the number of moves between primary and peripheral (and vice-versa) for the traced individual.

Also, in face-to-face, participants should on average produce more words as speaker (and subsequently receive more as addressees and other statuses) due to the lower 'production costs' of speaking compared to typing in TCZ. We can also reject this, as there was no significant difference between what speakers produce and what addressees receive in both conditions. There was however a significant difference in what side-participants receive,

with TCZ users receiving longer turns than BNC users. One possibility for this difference is that side-participants are easier to control in virtual interactions, they can be selected through the command used to send a message, e.g. a message sent to Fred, Harry and Bill but directed at Fred means Harry and Bill as peripheral participants are pre-determined and known. This is not always the case in face-to-face.

A further example can be drawn from the fact that users can receive half conversations, dependent upon the configuration of other users' friend lists. So for example let us take Fred, Harry and Bill. Fred has, amongst other users, Harry on his friends list but not Bill. And Harry has, amongst others, Bill on his friends list as well as Fred. If Fred and Harry start to have a conversation between their mutual friends using the tell friends command, Bill will start to receive responses from Harry, but not the original turns from Fred.

Such half conversations can be useful in monitoring the subjects of friends' conversations with others and users have three options to deal with it.

Option 1 - TCZ allows it to happen, it's not ideal, but I cope with it.

Option 2 - I want to see the other half of the conversation. Bill in our example can either (a) add Fred to his friends list and thus receive Fred's tell friends messages as well, or (b) add all of Fred and Harry's friends to his list and miss nothing. (Such a process is possible in technologies such as TCZ, but not possible in others, such as mobile phone conversations. See Monk et al, 2004 for a study of the 'need-to-listen' effect.)

Option 3 - These half conversations are a problem at the moment, I can set my pagetellfriends flag on that person (in our example Harry) and I won't receive his tell friends messages any more.

The point here is that without constantly checking which other users are on each others friends lists using a command, users are never 100% sure that their messages are not going to someone they haven't got on their friends list. But there is a level of acquiscence that differs from face-to-face. In face-to-face, possible 'overhearers' are not always accountable, for example someone standing next to an open door listening to a conversation. With these virtual examples, the 'overhearers' are vetted in some way through the process of being a friend of a friend. This gives a form of permission that it is alright to speak in front of them.

It should also be pointed out that conversations carried out using friend lists are of a more

general nature, and anything more sensitive or private would normally entail the use of a distinct page or tell command to a single or specific group of other users.

The final two questions dealt with holding multiple status and numbers of conversations. For TCZ, the results show that even though holding two concurrent exchanges is common, it is also not uncommon to be involved in three or even four simultaneous exchanges. It appears therefore that this phenomenon is something that TCZ users regularly take advantage of, and as previously mentioned, employ a variety of strategies in order to manage it.

With regard to conversations, users of TCZ had more frequent 'conversations' than those in the BNC. This reflects the fact that in face-to-face interaction it is almost guaranteed that as all of the primary participants are always mutually aware of one-another, they will all have symmetrical access to the conversational channels. This observation is supported by the fact that, with regard to the BNC, none of the three clauses in the previously defined operational definition of a conversation were invoked. With regard to TCZ, only clause a) was invoked. Table 4.8 below summarises the participatory distinctions between interactions in the BNC and TCZ.

Table 4.8: Participatory Distinctions between BNC and TCZ

—	BNC	TCZ
Status Distribution	Even distribution as speaker and hearer. More peripheral status than TCZ	Higher level of addressee than BNC, fewer turns in peripheral status
Number of Interactions	Single interaction at a time	Many concurrent interactions
Turn Length	Same in primary status, shorter in peripheral	Same in primary status, longer in peripheral
Mobility of Status	No significant difference	No significant difference

Table 4.8 highlights that when moving from the actual to the virtual, participants hold primary statuses more than in face-to-face. They are also involved in more concurrent interactions and receive longer turns in peripheral statuses than in face-to-face.

Relevance of Findings to Previous Models

The findings discussed here have interesting implications in relation to the previous models of participation covered in chapter two. Firstly, neither Goffman's, Levinson's or Clark's models explicitly account for either higher numbers of participants or group interaction.[7] Because technologies such as TCZ ease the process of many multiple users concurrently participating, this can affect the resultant participatory structure. For TCZ, this was reflected in the fact that high numbers of messages went to groups and that any 'production costs' the medium might have incurred were not significant in terms of what those groups received. Group management, co-ordination and control has distinct properties from the management and control of say, single addressees. As such, consideration needs to be given to how the technology provides configuration for group members to be 'assigned' statuses within either a participation framework or conversation.

Secondly, the previous models do not account for the holding of multiple concurrent statuses, or the ways in which they might be managed. Goffman acknowledges this phenomenon occurs with his notion of 'in-stream', 'out-of-stream' conversations. However, he does not formalise this or put in it relation to his participation framework. Supporting such activity when it is clearly taken advantage of in a TBVE is another important consideration for designers.

Thirdly, the previous models do not take a clear stance on the relationship between changes in participatory status and the 'conversations' they might relate to. For Goffman, his set of statuses are in relation to a 'time-slice' across all participants in relation to an utterance (and as such is limited to a single modality). Neither Levinson nor Clark give any structural commentary on useful ways to relate definitions of conversations with participatory status. Our working definition accounts for the fact that unlike face-to-face, technologies do not always provide both awareness of all primary participants and symmetry within communicating channels. As such, our definition accounts for these points and does not rely on the face-to-face notion of conversation where, in the normal case, everyone sees and receives everything. These types of participatory phenomena highlight the distinct nature of online

[7] Except in the 'speech-event' sense such as podium talk, which is not directly applicable here.

interactions.

Fourthly, and in terms of participant roles, the previous models all incorporated a decompositional approach (albeit at varying levels). For this particular technology, however, we have seen a set of roles that, as previously mentioned, could be glossed as having a 'flatter' structure. In fact, the results lean towards a more 'tri-partite' participatory distinction, that of primary, peripheral and non-participant. This stands in contrast to other technologies such as e-mail, where a need for greater decomposition has been identified (see Pemberton, 1996). The idea that interaction is 'flatter' is that, on average, people spend more time in primary statuses and the technology makes it easier to control other forms of peripheral participation (e.g. overhearing or bystanding). The empirical data can be glossed as evidence that when people have greater control over possible participation structures they take advantage of it. However, it does not necessarily follow that we need fewer distinctions about (in principle) possible types of participant. From this thesis, we have seen evidence for new participatory possibilities in virtual environments. As previously noted, there is a need for group-based participatory structures. Other phenomena, such as the possibilities for asymmetric access to channels, make strange kinds of semi-participation possible, e.g. the non-intersecting members of friend lists that only see half the conversations. There are also possibilities for complex, environment/culture-specific forms of participation evolving, e.g. TCZ's status distinctions such as 'Deity', 'Wizard' etc as a set of Clark-like 'layers'. To cover all such interesting phenomena, a rich set of participatory distinctions could be required. However, our primary concern here is with design. So the distinctions we require are those likely to be of most use to designers. For this primarily practical concern, phenomena such as the emergence of cultural layering phenomena (see above) are too unpredictable and complex. There is a requirement for simple categories that capture the most important distinctions in a reliable way (i.e. one that is usable by 'naive' design practitioners).

Having argued these points, it is pertinent to recall that some aspects of the previous models do have potential for use in supporting activity in both face-to-face and online interaction. One example is Goffman's notions of by-play, side-play and cross-play and their collusive counter parts. (See section 2.3.3 on page 41.) Although not specifically addressed as part of this study, it is interesting that for this technology at least, they can still be reproduced

electronically.

Relevance of Findings to Other Technologies

TCZ's flexibility and resource-light nature has influenced the production of the types of phenomenon discussed here. Other more resource-hungry systems (e.g. avatar-based VR) or less flexible visual systems (e.g. VMC) can limit either the number of concurrent participants or the quality and type of interactions available (see discussion in chapter three). Furthermore, if systems strictly enforce a spatial metaphor, then they can also implicitly incorporate some of the constraints of face-to-face interactions.

In comparison to other text-based technologies, we have already seen some participatory limitations of Instant Messaging (see chapter three). Apart from e-mail, other popular text-based media such as Bulletin Boards, SMS and Internet Relay Chat (IRC) have not been analysed strictly in terms of participatory status, and it is not clear whether they have the same potential for flexible configuration of participation.

4.6 Conclusions

The first question this thesis addressed was; do TBVEs exhibit different forms of participation from face to face? These data suggest the answer to this question is 'yes', as participation in TBVEs has been shown to differ through the following.

Circumventing the Spatial Metaphor

Face-to-face interactions are based on the physical constraints of co-presence and co-temporality, and the intuitive step in moving this into a virtual setting is to incorporate locations, or rooms for users to inhabit. This chapter has shown how users regularly ignore the environment's 'space' and the means to traverse it. In this situation, users develop new forms of conversational interaction and, correspondingly, new forms of participation.

Frequent Group Interaction

In TCZ, multiparty messaging was common. The ways in which the environment supported group interaction was regularly taken advantage of by its users.

Managing Multiple Interactions

With the fact that virtual users find it easier to maintain simultaneous concurrent interactions, management and control of these phenomena is also an important design issue. Text-based systems often offer a form of persistence for conversational history, but better interfaces could ease the amount of cognitive processing users have to spend in maintaining such interactions. TCZ does not support multiple conversations, and users have to find unique ways such as message colouring and name prefixing to aid the management and control of this process.

More Frequent Conversations

Virtual conversations (according to the participatory definition of a conversation) are more frequent than face-to-face. When moving from the actual to the virtual, the number of participants does not affect the level of primary statuses held (virtual users held more than those of face-to-face), and the 'production costs' involved in virtual interactions did not appear to affect the number of words produced and subsequently received.

This chapter has detailed an analysis of participation in a TBVE and also a comparison with face-to-face interactions. The data suggest that TBVEs do afford different forms of participation and that moving from the actual to the virtual gives users opportunities to exploit an environment where normal face-to-face constraints do not apply.

The second thesis question was "What is the right concept of participation for virtual environments?" Given the empirical evidence previously discussed, we can suggest that participation in virtual environments should be conceived primarily as a set of multiple group interactions, centered around the control and manipulation of multiple and distinct 'conversations'. Although there was evidence for some usage of TCZ's space, the vast majority of these group interactions were initiated from home locations, and as such highlighted the minor influence the environment's spatial metaphor had on participation. Current models of participation cannot adequately express this conception, and raises the third thesis question, "How can this a revised understanding of participation be formulated in a way that

makes it accessible to, or useful for design?"

It is clear that online communities foster, both intentionally and unintentionally, new forms of communicative organisation. Designers need to be sensitive to this in both the design and evaluation of these environments. Providing designers with a more appropriate model that can account for such phenomena is an important contribution. The next chapter is intended to propose such a model.

Chapter 5

Modelling Participation for Design

The previous chapter highlighted that participation in virtual environments should be conceived primarily as a set of multiple group interactions, centered around the control and manipulation of multiple and distinct 'conversations'. It detailed some participatory differences between face-to-face and virtual interactions:

- Unlike face-to-face, virtual 'space' is a weak factor in organising user interactions, with such 'space' not constraining participation, in terms of numbers of participants
- Group interaction forms an important part of virtual participation
- Concurrent interactions are frequent, with users finding novel ways to manage them
- In virtual participation, users hold a greater proportion of primary statuses, and 'conversations' (according to our definition) are more frequent

In light of the findings of Chapter 2 with regard to the limitations of current models of participation, and in order to answer the the third thesis question, "How can this a revised understanding of participation be formulated in a way that makes it accessible to, or useful for design?" , this chapter details the proposal of a new model that:

- is not constrained by such limitations, e.g. co-presence, co-temporality, being centred on the analysis of verbal interactions and the implication that participatory statuses are always symmetric

- can adequately capture 'virtual' participation (as highlighted by the participatory differences above),

- and could also be used by designers of other technologies where participation may not have been explicitly considered as a design issue.

Based on the above, the model (see Figure 5.1 below) is proposed as an organised set of empirically grounded design insights. Its purpose is to support system designers who may not have previously taken a 'stance' on participation in their previous work. Although one cannot guarantee complete coverage of all participatory issues, the basic premise and ideas are articulated here and provide scope for future enhancement. It should be noted that the model is aimed not only at designers of virtual environments, but is constructed in such a way that participatory issues related to interaction can be examined in a wider variety of technologies. It aims to achieve this by abstracting away from one specific medium, and instead centring design issues in relation to the creation, joining and reconfiguring of 'conversations'.

It is envisaged that the model could be used in several places in the design life-cycle relative to the system under investigation. For example, if the designer is at the initial stage of development, the model could be used in order to help elicit user requirement, by highlighting participatory possibilities throughout the conversational organisational process. Another possibility is that the model might be used post user requirements, or in the design stage, where alternative methods of implementing a requirement could be considered.

The aim of the chapter is to both present the model and provide some exploratory examination of its usability. This will be carried out by detailing an evaluation study, and subsequent possible revisions to the model as a result. The rest of this chapter is organised as follows. Firstly, a description of the model in terms of its primitives, notation and usage, including a comparison with the previous models discussed in chapter two. Secondly, an example comparison of two existing technologies using the model. Thirdly, an evaluation

of the usability of the model, with some potential revisions in light of the findings of the study. Finally, the chapter conclusions are presented.

5.1 The Model's Constituents

5.1.1 Basic Concepts

The model begins with a set of three basic concepts; identities, channels and networks.
The first concept is 'identities'. The term 'identities' was selected instead of 'users' as, although it is extremely difficult in some technologies to maintain concurrent distinct representations of the self, in others it is entirely possible. Thus the term is intended to cover both single and multiple instantiations of the same physical person. At any one time, a system will have a set of identities using it, and dependent upon the system in question, this set may or may not be the same as the number of physical users.
The second concept is 'channels'. Each channel is defined as a connection between identities, and as such, allows the possibility of the same identities conducting interactions on either single or multiple distinct channels.
The third concept is 'networks'. Networks are defined as sets of channels, and as such, identities (who are defined as belonging to channels) can also be members of multiple networks, thus providing a notion of interconnectivity between all identities. These three primitives are referenced in relation to some design issues that follow.

5.1.2 Model Notation

With reference to figure 5.1, the model's notation begins with a solid black square, or the 'initial state' symbol. This denotes the point of 'entry' into a system. Leading from this symbol are 'flow arrows' (lines with black arrow heads), that denote possible paths around the model. A box with plain text inside is an 'action box', something that has to be done by a user in order to proceed. Other boxes are 'communicative goal' boxes (indicated by the bold text) denoting a higher-level participatory goal, 'information boxes' (indicated by italicized text) that categorise a participatory state, binary 'decision boxes' (denoted by the single dotted line with 'Y'/'N' flow arrows) that offer a choice for the designer to consider,

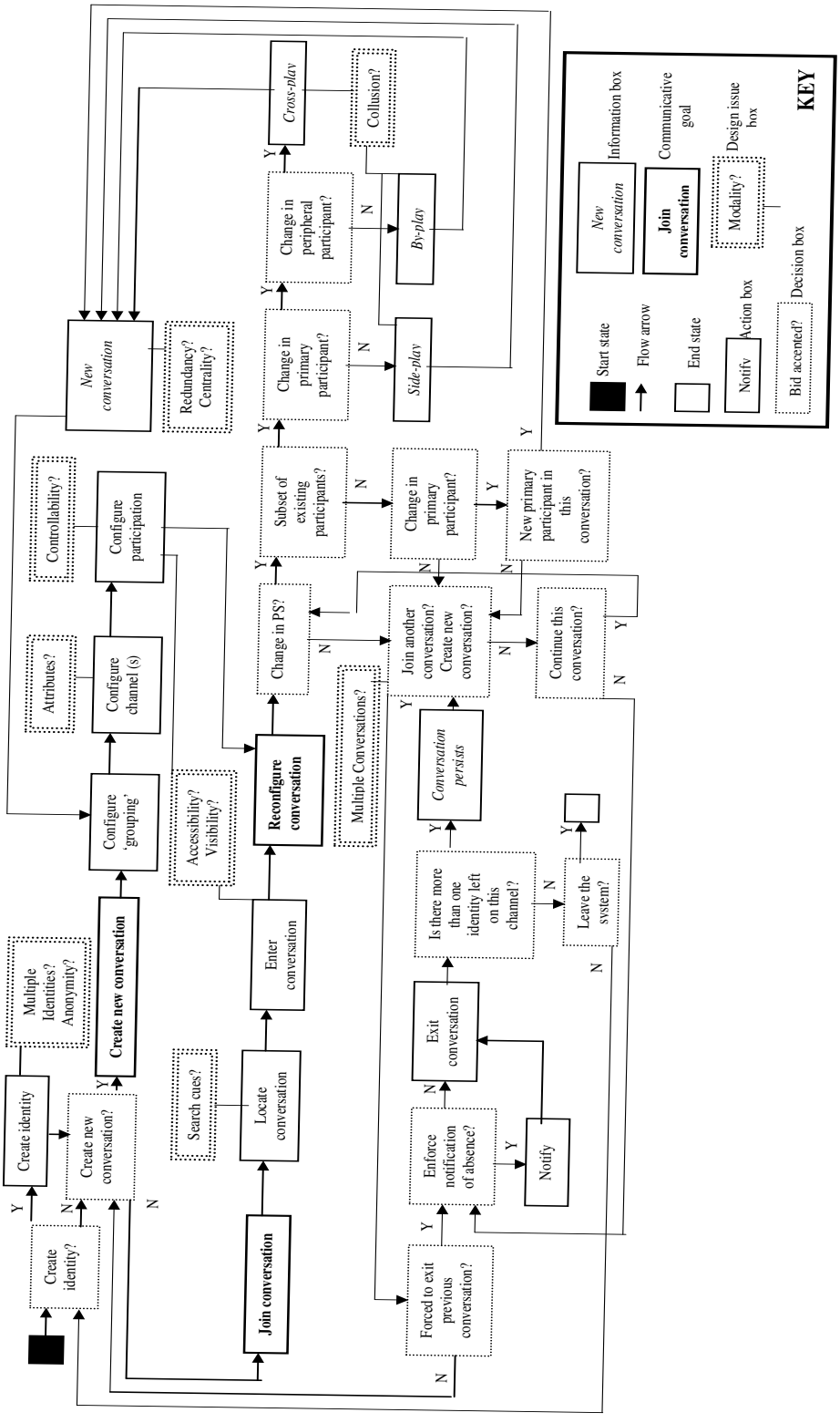

Figure 5.1: The Model

and 'design issue boxes' (indicated by the double dotted lines, joined at the point at which it is relevant by a single plain line) that highlight the relevant design issue in question. Finally, the 'end state' box is denoted by a solid white square, indicating the point at which interaction within the system ends.

We have previously suggested who may benefit from using the model, and at what stage in development its usage can be envisaged. The next section details how the model may be used.

5.1.3 Using the Model

For the purposes of this section, we propose the following scenario. A designer has been asked to produce a system to support communication and work practises in a company. The design brief has left open various possibilities in terms of selecting communicative modes, and the designer needs to clarify how certain design choices will affect participation within the system. As the model is aimed at raising such participatory-related design issues, let us step through the model in order to see what points it raises for our designer.

He begins at the 'start state' indicated by the solid black box. This indicates the entry point into the system.[1]

Following the flow arrow we reach a decision box 'Create identity?' where the designer must decide whether the system allows users to create (and possibly manipulate attributes of) an identity, or forces them to be verifiable. The point under consideration here is in connecting (or not, as the case may be) the real-world person and the system representation of that person. If the designer selects 'no', then he follows the flow arrow to the 'create identity' action box (a 'yes' selection would mean users connecting using their own details). Associated with this box are two design issues. Firstly, individuals with multiple identities. Will the system allow multiple representations? Secondly, the issue of anonymity. Will the system allow users to interact without any reference to their true identity? And at what

[1] There are other non-participatory-based design issues that could also be raised at various points within the model; e.g. what interface is presented at system entry etc. This model only addresses participatory-based design issues.

level will their true identity be known (if at all), for example only to those with high enough systems permissions?

5.1.4 Creating Conversations

After identity creation, we follow the 'flow arrow' to the 'create new conversation' decision box. If the answer is 'yes' then we follow the path to the 'create new conversation' communicative goal box. (If the answer was 'no' then the path leads to the 'join conversation' goal box which we will follow later). The first action box in this path is 'configure grouping'. Here the designer must consider how the system will organise conversations. For example, bulletin boards (BBS) would organise their conversations in terms of threads, rooms or activities (such as 'conference room' or 'club') by names or descriptions. Identities could be organised through the selection of a subset of other identities to create a conversation.
Once the conversational 'grouping' has been configured, the next action box is 'configure channel(s)'. Here the designer must consider the issue of 'attributes' that a channel (or channels) may have. Examples include (but are not necessarily limited to):

- Are the channels symmetric? In other words, asymmetric channels open the possibility for identities to receive one-sided conversations, or for identities not to be aware of who is in receipt of half of their conversations
- Distinct channels? Will they be textual, visual, aural or graphical?
- Are channel(s) synchronous/asynchronous?
- Are channel(s) reflexive/non-reflexive? Will the systems support a self-image; i.e. what an identity looks like to other identities?
- Are channel(s) ownable? Will the system allow others to control or close channels in which other identities are participating?
- What is the scope of the channel? Can an identity create a channel with everyone at once?

Following this, the flow arrow leads to the 'configure participation' action box. Here the designer can consider the level of control an identity has in terms of configuring who holds

primary and peripheral participatory status with regard to their conversation. Other design issues are accountability and visibility. In terms of accessability, the issue is whether the system allows a conversation to have access rights set on it. This is possible in relation to the levels of participation previously configured, e.g. ranging from primary or peripheral to no-access via non-participation. The design issue of visibility relates to how a conversation is 'broadcast' or made known to other identities. Once the participation has been configured, the flow arrow leads to the 'reconfigure conversation' communicative goal. We will detail this section shortly (section 5.1.6), following our return to the 'no' selection from 'create new conversation'.

5.1.5 Joining Conversations

The first box of this path is the 'join conversation' communicative goal. This leads to the 'locate conversation' action box. Here the design issue relates to the 'search cues' the system provides in order to locate an existing conversation. This is explicitly linked to both the 'grouping' of the conversation and how it was made 'visible'. For example, if the conversational grouping was a bulletin board notice, then the search cue might be textual in the form of a thread or subject. If the grouping was by identity then the search cue may be a name, age range or gender. If the grouping was a room or activity, then the search cue may be a location or description of an activity. This leads to the 'enter conversation' action box. Notice that this box has the same design issues as the configure participation box, only entering conversations that are accessible.

5.1.6 Reconfiguring Conversations

The previous two paths both eventually lead to the 'reconfigure conversation' communicative goal box. Here, the designer can consider how the conversation (either created or joined) may alter or be reconfigured during an interaction. This section involves three parts.

5.1.7 Part 1: The Participatory Structure 'Loop'

The first part is a loop that proceeds from a 'no' selection from the 'change in participatory structure (PS)' decision box. A 'no' selection indicates no change in the participatory struc-

ture and leads to the 'Join another conversation - Create new conversation?' decision box. Here the design issue is one of the possibility of holding multiple concurrent conversations. How would the system support such activity? Would it support them in complete synchrony, or force them to be parallel and interleaved? We will discuss a 'yes' selection from this box subsequently (section 5.1.11). If the selection is 'no' then it leads to the 'continue this conversation?' decision box. If the answer is 'yes' then the loop is made back to the decision box that tests for changes in participatory structure. Therefore the loop provides a way of accounting for continuing conversations that have a static structure, with the option to create new ones or leave the current conversation.

5.1.8 Part 2: A Change in PS?

The second facet of this section leads from a 'yes' answer to the 'change in PS?' decision box. The second decision box asks if the change involved a 'subset of existing participants?' In other words, is it the case that not all of the participants in the conversation are involved in the change? If the answer is 'yes' then this will lead to the third facet (section 5.1.9 below). Here, we follow the 'no' path, in other words there has been a change, and it did not involve a subset. The path then leads to the 'change in primary participant?' decision box. If the answer is 'no' (i.e. the change was a peripheral participant) then it leads back into the loop previously discussed. However if the answer was 'yes' (i.e. the change involves a primary participant) then it leads to a final 'new primary participant in this conversation?' decision box. From our definition of a change in conversation (see section 4.2.2 on page 101) we only count a change in conversation from a primary participant who has not held primary status with regard to that conversation before. This allows peripheral participants who have been primary to become primary again, without a change in conversation (i.e. at every interruption or turn change). If the answer, therefore, is 'no' (i.e. the change in primary participant was from someone who had previously held primary status) it goes back into the loop. But if the answer is 'yes' then we count this as a change, and subsequently a new conversation. The flow arrow, therefore, leads to the 'new conversation' action box. (See section 5.1.10).

5.1.9 Part 3: Subsets of Conversations

The third facet of this section leads from a 'yes' selection to the 'subset of existing participants?' decision box. Here there are three possibilities, either:

1. The subset is amongst primary participants, leading to the information box that this constitutes 'side-play'

2. The subset is amongst peripheral participants, leading to the information box that this constitutes 'by-play' or

3. The subset is across primary and peripheral participants, leading to the information box that this constitutes 'cross-play'

These decision boxes covers all possibilities of subset configuration and all lead to the creation of a new conversation. The design issue here is regarding the possibility of collusion. Or from the model's primitives, collusion is possible if for two identities there are two Networks N they are both members of and there is at least one identity who is not a member of both. Goffman (see section 2.3.3 on page 41) discusses all three forms of subsets and their collusive counterparts. Goffman delineates 'dominating' communication from 'subordinate communication' by stating that the 'subordinate' communication offers a 'limited interference' to the 'dominating' communication. Is this maxim the same 'virtually'? Would the system support such subsets and their collusive counterparts? In other words, the designer can determine what is possible. It should be noted that it is beyond the scope of this model to determine what is desirable in any given case.

5.1.10 New Conversation

The 'new conversation' action box has two design issues related to it. Firstly, the issue of redundancy, i.e. multiple links between the same identities. The designer can consider whether the system could prevent redundancy. Are system resources important? This is modelled as; redundancy occurs when at least two identities are connected through multiple distinct channels, C. The second issue is one of centrality; modelled as; the identity who is a member of the highest number of networks, N. Will your system allow all communication

to funnel through this one individual? Is this a good thing? Is this a security concern? The flow arrow leads from here back into the 'configure grouping' action box to allow for the fact that the new conversation may not necessarily have the same grouping as the preceding conversation. An example might be three identities with either a video or sound channel between them, and two of them open a text channel (thus deferring to side-play with a distinct grouping).

5.1.11 Exiting Conversations

Finally, the model deals with exiting conversations. If, within the loop, the system had to support the joining or creation of a new conversation, then the 'yes' flow arrow would lead to 'forced to exit previous conversation?' decision box. We previously discussed how systems may either support multiple conversations in parallel or force them to be in sequence or force the closure of the previous conversation. Therefore, if the answer is 'no' to this decision, the flow arrow leads directly back to the 'create new conversation?' decision box. If the answer is 'yes', then the flow arrow leads to 'enforce notification of absence?' decision box. Here the designer can consider whether the system under development forces notification to other participants that they are exiting a conversation (and thus leads to the 'notify' action box) or they can leave unannounced (thus leading to the 'exit conversation' action box). After exiting a conversation, the next decision box 'Is there more than one identity left on this channel?' tests to make sure that at least two identities are still involved, and if so leads to the 'conversation persists' information box and continues into the loop. However, if not, then the option is to either 'leave the system?' (and if so reach the end state (the solid white square)) or to go back to 'create new conversation?' decision box (with an option to 'create identity?' in the path to allow for users to create and maintain multiple identities if the designer so wishes).

5.1.12 Comparison with Previous Models

This model incorporates only some of the distinctions identified in previous work on participant structure. Firstly, the present model explicitly avoids incorporating any assumptions about co-presence or co-temporality in its treatment of participation.

The second difference has been to centre the model upon the operational definition of a 'conversation'; distinguishing relationships between contributions and participants. This stands in contrast to either a purely verbal utterance (Goffman), mutual obligation (Clark) or linguistic possibilities (Levinson). Through the process of creating, reconfiguring, joining and exiting 'conversations', related participatory-based design issues are drawn out. In contrast, what design issues might we infer in terms of a relationship to an utterance or a set of obligations (with their implied symmetry)? What considerations might we provide for a designer with a relationship to linguistic distinctions that may never be used? We argue that they would provide very little in terms of constructive design-related questions.

The third difference has been in terms of the way the model captures distinctions in relation to those proposed for conversation. As discussed in chapter four, the findings suggest a basis for the model built upon a 'tri-partite' participatory distinction, that of primary (speaker and addressee), peripheral (side-participants) and non-participants. In relation to Goffman's and Clark's (Goffmonesque) sets of statuses, they are similar except for the statuses of bystander (which is a type of side-participant for Goffman anyway) and eavesdropper (for which we saw little evidence of in practise). With regard to Levinson's distinctions, the model abstracts away from a role set based on grammatical possibilities and instead focusses on one that has the 'conversation' as the level of abstraction.

The fourth difference has been the inclusion of more system-centered aspects of participation, for example identity management, the notions of 'grouping' and channels, and the various design issues raised at certain points. These aspects have been included in order to present a model that steps through points of user participation from their entering a system until their leaving.

Finally, the model incorporates a way of considering the effects of movement between statuses or 'mobility of status' (see Monk, 1999 in section 2.4 on page 57). The 'reconfigure conversation' section accounts for both changes in primary and peripheral participants and whether the change involves a subset or all participants relative to the conversation. None of the previous models either capture or consider this issue.

In terms of similarities, Goffman's notions of side-play, by-play and cross-play (and their collusive counterparts) have been incorporated into the model. This allows the model to:

a) capture activities of varying sub-sets of participants

b) do this in a way that is relative to changes in 'conversation' and

c) allow designers to consider why their systems might (or might not) support collusion.

It should be noted that the in order not to produce an overly complex model that designers might find difficult to use, only clause a) from the definition of a 'conversation' has been incorporated into the model. As such it provides a useful way for designers to consider the notions of side-play and collusion. It is possible to consider appropriate places for clauses b) and c) to be integrated within the model, and this can be a consideration for future work.

5.1.13 Summary

The previous section has shown how the model can raise participatory-based design issues directly relevant to a system designer. In order to further illustrate this process, two existing systems are compared; the virtual environment already discussed in chapter 4 'TCZ' and AOL's Instant Messenger (AIM) discussed in chapter 2.

5.1.14 Example 1 - TCZ

In this section we will step through the model with TCZ and briefly discuss the design issues relevant to this example medium.

1) **Start State**

TCZ's start state is the home page that requests users to connect to the system.

2) **Create Identity?**

In TCZ users *have* to create an identity before using the system.

3) **Create Identity**

Here we can create our identity by selecting attributes for it such as name, gender and race. We can also set a description of the identity that is available for others to 'scan' and read. Although it is possible to maintain multiple distinct identities in TCZ, the practise is frowned upon and actively discouraged. However, certain users can create alternative

identities known as 'puppets' within the system. Such puppets are clearly marked as such and their 'owner' or 'creator' is also labelled. Multiple connections from the same I.P address are refused. Anonymity is preserved for identities if so required (unless users explicitly decide to use their own names and details). Members of TCZ 'admin' see all new connections to TCZ *and* where they log in from (in terms of their I.P address). Therefore, a user's geographical location is not hidden from a subset of other users.

Design Issues = *Strong notion of identity combined with anonymity and flexible self-representation.*

4) **Create new conversation - Create Grouping**

In TCZ there are a variety of groupings to select from. For example, there is the bulletin board system BBS (thread grouping), specific locations (spatial grouping), unique individuals (grouping by name), grouping by groups (via friends lists) or grouping by activity (chat-channels).

5) **Configure channels**

From the previous description there were six examples of channel attributes suggested, namely:

A - Asymmetric/Symmetric

B - Modalities

C - Asynchronous/Synchronous

D - Reflexivity

E - Ownability

F - Scope

Table 5.1 shows these attributes compared to the selections of grouping available in TCZ.

Design Issue = *Grouping affects channel attributes.*

6) **Configure participation**

In TCZ, the configuration of participation (and thus its controllability) is dependent upon

Table 5.1: Channel Attributes against Conversational Grouping in TCZ

	A	B	C	D	E	F
BBS	Sym	Textual	Asynch	No	Ownable	To all
Spatial	Sym & Asym	Textual	Asynch	No	Ownable	Just location
Individuals	Sym	Textual	Asynch	No	Dependant on rank	One identity
Groups	Sym & Asym	Textual	Asynch	No	Dependant on rank	Subset of Identities
Activity	Sym & Asym	Textual	Asynch	Yes	Dependant on rank	Subset of Identities

the communicative intention and actual command(s) used. For example, it is possible to configure the participation to just a single identity, a group of identities or even all identities in the system. It is also possible to configure all participants to be primary, or address a subset and make the others peripheral. The design issue of accessibility will depend upon who is selected as the other primary or peripheral participants (and in certain cases either the location of the conversation or the ownership of a particular chat channel). In terms of conversational visibility, other identities may never become aware of that conversation unless it is 'broadcast' in a sense. For example, (and from a generic sense) a conversational thread in a BBS is readily-visible to other identities, but a private chat amongst a select group may not be. The issue for the designer is whether to give identities the ability to make their conversational activity (should they so wish) known to others, and if so, by what means.

Design Issues = *Configuring conversations is easy, accessibility also dependent upon grouping, visibility has to be explicitly set.*

7) **Reconfigure conversation**

Here we will look at how the TCZ system deals with the PS 'loop', and subset choices.

8) **Change in PS loop**

The change in participatory structure loop is testing whether there has been a change in primary participants with respect to the entire set of identities in a conversation. New primary participants (who have not previously been primary with regards to that conversation) can emerge in a variety of ways, again dependent upon the conversational grouping in question:

- Thread grouping - new primary participant adds to thread
- Spatial grouping - movement of new primary participant into a location
- Identity grouping - peripheral participant who hasn't previously held primary status becomes primary

The join/create new conversation decision can be initiated at any time either by the identity or by request from a second identity. The continue conversation decision is decided by the identities in question (unless, under certain circumstances, an identity with a higher rank decides to 'kick' an identity from a location/channel/conversation).

9) **Subset Choices**

In TCZ, side-play, by-play and cross-play are all possible through the 'tell' or 'whisper' command (so that the other participants are aware that the 'play' is occurring), *and* their collusive variations through the 'page' command (where the other participants would not know of its existence). For the designer, it may be important to discover whether the 'collusion' enabling commands were user-contributed. It is also important to note that the command 'whisper' which does support by-play, cross-play and side-play (but not their collusive counterparts as others see a message that the command is being used) is rarely employed. This may be due to the fact that it cannot be done remotely.

Design Issue = *Collusion is easily possible*

10) **New Conversation**

If a new conversation starts in TCZ, there is no explicit support in the system for the maintenance of multiple conversations (should the old conversation still persist). As some

of the indications from the questionnaire highlight, identities in TCZ exploit other system configurations and techniques in order to ease such maintenance. This is a clear design issue that would need addressing in further iterations of the interface/system design. It is possible to have multiple connections between identities, so the design issue of redundancy is relevant. The issue of centrality is also worthy of consideration, as TCZ places no limit on the number of conversations in which an identity can be a member.

Design Issue = *No direct support for multiple conversations, redundancy possible in the system, centrality an unaddressed design issue.*

11) **Join Conversation**

The joining of conversations in TCZ involves their location as a first step.

12) **Locate Conversation**

Location of conversations is dependent upon the design issue of the search cues available. In TCZ this may be through topic, name(s), or activities/locations.

13) **Enter Conversation**

Entering a conversation in TCZ is interdependent upon the conversational grouping and their accessibility and visibility (See section 5.1.4).

14) **Forced to exit previous conversation?**

TCZ's interface does not explicitly support multiple parallel conversations. They are, in a sense, forced into a sequential form of parallelism. Identities can't type a message that is being read by another identity at the same time as receiving one. Identities on TCZ have to resort to other methods in order to maintain multiple conversations, such as name prefixing, colour and command selection. This is also a worthy area for further consideration.

15) **Enforce notification of absence?**

TCZ only enforces notification of absence in groupings such as locations or chat channels.

16) **Leaving the system**

When leaving the system, TCZ sends an announcement to the administrators that a certain identity has left the system. Other users can only tell that an identity has left the system when their name no longer appears on the 'who's connected' list.

5.1.15 Example 2 - AIM

To compare with TCZ, we step through the model with AIM.

1) **Start State**

The start state in AIM is a log in screen and presumes that an identity has already been created (see point 2).

2) **Create Identity?**

With the AIM system, the identity creation process takes place before using the system in the setup procedures. There are options to create up to eight identities, each with a different 'profile' of name, interests and preferences in terms of what is made visible to other users or 'buddies' (the AIM term for a set of friends), such as e-mail addresses etc. Also set in this procedure are details by which others can search, so it is in fact a way of setting the search cues for other buddies who have similar interests or topics on which they would like to start a conversation.

3) **Create Identity**

The process of creating an identity involves the choosing of a screen name, which opens the possibility for identity anonymity. It is easy to maintain distinct identities and the system is specifically designed in order to support this type of activity: i.e. one identity for work, one for home, one for friends etc. Each identity can have unique preferences set, but *only one* identity can be used at a time.

Design Issues =*Strong identity with flexible self-representation and anonymity*

4) **Create new conversation - Create Grouping**

In AIM, configuration of grouping is more limited than TCZ. For example, there is grouping

by topic in the form of a chat room, grouping by individual through the process of selecting one other unique identity to chat with and grouping by group through the selection of multiple identities. The last option sets up a unique private chat room that those identities can then inhabit to talk inside of. This room is *not* visible to other identities in the system.

5) **Configure channels**

Table 5.2 shows the channel attributes compared to the selections of grouping available in AIM.

Table 5.2: Channel Attributes against Conversational Grouping in AIM

	A	B	C	D	E	F
Individuals	Sym	Textual	Asynch	Buddy Image?	No	Yes
Groups	Sym & Asym	Textual	Asynch	Buddy Image?	No	Yes
Room	Sym & Asym	Textual	Asynch	Buddy Image?	No	Yes

Design Issue =*Grouping in AIM has less effect on channel attributes than TCZ.*

6) **Configure participation**

In AIM the configuration of participation (and thus its controllability) is also dependent upon the grouping selected. For example, the configuration of participation with just a single identity will limit the participation to just speaker and addressee (i.e. no peripheral participants). With a group of identities there is no *system-based* way of addressing a unique user and copying that message to the others (as in TCZ). Rather it would need to be explicitly set into the message text, e.g. 'Isn't that right, Bill?' which everyone reads. Unlike TCZ, in AIM there is no support for a group to form a conversation whilst in different system locations/rooms. They must be co-located and as such the system enforces the spatial metaphor. The design issue of accessibility to the conversation is determined

by invitation, i.e. a third user would not know a current conversation exists and may only become aware of the other parties upon joining that conversation. The AIM system contains no means by which conversations can be openly seen by other users other than in public chat rooms based on a topic where everyone can read what is being said.

Design Issues =*Controllability when configuring participation more difficult, accessibility and visibility more difficult to configure.*

7) **Reconfigure conversation**

How does the AIM system deal with the PS 'loop', and subset choices?

8) **Change in PS 'loop'**

With AIM, new primary participants (who have not previously been primary with regard to that conversation) can only emerge either by invitation, i.e. an existing participant makes a request to another, or by request from a third participant to talk to someone he did not know was already involved with another user. Although the create new conversation decision can be initiated at any time either by the identity or by request from a second identity, the join conversation part has less effect, other than entering a new chat room that is available to all. The continue conversation decision again is an arbitrary choice.

9) **Subset Choices**

In AIM, side-play, by-play and cross-play are all possible through the normal messaging in the chat window (so that the other participants are aware that the 'play' is occurring), *and* their collusive variations through the use of a private instant message between participants (where the other participants would not know of its existence).

Design Issue =*Collusion possible.*

10) **New Conversation**

Each conversation in AIM is started in separate windows (much like Internet Relay Chat). So it is possible to be a member of a conversation in a public chat room, have several private messaging windows open for private conversations with other unique identities and be in a

private room with another group. Such a scenario would entail having 5 or 6 concurrent conversational windows open at once. Minimizing some of these windows so that they flash when a message is received is one way offered by the system to ease the cognitive burden. In terms of redundancy, the more limited number of groupings means there is less likelihood of multiple channels being open to the same identity. In terms of centrality, again like TCZ there is no limit to the number of channels an identity can maintain.

Design Issue =*No direct support for multiple conversations, redundancy is less of a problem, centrality not explicitly considered.*

11) **Join Conversation**

The joining of conversations in AIM involves their location as a first step.

12) **Locate Conversation**

Location of conversations is through a process of location of identities with similar interests (although you can also just start talking to any other identity available) and relates to the design issue of the search cues available. In AIM this may be through topic (i.e. chat rooms based on relative interests) or specific individuals or groups. This is interdependent upon the personal details set in the preferences when the identity was created. For example, I could set my identity to be interested in news or cars. Thus another identity can search for all identities that are interested in that topic and then select one (or more) to chat with. Conversational location is also reliant upon identities being available. In AIM, identities can set their availability in many unique ways.

For example:

- I am available to everyone
- I am only available to my 'buddies'
- I am only available to this 'buddy'
- I am available to everyone except x,y and z.
- I am not available, away, busy (set a personal 'away' message)

Such settings can enable only a subset of possible participants to interact.

13) **Enter Conversation**

Entering a conversation in AIM is dependent upon the conversational grouping and their accessibility and visibility. So entering a public chat is easy, entering a private conversation is only by invitation or by asking another identity to chat where it was not made salient that they were already involved in a private conversation.

14) **Forced to exit previous conversation?**

AIM's interface does not explicitly support multiple parallel conversations. They are, like TCZ, forced into a sequential form of parallelism. Again, identities can't type a message that is being read by another identity at the same time as receiving one. It is very much an asynchronous textual interaction and opens the possibility for threads to get crossed in the-turn taking process.

15) **Enforce notification of absence?**

AIM only enforces notification of absence in public chat areas.

16) **Leaving the system**

Other users can only tell that an identity has left the system when their name becomes unavailable to be contacted.

5.2 Design Issues - TCZ & AIM

The model is designed to highlight the design issues related to participation. In the two example systems above we have seen a comparative set of participatory-related design issues unique to each system. These are summarised in table 5.3 below.

We can see a clear contradiction from step three in how both systems deal with identities. In TCZ, creating more than one identity outside of the system is discouraged, in AIM it is

Table 5.3: Design Issues - TCZ vs AIM

	TCZ	**AIM**
Step 3	Strong notion of identity combined with anonymity and flexible self-representation	Strong identity with flexible self-representation and anonymity
Step 5	Grouping affects channel attributes	Grouping in AIM has less effect on channel attributes than TCZ
Step 6	Configuring conversations is easy, accessibility also dependent upon grouping, visibility has to be explicitly set	Controllability when configuring participation more difficult, accessibility and visibility more difficult to configure
Step 9	Collusion is easily possible	Collusion is possible
Step 10	No direct support for multiple conversations, Redundancy possible in the system, Centrality an unaddressed design issue	No direct support for multiple conversations, Redundancy is less of a problem, centrality not explicitly considered

actively supported. Inside the system, TCZ fully supports multiple identities, but in AIM you are restricted to only one. Such contrasts in identity management has an affect on the types of participation possible and either restricts or expands the participatory possibilities. In step five we can see that the greater variety of conversational groupings in TCZ has a greater effect on the channel attributes. These effects are not so great in AIM. In step 6, the configuration of participation between primary and peripheral participants is easier in TCZ than AIM. Another contrast here is that it is more difficult to locate conversations in AIM than TCZ. In step 9, both systems provide the possibility for collusion. In step 10 the lack of focus on redundancy, the notion of centrality unaddressed and no direct support for multiple concurrent conversations is equal between the two systems.

It is clear that for TCZ there is no clear support for multiple conversations and this is a primary design issue that could be addressed. For AIM, the greater difficulty in configuring

participation and in locating conversations are both issues that could also be addressed. The model has also highlighted an interesting comparative difference in the manner in which the two systems manage and conceptualize identities. In TCZ, users generally adopt one identity but can use other representations of themselves inside the system (and these representations are attributable). In AIM, users can adopt up to eight distinct identities, of which only one may be used at a time and other users have no way of knowing which are the same person.

5.3 Evaluation of the Model

The previous sections have described the model's components and shown how it can highlight design issues through a comparison of two example systems. In order to explore the usability of the model for designers, an evaluation was carried out.

The purpose of the evaluation was to see if the subjects could use the model to:

a) identify/diagnose the kinds of phenomena that the model is supposed to highlight, and

b) get results that are consistent with other people who use the same model to analyse the same thing.

5.3.1 Method

Subjects

Three PhD students, all unpaid volunteers, took part in the evaluation. The students were all studying HCI (Human Computer Interaction) but did not have any specific interest in participatory status. As such, they are similar to the target population (i.e. designers).

Task and Materials

The subjects were asked to step through the model with three example Computer Mediated Communication (CMC) systems, namely;

1) 'Habbo Hotel' - http://www.habbohotel.com

2) 'Chat Circles' - http://www.chatcircles.com

3) 'MSN Messenger' - http://www.msn.com

Both Habbo Hotel and Chat Circles were selected as they provided a rich visual and graphically-based interface to the user, whilst MSN Messenger was a purely textual interface. The first two systems were also selected as the subjects probably had little or no experience of using them (compared to MSN Messenger), and therefore provided a way of testing whether agreement on participatory phenomena was affected by level of experience. Each system provided different opportunities for locating and creating conversations, and therefore presented the possibility of providing distinct design issues for consideration. Screen shots from each system are given below.

Figure 5.2: Habbo Hotel

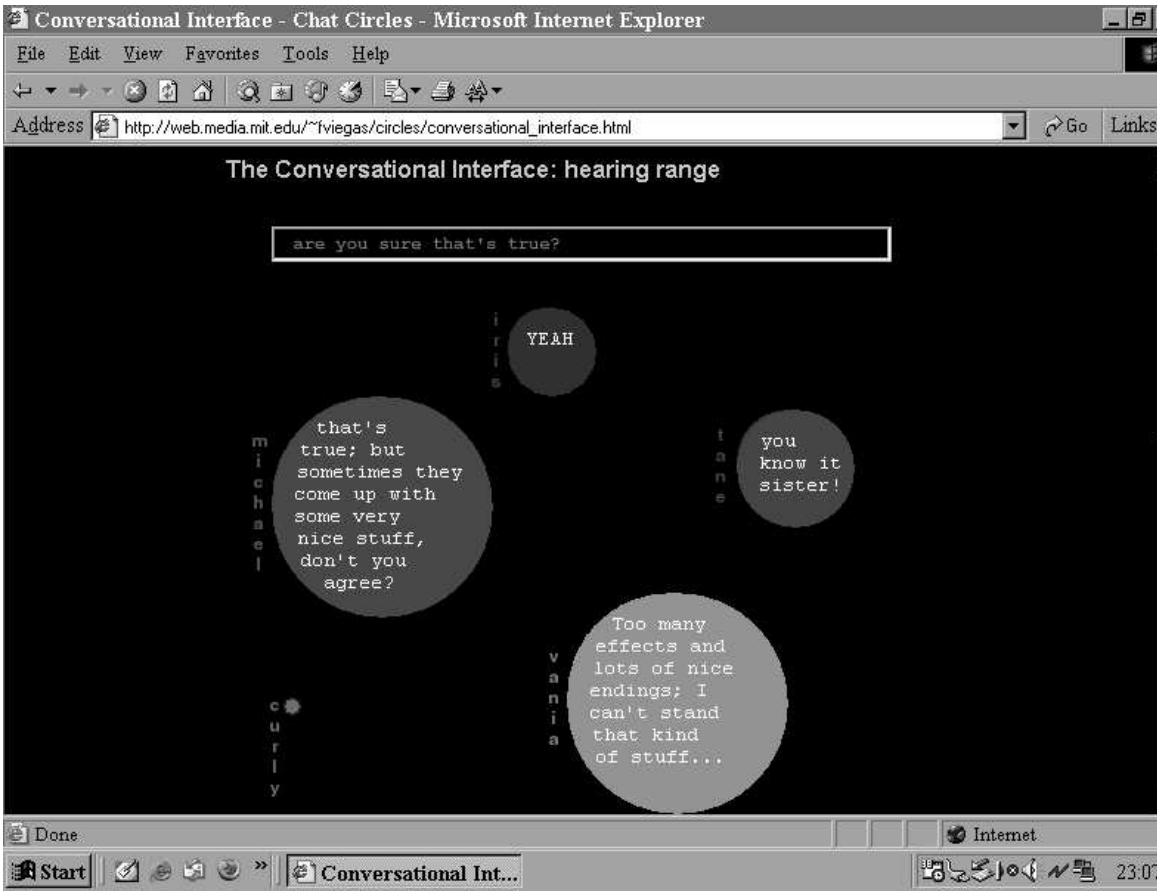

Figure 5.3: Chat Circles

Figure 5.4: MSN Messenger

The evaluation was carried out on a single pc, and each system was prepared and loaded into a browser to prevent delays.

Evaluation Design and Procedure

The various sections of the model were presented to the users in terms of four tasks, namely;
task 1) Login to the System
task 2) Create a New Conversation
task 3) Join an Existing Conversation
task 4) Exit a Conversation
In order to make the task of eliciting responses from the subjects easier, the model was put into written question format, with either a 'yes/no' selection or space for comments if the user wished to make any. The users also had the model in diagrammatic form (referred to as 'Sheet A' in the instruction sheet) to refer to. The instructions for subjects, example task sheet and questionnaire are given in Appendix G. Each set of tasks had to be carried out for each of the three systems. Prior to starting the evaluation, the model was demonstrated to each subject with a different system to the ones they would be using. Each subject then had to rate their prior experience of using each system on a scale of one to ten.
After completing the tasks, the subjects were asked to complete a post-use questionnaire.

Results

Tables 5.4 and 5.5 below show the results for system 1, Habbo Hotel. For brevity, the questions have been put in minimal form, the full wording appears in Appendix G.
Habbo Hotel - Task 1 - Login To System
All three subjects recognised that Habbo Hotel requires an identity creation process, that its users can have multiple identities (in fact this would have to be in separate browsers), and two out of the three thought that you could login anonymously.
Design Issue =*Anonymity supported, multiple representations more difficult to manage.*

Table 5.4: System 1: Habbo Hotel

Experience Rating = (x)	**Subject1(0)**	**Subject2(0)**	**Subject3(4)**
Task 1 - Login to System			
Identity creation process?	yes	yes	yes
Multiple identities?	yes	yes	yes
Login anonymously?	yes	no	yes
Task 2 - Create a New Conversation			
Grouping options? e.g. thread grouping?	yes	no	no
Location grouping?	yes	yes	yes
Identity grouping?	yes	yes	no
Another grouping?			
One selected?	location	location	location
Type of channel to open?	textual,visual	textual,visual	textual,visual
Is the channel symmetric?	yes	no	no (you can whisper)
Synchronous/asynchronous?	asynchronous	synchronous	synchronous
Is the channel reflexive?	yes	yes	yes
Is the channel ownable?	no	yes	yes
What is the scope of the channel?	whole group	(no answer)	all identities
Control addresses in your conversation?	yes	(no answer)	selective participants
Is conversation visible to other identities?	yes	yes	no
If Yes, how is it visible?	people in room	depends on physical distance	
New conversation without exiting old?	yes	yes	no
Side-play?	yes	don't know	yes
By-play?	yes	no	yes
Cross-play?	yes	no	yes

Table 5.5: System 1: Habbo Hotel (Continued)

Experience Rating = (x)	**Subject1(0)**	**Subject2(0)**	**Subject3(4)**
Task 3 - Join Existing Conversation			
Join existing without leaving current?	yes	no	no
Cues available, e.g. Subject Thread?	no answer	no	no
Identity details?	sex, virtual appearance	no	identity,name
Room name or activity description?	yes, places in hotel	yes, list of locations	room names
Other?	no answer	no answer	spatial configuration
Which one have you selected?	the club	doesn't say	room name+gender
Is conversation located accessible to you?	yes	yes	yes
If not why not?			
Task 4 - Exit a Conversation			
Notification of exit?	no	no	no

Habbo Hotel - Task 2 - Create New Conversation

In terms of configuring the conversational grouping, the most prominent groupings were location (i.e. public and private rooms) and identities. Thread grouping was not found by two of the three subjects (and in fact does not exist). In terms of selecting a channel to open, all subjects chose a textual and visual channel (the visual aspect being the ability to wave to others). Two of the three subjects thought the channel was synchronous, but all agreed that it was reflexive. Two of the three thought the channel was ownable. In fact, there is nothing stopping another identity in Habbo Hotel from walking up and joining the conversational channel. The only place this could not occur would be in a private location. There would therefore be a relationship between an ownable location and conversational channel. Two of the three responded that the scope of the channel was all identities on it, and that you can select who is addressed. Two of the three thought the conversation was visible to other identities (this is limited to other identities in the same location). Subject two noted that the conversation is only visible dependent upon physical distance. This is because in Habbo Hotel, the spatial metaphor is rigorously enforced, if you are a certain distance from others, you only see bits of their conversations, and can only read them in full when you physically move closer. Two of the three though it possible to start a new conversation without exiting the old one (only possible with whispering). Whispering also allowed for collusive by/side/cross play, their normal counterparts being possible in the normal text facility.

Design Issues =*Strong locational grouping affects channel attributes. Spatial orientation affects access to conversation. Accessibility only dependent upon presence. Visibility is not configurable, you are either in the system and visible or not.*

Habbo Hotel - Task 3 - Join an Existing Conversation

With regard to joining an existing conversation, two of the three subjects noted that you cannot join an existing conversation without leaving your current one, there were no conversational subject threads to locate ongoing conversations, only aspects of identity or locations.

Design Issue =*No direct support for multiple conversations.*

Task 4 - Exit a Conversation

All three subjects noted that other participants were not directly notified that they had left the conversation.

Design Issue =*No support for notification.*

Tables 5.6 and 5.7 below show the results for system 2, Chat Circles.

Chat Circles - Task 1 - Login To System

All three subjects recognised that Chat Circles requires an identity creation process, that its users can have multiple identities (like Habbo Hotel, this would also have to be in separate browsers), and all three thought that you could login anonymously.

Design Issue =*Anonymity supported, multiple representations more difficult to manage.*

Chat Circles - Task 2 - Create New Conversation

In terms of configuring the conversational grouping, the most prominent groupings were locations. (In Chat Circles these are in fact areas in the same interface). Thread grouping was not found by any of the three subjects. In terms of selecting a channel to open, all subjects chose a textual one. Two of the three subjects thought the channel was asynchronous, and that it was reflexive. No-one thought the channel was ownable. Two of the three responded that the scope of the channel was all identities on it, and you cannot select who is addressed. Subject three noted that the channel scope is dependent upon what part of the screen is being viewed, i.e. that a conversation can be taking place in one part of the interface but your identity has scrolled to another. All three thought the conversation was visible to other identities. All three thought it impossible to start a new conversation without exiting the old one. All three recognised that side, cross and by-play would be extremely difficult and collusion is not possible.

Design Issues =*Strong locational grouping, limited channel attribute of text. Spatial orientation affects access to conversation. Accessibility only dependent upon presence. Visibility is not configurable, you are either in the system and visible or not. Subordinate communication difficult, collusion not possible.*

Table 5.6: System 2: Chat Circles

Experience Rating = (x)	**Subject1(0)**	**Subject2(0)**	**Subject3(0)**
Task 1 - Login to System			
Identity creation process?	yes	yes	yes
Multiple identities?	yes	no	yes
Login anonymously?	yes	yes	yes
Task 2 - Create a New Conversation			
Grouping options? e.g. thread grouping?	no	no	no
Location grouping?	no	yes	yes
Identity grouping?	no	no answer	yes
Another grouping?	no answer	no answer	color of circle
One selected?	no answer	no answer	location(area)
Type of channel to open?	textual	textual	textual
Is the channel symmetric?	no answer	yes	yes
Synchronous/asynchronous?	asynchronous	synchronous	asynchronous
Is the channel reflexive?	no	yes	yes
Is the channel ownable?	no	no	no
What is the scope of the channel?	all identities	no answer	all identities viewing same part of screen
Control addresses in your conversation?	no	no answer	no
Is conversation visible to other identities?	yes	yes	yes
If Yes, how is it visible?	to everyone	very, but not in order	it's asynchronous
New conversation without exiting old?	no	no	no
Side-play?	no	no	no
By-play?	no	no	no
Cross-play?	no	no	no

Table 5.7: System 1: Chat Circles (Continued)

Experience Rating = (x)	**Subject1(0)**	**Subject2(0)**	**Subject3(0)**
Task 3 - Join Existing Conversation			
Join existing without leaving current?	no	no	no
Cues available, e.g. Subject Thread?	no	no	no
Identity details?	no answer	none	name
Room name or activity description?	no answer	none	area
Other?	colour circles next to each other	not applicable	circle colour
Which one have you selected?	a random circle	not applicable	area
Is conversation located accessible to you?	yes	no	yes
If not why not?	no answer	no answer	n/a
Task 4 - Exit a Conversation			
Notification of exit?	no	no	no

Chat Circles - Task 3 - Join an Existing Conversation

With regard to joining an existing conversation, all three subjects noted that you cannot join an existing conversation without leaving your current one, there were no conversational subject threads to locate ongoing conversations, only a user name or screen areas.

Design Issue =*No direct support for multiple conversations.*

Task 4 - Exit a Conversation

All three subjects noted that other participants were not directly notified that they had left the conversation.

Design Issue =*No support for notification.*

Tables 5.8 and 5.9 below show the results for system 3, MSN Messenger.

MSN Messenger - Task 1 - Login To System

All three subjects recognised that MSN requires an identity creation process, that its users can have multiple identities, and two out of the three thought that you could not login anonymously. This may have been due to the use of an e-mail address as part of the login process, although it is feasible to create an anonymous e-mail address and use that.

Design Issue =*Anonymity questionable, multiple representations easier to manage.*

MSN Messenger - Task 2 - Create New Conversation

In contrast to the other two systems, the most prominent grouping was in in terms of identities. Thread grouping was not found by two of the three subjects (and in fact does not exist except in terms of identities manipulating their description to say what they are currently talking about). Subject three considered availability as a grouping option (i.e. as an aspect of identity). In terms of selecting a channel to open, all subjects chose a textual channel (subject three mentioned the more varied modes available in his answer). Two of the three subjects thought the channel was asynchronous, reflexive and ownable. Subject one noted the fact that you can selectively block others, and subject three noted that the channel was “mutually ownable”, i.e. ownership being divided. There was a difference of opinion with regard to the scope of the channel, subject one saying all on a contact list,

Table 5.8: System 3: MSN Messenger

Experience Rating = (x)	**Subject1(10)**	**Subject2(3)**	**Subject3(9)**
Task 1 - Login to System			
Identity creation process?	yes	yes	yes
Multiple identities?	yes	yes	yes
Login anonymously?	no	no	yes
Task 2 - Create a New Conversation			
Grouping options? e.g. thread grouping?	yes	no	no
Location grouping?	no	no	no
Identity grouping?	yes	yes	yes
Another grouping?			availability grouping
One selected?	individual	individual	availability
Type of channel to open?	textual	textual	textual
Is the channel symmetric?	no	yes	yes
Synchronous/asynchronous?	asynchronous	asynchronous	synchronous
Is the channel reflexive?	yes	no	yes
Is the channel ownable?	yes, you can block others	no	mutually ownable
What is the scope of the channel?	everyone in contact list	don't know	subsets
Control addresses in your conversation?	yes	don't know	only single individuals
Is conversation visible to other identities?	no, private	no, only to friends	no
If Yes, how is it visible?			
New conversation without exiting old?	yes	yes	yes
Side-play?	yes	yes	yes
By-play?	yes	yes	yes
Cross-play?	yes, but you can't tell if someone else is having another conversation	yes	yes, but in new channel

Table 5.9: System 3: MSN Messenger (Continued)

Experience Rating = (x)	**Subject1(10)**	**Subject2(3)**	**Subject3(9)**
Task 3 - Join Existing Conversation			
Join existing without leaving current?	yes	yes	yes
Cues available, e.g. Subject Thread?	no answer	no	no
Identity details?	no answer	contact names	none
Room name or activity description?	no answer	no	no
Other?	status possibly	no	status?
Which one have you selected?	online, free to talk	chat	none
Is conversation located accessible to you?	yes	no	no
If not why not?		can't jump into others' conversations	can't find one
Task 4 - Exit a Conversation			
Notification of exit?	no	yes	yes

subject two didn't know, and subject three saying a subset of identities.

In terms of selecting addressees, two of the three said control was only through the selection of single individuals. No-one thought the conversation was visible to other identities. All three though it possible to start a new conversation without exiting the old one (only possible with a distinct channel). This therefore allowed for collusive by/side/cross play, their normal counterparts being possible.

Design Issues =*Strong identity grouping, availability suggested as alternative. Conversational control easier through blocking, availability easily configurable. Collusion possible only in distinct channel.*

MSN Messenger - Task 3 - Join an Existing Conversation

With regard to joining an existing conversation, all three subjects noted that you can join an existing conversation without leaving your current one, there were no conversational subject threads, identity details or room names to locate ongoing conversations.

Design Issue =*Multiple conversations supported, locating ongoing conversations difficult.*

Task 4 - Exit a Conversation

Two of the three subjects thought that other participants were notified that they had left the conversation.

Design Issue =*Notification supported.*

Analysis of Results

The purpose of the evaluation was to provide some evidence for the model's usability. In terms of seeing if the model can be used by someone to identify the types of phenomena it is supposed to highlight, we refer to Table 5.10 below shows the relative design issues raised by the model across the three systems. Here we can see a range of participatory phenomena identified by the subjects for each system, including anonymity, multiple representations, grouping issues, reference to spatial orientation, accessibility, visibility and the management of multiple conversations.

Table 5.10: Comparison of Relative Design Issues

	Habbo Hotel	**Chat Circles**	**MSN**
Login to System	Anonymity supported, multiple representations more difficult to manage	Anonymity supported, multiple representations more difficult to manage	Anonymity questionable, multiple representations easier to manage
Create New Conversation	Strong locational grouping affects channel attributes. Spatial orientation affects access to conversation. Accessibility only dependent upon presence. Visibility is not configurable, you are either in the system and visible or not	Strong locational grouping, limited channel attribute of text. Spatial orientation affects access to conversation. Accessibility only dependent upon presence. Visibility is not configurable, you are either in the system and visible or not. Subordinate communication difficult, collusion not possible	Strong identity grouping, availability suggested as alternative. Conversational control easier through blocking, availability easily configurable. Collusion possible only in distinct channel
Join Conversation	No direct support for multiple conversations	No direct support for multiple conversations	Multiple conversations supported, locating ongoing conversations difficult
Exit Conversation	No support for notification	No support for notification	Notification supported

In terms of seeing if the results are consistent between subjects, these findings suggest that independent judges identify similar issues when using the model to evaluate a target system. This provides a level of evidence that the model is generally effective in generating reliable judgements.. However, the experience ratings for each system could highlight a possible reason for any divergence of phenomena identified in unfamiliar systems and convergence on systems they had had previous experience with. The ratings show virtually no familiarity with two of the systems (Habbo Hotel and Chat Circles) and high familiarity with the third system MSN Messenger.

The results indicate that the subjects generally agreed on the issues that dealt with logging into the systems. In terms of creating a new conversation, they converged on the strongest type of grouping the system presented. There was divergence on whether the channels they opened were symmetric and either synchronous or asynchronous. In terms of symmetry, one of the subjects did not notice the whisper command, and did not answer this question in Chat Circles. In terms of synchrony, the divergence may be in part due to confusion to the actual meaning of these CMC-related terms (although none of the subjects asked for further clarification). There was generally greater agreement on the aspects of channel reflexivity and ownability, scope and conversational visibility. There was complete agreement between subjects with regard to new conversations and by-play etc. (and thus collusion) in Chat Circles and MSN Messenger. However, the subjects differed on these issues in Habbo Hotel. This may have been due to the lack of knowledge on the available commands and subsequent communicative possibilities. With regard to joining an existing conversation, there was general agreement on the question of whether leaving a current conversation was necessary or not and the types of cues available to locate an existing conversation. Finally, they all agreed in two of the systems regarding task four, notification in terms of exiting a conversation.

In order to elicit from the subjects their comments on using the model, a post-use questionnaire was completed.

The first question asked “Did you find the model easy to follow?” Responses given were:

“Yes, it followed the logical structure of a conversation, identifying features as and when

you would need them"
"Page one of two is fine" and
"Pretty much yes, some questions seemed tricky, perhaps the diagram is clearer"

The second question asked, "Were there any parts of the model that weren't clear?" Responses given were:

"No, got a bit confused talking about 'Communicative Goal'"
"Some questions assume a more detailed knowledge of application than you have" and
"Because of the system's diversity, some of the model's terms can be ambiguous"
These responses confirmed the reasons for previous comments.

The next question asked, "How useful was the model for each system?" Responses given were:

"Easy to use, I did not find the model hard to use, my problem was with systems that I had no experience with. The model was generic...applicable to all systems"
"Sort of, (then refers to previous point on system knowledge)"
"Habbo Hotel, no problems here once I got to know the system. For Chat Circles, a bit confused about synchronous and asynchronous, I think the system can be both, but most usually is used asynchronously. For MSN Messenger, the model was not well suited to this system. I found the notions of channel very difficult to apply to this system, along with the notion of grouping"

These comments are interesting in that the notions of a conversational channel and grouping were clear in the two more unfamiliar systems yet seemed confusing in the more familiar one. This suggests that it is not the notions themselves, but the particular system representation of the notion that is the source of confusion.

The final question asked, "Were there any issues that the model did not cover?" Responses

given were:

"Covered all fundamental aspects of online conversation. It might have missed other features such as sending files etc"

"Being able to model the specifics of each system"

"Customisable status and grouping for MSN Messenger. Identity location is not always the same or reflected by the visible interface"

The last comments highlight user manipulation of their visible descriptions in MSN Messenger that could also highlight their current conversations and another possibility as a grouping option; availability. With regard to Chat Circles, the comment regarding identity location refers to the fact that your identity can be in one part of the interface, but you can scroll to a different part. This raises the question of where you are in the system; where your identity is located or where you are actually looking on the screen. This could be an additional design issue worthy of consideration.

In terms of the resultant design issues identified by the subjects, for Habbo Hotel and Chat Circles they once again highlight the constraints on participation in a rigorously enforced spatial metaphor. With a strong locational grouping, the spatial orientation affects access to conversations. Visibility and accessibility are more difficult to configure, and there is no direct support for multiple conversations or multiple representations.

For MSN Messenger, the design issues highlight a strong identity grouping, and although multiple representations are possible, only one can be used at a time. Conversational control is easier than the other systems through blocking, but any form of side-play or collusion has to be done in a new channel. As such, multiple conversations are possible, but actually locating the conversations is very difficult.

In summary, the results highlight three things. Firstly the model is usable in the sense that it highlights the participatory phenomena it is supposed to. Secondly, the evaluation has shown that, for this limited number of users, there was a level of evidence with regard to independent judges identifying the same phenomena across systems. However, this claim would need further testing on a much larger scale in order to satisfy a more acceptable level

of reliability. Thirdly, the user comments suggest that overall, the model was usable and highlighted other design issues not originally included. The negative user comments are discussed below in relation to possible revisions of the model.

Revision of the Model

The results highlight two key weaknesses of the model, the terminology and participant's familiarity with the system. The responses indicate that confusion arose both in relation to both the questions asked and the terminology. As such, the CMC-related terms are possibly too technical for the population (designers) that this is aimed at. Putting the questions (and explanation of unfamiliar terminology) in a more appropriate way would be a useful improvement. With regard to the participant's familiarity with the systems under investigation, future evaluations could be carried out on systems that are completely familiar to the users, in order to ensure that participatory phenomena are not missed just due to the fact that the users have no knowledge that they actually exist somewhere in the system.

Possible future additions to the model could be the additional clauses from the definition of a conversation given in chapter four, and ways of designers conceptualising where the user is in the system in relation to the view of the system presented on the screen. This was one example that a user commented upon during the evaluation, and could have relevance in relation to a possible confusion over a user's 'location' (i.e. system vs screen) and their participatory status. For example, a user could be viewing one conversation on a part of the screen he has scrolled to (and thus be an overhearer in and of themselves) and yet their avatar or character could be out of 'shot' on the other part of the screen (and the same user still have a distinct participatory status there as well.)

5.4 Conclusions

The aims of developing a new model of participation for virtual environments was to make it free of face-to-face constraints, able to capture new forms of virtual participatory phenomena, and also provide designers with the flexibility to see how their designs will affect

important communicative functions of users' interactions. Such designs need not necessarily be limited to virtual environments.

This model is proposed as a way of meeting these aims by:

- not being limited by any inter-spatial or temporal constraints, with reference to levels of participation
- adequately expressing virtual participation, such as multiple conversations, group interaction and participatory phenomena such as side-play and collusion etc
- being usable (as we have demonstrated) in aiding design for other systems where participation may not have been explicitly considered in the design process.

The model is proposed as a contribution to the process of expressing computer-mediated participation.

Chapter 6

Conclusions

With growing numbers and genres of text-based virtual environments currently available, such technologies continue to be both popular, attractive and adaptive. They provide both connectivity and the opportunity to create novel social spaces for interaction. Previous design ideas for these systems have had varying emphasis, for example improving sustainability, supporting multi-cultural and multi-linguistic communities and supporting the social elements of interaction. This thesis proposed that an important contribution for design is to have a clearer understanding of the differences between face-to-face and virtual participation, the changes that occur when moving from the actual to the virtual and their relative implications.

6.1 Thesis Questions

The first question the thesis addresses is; "Do text-based virtual environments exhibit different forms of participation from those of face-to-face interactions?"

To address this issue, the thesis firstly investigated whether text-based virtual environments exhibit different forms of participation from face-to-face interaction. It investigated whether a spatial organisation constrained participation, and also the differences it made to participation when moving from the actual to the virtual.

The second question the thesis addresses is; "What is the right concept of participation for virtual environments?" This issue was addressed by presenting a new concept based on the empirical evidence. This influenced the third question, "How can this revised understanding of participation be formulated in a way that makes it accessible to, or useful for design?" This was addressed through the proposal of a more appropriate way to model such virtual participation and provide designers with a tool that promotes design considerations based upon participation in relation to conversations.

6.2 Précis of Results

6.2.1 Limitations of Current Models

In chapter two, the review of literature on modeling participation compared and contrasted the types of analysis and constraints that were either implicit or explicitly set out. The representations in these models of participation were primarily developed to overcome the inadequacies of the dyadic model in representing face-to-face interaction. For Goffman, his analysis encompassed all participants in relation to a single utterance. For Levinson, the analysis was to all participants in relation to language based distinctions. In contrast, Clark's analysis was to all co-present participants in relation to each other. The implicit or explicit constraints within these analyses included the visual and aural range of participants, the spatial co-location factor and the implicit expression that participatory statuses are symmetric. As such, these findings present interesting consequences for both the intended audiences of the work. For example, CMC, CSCW and C&T technologies are not limited to single modalities (i.e. speech) and only under certain circumstances is a direct visual connection possible. Such technologies present new opportunities to break free of these types of constraints and for new forms of participation. Therefore, designers need to make careful consideration when utilising existing models, that they are not limiting the participatory possibilities their systems can provide.

In summary, the chapter highlighted how current approaches to modelling participation

were not appropriate as candidates for analysing TBVEs due to: -

1) The implicit incorporation of face-to-face constraints;

- They have an implicit reliance on either co-presence or co-temporality in relation to their participatory distinctions.
- Some imply that participatory statuses are always symmetrical
- They were primarily developed in relation to one modality, that of verbal interactions.

2) Some unaddressed participatory phenomena;

- 'Mobility' of participatory status in relation to an interaction
- The extent to which people manage simultaneous, distinct, levels of participation.

Designers also need to be aware that the unaddressed participatory phenomena also present areas for careful consideration, especially where commercial products promote the possibilities of managing multiple statuses through usage of avatars, persona and identities.

6.2.2 Opportunities for New Forms of Participation

In chapter three a comparison of example systems highlighted that users of VR technologies are constrained by the drive to mimic face-to-face interactions, and there are technological limitations on the number of participants that can co-participate and users are normally limited to a single representation of themselves. Like VR, VMC generally restricts participatory status distinctions, being mostly in the form of a dyad.

As with chapter two, the results of this work present some implications in relation to the designers of both VR and VMC technologies. Even given the limitations highlighted above, designers can still consider VR and VMC 'conversations' in participatory terms. Both primary and peripheral participatory distinctions in VMC can be manipulated in order to either keep others out of 'conversations' (and thus inhibit mobility of status), or to selectively assign non-participation status to others. In VMC the accessibility to, and awareness of others are candidates both for conversation changes and opportunities for manipulation.

With regards to VR, both accessibility and awareness are just as applicable, the difference being in the participatory distinctions afforded between a virtual space, where avatars collocate, and the hybrid space of PC monitor / office space given by a camera view.
Of the text-based systems, IM was designed to support sporadic, dyadic message exchanges between parties. It again is limited in that multiple participation is not feasible and users again have a single identity (or if they choose to have more, they can only use one at a time).
TBVEs however presented a different picture. Unlike the F-formation description from chapter two, TBVEs provide users with the ability to participate in a version of 'space' where distance, orientation or relative proximity do not affect the type or level of interactions available. They open the possibility for multiple distinct and simultaneous interactions and multiple representations. As such, they support, in principle, the construction of new kinds of participation compared with face-to-face.

6.2.3 Moving from the Actual to the Virtual

Circumventing the Spatial Metaphor

The results show how users regularly ignore the environment's 'space' and the means to traverse it. Although there were interesting cases where virtual space was utilised, overall the space was a relatively weak influence in organising user's interactions.

Frequent Group Interaction

In TCZ, multiparty messaging was common. The ways in which the environment supported group interaction was regularly taken advantage of by its users.

Managing Multiple Interactions

With the fact that virtual users find it easier to maintain simultaneous concurrent interactions, management and control of these phenomena is also an important design issue. Text-based systems often offer a form of persistence for conversational history, but better interfaces could ease the amount of cognitive processing users have to spend in maintaining

such interactions. TCZ does not support multiple conversations, and users have to find unique ways such as message colouring and name prefixing to aid the management and control of this process.

More Frequent Conversations

Virtual conversations (according to the participatory definition of a conversation) were found to be more frequent than those of face-to-face.

Participatory Distinctions

When moving from the actual to the virtual, the number of participants did not affect the level of primary statuses held (virtual users actually held more than those of face-to-face), and the 'production costs' involved in virtual interactions did not appear to affect the utterance length produced and subsequently received. The group sizes that messages were sent to formed a linear progression (after the dyadic mode) up to group size eleven. This provides evidence for the conceptualisation of virtual participation as being primarily group oriented.

Other Interesting Phenomena

The results also highlighted other interesting participatory based phenomena. For example, the non-intersecting distribution lists meant that some TCZ users had to construct strategies for receiving 'half-conversations'. This has consequences for how designers can provide support for their management, and the way they are presented to the user at the interface. Also, the majority of users in the questionnaire responded that they explicitly avoided other users. This has consequences for providing easier control over who can and can't send messages to a user and their relative locations.

6.2.4 An Appropriate Concept of Participation for Virtual Environments

Given the empirical evidence we suggest that participation in virtual environments should be conceived primarily as a set of multiple group interactions, centered around the control

and manipulation of multiple and distinct 'conversations'. Although there was evidence for some usage of TCZ's space, the vast majority of these group interactions were initiated from home locations, and as such highlighted the minor influence the environment's spatial metaphor had on participation.

6.3 Modelling Virtual Participation

In order to answer the third thesis question, "How can this revised understanding of participation be formulated in a way that makes it accessible to, or useful for design?", chapter five proposed a model of participation to overcome the inadequacies of existing models, to adequately express virtual participation and to provide designers with a tool for studying and thinking about participatory-based design issues.

The model incorporates no explicit or implicit reliance on either co-presence or co-temporality in relation to its participatory distinctions. It does not imply that participatory statuses are always symmetrical (in fact, it accounts for the possibilities of asymmetry as part of the operational definition of a 'conversation' incorporated into the model), and it can also express interactions in other modalities apart from (but also including) verbal interactions. In contrast to current models, it centres upon the operational definition of a 'conversation', and that through the process of creating, reconfiguring, joining and exiting 'conversations', related participatory-based design issues are drawn out.

In contrast to current models, the model utilises a basis built upon a 'tri-partite' participatory distinction, that of primary (speaker and addressee), peripheral (side-participants) and non-participants. This 'flatter' structure provides a suitable way of considering the effects of movement between statuses or 'mobility of status'. The 'reconfigure conversation' section accounts for both changes in primary and peripheral participants and whether the change involves a subset or all participants relative to the conversation. The model also emphasises other design-related aspects of participation, for example identity management, the notions of 'grouping' and the availability and location of conversations.

The evaluation provided evidence for the model's usability. Along with the previous examples, the evaluation also raised design issues related to the systems under investigation, such

as conversational grouping and management, and the consequences of enforcing a spatial metaphor. Subsequent interesting points were also raised, including possible additions to the model's grouping choices (grouping by availability) and possible confusion between the actual location of an identity (and the access to conversation it brings) and where the user is allowed to view via the interface (i.e. in a distinct location).

The model also presents an opportunity for the CMC and CSCW communities to consider more carefully the affects on participation that their technologies have. Chapter three highlighted both the technological and design constraints of example technologies on participation. The new model provides an opportunity to re-assess current designs in participatory terms, as described in the following section.

6.3.1 Implications for Design

Having a clearer understanding of the differences between actual and virtual participation can lead to a more informed design rationale. As previously mentioned, designers do not normally take a stance on participation, yet their systems produce consequences for it. This thesis has highlighted that since virtual participation is different from that of face-to-face, the configurative possibilities that technologies provide can lead to new forms of interaction. Such possibilities need to be considered in a more appropriate way, one that does not rely on the constraints of face-to-face interactions, or rely exclusively on a single modality. When technologies such as TBVEs play a central role in supporting the social activities of its users, being sensitive to how design considerations can affect communicative and participatory possibilities is important. The findings and model presented in this thesis are aimed at supporting and promoting that sensitivity. This is clearly an important issue for the more commercial systems such as Habbo Hotel, where the maintenance of a critical mass of users is vital. Being sensitive to how design can affect the social activities of a systems users will direct system iterations that help to maintain that critical mass.

6.4 Strengths and Limitations

In terms of highlighting the differences between actual and virtual participation, the methodology proposed in chapter four had both a pragmatic and theoretical basis. The technical constraints of processing the log files, and the qualitative requirements of the comparison between the corpora proved to be an adequate solution in this case. The task of proposing a more appropriate way to model such differences first involved a theoretical review of current models in order to highlight their limitations. The subsequent model has been shown to provide a way of modelling the differences found in chapter four.

The strengths of the thesis are its theoretical review of current models, and empirical analysis of participation in a TBVE and a tested solution to the question it addressed. The limitations of the thesis are pragmatic ones. Firstly, the available processing power and time available limited the size of the log used in the study. Secondly, as no tools were available for automatic parsing of the BNC and TCZ scripts, this also limited the number of subjects possible to process by manual means. Although the log size and user numbers were sufficient for current purposes, having more appropriate tools would provide an option to process much more data. With regard to the model, it would have been interesting to incorporate input from designers themselves, to see how the model might develop over a period of time. This was, unfortunately, not possible within the time frame of the research.

6.5 Summary of Contributions

1. The thesis has provided an addition to knowledge through an empirical analysis of participation in a virtual environment.

2. The thesis also detailed a novel comparison of participatory components in virtual environments with those from a corpus of face-to-face interactions.

3. The thesis also proposed a new model that:

    - is not limited by any inter-spatial or temporal constraints with reference to levels of participation.

- adequately expresses virtual participation, such as multiple conversations, group interaction and participatory phenomena such as side-play and collusion etc.
- is usable (as we have demonstrated) in aiding design for other systems where participation may not have been explicitly considered in the design process.
- demonstrates a level of usability.

6.6 Future Research

An outstanding issue not fully investigated within the remit of this thesis is with regard to mobility of status. As mentioned in chapter two, participatory status can be 'bi-directional', in the sense that each change in status can affect some participants in an interaction. This phenomenon still has some outstanding issues. For example, exactly how does a participant move from, say, being a side-participant to being an addressee? What cues do the participants use to assess levels of participation? What signals are used to propose, and agree, changes in level of participation? How are conflicts about participatory status managed? Even in face-to-face interaction little is known of the dynamics of how and under what conditions changes in participation are actually achieved. More understanding on these issues could feed into the model and provide more design issues for consideration.

Another area of consideration is to test the viability of alternatives to the spatial metaphor. Although this thesis has showed that the spatial metaphor has a relatively weak influence on communicative function, anecdotal evidence shows that users need some form of structure within which to interact. The paradox of such virtual spaces is that whilst talking in rooms can give users a sense of spatial proximity and also a sense of atmosphere through description, there is no practical need to be in that same space in order to converse. Another example is the fact that virtual environments present no physical boundaries or a sense of physical movement, yet spaces or rooms have subtle social meaning compared to, say, topic areas in other media such as IRC or AIM. The notion of privacy also seems important, with personal 'space' providing a form of rights of access. Providing alternative structures that take such points into consideration and at the same time do not try

to incorporate face-to-face modalities which are routinely ignored is an interesting challenge.

With the fact that virtual users find it easier to maintain simultaneous concurrent interactions, management and control of these phenomena is also an important design issue. Text-based systems often offer a form of persistence for conversational history, but better interfaces could ease the amount of cognitive processing users have to spend in maintaining such interactions. TCZ does not support multiple conversations, and users have to find unique ways such as message colouring and name prefixing to aid the management and control of this process.

A further area for consideration would be the automation of conversational thread retrieval to make analysis easier. Currently, selected users have to have all of their conversations individually retrieved and subsequently cross-referenced by hand against other conversations. Providing a means by which this could be done automatically and also provide a way to collate and display such thread structure would certainly ease the process of analysis.

A final area of interest would be the manipulation of the communicative commands available to users, in order to monitor the effects on certain participatory phenomena. This of course would have to be done in conjunction with, and the approval of, the environment's users, but could provide valuable insight into the types of strategies users might employ to overcome any subsequent deficiencies. Such work could enable the further development of the model into an even more predictive form and provide designers with data on likely user behaviour under certain conditions.

Design for virtual environments must attend to the ways that the technological infrastructure is transformed by, and in turn transforms, human communicative organisation. This thesis is offered as a contribution in that direction.

Chapter 7

Appendices

7.1 Appendix A - XSLT Stylesheets

7.1.1 Patterns of Movement

```
<xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Transform">

<xsl:output method="text"/>

<xsl:key name="kByID" match="DIRECT | LOCAL | GLOBAL | ADMIN"
use="CHARACTER_ID"/>
<xsl:key name="kByTargetID"
match="TARGET_CHARACTER_ID" use="."/>

<xsl:key name="kLocByCharacter" match="LOCATION_ID[not(. =
../preceding-sibling::DIRECT[1] /LOCATION_ID) ]"
           use="../CHARACTER_ID"/>

  <xsl:key name="kLocByValandChar"
```

```
          match="LOCATION_ID"
          use="concat(., '|', ../CHARACTER_ID)"/>

<xsl:variable name="vUniqueCharactersSending"
select="LOG/*[generate-id() = generate-id(key('kByID',
CHARACTER_ID )[1]) ]"/>

<xsl:variable name="vUniqueCharactersReceiving"
select="LOG/*/TARGET_CHARACTER_ID [generate-id() =
generate-id(key('kByTargetID', .)[1]) ]"/>

<xsl:variable name="vNumCharactersSending"
select="count($vUniqueCharactersSending)"/>

    <xsl:variable name="vNumCharactersReceiving"
                  select="count($vUniqueCharactersReceiving)"/>

    <xsl:variable name="vTotalSent"
                  select="count(LOG/DIRECT/CHARACTER_ID)"/>

    <xsl:variable name="NL" select="'&#xA;'"/>

<xsl:template match="/"> <xsl:for-each
select="$vUniqueCharactersSending"> <xsl:value-of
select="concat('CHARACTER_ID ',CHARACTER_ID, ' sent ',
count(key('kByID',CHARACTER_ID)), ' messages, received ',
count(key('kByTargetID',CHARACTER_ID)), $NL )"/>
</xsl:for-each>

<xsl:for-each select="$vUniqueCharactersReceiving
```

```
[not(key('kByID', .))]">

<xsl:value-of select="concat('CHARACTER_ID ', ., ' sent 0
messages, received ', count(key('kByTargetID',.)), $NL )"/>

</xsl:for-each>

<xsl:value-of select="$NL"/> <xsl:value-of select="concat('Number
of characters having sent a message: ', $vNumCharactersSending,
$NL )"/>

<xsl:value-of select="concat('Number of characters having received
a message: ', $vNumCharactersReceiving, $NL )"/>

<xsl:value-of select="$NL"/> <xsl:value-of select="concat('Total
sent: ', $vTotalSent, ', Average sent by a sending character: ',
$vTotalSent div $vNumCharactersSending, '&#xA;',

'Total received: ', $vTotalSent, ', Average received by a
receiving character: ', $vTotalSent div $vNumCharactersReceiving,
'&#xA;')"/>

<xsl:value-of select="$NL"/> <xsl:value-of select="concat('Room
moves by character:', $NL)"/>

<xsl:for-each select="$vUniqueCharactersSending"> <xsl:value-of
select="concat('Character_ID: ', CHARACTER_ID, ':', $NL )"/>

<xsl:for-each select="/LOG/*/CHARACTER_ID [. =
current()/CHARACTER_ID]">
```

```
<xsl:if test="not(../LOCATION_ID = ../preceding-sibling::DIRECT
[CHARACTER_ID = current()][1]/LOCATION_ID)">

<xsl:value-of select="concat('    ', ../LOCATION_ID, $NL)"/>
</xsl:if>

</xsl:for-each>

    </xsl:for-each>

  </xsl:template>
</xsl:stylesheet>
```

Sample Output (Edited as each file is 30 pages long)

```
CHARACTER_ID  44639  sent 1353 messages, received 1207
CHARACTER_ID  23470  sent 261 messages, received 99 CHARACTER_ID
17933  sent 392 messages, received 336 CHARACTER_ID  26782  sent
97 messages, received 48 CHARACTER_ID  28349  sent 388 messages,
received 388 CHARACTER_ID  6477  sent 581 messages, received 1047
CHARACTER_ID  16783  sent 1875 messages, received 1702
CHARACTER_ID  6148  sent 258 messages, received 114 CHARACTER_ID
10010  sent 569 messages, received 642 CHARACTER_ID  31484  sent
516 messages, received 661 CHARACTER_ID  1986  sent 608 messages,
received 561 CHARACTER_ID  9207  sent 1 messages, received 35
CHARACTER_ID  41170  sent 520 messages, received 706 CHARACTER_ID
23689  sent 946 messages, received 520 CHARACTER_ID  45226  sent
311 messages, received 237 CHARACTER_ID  6119  sent 4 messages,
received 11 CHARACTER_ID  14211  sent 68 messages, received 219
CHARACTER_ID  29998  sent 13 messages, received 2 CHARACTER_ID
```

43442 sent 374 messages, received 400 CHARACTER_ID 47350 sent 23 messages, received 0 CHARACTER_ID 31786 sent 46 messages, received 36 CHARACTER_ID 43943 sent 17 messages, received 17 CHARACTER_ID 47103 sent 211 messages, received 526 CHARACTER_ID 22721 sent 8 messages, received 3 CHARACTER_ID 10946 sent 288 messages, received 300 CHARACTER_ID 21915 sent 267 messages, received 420 CHARACTER_ID 41661 sent 31 messages, received 19 CHARACTER_ID 37239 sent 35 messages, received 195 CHARACTER_ID 11116 sent 2071 messages, received 802 CHARACTER_ID 34091 sent 205 messages, received 201 CHARACTER_ID 34101 sent 679 messages, received 716 CHARACTER_ID 32884 sent 679 messages, received 433 CHARACTER_ID 8520 sent 109 messages, received 73 CHARACTER_ID 12284 sent 452 messages, received 401 CHARACTER_ID 33084 sent 2196 messages, received 1355 CHARACTER_ID 40286 sent 14 messages, received 23 CHARACTER_ID 40993 sent 26 messages, received 141 CHARACTER_ID 8220 sent 4 messages, received 4 CHARACTER_ID 47079 sent 107 messages, received 192 CHARACTER_ID 12599 sent 25 messages, received 10 CHARACTER_ID 35153 sent 1156 messages, received 699 CHARACTER_ID 18817 sent 46 messages, received 25 CHARACTER_ID 44860 sent 104 messages, received 60 CHARACTER_ID 11084 sent 31 messages, received 20 CHARACTER_ID 46710 sent 314 messages, received 254 CHARACTER_ID 49071 sent 16 messages, received 10 CHARACTER_ID 25140 sent 5 messages, received 1 CHARACTER_ID 17484 sent 6 messages, received 3 CHARACTER_ID 18544 sent 14 messages, received 24 CHARACTER_ID 9911 sent 277 messages, received 180 CHARACTER_ID 11457 sent 146 messages, received 606 CHARACTER_ID 46421 sent 239 messages, received 220 CHARACTER_ID 13172 sent 21 messages, received 103 CHARACTER_ID 29652 sent 1 messages, received 0 CHARACTER_ID 21180 sent 6 messages, received 0 CHARACTER_ID 23749 sent 28

messages, received 136 CHARACTER_ID 35257 sent 91 messages, received 99 CHARACTER_ID 38652 sent 2 messages, received 0 CHARACTER_ID 34845 sent 12 messages, received 3 CHARACTER_ID 20703 sent 165 messages, received 153 CHARACTER_ID 42857 sent 4 messages, received 0 CHARACTER_ID 44178 sent 16 messages, received 36 CHARACTER_ID 41682 sent 289 messages, received 350 CHARACTER_ID 19664 sent 46 messages, received 38 CHARACTER_ID 34540 sent 71 messages, received 130 CHARACTER_ID 23736 sent 789 messages, received 481 CHARACTER_ID 43697 sent 1 messages, received 0 CHARACTER_ID 8024 sent 37 messages, received 42 CHARACTER_ID 32633 sent 23 messages, received 30 CHARACTER_ID 17336 sent 56 messages, received 47 CHARACTER_ID 11311 sent 182 messages, received 367 CHARACTER_ID 36402 sent 156 messages, received 42 CHARACTER_ID 9980 sent 595 messages, received 367 CHARACTER_ID 22993 sent 210 messages, received 234 CHARACTER_ID 1524 sent 19 messages, received 27 CHARACTER_ID 21250 sent 3 messages, received 1 CHARACTER_ID 44249 sent 608 messages, received 284 CHARACTER_ID 21268 sent 16 messages, received 32 CHARACTER_ID 21252 sent 1 messages, received 26 CHARACTER_ID 31953 sent 3 messages, received 2 CHARACTER_ID 12969 sent 103 messages, received 405 CHARACTER_ID 17501 sent 47 messages, received 34 CHARACTER_ID 17958 sent 26 messages, received 8 CHARACTER_ID 32783 sent 266 messages, received 278 CHARACTER_ID 43125 sent 2 messages, received 0 CHARACTER_ID 26527 sent 52 messages, received 67 CHARACTER_ID 12597 sent 155 messages, received 429 CHARACTER_ID 5486 sent 1139 messages, received 381 CHARACTER_ID 37026 sent 2 messages, received 0 CHARACTER_ID 37948 sent 1 messages, received 0 CHARACTER_ID 17443 sent 366 messages, received 328 CHARACTER_ID 46914 sent 206 messages, received 185 CHARACTER_ID 25353 sent 281 messages, received 84

CHARACTER_ID 26976 sent 7 messages, received 6 CHARACTER_ID 37503 sent 4 messages, received 1 CHARACTER_ID 12426 sent 63 messages, received 124 CHARACTER_ID 40138 sent 429 messages, received 361 CHARACTER_ID 14791 sent 2 messages, received 0 CHARACTER_ID 37703 sent 14 messages, received 1 CHARACTER_ID 19878 sent 26 messages, received 109 CHARACTER_ID 8731 sent 48 messages, received 23 CHARACTER_ID 21708 sent 97 messages, received 28 CHARACTER_ID 14371 sent 45 messages, received 33 CHARACTER_ID 1637 sent 7 messages, received 5 CHARACTER_ID 8911 sent 45 messages, received 14 CHARACTER_ID 31458 sent 1 messages, received 0 CHARACTER_ID 24941 sent 12 messages, received 19 CHARACTER_ID 42785 sent 81 messages, received 60 CHARACTER_ID 26007 sent 27 messages, received 24 CHARACTER_ID 19233 sent 28 messages, received 34 CHARACTER_ID 1864 sent 156 messages, received 44 CHARACTER_ID 13685 sent 119 messages, received 4 CHARACTER_ID 10347 sent 5 messages, received 3 CHARACTER_ID 31855 sent 101 messages, received 27 CHARACTER_ID 38625 sent 6 messages, received 0 CHARACTER_ID 26567 sent 1 messages, received 0 CHARACTER_ID 23138 sent 5 messages, received 1 CHARACTER_ID 27433 sent 27 messages, received 123 CHARACTER_ID 31988 sent 60 messages, received 61 CHARACTER_ID 33724 sent 50 messages, received 161 CHARACTER_ID 20241 sent 5 messages, received 106 CHARACTER_ID 19841 sent 8 messages, received 0 CHARACTER_ID 11237 sent 72 messages, received 81 CHARACTER_ID 226 sent 1 messages, received 0 CHARACTER_ID 42812 sent 1 messages, received 2 CHARACTER_ID 44396 sent 369 messages, received 169 CHARACTER_ID 41644 sent 20 messages, received 57 CHARACTER_ID 21714 sent 169 messages, received 359 CHARACTER_ID 47418 sent 4 messages, received 2 CHARACTER_ID 18908 sent 11 messages, received 7 CHARACTER_ID 16851 sent 78

messages, received 13 CHARACTER_ID 43006 sent 1 messages, received 0 CHARACTER_ID 6167 sent 78 messages, received 4 CHARACTER_ID 22856 sent 20 messages, received 1 CHARACTER_ID 4715 sent 2 messages, received 14 CHARACTER_ID 23562 sent 1 messages, received 0 CHARACTER_ID 715 sent 71 messages, received 67 CHARACTER_ID 6007 sent 7 messages, received 1 CHARACTER_ID 40097 sent 7 messages, received 32 CHARACTER_ID 10904 sent 2 messages, received 0 CHARACTER_ID 8057 sent 106 messages, received 89 CHARACTER_ID 26882 sent 188 messages, received 45 CHARACTER_ID 17583 sent 142 messages, received 19 CHARACTER_ID 47535 sent 1 messages, received 0 CHARACTER_ID 23212 sent 290 messages, received 188 CHARACTER_ID 27087 sent 88 messages, received 71 CHARACTER_ID 32437 sent 6 messages, received 0 CHARACTER_ID 3181 sent 2 messages, received 0 CHARACTER_ID 44473 sent 8 messages, received 1 CHARACTER_ID 19929 sent 3 messages, received 2 CHARACTER_ID 22441 sent 117 messages, received 76 CHARACTER_ID 28519 sent 47 messages, received 57 CHARACTER_ID 13680 sent 5 messages, received 15 CHARACTER_ID 49143 sent 36 messages, received 21 CHARACTER_ID 45155 sent 2 messages, received 5 CHARACTER_ID 3518 sent 12 messages, received 1 CHARACTER_ID 21177 sent 26 messages, received 11 CHARACTER_ID 18815 sent 41 messages, received 14 CHARACTER_ID 38783 sent 1 messages, received 0 CHARACTER_ID 16142 sent 4 messages, received 13 CHARACTER_ID 18672 sent 72 messages, received 53 CHARACTER_ID 21323 sent 122 messages, received 59 CHARACTER_ID 43028 sent 0 messages, received 2 CHARACTER_ID 7202 sent 0 messages, received 12 CHARACTER_ID 5166 sent 0 messages, received 5 CHARACTER_ID 39183 sent 0 messages, received 1 CHARACTER_ID 1959 sent 0 messages, received 45 CHARACTER_ID 10816 sent 0 messages, received 8 CHARACTER_ID 26115 sent 0

```
messages, received 2 CHARACTER_ID  32282  sent 0 messages,
received 6 CHARACTER_ID  12758  sent 0 messages, received 1
CHARACTER_ID  20823  sent 0 messages, received 1 CHARACTER_ID
3153  sent 0 messages, received 7 CHARACTER_ID  7561 sent 0
messages, received 2 CHARACTER_ID  14146  sent 0 messages,
received 3 CHARACTER_ID  15744  sent 0 messages, received 5
CHARACTER_ID  11280  sent 0 messages, received 1

Number of characters having sent a message: 162 Number of
characters having received a message: 155

Total sent: 25101, Average sent by a sending character:
154.94444444444446 Total received: 25101, Average received by a
receiving character: 161.94193548387096

Room moves by character: Character_ID:  44639 :
     45040
     19401
     293
     45040
     38475
     3091
     45040
Character_ID:  23470 :
     23222
     45040
     45040
     45040
     45040
     45040
```

```
45040
45040
45040
45040
45040
45040
45040
45040
45040
45040
20709
20709
20709
40581
40581
40581
40581
40581
40581
40581
40581
40581
40581
40581
40581
40581
40581
28560
28560
28560
23222
```

28560

28560

28560

47756

47756

47756

47756

47756

47756

47756

47756

47756

47756

28560

28560

28560

28560

28560

28560

28560

47756

47756

47756

23222

28560

28560

28560

28560

28560

28560

Character_ID: 17933 :

```
     18461
     18247
     23359
     18247
     18461
     18247
Character_ID:  26782 :
     293
     43448
     43448
     0
     27262
     293
     293
     31848
     31848
     31848
     6711
     6711
Character_ID:  28349 :
     5720
     23359
     3091
Character_ID:  6477 :
     1002
     1002
     1002
     1002
     1002
     293
```

293

34308

34310

1091

1002

1002

1002

1002

1002

1002

1002

1002

1002

1002

1002

1002

1060

1060

Character_ID: 16783 :

39784

2397

2397

2397

2397

2397

2397

2397

2397

2397

2397

```
     2397
     2397
     2397
     2397
     2397
     2397
     2397
     39784
Character_ID:  6148 :
     16545
     45996
     12774
     293
     16545
Character_ID:  10010 :
     24488
Character_ID:  31484 :
     43206
     293
     293
     43206
     5050
     43206
```

7.1.2 Message Destinations

```
<xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Transform">

  <xsl:output method="text"/>
```

```
<xsl:variable name="vTotalSent"
                select="count(LOG/*/MESSAGE)"/>

<xsl:variable name="vNumNotSame"
  select="count(LOG/*[number(LOCATION_ID) !=
                      number(TARGET_CHARACTER_LOCATION_ID) and
                      not(preceding-sibling::*[1]/MESSAGE =
                      MESSAGE)])"/>


<xsl:variable name="vNumSame"
  select="count(LOG/*[number(LOCATION_ID) =
                      number(TARGET_CHARACTER_LOCATION_ID) and
                      preceding-sibling::*[1]/MESSAGE !=
                      MESSAGE])"/>


 <xsl:template match="/">


 <xsl:text> The total number of messages sent was: </xsl:text>
 <xsl:value-of select="$vTotalSent"/>


 <xsl:text> The total number of messages sent to a different location was </xsl:text>
 <xsl:value-of select="$vNumNotSame"/>


 <xsl:text> The total number of messages sent to the same location was </xsl:text>
```

```
   <xsl:value-of select="$vNumSame"/>


</xsl:template>

</xsl:stylesheet>
```

7.1.3 Patterns of Congregation

```
<xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
xmlns:self="sdsdsd">

  <xsl:output method="text"/>

  <xsl:key name="kByID" match="DIRECT | LOCAL |
  GLOBAL | ADMIN" use="LOCATION_ID"/>


<xsl:variable name="vLocations"
 select="LOG/*[generate-id() =
generate-id(key('kByID', LOCATION_ID)[1])]"/>

<xsl:variable name="NL" select="'&#xA;'"/>

 <xsl:template match="/">

<xsl:for-each select="$vLocations">
      <xsl:value-of select="concat
      ('Location: ',LOCATION_ID,':',$NL)"/>
      <xsl:for-each
```

```
          select="key('kByID', LOCATION_ID)">

<xsl:if test="not(preceding-sibling:: *[self::DIRECT or
self::LOCAL or self:ADMIN or self:GLOBAL] [CHARACTER_ID =
current()/CHARACTER_ID][1]/LOCATION_ID = LOCATION_ID)">

<xsl:value-of select="concat('    ', CHARACTER_ID, $NL)"/>
</xsl:if>

      </xsl:for-each>

    </xsl:for-each>

  </xsl:template>
</xsl:stylesheet>
```

Sample Output Edited for length

```
Patterns of Location - For each room how many people inhabited it
per day?

Location ID = 1.xml = 2.xml = 3.xml =4.xml = 5.xml = 6.xml = 7.xml
= total 22189 = 0 = 0 = 0 = 0 = 0 = 3 = 2 = 5 22326 = 0 = 1 = 1 =
2 = 13 = 2 = 2 = 21 22470 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 22501 =
0 = 1 = 0 = 0 = 0 = 0  = 0 = 1 22707 = 0 = 0 = 0 = 0 = 0 = 2 = 0 =
2 22851 = 0 = 0 = 0 = 0 = 1 = 0 = 0 = 1 23018 = 0 = 0= 0 = 2 = 0 =
0 = 0 = 2 23036 = 0 = 2 = 0 = 0 = 0 = 0 = 0 = 2 2305 = 1 = 5 = 1 =
1 = 2 = 2 = 2 = 14 23222 = 17 = 24 = 3 = 10 = 16 = 19 = 22 = 111
23359 = 20 = 27 = 30 = 11 = 33 = 41 = 43 = 194 234 = 2 = 4 = 1 = 0
= 1 = 0 = 0 = 8 23578 = 0 = 0 = 2 = 0 = 4 = 4 = 0 = 10 23595 = 4 =
3 = 11 = 1 = 8 = 7 = 4 = 37 23623 = 1 = 2 = 1 = 0 = 0 = 0 = 1 = 5
```

23679 = 1 = 0 = 1 = 1 = 1 = 0 = 0 = 4 2377 = 3 = 1 = 1 = 4 = 1 = 2
= 2 = 14 23799 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 23826 = 0 = 0 = 0 =
0 = 0 = 1 = 0 = 1 23966 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1 2397 = 5 =
4 = 5 = 5 = 4 = 5 = 3 = 31 23983 = 1 = 0 = 0 = 0 = 0 = 0 = 0 = 1
24119 = 0 = 0 = 0 = 0 = 0 = 1 = 0 = 1 24357 = 0 = 0 = 2 = 0 = 0 =
0 = 0 = 2 24370 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 24447 = 1 = 1 = 0
= 0 = 0 = 1 = 1 = 4 24482 = 1 = 0 = 0 = 2 = 1 = 3 = 0 = 7 24488 =
1 = 1 = 2 = 0 = 3 = 2 = 4 = 13 24885 = 0 = 0 = 1 = 1 = 1 = 1 = 0 =
4 25149 = 1 = 0 = 0 = 0 = 0 = 0 = 0 = 1 25197 = 1 = 4 = 1 = 2 = 4
= 2 = 3 = 17 25220 = 2 = 0 = 0 = 0 = 0 = 0 = 0 = 2 25337 = 0 = 0 =
0 = 0 = 0 = 0 = 1 = 1 25466 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1 25700=
0 = 0 = 0 = 0 = 0 = 0 = 2 = 2 2580 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1
25836 = 0 = 1 = 0 = 0 = 0 = 1 = 0 = 2 25887 = 0 = 0 = 0 = 0 = 0 =
2 = 0 = 2 25912 = 3 = 2 = 1 = 2 = 2 = 3 = 2 = 15 26011 = 1 = 4 = 7
= 5 = 1 = 1 = 3 = 22 26207 = 0 = 0 = 0 = 0 = 0 = 0 = 5 = 5 26328 =
4 = 4 = 6 = 4 = 2 = 2 = 0 = 22 26452 = 3 = 0 = 1 = 1 = 0 = 1 = 0 =
6 26484 = 1 = 3 = 0 = 2 = 0 = 0 = 0 = 6 26511 = 0 = 0 = 0 = 0 = 0
= 1 = 0 = 1 26656 = 2 = 1 = 2 = 2 = 1 = 3 = 2 = 13 26758 = 0 = 0 =
1 = 0 = 0 = 0 = 0 = 1 26883 = 4 = 0 = 0 = 0 = 0 = 0 = 0 = 4 2689 =
0 = 0 = 0 = 0 = 1 = 0 = 0 = 1 27053 = 1 = 2 = 0 = 1 = 1 = 0 = 2 =
7 27143 = 0 = 0 = 1 = 1 = 0 = 2 = 1 = 5 27229 = 0 = 0 = 1 = 0 = 0
= 0 = 0 = 1 27233 = 0 = 0 = 0 = 0 = 0 = 1 = 1 = 2 27237 = 1 = 0 =
0 = 0 = 0 = 0 = 0 = 1 27262 = 3 = 0 = 0 = 1 = 0 = 1 = 17 = 22
27312 = 0 = 8 = 11 = 6 = 5 = 25 = 55 27354 = 1 = 0 = 0 = 0 = 0 = 0
= 0 = 1 2745 = 0 = 2 = 1 = 0 = 3 = 1 = 1 = 8 27455 = 0 = 0 = 0 = 0
= 0 = 3 = 0 = 3 27501 = 0 = 0 = 0 = 1 = 0 = 0 = 0 = 1 27648 = 1 =
0 = 0 = 0 = 0 = 1 = 0 = 2 27770 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1
2801 = 0 = 0 = 1 = 0 = 0 = 0 = 0 = 1 2854 = 0 = 0 = 0 = 0 = 1 = 0
= 0 = 1 28560 = 4 = 2 = 4 = 2 = 4 = 2 = 1 = 19 28577 = 1 = 0 = 0 =
0 = 0 = 0 = 0 = 1 28781 = 1 = 0 = 0 = 0 = 0 = 0 = 0 = 1 28893 = 1

= 0 = 0 = 0 = 0 = 0 = 0 = 1 29083 = 1 = 2 = 0 = 0 = 0 = 1 = 0 = 4
29255 = 1 = 0 = 1 = 0 = 0 = 0 = 0 = 2 29298 = 4 = 4 = 10 = 5 = 5
= 8 = 4 = 40 293 = 87 = 54 = 57 = 55 = 88 = 106 = 96 = 543 29389 =
0 = 0 = 0 = 0 = 1 = 0 = 0 = 1 2939 = 0 = 0 = 0 = 0 = 0 = 0 = 2 = 2
29429 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 29603 = 0 = 0 = 0 = 0 = 0 =
1 = 0 = 1 29632 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1 2968 = 0 = 0 = 0 =
0 = 1 = 0 = 0 = 1 29941 = 0 = 0 = 0 = 1 = 0 = 0 = 0 = 1 29942 = 6
= 2 = 2 = 2 = 1 = 3 = 4 = 20 29987 = 0 = 1 = 1 = 2 = 0 = 0 = 0 = 4
3 = 4 = 0 = 3 = 3 = 0 = 3 = 0 = 1 = 14 30128 = 0 = 0 = 1 = 0 = 0 =
2 = 0 = 3 30263 = 0 = 0 = 1 = 0 = 0 = 2 = 0 = 3 30345 = 1 = 0 = 0
= 1 = 1 = 0 = 2 = 5 30533 = 3 = 4 = 3 = 2 = 4 = 2 = 5 = 23 30592 =
0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 30613 = 0 = 0 = 0 = 0 = 0 = 0 = 5 =
5 3089 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 7 3091 = 2 = 0 = 0 = 0 = 0 =
0 = 0 = 2 30923 = 1 = 4 = 2 = 1 = 0 = 3 = 0 = 11 31 = 0 = 0 = 1 =
0 = 0 = 0 = 2 = 0 = 3 31047 = 0 = 0 = 1 = 0 = 1 = 0 = 0 = 2 31071
= 0 = 1 = 0 =1 = 1 = 0 = 0 = 3 31132 = 1 = 5 = 1 = 1 = 1 = 1 = 5 =
15 31185 = 0 = 0 = 0 = 0 = 2 = 0 = 0 = 2 31314 = 1 = 1 = 5 = 1 = 1
= 1 = 0 = 10 31379 = 0 = 0 = 0 = 0 = 1 = 0 = 1 = 2 3157 = 0 = 0 =
0 = 1 = 0 = 0 = 0 = 1 31576 = 0 = 0 = 0 = 0 = 1 = 0 = 0 = 1 31602
= 1 = 3 = 0 = 1 = 1 = 2 = 0 = 8 31752 = 3 = 1 = 0 = 0 = 0 = 1 = 0
= 5 31757 = 0 = 2 = 1 = 3 = 1 = 1 = 1 = 9 31771 = 0 = 0 = 0 = 1 =
0 = 0 = 0 = 1 31817 = 3 = 1 = 0 = 0 = 0 = 0 = 0 = 4 31848 = 4 = 1
= 0 = 1 = 1 = 3 = 1 = 11 31911 = 0 = 0 = 0 = 0 = 5 = 1 = 0 = 6
31998 = 0 = 0 = 1 = 0 = 0 = 0 = 0 = 1 32037 = 23 = 34 = 32 = 34 =
41 = 54 = 26 = 246 32046 = 0 = 0 = 0 = 0 = 0 = 0 = 2 = 2 32094 = 1
= 0 = 1 = 3 = 0 = 0 = 0 = 5 3210 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1
32286 = 0 = 0 = 0 = 0 = 0 = 1 = 0 = 1 32319 = 0 = 1 = 0 = 0 = 0 =
0 = 0 = 1 32331 = 0 = 2 = 0 = 0 = 0 = 0 = 0 = 2 32457 = 0 = 0 = 0
= 0 = 0 = 1 = 0 = 1 32815 = 0 = 0 = 0 = 0 = 0 = 0 = 2 = 2 33068 =
0 = 0 = 1 = 0 = 0 = 0 = 0 = 1 3330 = 0 = 0 = 0 = 3 = 0 = 0 = 0 = 3

33364 = 0 = 1 = 0 = 0 = 1 = 2 = 4 = 8 33438 = 1 = 0 = 1 = 2 = 1 = 1 = 0 = 6 33636 = 1 = 2 = 0 = 0 = 0 = 0 = 1 = 4 33689 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 33730 = 4 = 1 = 1 = 2 = 1 = 1 = 1 = 11 33744 = 0 = 1 = 0 = 1 = 0 = 0 = 0 = 2 33813 = 0 = 0 = 0 = 0 = 1 = 0 = 0 = 1 33832 = 1 = 0 = 1 = 0 = 0 = 3 = 3 = 8 34009 = 0 = 0 = 0 = 0 = 0 = 1 = 1 = 2 34044 = 1 = 2 = 0 = 1 = 0 = 0 = 1 = 5 34070 = 2 = 0 = 0 = 0 = 0 = 1 = 0 = 3 34089 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 34308 = 1 = 0 = 0 = 3 = 3 = 0 = 0 = 7 34310 =1 = 0 = 0 = 0 = 1 = 0 = 0 = 2 34438 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 34401 = 3 = 1 = 0 = 0 = 1 = 3 = 1 = 9 34611 = 0 = 0 = 0 = 0 = 2 = 1 = 0 = 3 34632 = 1 = 1 = 1 = 1 = 1 = 1 = 0 = 6 34765 = 1 = 0 = 0 = 0 = 0 = 0 = 0 = 1 34827 = 0 = 0 = 0 = 0 = 0 = 1 = 1 = 2 34972 = 0 = 0 = 0 = 0 = 1 = 0 = 0 = 1 34981 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 35212 = 1 = 2 = 2 = 2 = 1 = 1 = 3 = 12 35389 = 0 = 8 = 0 = 0 = 0 = 0 = 0 = 8 35585 = 0 = 1 = 0 = 0 = 1 = 0 = 0 = 2 35674 = 1 = 0 = 0 = 0 = 0 = 0 = 0 = 1

35699 = 2 = 0 = 0 = 1 = 1 = 1 = 0 = 5 35785 = 0 = 0 = 0 = 0 = 0 = 2 = 5 = 7 35819 = 0 = 0 = 0 = 0 = 1 = 0 = 0 = 1 35922 = 0 = 0 = 0 = 0 = 0 = 1 = 0 = 1 35939 = 1 = 1 = 0 = 0 = 0 = 0 = 0 = 2 36198 = 0 = 0 = 0 = 2 = 0 = 0 = 0 = 2 36241 = 2 = 2 = 2 = 0 = 1 = 0 = 0 = 7 364 = 5 = 0 = 0 = 3 = 0 = 0 = 1 = 9 36405 = 0 = 0 = 0 = 0 = 0 = 1 = 1 = 2 36419 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 36460 = 1 = 1 = 1 = 1 = 1 = 1 = 0 = 6 36569 = 0 = 0 = 0 = 0 = 0 = 2 = 0 = 2 36754 = 0 = 0 = 0 = 2 = 1 = 0 = 0 = 3 36767 = 3 = 2 = 1 = 1 = 1 = 1 = 1 = 10 36800 = 0 = 1 = 0 = 2 = 0 = 0 = 0 = 3 36808 = 0 = 2 = 0 = 0 = 0 = 0 = 0 = 2 37072 = 0 = 0 = 1 = 0 = 0 = 0 = 0 = 1 37130 = 0 = 0 = 1 = 1 = 0 = 0 = 0 = 2 3726 = 2 = 2 = 3 = 1 = 4 = 2 = 3 =17 3735 = 0 = 0 = 0 = 0 = 0 = 1 = 0 = 1 3737 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1

37450 = 1 = 0 = 0 = 0 = 2 = 0 = 1 = 4 37643 = 1 = 0 = 0 = 0 = 0 = 0 = 0 = 1 37683 = 0 = 1 = 1 = 0 = 0 = 0 = 0 = 2 38026 = 1 = 0 = 0 = 0 = 0 = 0 = 0 = 1 38035 = 0 = 0 = 0 = 0 = 1 = 0 = 0 = 1 38048 =

0 = 0 = 0 = 1 = 0 = 0 = 0 = 1 38325 = 0 = 0 = 0 = 0 = 1 = 0 = 0 =
1 3846 = 1 = 2 = 2 = 1 = 5 = 4 = 2 = 17 38475 = 1 = 0 = 0 = 0 = 0
= 0 = 0 = 1 38572 = 1 = 0 = 0 = 0 = 0 = 0 = 0 = 1 38621 = 1 = 0 =
0 = 0 = 0 = 0 = 0 = 1 38744 = 1 = 1 = 0 = 4 = 1 = 0 = 3 = 10 38773
= 1 = 0 = 1 = 0 = 0 = 0 = 0 = 2 3887 = 0 = 2 = 0 = 0 = 0 = 0 = 0 =
2 38967 = 0 = 0 = 0 = 1 = 0 = 1 = 0 = 2 38969 = 1 = 0 = 0 = 0 = 1
= 0 = 0 = 2 39192 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1 39287 = 0 = 0 =
0 = 0 = 1 = 0 = 0 = 1 39381 = 1 = 0 = 0 = 0 = 0 = 1 = 1 = 3 39386
= 0 = 0 = 1 = 0 = 0 = 0 = 0 = 1 39411 = 0 = 0 = 0 = 0 = 1 = 0 = 0
= 1 39554 = 5 = 1 = 1 = 1 = 1 = 1 = 1 = 11 39627 = 1 = 1 = 1 = 0 =
0 = 0 = 0 = 3 39712 = 1 = 1 = 1 = 1 = 1 = 7 = 1 = 11 39784 = 2 = 1
= 7 = 3 = 7 = 10 = 8 = 38 3983 = 2 = 3 = 3 = 2 = 3 = 0 = 0 = 13
40126 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1 40143 = 0 = 1 = 0 = 0 = 1 =
0 = 0 = 2 4035 = 2 = 0 = 0 = 0 = 0 = 1 = 1 = 4 40414 = 0 = 0 = 0 =
0 = 1 = 0 = 0 = 1 40448 = 0 = 0 = 0 = 0 = 0 = 1 = 0 = 1 4046 = 1 =
0 = 0 = 0 = 0 = 0 = 0 = 1 40475 = 0 = 0 = 5 = 0 = 0 = 0 = 0 = 5
40501 = 0 = 0 = 0 = 1 = 0 = 0 = 0 = 1 40581 = 2 = 1 = 0 = 0 = 0 =
0 = 0 = 3 40669 = 1 = 0 = 0 = 0 = 0 = 0 = 0 = 1 40929 = 1 = 1 = 0
= 0 = 0 = 0 = 0 = 2 40961 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1 40982 =
0 = 0 = 0 = 0 = 0 = 1 = 0 = 1 41017 = 0 = 0 = 0 = 0 = 1 = 0 = 0 =
1 41204 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 41341 = 1 = 0 = 0 = 2 = 2
= 0 = 2 = 7 4170 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1 41777 = 0 = 0 = 0
= 0 = 1 = 0 = 0 = 1 41917 = 0 = 0 = 1 = 0 = 1 = 0 = 0 = 2 41961 =
0 = 0 = 0 = 0 = 1 = 0 = 0 = 1 42022 = 0 = 0 = 1 = 0 = 0 = 1 = 1 =
3 42168 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 42417 = 2 = 2 = 2 = 0 = 2
= 2 = 1 = 11 42436 = 0 = 0 = 0 = 0 = 0 = 1 = 0 = 1 4272 = 0 = 0 =
2 = 1 = 4 = 2 = 0 = 9 42734 = 0 = 0 = 0 = 1 = 3 = 0 = 0 = 4 42844
= 2 = 1 = 1 = 1 = 1 = 1 = 0 = 6 42987 = 0 = 1 = 0 = 0 = 0 = 0 = 0
= 1 43206 = 3 = 2 = 4 = 2 = 2 = 1 = 0 = 15 43209 = 1 = 0 = 1 = 0 =
0 = 0 = 0 = 2 43223 = 0 = 0 = 0 = 0 = 0 = 1 = 0 = 1 43321 = 0 = 0

= 0 = 3 = 0 = 2 = 0 = 10 43371 = 1 = 1 = 7 = 2 = 0 = 1 = 0 = 12
43448 = 1 = 2 = 3 = 3 = 5 = 5 = 2 = 21 43560 = 0 = 1 = 0 = 0 = 0 =
0 = 0 = 1 43562 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 43582 = 0 = 0 = 0
= 1 = 0 = 0 = 0 = 1 43853 = 0 = 0 = 0 = 2 = 0 = 0 = 0 = 2 43856 =
5 = 1 = 0 = 1 = 3 = 5 = 3 = 23 43957 = 1 = 0 = 0 = 0 = 0 = 0 = 0 =
1 43962 = 2 = 0 = 0 = 0 = 0 = 0 = 0 = 2 44116 = 0 = 0 = 0 = 0 = 0
= 1 = 0 = 1 44125 = 0 = 0 = 0 = 0 = 1 = 0 = 0 = 1 44186 = 0 = 0 =
0 = 0 = 0 = 0 = 3 = 3 44204 = 0 = 0 = 0 = 0 = 1 = 0 = 0 = 1 4428 =
0 = 2 = 0 = 0 = 0 = 0 = 0 = 2 44284 = 0 = 0 = 0 = 0 = 0 = 0 = 1 =
1 44407 = 2 = 5 = 7 = 2 = 6 = 2 = 6 = 34 44839 = 4 = 0 = 0 = 1 = 1
= 1 = 0 = 7 44958 = 1 = 1 = 1 = 1 = 0 = 3 = 2 = 9 45040 = 4 = 1 =
3 = 4 = 2 = 3 = 2 = 19 45143 = 0 = 0 = 0 = 0 = 0 = 1 = 0 = 1 45192
= 1 = 1 = 1 = 1 = 0 = 1 = 0 = 5 45322 = 0 = 1 = 0 = 0 = 0 = 0 = 0
= 1 45520 = 2 = 2 = 2 = 1 = 3 = 4 = 2 = 16 4566 = 3 = 1 = 1 = 1 =
2 = 6 = 1 = 15 4570 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1 45716 = 1 = 3
= 2 = 2 = 1 = 4 = 2 = 15 45845 = 0 = 0 = 0 = 0 = 1 = 0 = 0 = 1
45846 = 0 = 0 = 2 = 1 = 1 = 0 = 0 = 4 45858 = 1 = 0 = 0 = 0 = 0 =
0 = 0 = 1 45925 = 0 = 1 = 0 = 1 = 1 = 1 = 0 = 4 45996 = 1 = 0 = 0
= 0 = 0 = 0 = 0 = 1 46117 = 0 = 2 = 0 = 0 = 0 = 0 = 0 = 2 46590 =
0 = 0 = 0 = 0 = 0 = 2 = 0 = 2 46639 = 1 = 8 = 5 = 1 = 3 = 5 = 2 =
25 46715 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1 46688 = 8 = 1 = 3 = 3 = 2
= 3 = 0 = 20 4682 = 0 = 0 = 0 = 1 = 0 = 0 = 0 = 1 46878 = 0 = 0 =
1 = 0 = 0 = 1 = 0 = 2 46933 = 3 = 4 = 2 = 1 = 1 = 3 = 2 = 16 47077
= 0 = 0 = 0 = 0 = 0 = 1 = 0 = 1 47080 = 0 = 0 = 1 = 0 = 0 = 0 = 0
= 1 47134 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 4728 = 0 = 0 = 1 = 0 = 0
= 0 = 0 = 1 47467 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1 47756 = 12 = 19
= 7 = 12 = 8 = 13 = 14 = 85 47840 = 4 = 0 = 0 = 2 = 0 = 2 = 4 = 12
47889 = 0 = 0 = 0 = 0 = 1 = 0 = 0 = 1 4800 = 1 = 1 = 0 = 1 = 1 = 1
= 1 = 6 48240 = 1 = 0 = 0 = 0 = 1 = 0 = 0 = 2 48473 = 4 = 0 = 0 =
0 = 1 = 0 = 0 = 5 4878 = 0 = 1 = 0 = 0 = 0 = 0 = 0 = 1 48834 = 1 =

```
2 = 1 = 0 = 0 = 0 = 0 = 4 48853 = 7 = 2 = 3 = 3 = 0 = 5 = 2 = 22
48984 = 2 = 3 = 1 = 0 = 2 = 1 = 0 = 9 49025 = 2 = 0 = 0 = 0 = 0 =
1 = 1 = 4 49056 = 3 = 8 = 2 = 2 = 2 = 1 = 1 = 19 4917 = 6 = 2 = 4
= 5 = 9 = 4 = 9 = 45 49534 = 0 = 1 = 0 = 1 = 0 = 0 = 0 = 2 49556 =
0 = 1 = 1 = 4 = 1 = 4 = 2 = 13 49803 = 0 = 0 = 0 = 0 = 0 = 0 = 2 =
2 5050 = 26 = 21 = 12 = 31 = 17 = 12 = 14 = 133 5064 = 0 = 1 = 2 =
0 = 0 = 1 = 0 = 4 5197 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1 53 = 0 = 0
= 0 = 0 = 2 = 0 = 0 = 2 5355 = 0 = 0 = 0 = 0 = 0 = 0 = 1 = 1 5403
= 2 = 2 = 1 = 2 = 5 = 0 = 0 = 12 5473 = 0 = 1 = 0 = 0 = 0 = 0 = 0
= 1 5579 = 1 = 0 = 0 = 0 = 0 = 0 = 0 = 1 5584 = 0 = 0 = 0 = 1 = 0
= 0 = 0 = 1 5671 = 1 = 0 = 0 = 0 = 1 = 0 = 0 = 2 5690 = 0 = 0 = 0
= 0 = 0 = 0 = 1 = 1 5720 = 2 = 0 = 3 = 1 = 2 = 0 = 0 = 8 5806 = 0
= 1 = 0 = 0 = 1 = 1 = 0 = 3
```

7.1.4 Levels of Expertise

```
<xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Transform">

  <xsl:output method="text"/>

  <xsl:key name="kByID" match="DIRECT | LOCAL |
  GLOBAL | ADMIN" use="CHARACTER_ID"/>

  <xsl:key name='kByStatus' match="DIRECT |
  LOCAL | GLOBAL | ADMIN"
   use="number(CHARACTER_STATUS)"/>


  <xsl:variable name="vUniqueCharacters"
```

```
  select="LOG/*[generate-id()=
  generate-id(key('kByID',CHARACTER_ID)[1])]"/>

    <xsl:variable name="NL" select="'&#xA;'"/>

  <xsl:template match="/">

  <xsl:value-of select="concat('Number of Unique Characters',
  ' ',count($vUniqueCharacters))"/>
  <xsl:value-of select="$NL"/>
  <xsl:value-of select="$NL"/>

   <xsl:for-each select="$vUniqueCharacters">
    <xsl:variable name='sameStatus'
        select="key('kByStatus',number(CHARACTER_STATUS))"/>
    <xsl:variable name='intersect'
        select='$vUniqueCharacters[count(.|$sameStatus)=
        count($sameStatus)]'/>

    <xsl:if test=".=$intersect[1]">
        <xsl:text>STATUS </xsl:text>
        <xsl:value-of select='CHARACTER_STATUS'/>
        <xsl:text>SUM </xsl:text>
        <xsl:value-of select="count($intersect)"/>
        <xsl:value-of select="$NL"/>
    </xsl:if>
</xsl:for-each>


 </xsl:template>
```

```
</xsl:stylesheet>
```

7.1.5 Group Size and Average Number of Words Received

```
<xsl:stylesheet version="1.0"
 xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
 xmlns:ext="http://exslt.org/common"
 exclude-result-prefixes="ext">

 <xsl:import href="strSplit-to-Words.xsl"/>

  <xsl:output method="text"/>

  <xsl:key name="kMsg" match="MESSAGE" use="."/>

  <xsl:key name="kByCount" match="m" use="@count"/>

  <xsl:template match="/">
    <xsl:variable name="vPass1">
      <xsl:for-each
        select="/*/*/MESSAGE[generate-id()
                             =
                              generate-id(key('kMsg',
                                              .
                                              )[1]
                                          )
                              ]">
         <xsl:sort select="count(key('kMsg',.))"
                   data-type="number"/>
         <m count="{count(key('kMsg',.))}"
```

```
          text="{.}"/>
    </xsl:for-each>
  </xsl:variable>

  <xsl:for-each
  select="ext:node-set($vPass1)/m
                 [generate-id()
                 =
                  generate-id(key('kByCount',
                                  @count
                                 )[1]
                             )
                 ]">
    <xsl:sort select="count(key('kByCount', @count))"
         data-type="number"/>

    <xsl:variable name="vAllText">
      <xsl:for-each select="key('kByCount', @count)">
        <xsl:value-of select="concat(' ', @text, ' ')"/>
      </xsl:for-each>
    </xsl:variable>

    <xsl:variable name="vrtfWords">
      <xsl:call-template name="str-split-to-words">
        <xsl:with-param name="pStr" select="$vAllText"/>
        <xsl:with-param name="pDelimiters" select="' '"/>
      </xsl:call-template>
    </xsl:variable>

    <xsl:variable name="vAvWords"
```

```
       select="(count(ext:node-set($vrtfWords)/word) - 1)
             div
               count(key('kByCount', @count))"/>

      <xsl:value-of select="concat(count(key('kByCount',
                                              @count
                                             )
                                        ),
                                   ' ',
                                   @count,
                                   ' ',
                                   $vAvWords,
                                   '&#xA;'
                                   )"/>
    </xsl:for-each>
  </xsl:template>
</xsl:stylesheet>
```

Sample output (From one of over 100 files)

```
Number of Instances - Group Size - Av No Words Received per Turn

1       4           1

1       13          1

1       18          2

2       12          2

4       3           3.75
```

```
5       2           6.2

6       11          8.166666666666666

10      6           10.3

14      5           4.857142857142857

27      7           13.814814814814815

27      9           9.62962962962963

30      10          9.9

44      8           11.113636363636363

185     1           10.535135135135135
```

Total numbers for all files - Instances of Messages Received per Group Size (Group size - Total)

```
1- 21759

2- 1021

3 - 787

4 -875

5 -1103
```

```
6 -1163

7 -1319

8 -1291

9 -1216

10 -1108

11 -1210

12 -629

13 -390

14 -373

15 -183

16 -107

17 -79

18 -34
```

Total numbers for all files - Average Number of words Received per Turn By Number of Recipients (Group size - Average)

```
1- 7.388636364
```

2- 5.005454545

3- 5.927272727

4- 6.365454545

5- 7.647272727

6- 7.644545455

7- 7.875454545

8- 7.625454545

9- 8.487272727

10- 8.693636364

11- 7.771818182

12- 7.060909091

13- 6.367272727

14- 7.043636364

15- 6.171818182

16- 6.208181818

17 -7.653636364

18- 3.798181818

7.2 Appendix B - TCZ Questionnaire

My name is Ahmad Reeves, and I am a PhD student in the Interaction, Media and Communication Research Group, Queen Mary, University in London. I am studying forms of participation in virtual environments, and TCZ is uniquely interesting in this area as it contains rich varieties and patterns of participation. Your answers will be used to help me understand how residents of TCZ control and manage their levels of participation with each other. Hopefully, these results will go towards making the design of TCZ and other technologies more appropriate. The questionnaire should take you about 10 minutes to complete. When you're finished, just click the 'Submit' button at the bottom of the page. You may withdraw from the survey at any time, and no data is stored prior to pressing the submit button. You may also skip any questions you do not wish to answer. All of the resulting data will be anonomysed. Thank you in advance for your time.

I give permission for the Interaction, Media and Communication Research Group, Queen Mary, University in London to utilise my answers in their research of participation in virtual environments.

Agree

Which country you access TCZ from?

Sex male female

Age 10-20 20-30 30-40 40+

Average number of logins to TCZ per week 1-5 2-10 10-20 20-30 40+

Average length of connection less than 1 hour 1 to 2 hours 2 to 3 hours 3-4 hours more than 4 hours

Where on TCZ do you spend most of your time?

Where else might you visit?

How do you normally move about TCZ?

Below is a list of the general commands of TCZ. In the box below list the top 10 commands you normally use (in order of usage) and why you use them when you do. (Note this list is not exhaustive. Please note any other commands not listed here that you use) Also, are there any commands you never use? If so why?

!!	admin	aliases	afk	ask
bbs	chat	close	cls	converse
date	disclaimer	drive	drop	edit
emergency	enter	examine	fadd	fchat
finger	flist	fothers	fremove	friends

fset	fwhere	fwho	get	give
go	goto	gripe	help	home
idle	inventory	junk	kick	lastseen
leave	lock	longspod	look	lwho
more	move	news	open	page
privileges	profile	QUIT	read	recall
repeat	reply	ride	say	scan
score	screenconfig	session	set	settings
spod	summon	swho	take	tell
think	throw	time	title	titles
tft	to	unlock	uptime	users
wake	warp	where	whisper	who
visit	yell			

Describe in detail some of the sessions you have had on TCZ. For example playing games, meeting new people or chatting with friends or admin. Also note down the first five or six things you normally do when you log on.

What sort of things do you normally talk about?

How often do you have multiple conversations with different TCZ residents at the same time? never once or twice more than five times

What is the easiest way for you to control these multiple conversations?

Are there any types of communication commands that TCZ does NOT

have that you think would be useful? If so, why?

Do you ever deliberately avoid communicating with people in TCZ? If so how?

Which flags do you normally use on TCZ e.g. haven, quiet, private etc and how often?

Do you have any puppets, and what actions do you get them to perform?

Give an example of something you've built on TCZ and say why you like it.

Comments Please use the space below to add any other comments you feel relevant to how you maintain, control and manage your communication and participation with other residents on TCZ.

Thank you for your time in answering these questions. Please click on the button below to submit your answers.

7.2.1 Two Example Questionnaire Responses

Example One

agree: V1

country=Canada

sex=male

Age=20-30

logins=20-30

duration=1 to 2 hours

where=I usually sit in my homeroom.

visit=The pub or any room I am working on a project.

move=Normally through exits between rooms, I use global teleports less often.

commands=1) tell - I use this to talk to people, and in conjunction with 'friends' (shortened to tf), I speak with friends. I do it all the time. 2) nat (or @nat) - I use this to speak to fellow admin, and I use it all the time. 3) say - I use this to speak in a room with others, normally whenever I go to the pub to be social. 4) fwho - I use this to see which friends are on, and I use it all the time. 5) bbs - I always read the bbs, so this is used whenever there are any bbs messages to read. 6) who - If I want to see who is online, I use this at any time. 7) fwhere - If I want to see where my friends are, I use this. 8) examine - To examine anything on TCZ, usually my own commands, but often others', I use this command. 9) @log - As an admin, I want to keep up with what's been happening on the admin side of things, so I use @log to check the logs. 10) profile - Sometimes I just want to see what people tell of themselves.

I can't really say what commands I don't use. Can't think of any.

sessions=Most of the time when I log on, I just chat and do various other tasks. I'm usually in my homeroom and chat with friends using tf (tell friends) or chat with admin on nat. I may also go to the pub to chat with people there. If I'm in the mood to do some coding, I usually go to one of the numerous rooms I'm working on. Apart from that, I also do general admin duties.

The first things I do when I log on are to say "hi" to everyone, read the bbs, check my TCZ Bingo card, check the logs, and then just chat. talk=With friends, I talk about a large variety of things, from current events, weather, sex (or lack of), and general gossip. With admin, it's often the same things, but with administrative topics added in.

multiple=more than five times

control=I'm usually using different methods for multiple conversations. I will talk on nat with admin, talk on tf with friends, take it to a direct tell for just a single person, and use any of the other chatting channels I'm on.

missing=I couldn't say. If there was a type of communication command that TCZ does not have, I would probably code it.

avoid=Yes. To avoid talking to other admin, I set myself quiet. If I just don't want to talk to anyone, I set myself haven.

flags=I will use haven and quiet if I'm coding, but not very

```
often.  I can usually handle the conversations while I'm coding. I
also use the listen flag all the time, so I can see who is
connecting.  I have it on all the time.

puppets=Yes, I do.  I use my puppet for general testing of code,
and as my puppet is an admin puppet, I can be in two places at
once if need be.

built=The TCZ Town Directory.  This is the command that lists
where everything is in the town, and it's the basis for an ongoing
town project that I'm participating in (and partly heading).  I
like it because it's making the town more visible and accessible
for the general use of TCZ users.

comments=

B1=Submit
```

Example Two

```
agree: V1

country=USA

sex=female

Age=20-30

logins=10-20

duration=2 to 3 hours
```

where=Where I have set my home, and my irl hubby's home

visit=the Swan Pub, BBS, or other's homes

move=That depends on where I'm going. If I'm going home, then 'home', if it's the pub, 'pub'.. so in this case, I would type the name of where I want to go. If I want to go to someone's house, then I either ask to visit, or wait for a summons.

commands=tft - Why else to use tft? To talk to my flist all at once.) fwho - So as to see who is on, and who I can start my odd conversations with. who - To see who is connected to TCZ as a whole, and to read any titles that might spark an interesting topic. say/s/" - If I dont want to talk to a group of people, and just want to talk to someone in particular, it's the command to use. tb - I dont really know what it stands for, but I know it checks to see if there's anyone connected that I need for my bingo list. title - To share my ever-loving opinions to allllll who will listen to it. Most of the time I cant think of anything unique, so it comes out looking pretty common. QUIT - Why else? To quit for a while. profile - You can tell a lot about a person through their profile. I fell in love with my hubby through his profile: p Er.. well, at least I knew he is who I wanted after reading it. .. if that makes any sense. lastseen - There are very few people I use it for, but if I need/want to talk to someone, I'd like to know how long it's been since they've been on. Especially if I need them for Bingo bbs - I rarely use it, but I'm starting to more than before. Mostly to look at the news and see what slander is being spread about people I care for. *shrugs* That's life.

There are alot of commands I dont use on TCZ. I rarely/never use any of the build commands and some commands that are on the Zone dont, in my opinion, pretain to me. I'm just there to have a good time.

sessions: Umm.. I used to play Uno on there alot, but it got old (in the sense that my attention span is minimal).. so I really dont know what you want for this question.. after logging on, I check my 'tb' for bingo, do an fwho, then maybe a who for kicks.. the rest consists of just tft's and tells. I'm not that exciting. talk=*coughs* I cant say.. admin didn't like it last time and we got in trouble *puts her dunce hat on and sits in the corner* *snickers*

multiple=more than five times

control=Thats easy enough.. have a memory that consists of who said what, and Pay Attention! p

missing: I couldn't really think of anything offhand.. that isn't my section of thought. In other words, Im not that creative.

avoid=YES.. there are some people that I just Can Not get along with. I either avoid them by... well, not talking to them.. or like one person on there, set them enemy and take all their flags away.

flags=I normally just use the regular flags, and I rarely have a use for haven and whatnot. If anything, I turn ptf off so I dont

have to hear everyone talk over it. Other than that, I use AFk, but rarely.

puppets=I have a puppet (William) and as of now, he isn't doing anything. I haven't really used him for anything that a puppet is supposed to be used for atm, except for maybe logging him in so someone can get a puppet for another game (cant remember what it's called off hand)

built=I built a house once, sort of.. I think it might still be there somewhere.. and I liked it because it was Mine. It came from my brain and i was proud of myself for doing it.. even it the extent of my commands was "Wow! My door worked!")

comments:

B1=Submit

7.3 Appendix C - TCZ & BNC Transcripts

TCZ Script

sender in.... serial..... MESSAGE..... recip in.....

33510 34827 1854054 waves farewell 36402 35785 23:42:42 36402

35785 1856012 thinks Nice one. 23:46:58

36402 35785 1856295 nods in agreement.. 23:47:35 36402 35785

1856385 agrees that the last move can be undone 23:47:46

36402 35785 1856468 looks at you a bit funny 23:47:56

36402 35785 1856633 hbbpppts at you now. 23:48:23

36402 35785 1856980 says Not a problem.. 23:49:08

36402 35785 1856987 smiles 23:49:12

36402 35785 1857437 will catch you .. somehow.. 23:50:20

36402 35785 1858027 is back 23:51:35

36402 35785 1859213 thinks Wow... 23:54:41

36402 35785 1859547 thinks Phone. 23:55:31

36402 35785 1877005 says "Thanx. Love." 00:31:41

42785 8197 1877215 Congrats 36402 35785 00:32:13 36402

35785 1877611 Thanx, hun... 42785 8197 00:33:00

36402 35785 1878964 grins... 00:35:34

36402 35785 1879489 says "I am just getting lucky> 00:36:43

36402 35785 1881177 says "Good one. 00:40:09

```
36402  35785  1881572  giggles and grins    00:40:55

36402  35785  1888592  says "Not a problem."    00:54:51

36402  35785  1896440  says "Yes.. It is.."    01:10:06

36402  35785  1897774  OK that blank is 'L' making the word

36402  35785  1897979  says "I am getting very lucky here."

36402  35785  1899810  says "I simply got lucky..."    01:16:37

12319  12353  1902727  how are ya?  36402  35785  01:22:16

36402  35785  1902936  says "Not a problem..."    01:22:41

36402  35785  1903550  Hi.. I am well.. You?  12319  293  01:23:59

12319  293  1904240  good as ever..need a woman...been a while

36402  35785  1905012  You will find one....  12319  293  01:26:39

36402  35785  1905202  says "Another stroke of luck..." 01:26:55

12319  293  1905449  are you a good witch or a bad witch  36402

36402  35785  1905720  A good one...  12319  12353  01:27:47

10010  24488  1912845  huggles ya hello  36402  35785  01:41:28
```

36402 35785 1912950 Hi. 10010 24488 01:41:42

10010 24488 1913046 what's up? 36402 35785 01:41:55

36402 35785 1913142 Not a lot... 10010 24488 01:42:09

10010 24488 1913322 yeah same here 36402 35785 01:42:24

36402 35785 1913865 says "I am very lucky this eve." 01:43:33

36402 35785 1914418 smiles, "Thanks... ;0' 10010 24488

10010 24488 1919765 tickles ya 36402 35785 01:55:16

36402 35785 1919863 says "I really got lucky..." 01:55:29

18908 12053 1920049 whats a cna test? 36402 35785 01:55:50

36402 35785 1920337 says "Ooooers..." 01:56:28

36402 35785 1920528 Certifted Nurse's Aide. 18908 12053

BNC Script

/extra/local/bnc/Texts/K/KB/KB3

Title: 8 conversations recorded by 'Alison' (PS147) between 30 January and 4 February 1992 with 4 interlocutors, totalling 1966 s-units, 10492 words, and 2 hours 20 minutes 32 seconds of recordings. Description: at home - helping son with homework; at

home - helping son with homework; at home - helping son with homework and general; Participants: Grant (7), student (state primary), Scottish Annabel (2), student (private pre), Scottish Bob (53), deputy prison governor, Scottish Alison (43), housewife, Scottish

---------- New Conversation ----------

Grant Yes. Alison What have we got?
We don't want

Grant <unclear> <unclear>

Alison Oh good.
<pause> Did

Grant Mm.

Alison you manage your sums at school today?

Grant Yes.

Alison You did.
Good boy.
<pause> Now what do you want to do first?

Grant Er

Alison Reading?

Grant spelling.

Alison Spelling.
<pause> Now

Grant Oh should have a pencil in the bag

Alison Hopefully hopefully the baby'll be asleep
in a few minutes.
Erm

Grant here.

Alison Snip, snap and snub.
So do you want to do this first?

Grant Yes.

Alison And Mummy'll put on some coffee for Daddy.
<pause> Good boy, darling.
Good boy.
How many times, five?

Grant Six.

Alison Two, three, four five, six, good.
<Reading title of book> <reading>:[Machines Work For All].

Grant I'm going <unclear> mum.

Alison Good, but I think we should be slightly bigger, Grant.

Mummy was as school as, as though er a too small,
teacher used to smack us. <laugh>

Grant <laugh>

Alison We did, we used to get the ruler across the knuckles when mummy was in primary school. That's why we were taught to write beautifully I suppose. Snip, good and Mummy'll see if Daddy's <pause> make the coffee

Grant <unclear>

Alison Oh she should be in bed.
<pause> Mummy has forgotten the milk.
I think we'll put it to off just now, Grant.

Grant <whispering>:[<unclear>]

Alison Yes, because <unclear> because there's a pause.

Alison Good

Bob Is that your homework that you've got?

Grant Yeah and it's just gonna finish it.

Alison Jus just spell them to me and then he's got to read.

Grant S N

Alison Snip

Grant I P, S N A P

Alison snap

Grant S N O

Alison S N O B.
Or do you still O.
Good boy.
Good boy

Grant Now now we're gonna do my reading, Dad.

Bob Well before you do that what about

Alison So how many pictures, Grant?

Bob what about doing it without looking
at the book? <unclear>

Alison I think it's jolly good.

Grant Dad!
Can I just go <unclear>

Bob No, how do you

Alison Spell them to daddy again first darling and then

Bob how do you spell snip?

Alison you can read your book.

Bob Without looking at the book.

Alison <whispering>:[Twenty three to thirty two]

Grant S I

Bob No, snip.
How do you spell snip?

Alison Snip

Unknown S N I P

Alison <whispering>:[Come on darling, you can do it].

Grant S I

Bob No, S N I P <pause> S N I P how do you spell snip?

---------- End ----------

7.4 Appendix D - Primary and Peripheral Moves

Subject	BNC	Divided by Average No of Participants = 2.8
1	14	5
2	10	3.5
3	2	0.7
4	6	2.1
5	31	11
6	2	0.7
7	9	3.2
8	5	1.7
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	9	3.2
17	25	8.9
18	10	3.5
19	18	6.4
20	12	4.2
21	6	2.1
22	23	8.2
23	4	1.4
24	17	6
25	8	2.8

Subject	TCZ	Divided by Average No of Participants = 5.3
26	4	0.7
27	7	1.3
28	3	0.5
29	6	1.1
30	27	5
31	11	2
32	12	2.2
33	10	1.8
34	12	2.2
35	11	2
36	26	4.9
37	6	1.1
38	3	0.5
39	7	1.3
40	4	0.7
41	15	2.8
42	2	0.3
43	22	4.1
44	10	1.8
45	6	1.1
46	14	2.6
47	8	1.5
48	1	0.1
49	10	1.8
50	21	3.9

7.5 Appendix E - Av No Words per Turn per Status

Subject-bnc	Speaker	Addressee	Side-Participant
1	5.3	7.3	-
2	8.6	4.4	-
3	10.9	2.9	1
4	5.5	3.6	5.9
5	3.6	13	3.1
6	6.2	3.1	6
7	6.2	2.8	5.6
8	23.6	8.7	-
9	3.8	8.3	-
10	9.6	13.1	12
11	12.6	4.9	-
12	3.8	4.2	-
13	10.9	12.1	-
14	19.6	2.4	-
15	13.3	3.8	-
16	2.1	2	6.4
17	5.4	8.8	16.3
18	6.1	2.4	7
19	7.1	3.4	2.5
20	7.8	13.9	3.2
21	2.2	2.5	4.9
22	5.1	3.3	3.9
23	5.8	11.6	4
24	3.7	7	6.8
25	9.2	3.6	4

Subject-tcz	Speaker	Addressee	Side-Participant
26	7.2	5.5	5
27	3.1	5.2	4.1
28	4.4	7.2	8.7
29	6.3	9.4	5.2
30	5.5	3.8	6.5
31	5	11.6	9.8
32	6.5	8.6	6.8
33	6.6	7.8	7.3
34	5.5	4.8	7.3
35	3.6	8	6.5
36	4.5	4.3	9.3
37	4.5	3.7	-
38	3.6	3.5	-
39	11.7	3.7	-
40	7.3	6.4	-
41	8.6	6	7.2
42	7.6	8.8	10.5
43	5.6	4	6.3
44	10.1	9.2	12.8
45	12.2	8.7	11.5
46	5.6	4.8	4.2
47	7.7	6.6	6
48	5.3	6.2	4
49	6.6	6.8	5.5
50	5.5	6.5	5.3

7.6 Appendix F - Av No Words per Turn as Speaker

Subject-bnc	Without Side-Participant	With Side-Participant
1	8.6	
2	5.3	
3	23.6	
4	3.8	
5	12.6	
6	10.9	
7	19.6	
8		3.6
9		10.9
10		5.5
11		6.2
12		6.2
13		9.6
14		3.8
15		13.3
16		2.1
17		5.4
18		6.1
19		7.1
20		7.8
21		2.2
22		5.1
23		5.8
24		3.7
25		9.2

Subject-tcz	Without Side-Participant	With Side-Participant
26	4.5	
27	3.6	
28	11.7	
29	6.4	6
30	5.3	
31	3.6	11.9
32	3.1	
33	5.5	3
34		6.8
35	5.5	6.5
36	7	3
37	5.8	7
38	6.3	
39	6.2	2.5
40		3.6
41	4.8	1
42	2	7
43	8.4	7.5
44		5.6
45		10.1
46	16.2	5.5
47	5.3	11
48	5.7	12.1
49	6.2	9
50	7	5.6

7.7 Appendix G - Instructions, Task Sheet & Post-Use Questionnaire

Instructions for Subjects

You have been asked to step through sections of a model (see attached sheet A) with three example CMC systems;

1) Habbo Hotel - http://www.habbohotel.com

2) Chat Circles - http://www.chatcircles.com

3) MSN Messenger - http://www.msn.com

We are assessing the effectiveness of the model as an analytical tool. To do this we are asking you to use it to analyse three systems. We are interested in how easy you find it to apply as well as what issues the tool identifies with the systems they are analysing. In order to keep things consistent, you will try to carry out the same tasks with each system.

You may use the CMC systems in any order. The whole procedure should not take longer than one hour. After finishing the three systems, you will be asked to give some feedback on the model by answering a short questionnaire. You may ask the investigator questions at any time during the session. There are no right or wrong answers, and your responses will be anonomysed in order to protect your privacy and identity.

Task For each CMC system you are asked to carry out the following four tasks in order;

1) Login to the system

2) Create a new conversation

3) Join an existing conversation

4) Exit a conversation and logout.

For each task you will be asked a set of questions from the model. Please indicate your answers by either selecting Yes or No, or writing in the space provided when appropriate. Before the session begins, the investigator will talk through the model with an example system in order to provide familiarisation.

Example Task Sheet

System 1.

Enter CMC system name:.....

Task 1 - Login to the system. (Model Area 1)

- Decision box 'Create identity?'.

Does the system request an identity creation process? Yes / No (If the answer is 'No' you can move to task number 2)

Can you create multiple identities? Yes / No

Can you login anonymously? Yes / No

Task 2 - Create a New Conversation. (Model Area 2)

- Action Box 'Configure Grouping'

What grouping options do you have to create a new conversation?

Thread grouping, e.g. starting a new conversational thread? Yes / No

Location grouping, e.g. addressing a room or place? Yes / No

Identity grouping, e.g. addressing an individual or group? Yes / No

Another grouping ?.....

Which one did you select?.....

- Action Box 'Configure Channel'.

What type of channel are you going to open, textual, visual, aural or graphical?.....

Is the channel symmetric, i.e. does everyone see the same thing on the channel? Yes / No

Is the channel synchronous / asynchronous? .....

Does the channel have the attribute of reflexivity, i.e. can you see what your identity looks like to other identities? Yes / No

Is the channel ownable, i.e. could another identity control it, or could you block another identity from joining your channel?

....

What is the scope of the channel, i.e. could it include all other identities or only a subset?

.....

Action Box - 'Configure Participation'.

Can you set / control what other identities are addressed in your conversation, i.e. can you select a subgroup and disallow others, or can others access your conversation regardless?

.....

Is your conversation visible to other identities? Yes / No

If Yes, how is it visible?

.....

Communicative Goal - 'Reconfiguring Conversations' (Model Area 3) This goal deals with how the conversation may alter or be reconfigured during an interaction. Continue chatting in your conversation and step through each question once.

Could you start a new conversation without exiting this conversation? Yes / No

Could you talk / send a message to another primary participant, i.e. someone you have previously addressed or been addressed by without anyone else knowing? Yes / No

Could you talk / send a message to a peripheral participant, i.e. someone you have not previously addressed or been addressed by but had access to your conversation, without anyone else knowing? Yes / No

Wait until some other identities are talking on your channel and they have not addressed you, but you can see / read what they say. (You are now a peripheral participant). Could you talk / send a message to another peripheral participant, i.e. someone in the same situation as you without anyone else knowing? Yes / No

Task 3 - Join an Existing Conversations (Model Area 4)

Can you join an existing conversation without leaving your current conversation? Yes / No (If No, then leave your current conversation)

Action Box - 'Locate Conversation'

What cues are available in the system to locate ongoing conversations, e.g.

Subject Thread? Yes / No

Identity details, names, age, gender etc? .....

Room name or activity description?.....

Other?.....

Which one have you selected?.....

Action Box - 'Enter Conversation'

Is the conversation you have located accessible to you? Yes / No

If not why not?.....

Enter the conversation and talk for a few minutes

Task 4 - Exit a Conversation (Model Area 5)

Decision Box - 'Enforce Notification of Absence?'

Does the system request notification to other participants that you are exiting a conversation? Yes / No

You may now logout of this system.

Post-Use Questionnaire

We would like to ask you a few questions on your opinion of using the model.

Did you find the model easy to follow?

Was there any part of the model that wasn't clear?

How useful was the model for each system?

System 1 -

System 2 -

System 3 -

Were there any issues that the model did not cover?

Thank-you. The task is now complete. Please hand your answers to the investigator.

Chapter 8

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