Factors Determining the Formation of E-mail Communities in a University Class

Margaret Scott Martin

Department of Psychology

University of Glasgow

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ABSTRACT

This thesis is an attempt to explain some of the factors impacting on e-mail adoption and use in undergraduates. It is an extended case study, and therefore real world based, spanning eight years from 1993 to 2001, the population under scrutiny being five cohorts of undergraduates studying Psychology at a Scottish University.

In a time of rapid technological advance, where computer experience is rising, access to computers is widespread, and IT training is compulsory for students in the institution under investigation, e-mail use has changed too. However, an unexpected drop in e-mail use during the 1996/97 session seemed to be atypical and led the original focus of the thesis away from individual differences such as computer experience, computer related attitudes, gender and personality, towards social and situational factors.

Careful observation of the 1993/94 and 1994/95 cohorts' e-mail behaviour, using surveys, e-mail logs, and examination of e-mail messages, provided insight into the unique nature of the e-mail environment for these groups. The final conclusions of the thesis are that what appeared to be small features of the e-mail system, and the nature of the computer laboratories where access was restricted to the class, provided the requirements for an e-mail community to form. Some significant results were found for individual differences, and these had some effect on the adoption of mail by the earliest users (those who really instigated the network) but a minimal effect on eventual e-mail use within the class. A group of

enthusiastic e-mail users, with very little training in the system, began to mail either groups of classmates, or individuals, making use of the system's list of class e-mail addresses, and the list of users logged on to the system. These were speculative messages to unknown recipients but they were to individuals the senders knew they had some common interest with as they were in the same social group (the class). The mail was mainly of a social nature, often almost synchronous, and obviously enjoyable to those who adopted the novel technology. The e-mail messages revealed evidence of 'playfulness' in the exchanges ranging from the use of nicknames in headers, signatures, and distribution of poetry, song lyrics, jokes and graphics. The class was large and forming e-mail relationships was one way of 'meeting' others.

This behaviour was missing in the 1996/97 sample, when e-mail was not available in the computer laboratories. E-mail was available throughout the campus but the computer laboratory became a place for work only, and not for communication with classmates. In the 1999/00 and 2001/02 cohorts there is still no evidence of an electronic community forming in the class, despite even more computers being available for e-mail. Changeover to a university-wide e-mail system for students has removed the features that were so important to the formation of the network in the 1993/94 and 1994/95 cohorts.

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I dedicate this thesis to my husband, Jeff Martin.

Declaration

I declare that this thesis is my own work carried out under normal terms of supervision.

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Chapter 1: INTRODUCTION TO THE THESIS

1.1 The thesis

This thesis reports a longitudinal study of the use of electronic mail (e-mail) by five successive cohorts of students over a period of nine years. In particular it covers the use of e-mail to establish social relationships between students in a first year class. Its most unusual feature turned out to be that usage dropped markedly in contrast to the gradual increasing level of familiarity with the technology, thus allowing a glimpse of the importance of other factors.

1.2 Why investigate the topic of e-mail use?

One general reason for investigating the topic of e-mail use is as an example of Information and Communication Technology (ICT) use in education. E-mail is particularly important however as a core tool, and as the most widely used ICT application of all. When this study began in the early 1990s e-mail was a relatively new communication medium. As an educationalist the author had an interest in the use of e-mail in the management of large classes, both as an administrative tool and as an aid to the reduction of isolation in students belonging to large introductory classes. Despite efforts to maximise the ease of use of the e-mail system, simple training, and encouragement to use e-mail as the principal means of communication with staff, take-up was not 100%.

Over the last ten years or so higher education has expanded the use of computer-mediated communication (CMC) from academic and support staff to include student participation. Various forms of CMC including e-mail, electronic bulletin boards, and computer conferencing have been used for communication between staff and student, student to student, for the dissemination of information, work related discussion, and project teamwork. Despite a great deal of time and effort being expended on the introduction of CMC technology into both distance learning and campus-based contexts, not everyone takes advantage of the available technology. The assumptions are that availability automatically means universal use and that all use is voluntary (Mitra, Hazen, LaFrance and Rogan, 1999).

Although the use of CMC technology differs between institutions, ranging from a simple communication tool to a fully online distance-learning course, similar factors are expected to affect adoption. A good campus or distance learning network infrastructure is essential if CMC is to be used in a teaching environment and this must be well supported technically (Salmon 2000, Liebscher, Abels and Denman, 1997). CMC can afford the "flexibility" of access required by students who have family or work commitments, or have disabilities, that allows them to choose when and where to study. This means constant access to network resources, both on campus and at home, is required in order to meet varied demand (Steeples, Unsworth, Bryson, Goodyear, Riding, Fowell, Levy and Duffy, 1996). Training in the use of systems is imperative (Yu and Yu, 2001, McCormick and McCormick, 1992, Salmon, 2000). However, Sunderland (2002) reported her distance-learning subjects learning the new medium very quickly despite the distributed nature of the group and differences in resources and support for e-mail in their various universities.

Individual differences such as computer skills and experience (Mitra, Hazen, La France and Rogan, 1999, Gal-Ezer and Lupo, 2002) are also important considerations, although Tolmie and Boyle (2000) concluded that experience of CMC may have been more important in the past when systems were less user friendly. Wilson (2000) argues that experience of CMC may not be beneficial if work based tasks are to be completed using the technology when prior experience consists of mainly social exchanges.

There has to be motivation for using CMC (Salmon, 2000), and clear instruction on tasks to be carried out (Tolmie and Boyle, 2000, Salmon, 2000). Structure is important if CMC is to be used for discussion or group tasks, setting specific goals and working in small groups controlled by a tutor (Mason and Bacsich, 1998). The user must also find benefits or advantages in adopting CMC technology (Mitra et al, 1999).

Facilitators of learning are also necessary as teachers have to become more than just presenters of information (Yu and Yu, 2001). Salmon refers to these teachers as 'e-moderators', facilitators who are central to the success of teaching online. However, careful consideration of at least some of these factors when introducing CMC to teaching still does not guarantee successful implementation. Students are more likely to use e-mail for social rather than work purposes, or to ask general questions about coursework (Tolmie and Boyle, 2000, Mason and Bacsich, 1998, Wilson, 2000).

Whether e-mail is being used as a communication tool, as a means of promoting discussion between students or between tutors and students, or as part of a fully integrated distance-learning package, it is important to investigate factors likely to affect its adoption and use in a student population. In the early 1990s, when this study began, little was known about e-mail use in student populations. This thesis was an attempt to discover some of the factors involved.

1.3 Focus of the investigation

After an extensive literature search, individual differences such as computer experience, computer related attitudes, gender, and personality were identified as factors that could be influencing adoption and use of e-mail in the initial cohorts of this study. All of these factors were found to have some influence to varying degrees, computer experience being the most predictive of e-mail behaviour.

1.4 Change of focus

Although individual differences seemed to be important in the early cohorts, and other research in the area at this time had come to similar conclusions, the longitudinal nature of this study revealed changes over time that have shown them to be less important than first thought. A slump in the use of e-mail at a time when availability of networked computers had increased led to the conclusion that other factors had to be involved. The focus of the study therefore changed to social or situational factors. The thesis shows that seemingly small differences between the e-mail situations of the cohorts had a strong influence on e-mail behaviour.

1.5 Literature reviews

The diverse nature of the study where different cohorts were measured using different methods makes this a complex thesis. A single literature review was not appropriate and therefore reviews are found throughout the thesis where they present the background to a particular factor such as computer-related attitudes or playfulness in computer mediated communication. The following chapter outlines show where different topics are reviewed.

1.6 Chapters 2 – 9 outlined

1.6.1 Chapter 2

Chapter 2 is a literature review of three theoretical perspectives involved in media choice research, Media Characteristics, User Characteristics, and Social or Situational Factors, and provides an evaluation of theories within each of these perspectives. Individual differences (computer experience, computer-related attitudes, gender and personality) and social/situational factors were chosen for investigation.

1.6.2 Chapter 3

This chapter describes observed e-mail behaviour in Cohort 1 (1993/94) and discusses the results of a questionnaire on e-mail use in this sample. Not all adopted e-mail but there was evidence of a subculture of e-mail among a proportion of this cohort.

1.6.3 Chapter 4

Chapter 4 introduces Cohort 2 (1994/95), which is the main focus of the study. It begins with a review of studies on computer experience including the effect of training on experience. It goes on to review computer-related attitudes as well as the scales used in their measurement. The influence of computer experience on computer-related attitudes and e-mail use is investigated. Computer experience was found to be the best predictor of e-mail use.

1.6.4 Chapter 5

Gender differences in Cohort 2 are examined in respect of computer experience, computer-related attitudes and e-mail use. The literature review in this chapter includes gender in computer careers. No gender differences were found for computer-related attitudes when experience was controlled for, and no gender differences were evident in e-mail use.

1.6.5 Chapter 6

Personality studies and computer use are reviewed here, mainly in terms of the so called "programmer personality". The stereotype of the heavy computer user from the hacker culture to the computer nerd is also reviewed. The role of personality in computer-related attitude and e-mail use is examined in this chapter and the stereotype of the heavy computer user is compared with heavy users of e-mail. Personality was found to have a slight influence on computer-related attitudes and e-mail use, but found to be more influential in e-mail use in females. There was some evidence of similarity between heavy e-mail users and the stereotypical heavy computer user.

1.6.6 Chapter 7

The literature review begins with a review of studies covering social influence, subcultures and "virtual communities". Chapter 7 investigates the social and situational factors and is split in to two parts. The first part covers networks, in particular social networks as they evolved in Cohort 2, mainly through speculative e-mail sent by "multiple mailers" to distribution list they compiled, or to individuals logged on to the system. The second part of the chapter reviews the concept of "flow" and the features and conventions apparent in norm formation in e-mail behaviour. The chapter describes the content of the mailbox messages and examines the evidence for playfulness in the student exchanges. The playful nature of the e-mail communication was important in the formation of the evolving subculture.

1.6.7 Chapter 8

Chapter 8 contains the results of further questionnaires administered to Cohorts 3, 4 and 5 and discusses the different e-mail environments for each cohort as well as the consequences of these differences. E-mail use dropped in Cohort 3 and was used less for contact with classmates. As e-mail access continued to grow in subsequent cohorts, e-mail was used by almost all of Cohort 5. However, friendship formation via e-mail was no longer prevalent in this group.

1.6.8 Chapter 9

This chapter is a comparison of e-mail use between Cohorts 1, 3 and 5. There is also a survey of mobile 'phone use on Cohort 5. E-mail use in Cohort 3 showed an unexpected drop in use at a time when e-mail access had gone beyond the Psychology computer laboratories to a much wider range of availability. E-mail use had increased to virtually universal adoption in Cohort 5. Despite social exchanges still being the most common purpose, forming friendships through e-mail contact was unusual in this cohort. Mobile 'phone use in Cohort 5 competes with e-mail as a means of communication with established friends but is not used to form relationships with classmates.

1.6.9 Chapter 10

Chapter 10 is split into two sections. The first section is a summary of the thesis' findings. Further conclusions drawn from these are then presented in the final part of the chapter. Small aspects of the environment were conducive to the formation of a community of e-mail users in cohorts 1 and 2 where a number of individuals in these groups began to build a network.

1.7 Design of the research

The research was in essence an extended case study as it consisted of the collection and presentation of detailed information on the adoption and use of e-mail in a series of cohorts of students over a period of years from 1993 to 2002. The community under scrutiny was very specific and no generalisation to e-mail behaviour in different populations was tested.

Case studies have an advantage over, for example, experimental manipulation, as they deal with real-life situations. The longitudinal nature of the study evolved as changes in e-mail behaviour became apparent and warranted further investigation. In particular, the e-mail behaviour in the 1996/97 cohort changed when e-mail access was removed from the Psychology computer laboratories and provision was campus-wide. There was a further change in 1999/00 when e-mail was accessible both in the Psychology computer laboratories and campus-wide, as well as through web mail. Then as mobile 'phones were becoming prominent in student communication the final cohort was investigated in the session 2001/02.

1.8 Methods used in this study

Several different methods have been employed in the study of CMC, such as field studies (or naturalistic observation), self report studies and questionnaires, as well as experimental laboratory based research. Various methods were used in the study as they revealed different kinds of information about e-mail behaviour in the cohorts.

Experimental, laboratory based studies were not used here as these can be problematic in this type of research. Some of the problems concern external validity where subjects are an "atypically captive audience", the group sizes studied are often small, and many of the studies focus on comparisons between face-to-face and CMC (Rafaeli and Sudweeks, 1997).

1.8.1 Observation

Observational techniques were required to discover the influence of contextual or situational variables such as e-mail culture among the students in the cohorts. Naturalistic observation of e-mail behaviour in the Psychology computer laboratories provided insight into how students were actually using the system. Unobtrusive observation of the students in the laboratory was undertaken. This informed the design of questionnaires to verify the nature of the e-mail behaviour. In order to obtain samples of e-mail from the students, permission was sought to access mailbox contents. E-mail samples were a rich source of information about e-mail content, style, and behaviour in the 1994/95 cohort.

1.8.2 System logs

Objective logs were used as the measure of e-mail use in the 1994/95 cohort. In many studies these are not available and self-report indicators are used. These are not precise measures however, and the preference is for objective measures to be used, where available. Although incomplete, they gave a measure of e-mail use that could be used to distinguish heavy users from light users and non-users.

1.8.3 Self-report questionnaires

Self-report was used mainly in the collection of demographic information as well as some of the measures of computer experience. Self-report questionnaires are a frequently used method of observation in the Social Sciences.

1.8.4 Psychometric measures

In the individual difference part of the study, psychometric measures were used. These are appropriate to this type of research as they measure psychological characteristics such as personality, intelligence, attitude and aptitude. Psychometric questionnaires, ones where items are combined to give a scale measuring trait or attitude, were used in both the attitude measure and the personality measure in this study. In the attitude study, factor analysis confirmed three components and established which items in the scale combined to produce the components. The Cattell 16PF5 personality questionnaire was used as the measure of personality as it is a broad measure of normal personality used in research as well as selection and other areas. The 16PF5 provides both higher order factors (extraversion, anxiety, tough-mindedness, independence and self-control) as well as 16 personality factors, some contributing to the higher order factors. The 16PF5 questionnaire is widely used in both individual and occupational assessment and provides several norm groups for comparison.

1.8.5 Survey method

E-mail behaviour was studied using the survey method. This method allows the gathering of a large sample of data relatively easily.

Surveys are defined essentially by the mode of sampling. Ideally this is random for some combination of random sampling with stratification according to, for example, gender, experience, and education. The data capturing techniques in surveys can vary but is often questionnaire based. However, a mix of questionnaire techniques can be used, such as fixed response questions, rating scales, open-ended questions. Surveys occasionally use semi-structured interviews, word association and a range of other devices.

Computer-related attitude in this study was measured using a test developed and used previously, for that purpose. As no questionnaires of e-mail use were available, these were designed specially for the study. Similarly, using the results from a pilot study to guide the design, the mobile 'phone questionnaire was specially created.

1.9 Timeline diagram of studies

COHORT 1 1993/94 (Chapter 3)

- System log collected throughout session – showed pattern of mailing.
- Observation of e-mail behaviour in shared, open-access computer lab over the session
- Survey of e-mail use using online QMARK questionnaire (Q1).

Measures showed that take-up of e-mail was not universal and revealed growing e-mail culture in a sub-group of students
All students had the same access to an easy to use system and were equally encouraged to use e-mail.

User characteristics and situation were chosen for investigation.

COHORT 2 1994/95 (Chapters 4-7)

- A questionnaire (Q2), previously used in other educational settings, was administered - self report of demographic details, computer training, access to home computer, type of training, computer training on tasks, as well as 16 multiple choice questions measuring computer knowledge. The questionnaire also contained 19 questions measuring computer-related attitudes.
- The Cattell 16PF5 personality questionnaire was also administered. Personality was measured as it influences computer use and has also been cited as a factor in Internet use. This particular test was chosen as it has a wider scope of factors and is widely used in the business world to distinguish characteristics of specific occupational groups, including computer programmers.
- Both questionnaires were administered at the beginning of the session, before students had used the computer labs.
- System log for part of session. E-mail behaviour in the computer lab. (now moved into different building and first and second year classes in adjacent labs.) observed over the course of the session.
- Donated mailbox contents scrutinised for information on type of message and e-mail style. Collected in May 1995. Without actual e-mail messages this sort of information can not be obtained.
- Questionnaire (Q3) on e-mail expertise was timeline diagram at administered to sub sample of the cohort at the beginning of the 1995/96 session. Administration of the questionnaire was delayed until subjects had one year's experience of e-mail. The delay meant only a subset of the cohort (who had progressed to second year) could be sampled.

- Cohort 2 data allowed a rich picture of e-mail behaviour in the first year class to be established.
- E-mail was shown to be mainly social and a subculture of e-mail became evident in at least part of the class.
- Individual differences influence take-up and situational/contextual variables impact on e-mail behaviour.
- E-mail was not available in the Psychology computer labs in the following two years. This prompted another investigation.

COHORT 3 1996/97 (Chapter 8)

- A questionnaire (Q4) including some questions from the Time 2 questionnaire, plus some extra questions to determine differences in e-mail behaviour of students in the absence of e-mail in the Psychology computer labs.

Results showed a difference in e-mail behaviour and this prompted further investigation as access to e-mail changed once again.

COHORT 4 1999/00 (Chapter8)

- Questionnaire (Q5) on e-mail behaviour

Results showed that e-mail behaviour differed from cohort 1 and 2 cohorts as well as cohort 3.

COHORT 5 2001/02 (Chapter 8)

- Questionnaire (Q2) used for Cohort 2 repeated for this cohort
- Computer knowledge measure from Q2
- Mobile 'phone use questionnaire (Q6) also administered to same group at the same time.

1.10 Changes in e-mail situation

1993 – 1994

E-mail in dedicated computer laboratory, 30 computers.
Laboratory shared by first and second year students.
Welcome message to encourage use of e-mail.

1994 – 1996

E-mail in dedicated computer laboratories.
Laboratory 1: first year students, 30 computers.
Laboratory 2: second year students, 16 computers.
Laboratories were adjacent and both years shared the same system and server.
Welcome message to encourage use of e-mail.

1996 – 1997

E-mail no longer available in Psychology computer laboratories.
E-mail campus-wide on computer clusters under the Common Student Computing Environment (CSCE).
Students accessed Psychology computer laboratories for completion of laboratory exercises and Internet access only.

1997 – 1999

Laboratory 1: first year students, 30 computers. E-mail, Internet browser,
Laboratory 2: second year students, 16 computers. E-mail, Internet browser.
E-mail, Internet browser and other services accessible through CSCE throughout the campus and in student halls.

N.B. There were occasionally some problems accessing e-mail in the Psychology computer laboratories between 1997 and 1999.

1999- 2002

Laboratory 1: first year students, 30 computers. E-mail, Internet browser,
Laboratory 2: second year students, 16 computers. E-mail, Internet browser.
E-mail, Internet browser and other services accessible through CSCE throughout the campus and in student halls.
E-mail now web based and students can access from home or on any networked computer.
Mobile 'phone ownership prevalent in student population.

1.11 Conclusions

To summarise, this thesis seeks to investigate the use of e-mail by five successive cohorts of students over a period of nine years. During the period involved many changes, both in technology and in the e-mail situation of the various cohorts, took place. An initial focus on individual differences as predictors of e-mail adoption and use, such as computer-related attitudes, computer experience, gender and personality, changed with the realisation that social and situational factors were influencing e-mail behaviour. The preceding timeline diagram of studies and the information regarding changes in the e-mail situation of the cohorts are included in this chapter to guide the reader through the complex structure of the thesis.

Chapter 2: THEORETICAL PERSPECTIVES IN THE ADOPTION AND USE OF E-MAIL

2.1 Aims of the chapter

The aims of this chapter are to introduce and describe the different perspectives involved in theories of e-mail adoption and use. It also seeks to evaluate their impact on the research area.

2.2 Theories in the area

One aspect of CMC research that has been criticised is the apparent lack of any supporting theory (Rudy, 1996, Metz, 1994, Fulk and Boyd, 1991). Fulk and Boyd described the early CMC research as 'data rich but theory poor' (p. 409). Metz (1994) argues that the lack of a theoretical framework is due to the perception by researchers that such underlying theory is unnecessary as their research is often an extension of research in other areas of communication. Existing theories are therefore used or adapted rather than new ones being developed. Rudy accepts this as a viable alternative, arguing that human interaction is not unique to CMC technology, and other related fields might have some relevance to CMC research.

2.3 Origins of Media Choice Theories

The area responsible for the majority of media choice theories is organisational communication research. It was recognised that there was a need to discover ways to identify the factors involved in the efficient selection of communication channels and therefore a wide-ranging variety of research in the area began.

Fulk and Boyd (1991) discuss some of the roots of the media choice theories in organisational research. These are Organisational Information Processing Theory, Structural Symbolic Interaction Theory, Social Information Processing Theory, and Social Learning Theory.

Some of the older theories predate the introduction of electronic media in organisations and therefore they had to be revisited to account for media choice in the newer technologies.

2.4 Media Choice Theories

There are a number of competing theories, mainly covering media choice in general, not CMC or e-mail in particular. The theories arise from a variety of backgrounds although it is rare for researchers to identify the perspective of their study. It is also difficult to place some theories into one category as they sometimes have aspects belonging to more than one. Investigation of the literature revealed the following perspectives although there may be others not discussed here. For the purposes of this thesis the theories can be grouped as follows.

2.5 Media Characteristics

2.5.1 Introduction to Media Characteristics

This perspective focuses on properties of the technology itself or the appropriateness of the media for a specific task. Examples of theories following the "media characteristics" perspective are Social Presence Theory, Reduced Social Cues, Media Richness Theory, Diffusion of Innovations, and Accessibility.

2.5.2 Social Presence Theory

Social Presence (Short, Williams and Christie, 1976) is described by the authors as a "subjective quality of the medium" (p. 65). Social Psychology concepts of intimacy and immediacy are the roots of the model (p. 72). Media differ in the extent to which they can provide a perception of the communication partner in an exchange, based on the amount of information available with constraints such as location, time, permanence and distance. Individuals who understand a medium's social presence may choose the optimal channel for the task, given its level of complexity. Media can be ranked according to their social presence with business letters low on the scale, and face-to-face interactions at the top.

Although Short et al's Social Presence Theory was originally based on perceptions of audio and video-conferencing, their view of electronic media was that the lack of cues made CMC very low in social presence compared with face-to-face. However, more recently Walther (1992) argued that CMC should be effective in interpersonal communication as long as time is allowed. While not equivalent to face-to-face, nevertheless CMC may be just as efficient. Social presence can be influenced by factors such as social relationship, involvement, choice and type of task, according to Tu (2002), and a recent comparison of three CMC systems (e-mail, bulletin board, real-time discussion) by Chih-Hsuing (2002) reported e-mail as the highest of these media in social presence.

This theory is included under the heading of "media characteristics" as it concerns complexity of task and the ability of media to match this.

Rice (1993) used Social Presence Theory in a comparison of new and more established forms of organisational communication, measuring media appropriateness. He describes the theory as providing "a useful, consistent, meaningful, discriminating way to characterise media" (p. 481). However, the theory has been criticised by Rudy (1996) for its lack of supporting empirical studies.

2.5.3 Reduced Social Cues

Another, similar model, developed by Kiesler, Siegel and McGuire (1984), is Reduced Social Cues. Social and contextual cues are said to be sparse in CMC and a lack of social norms and constraints leads to depersonalisation. This in turn means the medium is impersonal and therefore not ideal for the formation of relationships.

Although these theories describe CMC as impersonal and poor in interpersonal exchanges, field studies have often shown that CMC can be successfully used both in the formation and the maintenance of relationships. Walther (1992) argues that time is an important factor in communication and although it may take a little longer to form relationships using CMC, it is still possible. CMC has been widely used for social exchanges such as social chats (Rice and Love, 1987, Hiltz and Johnston, 1989). Indeed what might be termed "intimate", communication, often between strangers, has been evident in electronic messages (Hilz and Turoff, 1978). These intimate exchanges have been referred to by some as "pseudo-intimate" rather than real due to the lack of physical relationship. Calhoun (1991) took this view and argued that online communication consists of "indirect social relationships" where community is more imagined than real. However Rheingold (1993) points to a community online which is "real" in terms of the sense of community it provided. Cerulo (1997) outlines the traditional view that in the absence of face-to-face interaction intimacy is considered to be "pseudo", or somehow less valid. She found that very personal information was exchanged online and that this could lead to long-term relationships being formed without the need for physical co-presence. Walther argues that lack of cues can in fact lead to exchanges that are not only interpersonal but indeed "hyperpersonal", where individuals can be selective in their self-presentation online without the restrictions of physical reality and real time interaction (Walther, 1996).

2.5.4 Media Richness Theory

Another media characteristic, which followed social presence, and has some similarities, is media richness. This theory is the most influential in organisational communication research, and has been tested and modified in several ways.

The 'media richness' model, proposed by Daft and Lengel (1984,1986), was based on organisational information processing theory. Galbraith (1977), and Tushman and Nadler (1978) proposed the theory and, according to Tushman and Nadler, there are three assumptions fundamental to such an approach: organisations are information processing systems; organisations deal with uncertainty; and organisations consist of groups, departments, or units.

Organisations are assumed to be human interaction systems where information in the form of symbols or language is exchanged through networks. The issues involved are rarely simple but can be fuzzy, ill defined or ambiguous, and so mechanisms have to take account of this uncertain environment.

In Daft and Lengel's model, media are placed on a continuum of 'richness' depending on their ability to reduce uncertainty and ambiguity. Uncertainty occurs when there is a difference between the amount of information available and the information required for completion of a task. On the "richness" continuum "lean" media, such as written documents, are considered sufficient to reduce uncertainty but not equivocality. Equivocality is ambiguity or the presence of several conflicting interpretations. "Richer" oral media are therefore considered to be necessary for effective communication in such circumstances, according to the media richness model. Several modifications were made to the original model, and there was a recognition that other factors, such as the need for formality, might lead to a less "rich" medium being used, even in an ambiguous situation. There is evidence to suggest that electronic messages are less formal than, for example, equivalent face-to-face exchanges (Kohler, 1987). Sallis and Kassabova (2000) carried out a study on the readability of e-mail messages. They found the messages, drawn from several newsgroups, to be informal, with poor grammar and vocabulary, and they concluded that these features of e-mail could lead to ambiguity.

Daft, Lengel and Trevino (1987) studied information processing in managers and outlined the background to their communication activity, as well as discussing how channels of communication differ in their capacity to facilitate shared meaning. Several factors said to be involved were identified. These are feedback, multiple cues, language variety, and personal focus. Immediate feedback allows the message receiver to ask questions and have points clarified as well as corrections made.

There are a different number of cues available in a message depending on the medium. Cues include body gestures, voice inflection, numbers, and physical presence. Language variety refers to the meaning conveyed by symbols. Thus numbers are more precise than natural language although natural language is able to convey a less narrow set of ideas. A message has personal focus if it is intended for, and addressed to, a particular recipient. Based on these criteria, media were placed on a hierarchy of 'richness', the highest being face-to-face communication. This was because of the number of cues, immediate feedback, and good personal focus. Interactive media such as telephone and electronic media come next in the hierarchy as they involve quick feedback, although body language cues are missing. Written messages, which are addressed, have personal focus but slow feedback, but the lowest in the richness scale are impersonal written messages as they have no personal focus, low cues, and no feedback.

Messages also differ in communication difficulty, and Daft and Lengel (1986) proposed a continuum of routineness. Non-routine messages are more likely to cause confusion, as there may be a lack of common ground between communicators. A richer medium is therefore required to compensate for this and other influences, which may make interpretation problematic. Effective communication is achieved if there is a match between richness and type of message. Daft and Lengel propose that success is achieved if a rich medium and non-routine message are matched, while failure might follow if a non-routine message is sent through a less rich medium.

Research emanating from the media richness model has been considerable but the results have been conflicting. El Shinnaway and Markus (1997) recognise the model's merit in comparisons of traditional media but their study compared two new electronic media, e-mail and voice mail. They found support for uncertainty reduction but not for the reduction of equivocality. Their conclusion was that e-mail was preferred for reasons other than richness such as features of the medium itself and users' roles. E-mail may be the preferred medium, for instance, due to its ability to transmit information accurately using text. Its text base also allows messages to be easily stored and searched. The authors also point out that Media Richness Theory does not take into account whether users are primarily sender or receivers of e-mail. Communication role may, however, be an important factor. Video communication and CMC were the focus of another study testing media richness theory by Dennis and Kinney, 1998). They found that performance was not improved when the communication medium was chosen for its ability to reduce equivocality.

In a study by Dennis, Kinney and Hung (1999), support was found for media richness, but only in the female teams' decision making with CMC media. Rudy also criticises the original studies on several counts. One of these is that managers were asked which medium they would use for particular tasks but they did not actually have to carry them out. This casts some doubt on the theory, as people do not always behave in real situations in the way they say they would. In real situations other factors may influence their communication behaviour.

Media Richness was placed in this category, as it is clearly a characteristic of the medium and its ability to convey information or bring about shared meaning.

2.5.5 Accessibility

Several authors have mentioned the importance of access to computers if users are to become keen and frequent users. Open access to computing facilities gives users the opportunity to develop skills and become comfortable using computers for a range of tasks, including communication (Panero, Lane and Napier, 1997, Smith, Bizot, and Hill, 1988). On the other hand, the lack of computing facilities, especially in the education sector, is a disincentive to learning about computers and using them for everyday tasks such as communication. As the communication revolution continues, access to computers is increasing and developments such as e-mail via television and mobile phone becomes more widespread. This may eventually make computer mediated communication as commonplace as using the telephone.

2.5.6 Diffusion of Innovations

Rogers (1983) Diffusion of Innovations Model is a general one covering a variety of situations. The perceptions individuals within an organisation have of an innovation or new technology affect its adoption. These perceptions are derived from the following factors: "relative advantage, compatibility, complexity, trialability, and observability". The initial adopters are those who stand to gain the most from adoption, and further take-up, or diffusion, is dependent on how these first adopters inform others about the use of the innovation.

Williams, Rice and Rogers (1988) adopt a similar position to Rogers (1983) 'diffusion of innovations' theory where perceptions of the new technology affect its adoption by members of an organisation. Williams et al propose that those who are first to adopt a new technology are those who stand to gain the most benefit from it. Whether or not others in the organisation follow their lead is dependent on how much they are encouraged to do so by the initial users.

2.5.7 Media characteristics summary

The media characteristics perspective has been influential, particularly in organisational research. Media Richness Theory defined electronic media as "lean" and therefore unsuitable for communication tasks involving ambiguous or complex information exchange. Social Presence Theory and the Reduced Social Cues approach defined electronic media as low in cues required for interpersonal communication. Walther (1996) therefore concluded that CMC should have no use at all if these theories were accepted, and he points to the evidence that CMC is in fact widely used, calling into question the usefulness of such approaches. Certainly, all have been criticised for their technological determinism and failure to take into account social context and other factors. Another criticism, levelled at media choice research, is that much of it compares newer technology with established communication media (normally the "ideal" – face-to-face). Many comparisons ignore the possible advantages of new technology and the different capabilities they may have (Markus, 1994).

Other media characteristics such as accessibility and diffusion of innovations have been overtaken by time in most areas of the world, as there has been a prolific expansion in networked computers in recent years.

The subjects in this study did not have a wide choice of media to facilitate day-to-day communication; all that was available to them was e-mail and face-to-face interaction. Before the investigation began it was noted that students appeared to be using e-mail for social purposes and all had equal access to the system. These observations led to the decision that media richness, social presence, accessibility, and other media characteristics would not be a fruitful area of investigation in this particular situation.

2.6 User Characteristics

2.6.1 Introduction to User Characteristics

The most influential theory of media choice in organisations is Media Richness Theory. Managers, the usual subjects in studies in this area, are said to be more effective when they are strong in "media sensitivity", that is the ability to choose the optimal medium for the communication task. However, this assumes that all managers behave in the same way, have the same motivations, the same media preferences, communicating similar information for the same reasons. Individual differences are not considered although it is likely that these will affect their media choices.

The user characteristics perspective includes user self-efficacy, which predicts user acceptance and adoption of a medium dependent on ease of use of the technology and perceived usefulness to the user. Subsumed under this perspective would be individual differences such as personality, media preference, and communication apprehension, as well as technology acceptance.

2.6.2 User Satisfaction

A general measure, based on the Theory of Reasoned Action, is user satisfaction, and this could have some relevance to CMC adoption and use. The Theory of Reasoned Action (Fishbein and Ajzen, 1975) states that an attitude, which stems from beliefs previously held, leads firstly to intentions and then to actions towards an object. Once the action has taken place there is modification of beliefs based on what occurred during the action.

The construct of user satisfaction is an attitude affecting users' intentions and ultimately their behaviour towards computers. An instrument to measure this construct was devised by Doll and Torkzadeh (1991). The End User Computing Satisfaction Instrument (EUCSI) was developed in response to criticisms of previous instruments.

Since Swanson in 1974 there has been a series of user satisfaction studies. For example Baroudi, Olsen and Ilves (1986) found a strong relationship between satisfaction and use of computers. A study by Harrison and Rainer (1995) used the EUCSI to measure user satisfaction with computer applications and the relationship between user satisfaction and computer attitudes, computer anxiety, computer skill and computer use. They found that user satisfaction correlated positively with positive computer-related attitudes, had a negative correlation with negative attitudes and with a lack of understanding of computers.

2.6.3 Technology Acceptance Model

The Technology Acceptance Model (Davis, 1989) has theoretical foundations in several areas including self-efficacy theory (Bandura, 1982), and behavioural decision theory (Beach and Mitchell, 1978). Two factors are included, ease of use, a measure of the effort required in adoption and use of a medium; and perceived usefulness, a measure of how the user will benefit from the technology.
The ease of use may be affected by the technology itself but also by characteristics of the individual. One of these individual characteristics is computer skill affecting the perceptions of ease of use. For instance, if an individual is skilled with computers then this may mean that their perception of the technology will be that it is easy to use.

There are aspects of self-efficacy involved in this theory, which place it in the 'user characteristics' section. However, there are some aspects of technology characteristics involved in ease of use and usefulness.

Adams, Nelson and Todd (1992) replicated studies by Davis and found the measures to be valid and reliable. The authors argued that ease of use, while it is important in adoption of a technology, might not be as big a factor in level of usage. Adams et al concluded that characteristics other than ease of use and usefulness might also play a part in usage. They suggested user experience, type of system, and type of task as possibilities.

Fang (1998) also found supporting evidence for the usefulness factor in media choice and usage, and he found this to be a better predictor than ease of use. It seems that the benefits of the technology outweigh the difficulties encountered in its use. However, Fang also concluded that ease of use was most important at the adoption stage of technology use.

Fang's model focuses on perceived usefulness and ease of use as the most important factors in predicting attitudes and behaviour towards information technology.

The second influence proposed by Fang in his model involves characteristics of the technology itself and its ability to carry out a communication task effectively. He also cites social influence as a contributing factor of CMC choice and usage.

Fang therefore recognises the complexity of CMC adoption and use and recommends an organisational approach, taking all of these factors into consideration when considering whether to introduce new systems.

Fang's model is placed in this perspective as it has ease of use and perceived usefulness at its core. However, social influence is also a factor in the model.

2.6.4 Flow Theory

Flow is a construct first introduced by Csikszentmihalyi (1975) to describe a state achieved when an enjoyable experience is encountered. The amount of flow depends on the perception of degree of pleasure. The experience is therefore repeated to achieve the flow-state.

Trevino and Webster (1992) applied flow theory to interaction with computer technology, the flow-state being reached through enjoyment in the experience. They describe the interaction as 'playful and exploratory' (p.540). Lieberman (1977) argued that once an individual has achieved a level of skill in a technology, they become more likely to use it in a playful, exploratory way.

Influences on the flow-state come from the technology itself as well as ease of use and the computer skill of the user. Thus computers may be chosen to mediate communication not just because of their utility but also because of the enjoyment achieved in the interaction.

Important factors in flow are:

Control

- Computers allow control by individuals over the interaction e.g. word processing on a computer allows far more control by the user than if a typewriter was used

Attention Focus

- Attention focussed during the flow state, which means other perceptions are ignored as the person becomes involved in the interaction with the computer. Trevino and Webster (1992) mention the focus of attention, which arises in e-mail when the screen helps to narrow the attention of the individual to the interaction.

Curiosity

- Sensory curiosity occurs during the interaction (Malone, 1987) for example both colour and sound menus invite exploration and there may also be a desire on the behalf of the individual to become skilled in the technology.

Intrinsic Interest

- Involvement in the activity for pleasure purposes

Although computer skill is one of the factors involved in achieving the flow-state, Trevino and Webster (1992) warn that there may be a danger of those highly skilled in the use of computers becoming bored with CMC technology.

Flow theory has not been prominent in CMC research. The authors of the study mention that using CMC for activities not connected to work might affect flow. If interaction with and through computers became too enjoyable, employees might become less productive. Organisations therefore have to be careful not to make the technology too attractive for purposes other than work related ones. This could be a reason for the lack of interest in this construct.

Flow theory has been placed in this perspective as it concerns user perceptions of media. However, technological characteristics of the medium, user characteristics and context variables such as management support are involved and these belong elsewhere.

2.6.5 Communication Apprehension and Self-Monitoring

Alexander,Penley and Jernigan (1991) discussed the possibility that personality characteristics might affect media choice. They investigated the effects of two measures, apprehension and self-monitoring.

Communication apprehension has been the subject of several studies. McCroskey (1977) focussed on oral apprehension and concluded that it lead to avoidance of situations where oral communication would be required. It was also found to affect job choice (Scott, McCroskey and Sheahan, 1978). Daly (1985) came to similar conclusions in his study of writing apprehension.

Self-monitoring occurs when behaviour is adjusted to allow for environmental demands. A high degree of self-monitoring would therefore to be expected to increase media sensitivity.

The results of Alexander, Penley and Jernigan's (1991) study showed that the individual differences tested did affect the performance of managers' media choice. The study complements Media Richness Theory and is placed under the heading of 'user characteristics' as it concerns individual differences and their affect on media choice.

Mabrito (1991) also investigated communication apprehension in a study using high and low apprehensive subjects comparing them on face-to-face versus electronic communication tasks. He found that those with high apprehension did better using e-mail, contributing more to group interactions. However, the study used a small sample size and until replication using a larger number of subjects takes place it is difficult to say it is a robust result.

2.6.6 Personality Traits

One possible influence on the adoption and use of e-mail is personality. The literature reveals references to introverted individuals' preference for impersonal communication via computer (for example Huff, Sproull and Kiesler, 1989, Finholt and Sproull, 1990).

Livingood (1995) cites a telephone conversation with Theusen (one of the authors of a book about the Myers-Briggs Indicator) who mentions evidence for a greater use of e-mail among introverts. Internet mailing lists for Myers-Briggs 'types' are reported as being used more often by introverts. This is despite the fact that in the USA extroverts are more prevalent (25-30% of the population are introverts but five times as many introverts use these mailing lists).

Hawk (1989) investigated the interaction between computer involvement and locus of control and attitudes towards computers. He found that subjects with an external locus of control, not highly involved with computers, had less positive attitudes towards computers than either internal or external locus of control subjects with high involvement. Hawk also concluded that computer experience was the most important factor in attitudes towards computers.

Charlton and Birkett (1998) compared students taking either programming or computer applications courses. They found programming students, predominantly male, were more introverted. They also found male programming subjects were higher in independence. Those on programming courses had more previous experience with computer languages and females were more likely to do applied courses such as word processing. Their results confirmed those of Shotton (1989) who found subjects who had a heavy involvement with computers were introverted and did not regard the computer so much as a tool but rather as a companion.

Unfortunately, the majority of the work in this area concentrates on general computer use, and the so called "programmer personality". Although personality factors are often mentioned in studies, there has been no attempt to develop a model of media adoption and use based on personality alone.

2.6.7 User Characteristics summary

Perceived ease of use and perceived usefulness are factors affecting adoption and use of media at different times. Ease of use is important in the adoption stage and as systems become increasingly user friendly and simple the effect may be lessening in importance. Perceived usefulness may also be affected by expanding access to electronic media, as the opportunity to use CMC for a variety of tasks is increased.

Individual differences such as personality have received scant attention in the literature and other factors such as computer experience and computer-related attitudes have been more prominent. However, the focus of these studies has been for the most part on computer use, not on CMC or e-mail use in particular.

Changeover to a simpler e-mail system was expected to facilitate adoption of this new medium. However, not everyone used e-mail, and user characteristics appeared to be a perspective with some potential areas for exploration, especially since the research area was relatively new in respect of electronic media.

2.7 Social /Situational Perspective

2.7.1 Introduction to Social/Situational Factors

User characteristics may indeed have a part to play in media choice but individuals exist within groups, families, organisations and cultures and these too have to be considered. Outside influences on the potential user are the focus of this perspective. These may consist of organisational pressures to adopt a new technology; the influence of superiors or other co-workers either through observation or encouragement to follow their lead; and use of a technology which is widely used within an organisation. This perspective also concerns cultural norms and subcultures as influences on the adoption and use of e-mail.

2.7.2 Social Influence Model

One development has been the formulation of the 'social influence model of technology use' by Fulk, Schmitz and Steinfield (1990) which covers the newer communication media. This model proposes that media perceptions such as richness depend not only on the individual's evaluation of media, but is also influenced by social processes within the organisation. At least four forms of social influence are said to be involved; (a) influence from fellow workers, (b) learning through observing others, (c) norms concerning the use of media, and (d) social definitions of what is effective use of media. Groups who have regular interaction develop similar patterns of media use, despite task ambiguity, and choice may not always appear rational as other influences have an affect on which medium is selected.

Empirical support for this theory comes from a study by Markus (1994) where the pressure from the Chairman of an organisation was the main factor in the choice of e-mail. In another study the influence from co-workers and those immediately above in the hierarchy was found to affect media choice (Schmitz and Fulk, 1991). Researchers have realised the influence of this perspective on media choice and adoption of CMC. The importance became obvious as an explanation for the conflicting results of studies, for instance differences in media use between organisations. Rudy (1996) criticises the assumption of researchers that they can define a situation-independent model. What is true in one situation and in some individuals does not necessarily generalise to all situations and all people. Mantovani (1996) argues that there is a need to consider context in terms of social norms and cultural values, as well as situational factors and user- system interaction.

2.7.3 Critical Mass Theory

The interactive nature of e-mail requires more than one person within an organisation to adopt it for the system to be viable. Several researchers (for example, Culnan, 1985, Markus, 1990, Rice and Shook, 1988) address the interactive aspect in the 'critical mass' theory. A new medium will only be effective if a minimum number of users become involved with the system.

Critical Mass Theory predicts that the medium most likely to be chosen by an individual is the one most widely used within their communication circle. It may not be the preferred choice, but if it allows communication with the greatest number of people then this factor will override other considerations. A medium will become the main means of communication once a 'critical mass' of users is established. If an organisation wants to promote the use of new technology then they have to take measures to encourage use. If this does not happen then a critical mass of users may never be formed and the technology will be redundant. Rice, Grant, Schmitz and Torobin (1990) refer to Critical Mass Theory in terms of network influence and they note that critical mass says nothing about level of use, only adoption of a medium.

2.7.4 Subcultures

The development of subculture, also referred to as 'virtual community' by Rheingold (1993, is also part of this perspective. The earliest subculture was formed by computing scientists, who initiated the network revolution. Together with hackers and computer nerds they were the first to use mediated communication. These subcultures have their own set of rules and norms, which evolve through time.

Evidence for the existence of a subculture was found by Hellerstein (1985), among college staff and students (the sample was mainly drawn from the student population). Despite the closed culture of university life, this was a separate subculture formed by heavy computer users. She found that e-mail was used for social purposes almost entirely, and that users had a preference for interacting through CMC. They also reported some dependency on computer communication although they saw this as a positive aspect of their lives.

2.7.5 Summary of Social/Situational Factors

The move away from the view that depersonalisation and negative social effects are features of electronic media has been enhanced by research into virtual communities and social use of CMC. Increasingly researchers are coming to the conclusion that communication takes place in a social setting with influences from others playing a large role in the adoption of new media. Haythornthwaite (2001) explores what she refers to as "multiplexity" in her study of social network studies in a computer-supported distance learning class. She recognises that social aspects interact with the technology used, and social contexts give rise to the social norms that develop within groups of communicators. Haythornthwaite stresses the need to take into account multiple factors when examining group communication and media use.

This longitudinal study spanned a number of years over which many changes took place, in e-mail situation of the cohorts as well as access to e-mail and advances in computer literacy. It was important therefore to take into account situational factors, and how they interacted with other aspects, when assessing adoption and use of e-mail.

2.8 Conclusions

Much of the early research focussed on either how the medium fits the task, or how group norms determine whether a medium is appropriate for a given task. They focussed on the kind of information exchanged. The individual perspective focuses on the types of media chosen but fails to consider who the individuals are, whom their communication partners are, or what kind of interaction is taking place. These perspectives ignore the possibility of interactions between system, user, and social context. For instance, the media characteristics perspective fails to take into account factors such as user intentions or social context. Markus (1994) argues that the context of the communication task is an important factor, as social influence, in the form of peer pressure, or organisational norms affect media choice, not merely media characteristics. Lee (1994) concludes that richness cannot be assumed to be merely a feature of e-mail itself but in the interaction between the medium and the context in which it is taking place. Fulk, Schmidt, and Steinfield (1990) also criticise media richness theory due to its assumption that choice will always be objective and made without taking into account people around the individual.

In the case of both Social Presence and Media Richness Theory, they were developed for organisational use, Media Richness mainly to describe managerial media choice. When attempting to generalise to other populations the problems become apparent. Managers' communication patterns are not the same as lower level workers and so we might expect them to have different communication behaviours. This might be especially true if we accept El Shinnaway and Markus' observations about communication roles and their effect on media choice. The situational factors involved in organisational research are not present in users accessing CMC technology at home or in other situations. The type of message will most probably be different, as will the reasons for communication. As we have seen, Media Richness Theory does not offer clear explanations for newer technology, even in organisational settings, so we would not expect it to have very much to say about other situations.

As e-mail becomes accessible to many more people, the theories concerning accessibility and critical mass may become less important, and other factors have to be addressed.

While aspects of the technology itself, such as ease of use and suitability for specific communication tasks, are important in some situations, it would be foolish to take a view that was too technologically determined. While adoption of a new medium may have an impact on human behaviour and on the way organisations function, in some situations individual differences or social and cultural norms may override the features of the medium.

Computer networks connecting people should also be regarded as social networks, according to Haythornthwaite and Wellman (1998). They argue that media choice may be socially determined and that ties and strengths of relationships between people affect the medium chosen for a task as well as the amount of interaction that takes place. CMC technology such as e-mail is just one of a range of media chosen to communicate with others in the network. Closer ties mean more interaction, and more varied use of the available media.

In more comprehensive studies, researchers have realised that factors do not stand alone, and a gradual move away from such a simplistic view has gradually taken place. A more complex, inter–related perspective appears to be a more realistic strategy. Looking for interactions between factors, or taking the view that in some situations one factor will be dominant, while in other situations may have no influence at all, is a view that fits the theory of knowledge known as 'contextualism'. One proponent of this theory is McGuire (1983), who argues for a more contextual approach to research in which hypotheses are both "relatively" true and false, dependent on situation. Researchers adopting this approach should look for multiple causes as this is considered by McGuire to be more consistent with the complexity of influences in real life situations. Without adopting a totally contextual perspective, it may be necessary to think in terms of different influences and contexts on the adoption and use of e-mail.

2.9 Perspectives to be investigated in the thesis

2.9.1 Choosing the perspectives

Taking into account the perspectives outlined above, and the huge variability in e-mail use in Cohorts 1 and 2, the main focus of this study was initially individual differences. Computer-related attitudes, computer experience, personality and gender were therefore chosen as areas of investigation. However as the study evolved, it became clear that individual differences alone could not explain the differences in take-up and use in later cohorts. This resulted in a change of focus to situational factors such as network formation and e-mail culture.

2.9.2 Why choose Individual Differences for investigation?

The use of computers in the home, in educational institutions, and in the workplace has increased enormously in recent years. The interaction between computers and their users has been referred to as human computer interaction (HCI) and Card, Moran and Newall (1983) defined HCI as "any process in which the user and computer engage in a communicative dialogue whose purpose is the accomplishment of some task" (p4). There are two aspects to HCI research. One is involved with the machine itself while the other is concerned with the person using the computer. The focus here is on the user characteristics in HCI, such as computer attitudes, gender and computer experience and how these affect adoption and use of a computer technology, e-mail.

Despite the proliferation of computers in daily life in the early 1990s, there were still many people avoiding them as much as possible. In a survey carried out by the Dell Computer Corporation 33% of teens and 67% of adults were found to be 'technophobic' when it came to using computers (Self, 1993). We would therefore expect a proportion of our early cohorts to have anxieties about using computers and avoid them where possible. Communication using computers is also expanding at a very fast rate since the Internet emerged as a quick, cheap and efficient means of contact between people world-wide. Computer avoidance can therefore affect an individual's life more now than ever before due to the rapid expansion of computer involvement in both education and employment situations (McIlroy, Bunting, Tierney and Gordon, 2001). Most people now come into direct or indirect contact with computers on a daily basis but this does not mean that all find this to be an enjoyable or non-anxiety provoking experience. Recent studies still report computer anxiety in student populations (Beckers and Schmidt, 2003, Namlu, 2003). We therefore would expect some computer anxiety to exist in the more recent cohorts. Clearly there is a need to discover what individual characteristics are involved in the avoidance or adoption of computer technologies.

2.9.3 Individual differences

The perspectives introduced earlier in the chapter have all produced studies but none have resulted in a convincing model of e-mail adoption and use. This implies that more has to be done to expand on areas previously only given scant attention. User characteristics is one such perspective and this thesis investigates the following individual differences:

Computer experience

Computer-related attitudes

Personality

Gender

These four factors were chosen for the following reasons. There is a large body of evidence that computer experience and computer-related attitudes have an influence on computer use generally. It was therefore expected that these factors would impact on the adoption and use of e-mail. There is also a great deal of research into gender differences in computer experience, computer-related attitudes, and computer use. It was therefore decided that this factor should also be investigated. Personality has also been mentioned in the literature as an influential factor in computer use, the main area of research focussing on the so called 'programmer personality'. As e-mail involves both computer use and communication, we might expect there to be differences between individuals in their take up of the medium. We might also expect there to be evidence of similar personality traits to those of stereotypical heavy computer users.

2.9.4 Social/Situational factors

Social or Situational factors have recently been the focus of research and this thesis also investigates some aspects of this perspective.

The subjects in the early cohorts of this study were drawn from a population of undergraduates. All had equal opportunity to use e-mail. There was no existing culture of communication as they were all first year students, at the beginning of their course. Computing facilities were good, and there was open access to all in a dedicated computer laboratory. However, some students adopted e-mail enthusiastically while others ignored it completely. The avoidance of computers, except for essential use (the practical laboratory component of the course was run on computers), implies either something inherent in the individual or situational factors affecting take-up and use. This large variability in usage led to an initial focus on individual differences such as computer experience, gender, computer-related attitudes and personality. However, taking a narrow view where single factors are assessed without taking into account the interaction between individual, situation, group norms and social influence, cannot explain e-mail behaviour. For this reason the study was diverted towards contextual variables such as e-mail situation as a possible explanation for what was happening.

Chapter 3: COHORT1, 1993/94

3.1 Aims of the chapter

This chapter explains the motivation for the introduction of a simple, highly accessible e-mail system to a Psychology undergraduate population. It shows through observation and the analysis of a survey the student reaction to its introduction, what it was used for, and how friendship networks were formed in an emerging e-mail subculture in at least a proportion of the classes involved.

3.2 Introduction of new e-mail system

E-mail was available to Psychology undergraduates for several years but the take-up was low. This was mainly due to the UNIX based system, accessible only from a very small number of computers, and lack of training in its use. The number of undergraduates in the department was increasing rapidly with over 900 in first year and 400 in second year. This resulted in split teaching (first year lectures were repeated 3 times daily and second year twice daily) making it difficult for students to get to know others in their class. This difficulty was further compounded as the Psychology courses consisted of students from three faculties, under the Scottish system studying a wide range of subjects. Students may therefore have had little opportunity to meet many of their classmates except in the Psychology lectures or laboratories. The existing means of communication using notices, reading announcements at lectures, and writing to students were inefficient and new solutions were sought. E-mail was seen as a useful means of communication between staff and students as well as among students themselves and all students in the department were given an e-mail account. The system was set up and run by the Computing Support staff in the department through a departmental server connected to the network. A bulletin board was added to have an easy means of conveying information to the classes, and a moderator (one of the class secretaries) was appointed to operate the message system.

3.3 Measures taken to encourage the use of e-mail

To encourage the use of e-mail the following steps were taken.

- Changeover to Pegasus Mail in a WINDOWS environment
- Introduction to Pegasus Mail included in the initial training in the use of the computers
- "Welcome Message" placed on the electronic bulletin board inviting students to send messages to the co-ordinator of the laboratory course (the researcher). This was also reinforced during the introductory training.

  The message appeared on the screen automatically when students first logged in to computers in the Psychology laboratory, and thereafter could be accessed by choosing the 'noticeboard' option from the menu.
- students were encouraged to login at least once a week to check for e-mail from tutors and other staff, and also encouraged to contact staff via e-mail as the principal means of communication.

3.4 Description of e-mail situation

In the academic year 1993/94 Psychology students in first and second year accessed their e-mail in a dedicated computer laboratory only they could use. The laboratory was furnished with 30 computers on rows of partitioned tables. The partitions were around the height of the computer monitor and provided some privacy between workstations. A welcome message placed on the electronic bulletin board asked students to send an introductory message to the laboratory co-ordinator to show that they knew how to use the system.

(A total of 1324 messages were received by the laboratory co-ordinator, more than half of these were of the introductory message type).

A member of staff was available in the laboratory at all times to answer questions about the computer run exercises and e-mail queries. Basic training in e-mail use was given when the students registered for the class. This consisted of instructions on how to read and write messages, how to access the address lists, how to reply, and how to delete messages from the mailbox.

Students were able to come into the computer laboratory at any time between 9 a.m. to 8p.m. Monday to Thursday, and 9a.m. to 5p.m. Friday to complete their classwork assignments and use e-mail. The assignments consisted of a series of computer-based experiments with associated multiple-choice questions. Students in the laboratory had access to a list of all staff and student e-mail addresses as well as a list of those who were currently logged on to the system. These addresses were available by pressing specified keys (such as F4 for a list of logged on users). At this time e-mail was not readily available to other undergraduates except in Computing Science.

3.5 Observation of e-mail behaviour

The technique used was basically that of participant observation. This has known limitations, namely the observer's sampling of behaviour, places and times is not comprehensive. Also there is an observer bias in the way the behaviours are interpreted. The traditional way of counteracting these biases, and the method used here, is to triangulate the observations with reports from informants. These help to reveal the subjective perception of the participants. Although not ideal, this method serves to generate testable hypotheses.

Observation of behaviour in the laboratory showed that despite sitting in adjacent booths, often e-mail was used as a means of communication between students in preference to face-to-face interaction. The computer laboratory was a very social place although demonstrators were instructed to remove students who became too noisy, or were using e-mail when others were waiting for a computer to complete classwork. There was a tendency for those wishing to remain undetected to sit at the back of the room. A number of avid e-mailers were evident in the class, and they spent a great deal of time e-mailing. Some of these students were seen waiting to enter the computer laboratory when it opened or remaining in the computer laboratories until they closed at 8 p.m.

3.6 Survey of e-mail use

3.6.1 Introduction

As class sizes rose, and the need for a more effective communication medium became apparent, changes to the e-mail system for students in the department involved in this study were made. It was important to both monitor use and encourage take-up of e-mail as it was envisioned as the principal means of communication student to student, and staff to student.

E-mail was a relatively new medium when this survey took place, and research in educational and other settings produced a variety of explanations for adoption of the technology and for its usefulness in communication tasks. There was therefore an opportunity to discover who the subjects were contacting via e-mail, to confirm observations that e-mail use in this cohort was of a mainly social nature and confined for the most part to interactions with classmates.

3.6.2 Subjects

A. 590 Scottish University entrants to a Psychology course in 1993/94. This represented around 2/3 of the class.

B. 190 Second year Psychology students. This represented around 2/3 of the class.

3.6.3 Materials

A questionnaire (Q1) was designed using QMARK software and administered through the computer system at the end of term 1. Students were sent a message on the bulletin board asking them to complete the questionnaire and given instructions about how to access the questionnaire. The request remained on the board until it was either read or removed. The questionnaire can be found at appendix A.

3.6.4 Results

A. Results showed that 91% of the cohort had not experienced e-mail before coming to university although 81% agreed/strongly agreed that the system was easy to use. The majority of e-mail was sent to classmates (85% used e-mail for this purpose). Tutors were contacted via e-mail by 45% of the group, the laboratory co-ordinator by 34% and lecturers by 8%. Individuals outwith the university were contacted by 13% and others within the university by 19%. When asked what mode of communication e-mail most resembles 74% answered that it was most like a personal note. Only 8% of the subjects ranked a personal note first in their preference for communication, while 73% put a face-to-face chat first. Frequency of e-mail use was part of the questionnaire and 45% sent e-mail once a week, 66% checked for e-mail weekly. Only 11% e-mailed daily and 15% checked for e-mail every day. 62% of the subjects answered e-mail immediately.

Social contact was ranked the highest use of e-mail by 67% of the subjects, seeking information was the second highest with 18% using it for this purpose. Subjects also agreed that e-mail was a good means of communication between staff and students (94% agreed).

The subjects were also asked if they took the same care when composing e-mail messages as they did with written messages. Only 54% responded that they were as careful.

When asked how many people they knew in the class at the beginning of term, a total of 81% answered 1-5. At the end of the year 62% knew between 6-20 and 57% reported "meeting" one of them via e-mail.

78% of the class had communicated with between 1 and 5 people they had never met.

A full set of results is available in Appendix B.

B. Results for the second year students were similar to those of group A. However, some small differences are discussed in section 3.7

A full set of results is available in Appendix C.

3.6.5 Discussion

It is clear from the results of the survey that the students in this cohort used e-mail mainly for social purposes, to contact classmates, although it was also used to contact members of staff. It is also evident that e-mail was used to 'meet' others in the class and likely that some of these remained e-mail 'penfriends'. However, a proportion of the class did not adopt e-mail, despite an easy to use system, open access to computers, encouragement to use e-mail, and the task of replying to the Welcome message.

3.7 Differences between Group A and Group B

Group A were the first year group and they knew fewer people at the beginning of term because they had no opportunity to meet classmates before the questionnaire was administered. There may have been a few exceptions as a small proportion of the class lived in student accommodation and had already met classmates in halls. 49% of Group B reported knowing more than 6 people in their class while only 18% of Group A knew as many. It should also be noted that Group B consisted of those who chose to progress and it is possible that some of those they had met the previous year would not have followed them into the class, thus reducing the number of classmates known at the beginning of term.

When the figures for the numbers "met" via e-mail are aggregated (0 – 5) the difference between the groups is small (93% for Group A and 98% for Group B). However, the figure for zero is larger for Group B possibly implying that the culture of e-mail relationship formation may have been a little stronger for Group A. This may have been due to the transmission of e-mail culture from second year (Group B) to first year (Group B) students.

3.8 Examination of system log

A system log was kept for all transactions through the departmental server. Scrutiny of the log showed that e-mail was used regularly, and the majority of the e-mail was to classmates. Some evidence was found of multiple mailing to several addresses simultaneously. However no further information about e-mail behaviour could be seen in the log.

3.9 Conclusions

The observation of e-mail behaviour in the laboratories, the evidence of e-mail use in the system log, and the results of the survey of e-mail use showed that there was a growing subculture of e-mail in a section of the students. E-mail was mainly used for social purposes and used to form friendships with others in the Psychology computer laboratories. However, it was also evident that a sizeable proportion of the students had never used e-mail despite efforts to encourage its use. Taking account of these results, and considering the theories of media choice and adoption, further investigation of a subsequent cohort was planned. The focus of the investigation was firstly individual differences but social or contextual factors were also studied.

Chapter 4: COHORT 2, 1994/95: THE ROLE OF COMPUTER EXPERIENCE IN COMPUTER-RELATED ATTITUDES AND E-MAIL ADOPTION.

4.1 Aims of the chapter

The purpose of this chapter is to examine the role of computer experience, firstly its relationship with computer-related attitudes, and then its effect on adoption of e-mail. The literature cites computer experience as the strongest predictor of positive computer-related attitudes. Attitudes are a direct influence on an individual's intentions. These intentions in turn affect actual behaviour, and are mitigated by other factors. For instance, Davis (1989) Technology Acceptance Model suggests ease of use and perceived usefulness are two attitudes related to computer use that initially influence attitudes towards use, and ultimately to actual use. Thus positive computer- related attitudes would be expected to lead to an increase in computer use, and may include new technologies such as e-mail. Before investigating the relationship between computer experience and computer-related attitudes however, there will be a comparison made of the various measures of computer experience used in the study. This is necessary due to the variety of different measures found in the literature. Without a clear measure of computer experience it is difficult to know whether the results found in previous studies are comparable, or to know if using self-report as opposed to measuring actual computer knowledge affects results.

4.2 Computer Experience

One factor, which may influence an individual's use of computer technologies including Computer Mediated Communication (CMC), is computer experience. That is, familiarity with or skill in using computers may affect the likelihood of an individual feeling comfortable with an electronic communication medium. Russell (1995) found that naive e-mail users, who had never used the technology before, had a wide variation of computer experience, some being very skilled while others had avoided contact with computers completely. If experience is limited, naive users may display anxiety, as they are unsure about what learning to use computers entails. Thus computer experience becomes an important factor in the effective use of e-mail. The technology involved has to become 'invisible' according to Russell i.e. the intrusiveness of the medium has to disappear before e-mail can be used to its full potential. Russell concludes this is a 6 stage learning process.

1. awareness
2. learning the process
3. understanding the application of the process
4. familiarity and confidence
5. adaptation to other contexts
6. creative application to new contexts

(p. 175)

Anxiety may be related to individuals' attitudes towards computers as well as to the individual's computer experience. Russell found that once naive users had learned to use e-mail they enjoyed the experience so much that their negative feelings about the technology were overtaken.
E- mail is one of the computer technologies studied, but the relationship between computer experience, computer attitudes, and the adoption of computer technologies has more commonly been addressed in respect of computer use in general.

In a study by Dyck and Smither (1994), a comparison was made between younger (30 years and under) and older (55 years and over) subjects. They were measured on computer attitudes, computer experience, and computer anxiety. Computer anxiety was found to be lower across all subjects when experience was higher. They also found that positive attitudes towards computers were prevalent among those with more computer experience, again in both groups. The authors concluded computer experience was the best predictor of positive attitudes towards computers, while age was not established as an important factor.

4.3 Computer Anxiety

Computer experience, computer attitudes and computer anxiety seem to be linked, and to have a bearing on the use of computer technology, including computer-mediated communication. High computer experience and positive attitudes lead to low anxiety and increased use of CMC. Studies have confirmed the relationship between computer experience and computer anxiety (Todman and Monaghan, 1994, Maurer, 1994). However, Weil and Rosen (1995) argue that the relationship is due to the avoidance of computers by those with computer anxiety rather than a function of computer experience per se. Rohner and Simonson (1981) argued that if able to choose, those who are computer anxious might decide not to use computers at all. Mahar, Henderson and Deane (1997) further concluded that those with high anxiety scores were more likely to avoid using computers regardless of previous computer experience.

Chua, Chen, and Wong (1999) conducted a meta-analysis on studies concerning computer anxiety and its relationship with age, gender and computer experience. They concluded that, as far as computer experience is concerned, increased experience leads to lower anxiety. However, computer experience measures were not consistent across studies and this caused difficulties in determining the extent of this relationship.

4.3.1 Definitions of computer anxiety

There are various definitions of computer anxiety including:

- Raub (1981) "the complex emotional reactions that are evoked in individuals who interpret computers as personally threatening"

- Maurer (1983) " the fear and apprehension felt by an individual when considering the implications of utilising computer technology, or when actually using computer technology"
- Rohner and Simonson (1981) ' the mixture of fear, apprehension and hope that people feel when planning to interact or when actually interacting with a computer"
- Loyd and Gressard (1984a)

  "anxiety toward or fear of computers or learning to use computers'.

4.3.2 Trait or State?

Computer anxiety is situation or state dependent, not a personality trait. If anxiety is a trait this would imply that individuals displaying computer anxiety have a proneness to anxiety in situations other than those involving computers. If, however, computer anxiety is a STATE rather than a TRAIT then it might be possible, over time, to reduce the anxiety-state using methods such as increasing exposure to computers, and training in their use. Thus whether computer anxiety is a personality trait or specific state experienced by normally non-anxious individuals, carries implications for 'treatment' of computer anxious individuals.

Raub (1981) recognised that trait anxiety might also be a factor in computer anxiety as did Howard (1986) and Howard and Smith (1986). Howard also suggested that attitudes towards computers would improve if the level of anxiety could be reduced.

4.4 Self-Efficacy

Computer experience affects perceived competence with computers, or self-efficacy, which in turn determines whether the technology is used (Hill, Smith, and Mann, 1987). Experience and positive attitudes towards computers are factors contributing to 'self-efficacy' according to Delcourt and Kinzie (1993). Self-efficacy, or efficacy expectancy, was introduced by Bandura (1977) and concerns an individual's expectation of his/her ability to undertake a specific task. This is thought to affect directly whether the individual will take part in the behaviour, what strategies will be employed, and how much effort will be expended to reach the end result. Self-efficacy comes through direct experience as well as watching others performing the task, self- assessment of motivations and emotional involvement with the task. The higher the degree of self-efficacy, the more likely the goal will be reached.

Self-efficacy may not be entirely situation specific. Sherer, Maddux, Mercandante, Prentice-Dunn, Jacobs, and Rogers (1982) argued that self-efficacy could be made up of many self-efficacies the individual has accrued across a variety of situations. Tipton and Worthington (1984) found evidence for this proposal in their study, which found a positive relationship between general self-efficacy and specific task performance.

Compeau and Higgins (1995b) conducted a survey to allow the development of an instrument to measure computer self-efficacy. They found that computer self-efficacy has an effect on computer anxiety, expectations, and computer use. Self-efficacy was described as an "individual trait" which has moderating effects on organisational factors and is an important factor in computer usage. Compeau and Higgins (1995a) also found that self-efficacy had a strong positive effect on performance in computer training. Igbaria and Iivari (1995) studied the effect of self-efficacy on computer usage. Self-efficacy had an affect on the use of computer technology both directly and indirectly through perceived ease of use. They also found that computer experience affected self-efficacy as well as perceived ease of use, perceived usefulness, and actual take up of the technology. A study by Tam (1996) found that the best predictors of successful computer software training, among physically disabled subjects, were computer self-efficacy and pre-training computer skill.

Self-efficacy has therefore been adjudged to be an important factor in the adoption of computer technologies. A programme, designed to increase computer self-efficacy and so increase the use of computer technology in an academic setting, produced successful results. Those subjects who believed they were confident enough to use computers effectively incorporated computers into the classroom. Faseyitan, Libii, and Hirschbuhl (1996).

4.5 Conclusions

Taking into account all of the studies cited here, the conclusion is that the adoption of computer technologies, including CMC such as e-mail, is dependent on positive computer attitudes, low computer anxiety, and high self-efficacy. These in turn may be affected by previous computer experience. This study seeks to determine if prior computer experience does affect computer attitudes and predict the adoption of computer technologies such as e-mail.

4.6 Assessment of Computer Experience

There are several ways to assess computer experience including:

- Self-report of training (school, college courses etc.)
- Self-report of computer skills (WP, DTP, spreadsheets etc.)
- direct measurement of computer usage
- test of actual knowledge of computers

For instance Shashaani (1994) asked the following questions to assess computer experience:

1. Computer courses undertaken or not
2. Number of courses
3. Ownership of home computer
4. Weekly computer use

5. Intention to extend computer training
6. Where computers were first encountered by the subject
7. In which areas subjects would choose to use computers

Busch (1995) measured previous computer experience by asking the extent of experience with word processing, spreadsheets, programming, and computer games, as well as home computer ownership both before and after college entry. Bozionelos (2001) also used the extent of experience of various applications, subjects indicating their level of experience on a Likert type 5- point scale. Weil and Rosen (1995) used three measures of computer experience. These were prior experience, a self-rating of computer knowledge, availability of computer and current computer use. Schumacher and Morahan-Martin (2001) compared two cohort groups using self-report of programming languages, a skill rating in several areas of computing, and a self-reported rating of experience in applications.
These are some of the many different approaches to the assessment of computer experience, mainly relying on self report in the assessment, self report being the most commonly used method of obtaining information about previous computer experience.

The wide range of definitions of computer experience and the lack of consistent means of assessment make it difficult to assess research in the area. Often what is measured is the quantity of exposure to computers while the quality of the experience is ignored. Smith, Caputi, Crittenden, Jayasuriya and Rawstorne

(1999) propose three aspects of computer experience that can be measured. These are (1) the amount of computer use over time, (2) the accessibility of computers at home, in the workplace, in education, and (3) the variety of software packages or type of exposure to computers (including games, computer assisted learning, word processing, programming). These measures are classed as objective computer experience by the authors.

4.7 Assessment of Computer Experience in this study

4.7.1 Subjects: Cohort 2

The subjects in this study were 657 undergraduates entering a level 1 Psychology course. This represented around 75% of the class. The Mean age was 19.6 (SD 4.8) with a minimum age of 16 and a maximum age of 60 years. 63.93% (420) of the sample were female and 36.07% (237) were male.

4.7.2 Measures obtained

Studies include many different measures of computer experience and it is difficult to know how these compare with one another. In this study more than one measure was obtained from a questionnaire (Q2, found at appendix D) completed by subjects on entry to the course. This allowed a comparison to be made of the measures in order to assess how much they equate with each other.

1. It was noted whether subjects had computer training at any level
2. Had access to a computer at home
3. Type of training (school, college, or workplace)
4. Experience of training on 10 computer tasks (for example WP, programming, DTP, graphics packages)
5. 16 multiple choice questions measuring the extent of computer knowledge.

4.7.3 Measure 1: Training or not?

The questionnaire used in the study included a simple question on whether or not the subjects had received computer training of any kind. It required a yes or no response. 35.01% (230) responded 'yes', while 64.99% (427) responded 'no'.

4.7.4 Measure 2: Access to a computer at home

The questionnaire also contained a question on access to a computer at home. Subjects responded 'yes' or 'no' to this question. 211 subjects reported having access to a computer at home while 446 did not.

4.7.5 Measure 3: Level of training

The subjects were graded according to their level of training as follows:

4 Higher Computing/A Level Computing/University Course/ work related experience in systems.

3 Standard Grade Computing, GCSE Computing/ SCOTVEC/NC.

2 CAD/word processing/introductory courses over 6 months duration.

1 Short courses of less than 6 months duration.

0 no training

4.7.6 Measure 4: Computer skills

The ten skills below were listed and subjects indicated those in which they had received training.

- word processing
- spreadsheets
- graphics/draw packages
- desktop publishing

- CAD/CAM
- programming
- databases
- statistical software
- image processing
- other (please specify)

4.7.7 Measure 5: Computer knowledge

Measure 5 consisted of a series of 16 questions testing knowledge for computer terms and tasks.

The following are examples of the multiple-choice questions used.

(A full list of questions in the computer use questionnaire can be found in questionnaire Q2 at appendix D)

Example 1:

A computer program or file can be stored directly on a

(a) monitor

(b) modem

(c) disk

(d) disk drive

(e) don't know

Example 2:

In a database there are

(a) fields made up of records

(b) records made up of fields

(c) fields but no records

(d) no fields or records

(e) don't know

4.8 Which measure to use?

A decision was required about which of the measures obtained would be used to determine computer experience. Measure 1 (training or not?) was discounted as this was such a basic measure of computer experience and other measures were available. For the same reason access to a computer at home was not used. As previous studies had used self-report of computer experience, either of courses taken or computer skills such as word processing or programming, similar data collected in this study was analysed to discover whether these measures would be useful in determining computer experience. Lastly there was computer knowledge, a direct measure of computer experience. Knowledge of computers is important as it is gained through exposure and engagement with computers. Geissler and Horridge (1993) showed that access to a home computer and other computer use measures such as computer courses undertaken, are related to computer knowledge, and they used a measure of perceived computer knowledge in their study. It is likely that the other measures in this study would also contribute to the computer knowledge of the subjects. For example, someone with programming experience or who had been on a lengthy course in computing would display a greater knowledge of computers than someone with word processing skills but only used computers for this purpose. As this measure did not depend on self-report, and tested actual computer knowledge over a range of areas, it was chosen as the best available measure. A comparison was made of measures 3, 4 and 5 in order to justify using measure 5 in the study.

4.8.1 Comparison 1: Computer Skill and Computer Knowledge

The computer knowledge multiple choice questions produced a score, and using this score, 3 subgroups were identified:

Group 1

This group consisted of 40 subjects scoring the maximum of 16 in the multiple-choice questions. These subjects therefore displayed the most computer knowledge. 72.5% were male and 27.5% female, and 95% had received computer training of some sort while 5% had received no training at all. 67.5% of the group had access to a computer at home.

Group 2

This group consisted of 40 subjects randomly chosen from subjects scoring 8-9 in the multiple-choice questions. These were mid scores around the mean. 20% were male and 80% female and 45% had received computer training while 55% had received no training. 20% of the group had access to a computer at home.

Group 3

This group consisted of 48 subjects scoring 1-4 on the multiple-choice questions. These subjects displayed the least computer knowledge. 10.42% were male and 89.58% were female. Computer training had been undertaken by 33.33% while 66.67% had received no training. 10% of the group had access to a computer at home.

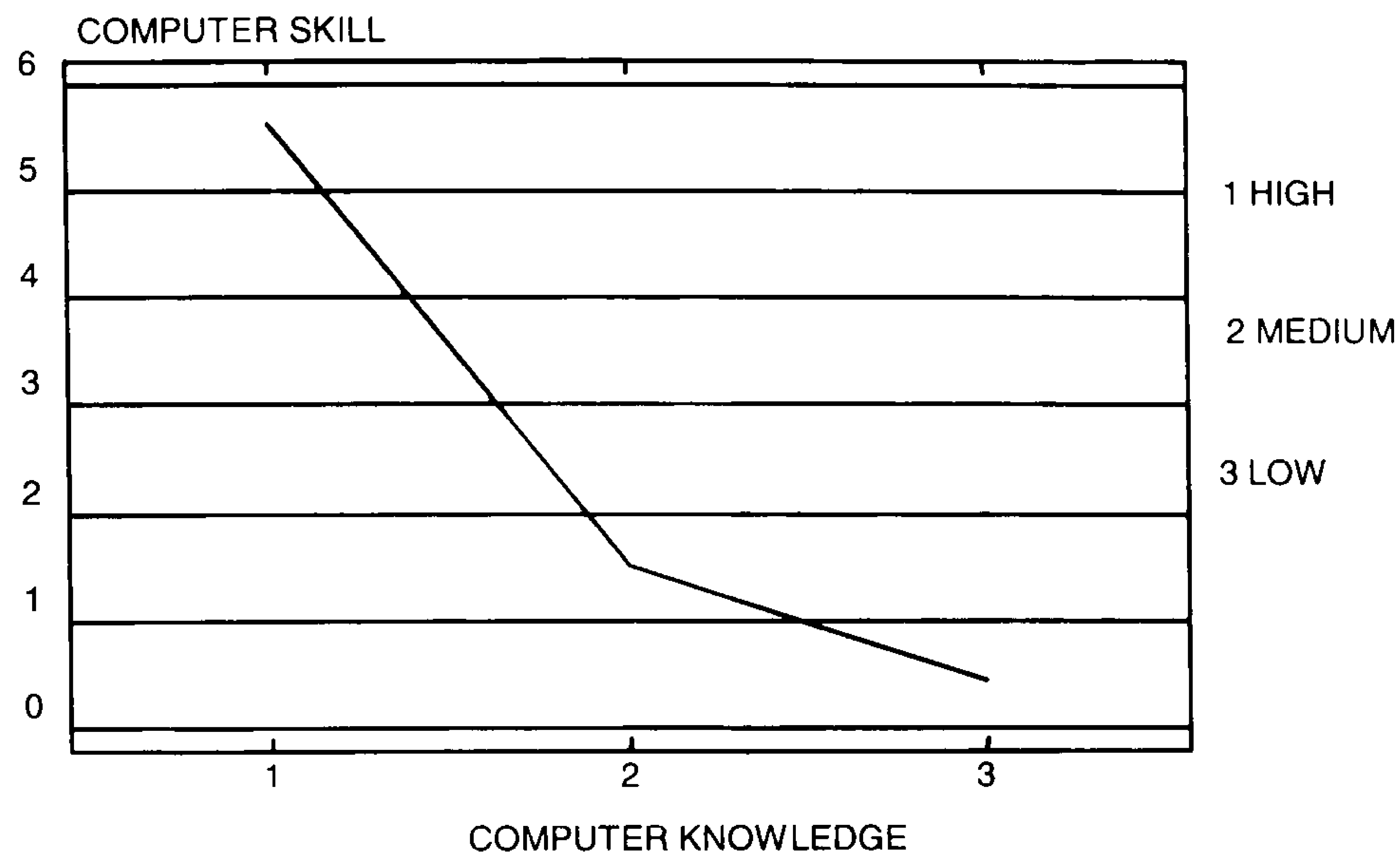
The mean for computer knowledge over the full set of subjects was 8.8 and the S.D. 5.38.

Subjects indicated which of the ten listed skills for which they had received training. (see section 5.9.6 for the full list)

Table 4.1 Means and Standard Deviations for computer skills

GROUP	MEAN	S.D
1	5.37	1.93
2	1.43	1.74
3	0.42	0.71

Fig. 4.1 Comparison of computer knowledge groups on computer skill



The results show a significant difference between the groups on computer skill [F (2,125) = 138.78, p< 0.001]

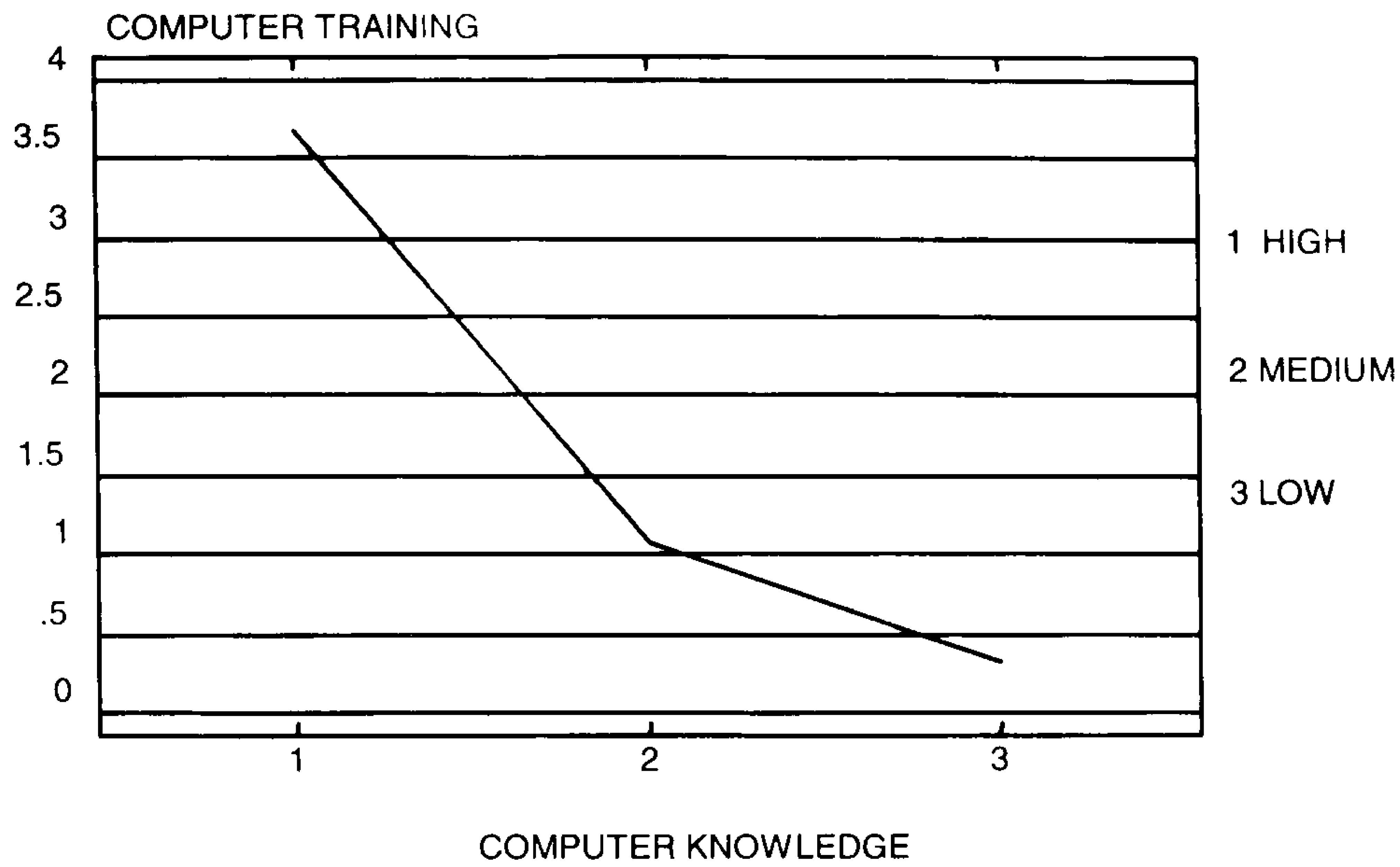
4.8.2 Comparison 2: Computer training and Computer Knowledge

Subjects reported the level of computer training they had received and this was coded for comparison (see section 4.9.5 for full list).

Table 4.2 Means and Standard Deviations for computer training

GROUP	MEAN	S.D.
1	3.68	0.91
2	1.07	1.18
3	0.31	0.69

Fig. 4.2 Comparison of computer knowledge groups on computer training



The results showed a significant difference between the groups [F (2,125) =149.51, p<0.001].

4.8.3 Conclusions

The results of these further analyses (computer skill and computer training) support the use of the computer knowledge questions as a means of dividing the groups in terms of computer experience. All of the measures show significant differences between the high, low and control groups in the direction expected.

The measure chosen to assess computer experience was therefore the score obtained on the 16 multiple choice computer knowledge questions (Measure 5). Although all of the measures tested were useful in defining computer experience, the computer knowledge measure was chosen as it did not depend on self-report and it consisted of a series of questions measuring knowledge over several aspects of computing.

4.9 Computer Attitude

4.9.1 Definition of computer-related attitudes

Aiken (1980) defines attitudes as 'learned predispositions to respond positively or negatively to certain objects, situations, concepts or persons" (p2). Attitudes can be used to predict behaviour, including behaviour involving the adoption and use of computer technologies.

4.9.2 Measuring computer-related attitudes

Computer attitude has been measured using many and varied constructs including computer usage, efficacy, anxiety, value, and enjoyment. Several computer attitude scales have been developed, some of which are summarised here.

Table 4.3 Summary of Computer Attitude Scales

DEVELOPED BY	SCALE	NO. OF ITEMS	MEASURING
Raub (1981)	ATC * Attitudes Towards Computers	25 items	computer anxiety impact on society appreciation
Maurer (1983)	CAIN * Computer Anxiety Index	26 items	computer anxiety
Erickson (1987)	BELCAT * Blomberg-Erickson-Lowery Computer Attitude Task	36 items	usefulness liking success male domain anxiety
Loyd and Gressard (1984b)	CAS * Computer Attitude Scale	29 items	computer anxiety confidence liking usefulness
Delcourt and Kinzie (1993)	ACT Attitudes Towards Computers	19 items	perceived usefulness comfort/anxiety
Kay (1993)	CAM Computer Attitude Measure	50 items	cognitive behavioural affective perceived control

4.9.3 Explanation of Computer Attitude scales

Gardner, Discenza and Dukes (1993) compared 4 of these scales (marked *) to establish their psychometric qualities (construct validity, reliability) and to identify a subset of items to form a short but reliable scale of computer attitudes.

From the scales compared in the study, a total of eight sub-scales were identified:

1. computer anxiety
2. computer liking
3. impact of computers in society
4. computer appreciation
5. computer confidence
6. computer utility
7. motivation to succeed with computers
8. computers as a male domain

(p. 492)

Not all of the scales included all of the sub-scales. One had a single dimension measuring computer anxiety (CAIN), while the remainder were multidimensional, constructed of a subset of the above sub-scales. The researchers found the scales were similar and all had a high reliability as well as reasonable validity. The BELCAT and CAS were found to be the most easily read (Flesch Reading Ease Scores of 84% and 73% respectively). Another point mentioned in the study was that the CAS and BELCAT constructs had less cross loading than the other two scales. Choice of an attitude scale would therefore depend on which sub-scales of attitude were of interest in a study. While all scales were assessed as being useful in computer attitude measurement, they recommended the use of a scale such as CAS or BELCAT if they incorporated the construct of interest.

Similar studies have examined the reliability and validity of a range of attitude scales and have come to the same conclusions as Gardner, Discenza and Dukes (1993). They found the scales they examined to have a high degree of overlap and consistency, as well as reliability and validity (Dukes, Discenza, and Cougar, 1989, Zakrajsek, Waters, Popovich, Craft, and Hampton, 1990, Woodrow, 1991). While the literature appears to support the view that attitude scales are, on the whole, similar, Kay (1993) reports that comparisons between studies are often difficult due to the varied ways attitudes have been assessed. Scales can be general or specific to certain situations, and Kay asserts that for prediction of behaviour to be made, such as computer use in classrooms by teachers, it is necessary to use a scale with items more specific to this particular situation.

4.10. The relationship between computer experience and computer-related attitudes

4.10.1 Computer experience as a predictor of computer attitudes

The following researchers cite computer experience as the best predictor of computer attitudes (Anderson and Hornby, 1996, Arthur and Olsen ,1991, Colley, Gale and Harris, 1994, Hawk, 1989, Loyd and Gressard, 1986, Pope, Donald and Twing, 1991, Shashaani, 1994). However, care has to be taken in the definition of computer experience as the level of experience can differ enormously.

4.10.2 Importance of type of experience

Koohang (1989) argued that the type of experience was important, and found that programming experience led to the most positive computer attitudes. Reed, Anderson, Ervin, and Oughton (1995), in a ten year study of teacher education students, found the lowest computer anxiety in those with programming experience. No computer experience went together with high computer anxiety, and those with applications and content software experience had anxiety scores falling somewhere in between the two extremes.

4.10.3 The effect of training on computer attitudes

Computer training is believed to reduce computer anxiety and increase positive attitudes towards computers.

A two-week training course in Desktop Publishing was successful in altering computer attitudes in older (57 - 87 year) age group. Attitudes toward computers became more positive on computer comfort and efficacy sub-scales (Jay and Willis 1992).

However, training in itself may not affect computer attitudes as Collis (1985) discovered. A compulsory computer course failed to increase computer interest or computer confidence in a female sample. Computer training on its own may therefore not be enough to alter attitudes and this is the view taken by McInerney, McInerney and Sinclair (1994). They used the Computer Anxiety Rating Scale (CARS) to measure computer anxiety before and after computer training. Although training did reduce anxiety, they found that a number of subjects retained a high level of anxiety and they concluded that computer experience on its own might not be enough to reduce computer anxiety.

The extreme cases of computer anxiety and negative computer attitudes are sometimes referred to as 'computer phobia' or 'technophobia"(Kennewell 1992, Rosen, Sears and Weil, 1993, Weil and Rosen, 1995)

Taking a different approach, Rosen, Sears and Weil (1993) used the Computer Phobia Reduction Program, a psychologically based intervention lasting five weeks, aimed specifically at the 'computer phobic'. When run alongside a course requiring computer interaction, the programme was found to reduce computer anxiety and improve computer attitudes and cognitions. A control group, who did not take part in the programme but did engage in a course involving computers, did not show such improved attitudes. Training may therefore not always improve computer attitudes and it may be that length, or type of training are important factors in changing negative attitudes towards computers to more positive attitudes.

4.11 The relationship between computer experience and computer-related attitudes

4.11.1 Subjects

The subjects in this study were Cohort 2.

4.11.2 Materials / Procedure

For the purposes of this study the 16 questions measuring computer knowledge and 19 computer attitude questions were used. Both measures were part of a questionnaire designed by the Institute of Computer Based Learning, Queen's University, Belfast, adapted by the TILT Research Group, University of Glasgow (Q2, found at Appendix D).

The majority of the questions in the attitude section of the questionnaire were the same or equivalent to those in well known, reliable scales such as CAIN, CAS, ATC and BELCAT (see 4.6.3 for a summary of these scales). The attitude section of the questionnaire consisted of Likert type questions (strongly agree – strongly disagree). The computer knowledge questions were of a multiple-choice type.

The subjects were asked to complete the questionnaire before accessing the computers in their course. The computer knowledge measure was therefore based on prior experience, before any training at university.

4.11.3 Hypothesis

Subjects with high scores in computer knowledge will have more positive computer-related attitudes.

4.11.4 Computer-related attitude – Analysis of data

4.11.4.1 Factor analysis

The technique chosen to analyse the attitude data was Factor Analysis. Factor analysis is a statistical procedure that allows a large number of variables to be reduced to a smaller, more manageable number. This is achieved by firstly observing relationships, or correlations, between the responses to the variables, and then putting them into groups or series of variables that are closely related. Factor analysis identifies latent variables (underlying effects not directly observed) explaining a large proportion of the variance in the data.

In questionnaire data, Factor Analysis can be used to identify overlap in items allowing refinement and development of scales. Dimensions in attitude mean groups of highly correlated behaviours. Factor Analysis can be used to test empirically that these dimensions exist. It is an extremely useful technique if there are a very large number of variables making it difficult to analyse them individually.

Principal Components Analysis (PCA) Factor Analysis is used in attitude measurement studies. Gardner, Discenza and Dukes (1993) carried out an analysis of 4 computer attitude measures. They used PCA and varimax rotations to confirm the constructs and subscales identified in the measures. Other studies using the same form of analysis include Kay (1993), who identified 4 computer-related attitude dimensions and their subscales, accounting for 60% of the variance, and Levine and Donitsa- Schmidt (1998) who identified 7 computer-related attitude factors accounting for 55.7% of the variance.

In this data Factor Analysis allowed a cluster of responses to be identified as characterising, for example, the computer-related attitude of Computer Anxiety. Using the software package, Statistica, Factor Analysis, with varimax rotation, was carried out to reduce the 19 attitudes to a smaller number of clearly interpretable factors. Varimax, or variable maximising rotation, was used in order to obtain a better fit of the factors with the measurement variables; in this study these were computer-related attitude questions. Initial analysis of all 657 subjects' data revealed 3 factors with eigen values greater than 1.00. This conforms to the Kaiser criterion, which states that all factors with an eigen value of more than 1 should be retained.

Table 4.4 Eigen Values

Factor	Eigen Value	% Variance Explained
1	6.48	34.07
2	2.08	10.94
3	1.37	7.22

All factor loadings exceeding an arbitrary level of 6% were included (both positive and negative loadings were used). The three factors identified accounted for 52.53% of the variance. Each of the factors is described below.

4.11.5 Factor 1

This factor was bipolar and accounted for 34.07% of the variance. Significant loadings were:

Question 2. (+ve)	I feel intimidated if a conversation turns to computers. (.68)
Question 4. (-ve)	I believe I could do advanced computer work (-.63)
Question 5. (-ve)	I feel confident when working with computers. (-.79)
Question 14. (+ve)	I avoid using computers whenever I can (.63)
Question 17. (+ve)	I feel threatened by the thought of having to use a computer (.71)
Question 19. (+ve)	I am often unsure about what to do when using a computer. (.79)

4.11.6 Factor 2

This factor was uni-polar and accounted for 10.94% of the variance. Significant loadings were:

Question 1. (+ve)	Learning about computers is worthwhile (.68)
Question 9. (+ve)	All students should learn something about computers as part of their course (.73)

Question 18. (+ve) I would like to know more about computers (.68)

4.11.7 Factor 3

This factor was uni-polar and accounted for 7.22% of the variance. Significant loadings were:

Question 3. (+ve) I find computers boring (.65)

Question 8. (+ve) I do not understand how people can enjoy working with computers (.70)

4.11.8 Factor Analysis results

The results of the factor analysis categorised the attitude variables into these three factors. These have been interpreted as follows.

Factor 1, Computer Anxiety

This factor was named 'computer anxiety' as the questions loading on to it involved avoidance of computers, lack of confidence with computers, and negative feelings about computers.

Factor 2, Perceived usefulness

This factor was named 'perceived usefulness' as the questions loading on to it concern how worthwhile computers are and how computer training is seen to be useful.

Factor 3, Indifference towards computers

This factor was named 'indifference towards computers' as the questions loading on to it concern lack of interest in computers.
These three factors were therefore used as the attitude measures in the study.

4.12 Computer knowledge and computer-related attitudes

4.12.1 Calculation of ANOVAs

A series of 1 way ANOVAs were calculated to ascertain if there were any differences between the computer knowledge groups on scores obtained for the 3 main attitude factors identified in the Factor Analysis. The prediction was that computer experience would correlate positively with computer attitudes.

Fig.4. 3 Comparison of computer knowledge groups on attitude factor 1, Computer Anxiety

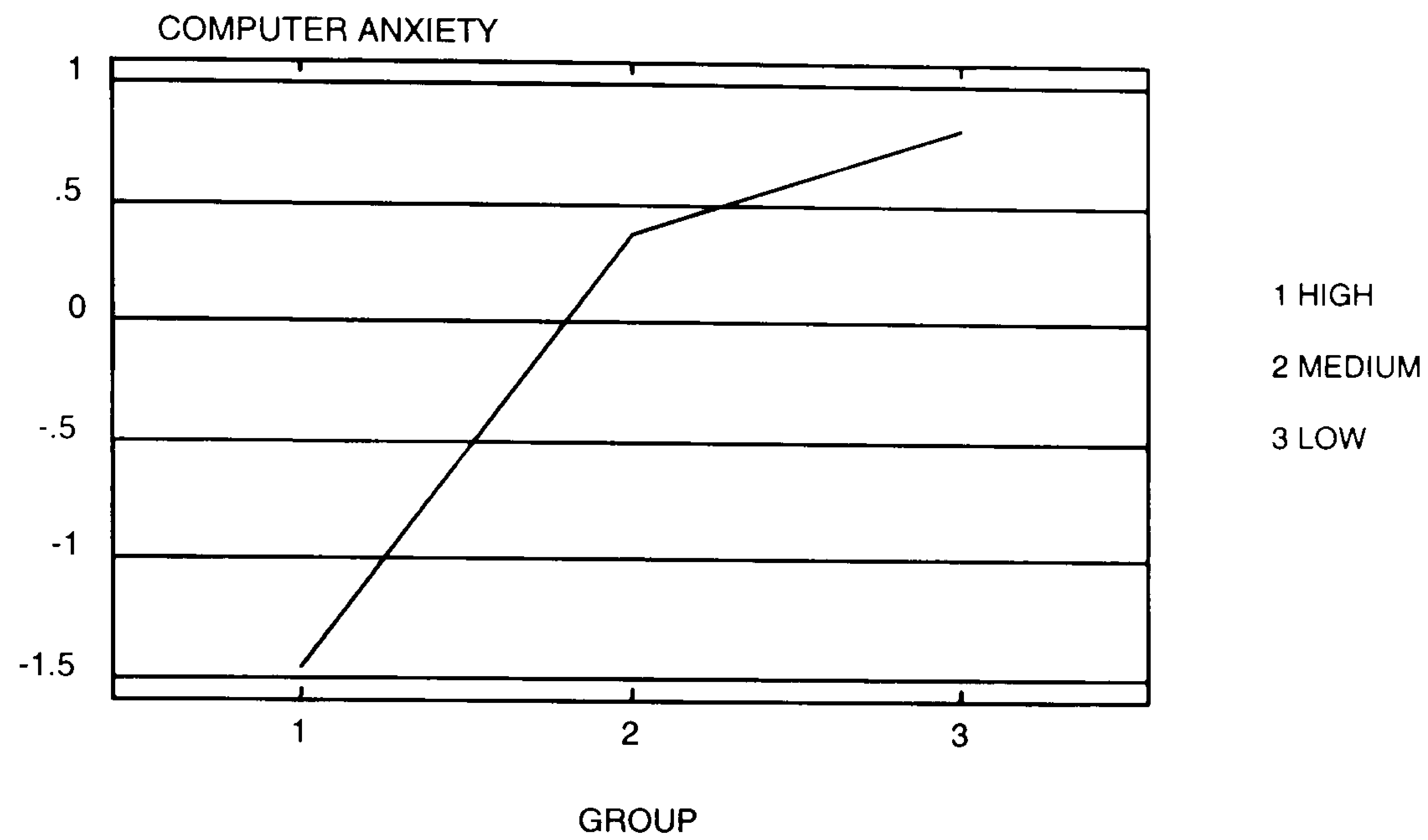


Fig.4.4 Comparison of computer knowledge groups on attitude factor 2, Perceived Usefulness

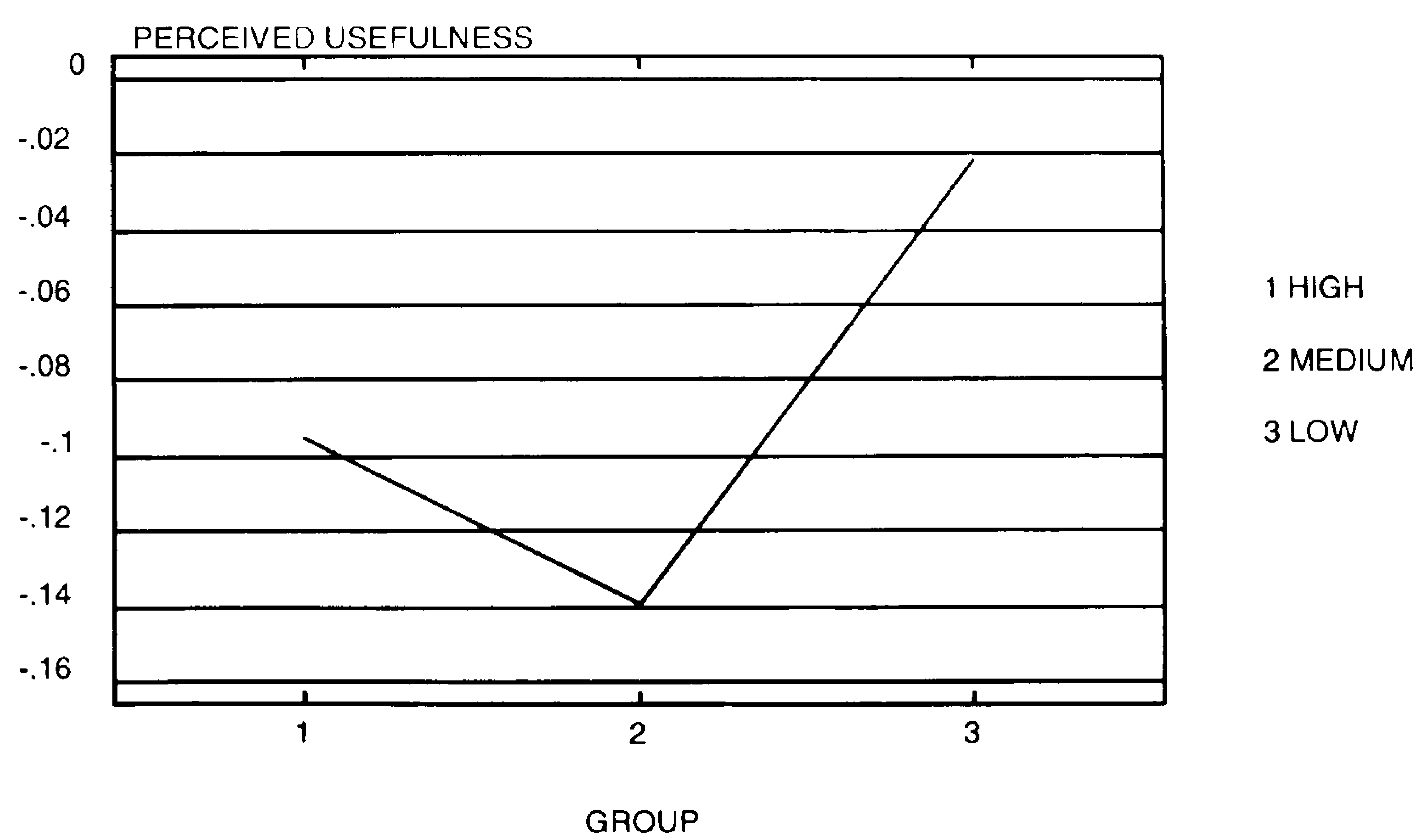


Fig.4.5 Comparison of computer knowledge groups of attitude factor 3, Indifference towards computers.

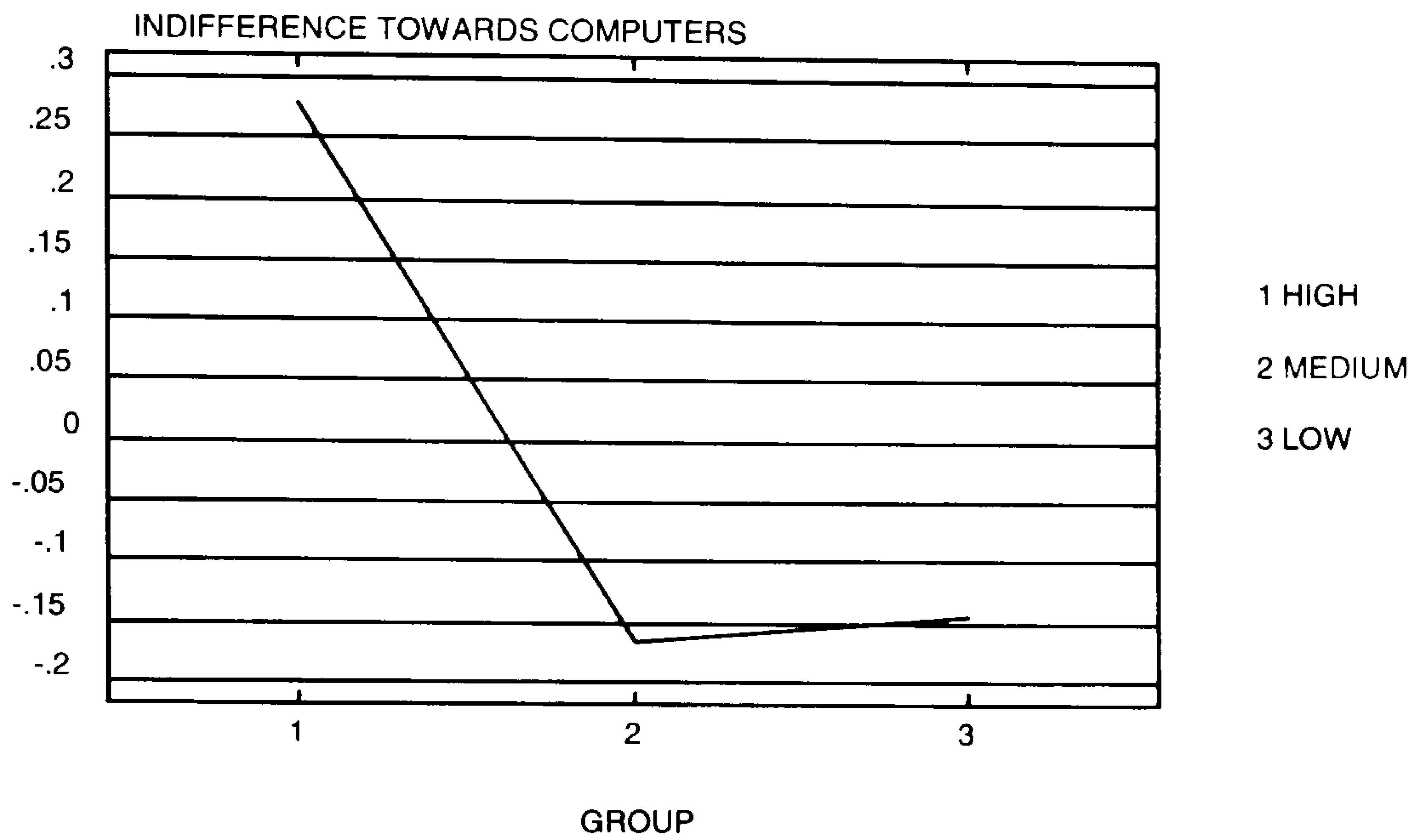


Table 4.5 Mean scores for computer knowledge groups on 3 factors

ATTITUDE	GROUP 1	GROUP 2	GROUP 3
Computer Anxiety	-.1.44 (S.D.0.59)	0.37 (S.D. 0.81)	0.81 (S.D. 0.81)
Perceived usefulness	-0.09 S.D. 0.81	-0.13 S.D. 0.83	-0.02 S.D. 0.90
Indifference towards computers	0.27 S.D. 0.80	-0.16 S.D. 1.0	-0.14 S.D. 1.0

There was a significant difference between the groups on computer anxiety [F (2,125) =121.65, p<0.001]. Perceived usefulness was not significant, and Indifference towards computers was borderline significant [F (2,125) = 2.76,p< 0.06].

4.12.2 Post hoc t tests

A Tukey HSD test was carried out on factor 1 data to determine which of the means differed.

Table 4.6 Means and SD for Factor 1, Computer Anxiety

Group	Mean	S.D.
1	-1.44	0.58
2	0.37	0.77
3	0.81	0.73

4.12.3 Results

The results showed that Group 1, (high computer knowledge) had lower computer anxiety than either Group 2 (medium computer knowledge) $p<0 .001$, and Group 3 (low computer knowledge) $p<0.001$.

The medium computer knowledge group also showed more computer confidence than the low computer knowledge group ($p<0.01$).

4.12.4 Discussion

We expected more positive computer attitudes in subjects with higher scores for computer knowledge and the hypothesis was confirmed for Factor 1 (Computer anxiety). Computer anxiety is an intrinsic motivation involving emotion. On the other hand perceived usefulness is an extrinsic motivation and no significant difference between the computer experience groups was found on this factor. Anderson and Hornby (1996) had a similar result in their study. This can perhaps be explained by the appreciation of the utility of computers not necessarily involving direct experience with computer technology.

There was also no significant difference found between the computer experience groups on Factor 3 (Indifference towards computers), although the ANOVA result was borderline significant. Group 1 (high computer knowledge scores) had, perhaps surprisingly, more indifference towards computers than the other groups. It is possible that the result was due to the extent of their experience over a period of time. Group 1 was mainly male and highly experienced in terms of level of training and computer skills and may have become indifferent to computers through using them mainly as tools rather than for enjoyment.

The hypothesis was therefore only partially supported. The highly significant result for Factor 1, Computer anxiety was expected, as this is the main computer-related attitude mentioned in the literature.

4.13 Correlations

A Pearson product-moment correlation was calculated on the scores for the computer knowledge groups.

4.13.1 Results

The results showed that there was a highly significant correlation between computer knowledge and Factor 1, Computer anxiety, ($r = -0.79$, $p < 0.001$). Factor 2, Perceived usefulness, was not significant. Factor 3, Indifference towards computers, was significant ($r = 0.19$, $p < 0.03$). Computer experience was therefore shown to be predictive of computer related attitudes computer anxiety and computer indifference. The results of the correlation further confirmed the ANOVA results, and Factor 3 was shown to be significant in this analysis although only borderline significant in the comparison of the group means.

4.14 Relationship between computer-related attitudes and e-mail use

4.14.1 Correlations between e-mail sent and computer-related attitudes

A Pearson product-moment correlation was calculated on the data for computer knowledge groups. The results were as follows.

4.14.2 Results

The results showed that there was a relationship between e-mail use and Factor 1, Computer anxiety ($r = -0.23$, $p<0.008$) and for Factor 3, Indifference towards computers ($r =0 .19$, $p<0.03$). There was a non-significant result for Factor 2, Perceived Usefulness.

4.14.3 Discussion

The results support the hypothesis there is a relationship between positive computer-related attitudes and e-mail use. The non-significant result for factor 2, Perceived usefulness, was expected as there was no relationship between this factor and computer experience.

4.15 Comparison of computer knowledge groups on e-mail use

The computer knowledge groups were compared using a one-way ANOVA on their e-mail sent measure. The hypothesis is that subjects with a high score in computer knowledge will send more e-mail.

Table 4.7 Means and Standard Deviations for computer knowledge groups compared on e-mail sent.

Group	Mean	S.D.
1	81.35	162.9
2	10.00	19.9
3	16.92	37.8

The results showed a significant difference between the groups on e-mail sent [$F(2,125) = 7.08$ $p < 0.001$].

4.15.1 Post hoc test

In order to ascertain which of the means differed significantly a Tukey HSD test was calculated.

The results showed that Group 1 (high computer knowledge) sent significantly more e-mail than either Group 2 (medium computer knowledge) or Group 3 (low computer knowledge). Group 2 and 3 did not differ significantly from one another.

4.15.2 Correlation between e-mail sent and computer knowledge

A Pearson product-moment calculation was made on the computer knowledge scores and the amount of e-mail sent for the computer knowledge groups.

4.15.3 Results

The results showed that there was a relationship between these factors ($r = 0.27$ $p < 0.001$) This supports the hypothesis that computer experience correlates positively with e-mail use.

4.16 Conclusions

The literature shows that adoption of computer technology, including CMC, is influenced by computer -related attitudes, computer anxiety, and self-efficacy. These in turn are affected by computer experience.

Computer experience can be assessed by several methods, and in this study computer training, access to a home computer, type of training, experience of computer tasks, and computer knowledge were used. After comparing these measures, and finding them all to be useful, a decision was made to adopt computer knowledge as the preferred measure of computer experience. This measure did not depend on self-report and reflected a wide range of computer experience in the questions used.

After Factor Analysis of the attitude data, three main factors were identified (Computer Anxiety, Perceived Usefulness and Indifference Towards Computers), and a comparison of groups differing in their computer knowledge scores showed that there was a relationship between computer experience and computer-related attitudes. Those with more computer experience displaying more positive computer-related attitudes, especially Computer Anxiety where the correlation was high. There was no relationship found with the Computer-Related Attitude, Perceived Usefulness, and a small relationship with Indifference Towards Computers. These results were not surprising given the number of studies that found a similar relationship between computer experience and Computer

Anxiety. The Perceived Usefulness of computers may be recognised by those with little experience, as well as those with a great deal. The attitude Indifference Towards Computers is not heavily represented in the literature, and as the correlation was very low, it may not be an important computer-related attitude.

A relationship was found between e-mail use, Computer Anxiety, and Indifference towards computers. However, the coefficients were small and explained only between 3% and 7% of the variance. Despite being small, in conjunction with other predictors these measures could still be useful.

The results also show that there is a direct relationship between computer experience and e-mail use. Those with more computer experience are more likely to use e-mail. Experience and skill with computers were two of the factors identified by Mahmood, Burn, Gemoets and Jacquez (2000) as important in user acceptance of a new technology. If users do not accept a new technology then it will not be used.

Chapter 5: COHORT 2, 1994/95: GENDER DIFFERENCES IN COMPUTER EXPERIENCE, COMPUTER-RELATED ATTITUDES, AND E-MAIL USE

5.1 Aims of the chapter

In Chapter 4 some support was found for a relationship between computer experience and computer-related attitudes. Computer-related attitudes, computer anxiety and indifference towards computers were also found to have a relationship with e-mail use. A direct link was found between computer experience and e-mail use.

When examining the make-up of the computer knowledge groups it is noticeable than females are over- represented in the low knowledge group, even while the majority of Cohort 2 are female (males 237, females 420). Gender differences are mentioned in the literature, in computer-related attitudes, particularly computer anxiety, and also in computer experience and computer use. This chapter will therefore explore the data for gender differences in computer-related attitudes, computer experience and e-mail use.

5.2 A review of the literature on gender differences and computers

5.2.1 Gender differences in computing careers

Frenkel (1990) reports a decline in the number of women with Computing Science degrees and also in women going on to higher degrees, resulting in a low number of females in academic posts in Computing Science and in the computing industry. Computer culture, heavily male dominated with 'almost obsessive' behaviour, makes likely that relatively fewer women will advance in computing. Cottrell (1992) also reports on the under-representation of women in computing careers, and several explanations for this have been proposed including lower self confidence with computers in females and more anxiety about computing skills. The computer industry also helps to maintain the low ratio of females to males, failing to promote females or even to recruit them in the first place (Panteli, Stack and Ramsay, 1999).

5.2.2 Explanations for these differences

Some of these explanations focus on childhood experience where school subjects which have a computer component, such as mathematics and some science subjects, are traditionally male dominated. Kiesler, Sproull and Eccles (1985) report the domination of school computers by boys unless there is intervention by staff to allow the girls equal access. They also mention educational software and computer games, more likely to be designed for boys rather than girls. The design of educational software has been biased towards males. In one case software commissioned for educational use for boys came in the form of games while software designed specifically for girls was in the form of learning tools. When the same designers were asked to produce software for use by both boys and girls they designed games, perhaps assuming that the majority of users would be male (Huff and Cooper, 1987). De Witt (1997) reports a figure of 23 – 33% of games sold for girls, a higher proportion than may have been expected but nevertheless much lower than the proportion of games aimed at boys. Culley (1988) found that boys use more of their free time than girls using computers and more boys take computing classes at school and in summer camps (Anderson, Welch and Harris, 1984). Games are described as the 'gateway to the computer' by Schumacher and Morahan-Martin (2001) and the authors conclude that playing computer games develops computer skills and makes the users more at home with technology.

5.2.3 Conclusions

We would therefore expect females to have less computer experience and hence less positive attitudes towards computers than males, and to be less likely to adopt computer technologies. However, research in this area has produced conflicting results.

5.3 Gender differences in computer attitudes

Overall, research into gender differences supports the view that males have more, on average, computer experience and females have more negative computer-related attitudes according to (Schumacher and Morahan-Martin, 2001).

Shashaani (1994), in a study of secondary school pupils, measured attitudes towards computers and computer behaviour. Results showed that males had more computer experience, used computers more and had more positive attitudes towards computers than females. Males were more confident in their ability to use computers and had more interest in them. Another study by Massoud (1991) also found males had more positive attitudes in confidence as well as in liking and anxiety sub-scales. Chen (1986) found males were more positive in confidence and interest as well as having less computer anxiety than females. However, Rosen, Sears and Weil (1993) found no relationship between gender and anxiety but discovered that women had more negative attitudes towards computers. Boys were also found to have more positive computer-related attitudes than girls in a study by Levin and Gordon (1989). The main conclusion in this study was that previous computer experience, especially if there was a computer at home, was more influential than gender.

Others such as Koohang (1989) and Lloyd and Gressard (1984a) found no relationship between gender and computer attitudes on anxiety, confidence and liking sub-scales, although Koohang did find a difference in the computer usefulness sub-scale, males scoring significantly higher than females. Busch

(1995) found no differences between males and females in computer attitudes (computer anxiety, computer confidence, and computer liking). He concluded that computer experience is the strongest predictor of computer attitude: males have more computer experience, in particular in programming, play more computer games, and have higher self-efficacy for complex computing tasks. However, Anderson (1996) reviewed several gender studies and concluded that there is no difference in computer attitudes between males and females, as long as other variables such as computer experience and math anxiety are controlled for. Gender differences in computer-related attitudes were indeed found to disappear if experience was controlled for (Dyck and Smither, 1994, Colley, Gale and Harris, 1994). However, McIlroy, Bunting, Tierney and Gordon, 2001) found that gender differences remained despite controlling for experience in their sample.

Parasuraman and Igbaria (1990) found no differences in computer anxiety between male and female managers and also found they had similar computer attitudes. Age, personality and education were found to be more important factors in computer anxiety than gender. Computer anxiety had a strong negative relationship with attitudes, especially among women, suggesting it might be an important predictor of computer use.

A study by Whitley (1996a) was based on the premise that differences in computer attitudes between sexes are related to the attitudes and behaviours measured. He found that there was a gender difference in anxiety (women had significantly higher scores than men), a small difference for negative beliefs, and small differences on computer-related behaviour.

5.3.1 Conclusions

The empirical evidence in the literature for gender differences in computer attitudes is inconclusive. The contradictory results may be at least partly due to the diversity of instruments used in the studies, measuring different aspects of computer-related attitude. Another major factor may be that the studies were conducted at different times and there may have been changes in female computer experience over a period of time. However, a longitudinal study by Durndell and Thomson (1997) found that gender differences in computer knowledge and computer-related attitudes was changing at a very slow rate with equality between the sexes a long way off. There also may be cultural differences involved in the inconsistency of results, as the studies have been conducted in several countries and situations. Controlling for experience is another inconsistency in studies. Most studies do not control for experience and there are a variety of methods of control used in those that do. There is evidence overall however, males have more computer experience than females. As computer experience has been found to predict computer-related attitudes generally, differences between males and females in attitudes are expected.

5.4 Gender differences in computer experience

5.4.1 Subjects

Subjects were 237 males and 237 females, the females systematically selected from an alphabetical list of the females in Cohort 2 in order to attain equal cell sizes.

5.4.2 Materials / Procedure

Computer experience was determined in this study using several measures (self-report of training, access to computer at home, level of training, computer skills, and computer knowledge scores on a multiple-choice test). It was decided previously to adopt computer experience as the best measure available and this measure was used here. Subjects completed a questionnaire (Q2, found at Appendix D) at the beginning of their course, before using computers at university.

5.4.3 Hypothesis

Females will have less computer experience, as measured by computer knowledge than males.

5.4.4 Comparison of males and females on computer knowledge.

There was a significant difference between males and females on computer knowledge [t (472) = -8.86, p<0.001]. Hypothesis 5 was supported, males had more computer knowledge than females.

5.4.5 Comparison of high and low scoring males and females on computer knowledge

5.4.5.1 Subjects

160 subjects were drawn from the original 657 on the basis of the highest and lowest computer knowledge scores for both males and females. Four groups were formed, with 40 subjects in each of the categories High male, High female, Low male, Low female)

5.4.5.2 Analysis

t tests were carried out between the high/low computer knowledge scores of the male and female groups.

Table 5.1 Means and Standard Deviations for high knowledge scores Compared

	Mean	S.D.
Female	15.12	0.64
Male	15.72	0.45

A significant difference was found [t (78) =-4.80, p< 0.001]. Males had higher computer knowledge scores.

Table 5.2 Means and Standard Deviations for low knowledge scores compared

	Mean	S.D.
Female	3.05	0.93
Male	6.32	1.5

A significant difference was found [t (78) =-11.23, p<0 .001]. Females had lower computer knowledge scores.

5.4.5.3 Discussion

Males were shown to have higher computer experience than females. The comparison of high and low scoring males and females showed that even those females with the highest scores in computer knowledge had significantly less experience than males.

5.5 Conclusions

In this cohort of Scottish University entrants in 1994, all of the computer experience measures show differences between males and females. The females displayed less computer experience, on average, in the sample. These results support those found by Shashaani (1994), Busch (1995), and Schumacher and Morahan-Martin (2001), and According to Levin and Gordon (1989) one factor that may play a role is having access to a computer at home. Schofield (1995) reported 20% of females in her sample of school students and 75% of the males had a home computer. Males were also exposed to computers earlier than girls. In our sample 109 females (26% of females) and 102 males (43% of males) had computers at home. 311 (74%) of females and 135 (57% of males had no home computer. Interestingly, the males reported more access to computers used exclusively for games (e.g. Nintendo, Atari) than females. 46.9% of males used games computers while only 23.6% of the females had done so. Busch (1995) also found females had less access to home computers and they were less experienced in programming and computer games.

5.6 Computer Attitudes and Gender

5.6.1 Subjects

The subjects were 237 males from Cohort 2, and 237 females, systematically selected from the 420 females in the sample.

5.6.2 Procedure

Scores for computer-related attitudes were compared.

5.6.3 Hypothesis

Males will have more positive computer attitudes than females.

5.6.4 Analysis

A t test was calculated between male and female groups' scores on computer-related attitudes.

Table 5.3 Means and Standard Deviations for Factor 1 Computer Anxiety

Group	Mean	S.D.
1 Females	0.27	0.9
2 Males	-0.37	1.0

5.6.5 Results

There was a significant difference between males and females on Factor 1, Computer anxiety [$t(472) = 7.29$, $p<0.001$]. Females had more computer anxiety than males.

The results for Factor 2, Perceived usefulness and Factor 3, Indifference towards computers were non-significant.

5.7 Controlling for experience

In order to test the conclusions made by Anderson (1996) that gender differences in computer-related attitudes fail to exist when computer experience is controlled for, a study was undertaken.

5.7.1 Subjects

34 females and 34 males equally matched for high scores in computer knowledge comprised Group 1, high knowledge. 34 females and 34 males equally matched for low scores in computer knowledge comprised Group 2, low knowledge.

5.7.2 Procedure

The groups were compared on computer-related attitudes.

5.7.3 Hypothesis

There will be differences in computer-related attitudes between computer knowledge levels but no differences expected for gender.

5.7.4 Analysis

An ANOVA was calculated on the computer knowledge scores and computer attitudes of the high and low knowledge groups.

Table 5.4 Means and Standard Deviations for computer knowledge groups on Factor 1, Computer Anxiety

	High (mean)	S.D.	Low (mean)	S.D.
Male	-1.23	0.81	0.54	0.85
Female	-0.80	0.85	0.44	0.72

There was a significant effect of knowledge [F (132) =117.70, p<0.001], no effect of gender and an almost significant interaction [F (132) =3.7, p<0.55]. There were no significant results for Factor 2 (Perceived Usefulness) or factor 3 (Indifference towards computers).

5.7.5 Discussion

The hypothesis was supported, as there were no gender differences for computer-related attitudes when experience was controlled. However, there was a near significant interaction between experience and gender, indicating that at the high level of computer knowledge, males were more confident with computers than females. This may be due to higher self-efficacy for computer use in males. Computer experience, and gender are expected to impact on computer-related attitudes and computer efficacy (Rozell and Gardner, 1999). The differences for

Factor 1, Computer Anxiety remained for the high/low knowledge groups. This reinforces the conclusion of Busch (1995) that computer experience is the best predictor of computer-related attitudes.

5.8 Correlations

Pearson product-moment correlations were calculated for the male/female groups based on computer knowledge and the 3 factors. The results were as follows. Both the male ($r = -0.77$, $p < 0.01$) and female groups ($r = -0.71$, $p < 0.01$) showed a significant correlation between computer experience and Factor 1, Computer Anxiety. The remaining results were non- significant. Computer experience was therefore found to be predictive of the computer attitude, Computer Anxiety, in both males and females.

5.9 Gender differences in e-mail use

5.9.1 Subjects

Subjects were 237 males from Cohort 2, and 237 females chosen randomly from the 420 females in the sample.

5.9.2 Procedure

The number of e-mail messages sent was measured from a log taken of e-mail use. This was the measure of e-mail use utilised in the study.

Table 5.5 Means and Standard Deviations for males and females on e-mail use

Group	Mean	S.D.
1 Females	34.5	125.04
2 Males	40.3	102.5

The results were non-significant

5.9.3 Comparison of knowledge groups on e-mail use

Table 5.6 Means and Standard Deviations for knowledge groups on e-mail sent

Group	Mean	S.D.
Female High scores	68.00	235.8
Female Low scores	15.5	33.20
Male High Scores	89.9	172.3
Male Low scores	12.1	32.9

There was no significant effect of gender and no interaction. There was a significant effect of computer knowledge [$F(1,156) = 7.75$, $p<0.006$].

5.9.4 Discussion

No relationship was found between e-mail use and gender. Experience was once again confirmed to be the strongest predictor of e-mail use.

5.10 Conclusions

The results have been mixed in this study. While computer experience clearly differs between males and females, the results for computer- related attitudes were significant only for computer anxiety. Both males and females, with low experience have high computer anxiety although the females are more computer anxious than the males. When computer experience is controlled for the differences disappear. Perceived usefulness has been found to differ between males and females, males scoring higher in usefulness scales, (Koohang, 1989) but no support was found for this in the data.

No relationship was found between gender and e-mail use, and experience was confirmed as the best predictor of use. This result does not support Whitley (1996a) or Mitra, Lenzmeier, Steffensmeier, Avon, Qu and Hazen (2000) who found small gender differences in computer use. However, the present study has e-mail as a measure of computer use and this brings the dimension of communication to computing which may affect the outcome. Gefen and Straub (1997) found no gender differences in e-mail use but did find differences in male and female perceptions of the medium.

Chapter 6: COHORT 2, 1994/95: THE ROLE OF PERSONALITY IN COMPUTER-RELATED ATTITUDES AND E-MAIL USE

6.1 Aims of the chapter

In chapters 4 and 5 computer experience was established as the best predictor of e-mail use. Computer experience was also found to have a relationship with computer-related attitudes, in particular computer anxiety. No gender differences were found if computer experience is controlled for. There were no gender differences for e-mail use.

Personality may also play a part in computer use, including computer mediated communication channels such as e-mail. Personality may be a direct influence or may be a factor in computer-related attitudes, which in turn may influence the adoption and use of e-mail.

Pocius (1991) defined personality as "the relatively stable, emotional, motivational, interpersonal and attitudinal characteristics of the individual" (p.104).

As computers invariably invoke some response from individuals, ranging from enthusiasm and praise, to indifference, anxiety, or even avoidance behaviour, it is reasonable to assume that personality has some influence on computer use and computer attitudes. The problem with any attempt to assess these studies is that they are found across a wide variety of journal areas and focus on different aspects, from computer aptitude (in particular for programming), to choice of computers for a specific task.

This chapter will therefore explore the role of personality in computer-related attitudes and e-mail use. It will also investigate the characteristics of heavy users of e-mail to discover if they resemble the stereotype of a heavy computer user.

6.2 A review of the literature

In the past heavy computer users were expert programmers due to complexity of computing at the time, so it is not surprising that much of the research has concentrated on specific computing tasks such as programming. Weinberg (1971) argued that personality was an important factor in computing aptitude.

Since the early 70s researchers have studied the relationship between personality and programming aptitude and achievement. Various instruments were used to measure personality dimensions such as introversion - extraversion, and several computer programming aptitude tests and other measures of programming achievement allowed the relationship to be assessed. The so called 'programmer personality' Lyons (1985) is characterised by the introverted, thinking, intuitive individual. A study by Whitley (1996b) however, found little evidence for introverted, thinking personalities' higher use of computers, computer aptitude and more positive computer attitudes.

Kagan and Douthat (1985) and Peterson and Howe (1979) are among those who found that individuals who do better on introductory programming courses had personality traits characterising introversion. Several studies have identified those individuals who choose programming careers or computing science degrees as being more introverted than the general population (Sitton and Chmelir 1984, Bush and Schkade 1985). We might expect lonely, socially isolated people to use the internet in preference to face-to-face interactions, and assume those with social skills and attractive personal qualities to have less need to interact electronically (Amichai-Hamburger, Wainapel and Fox, 2002). Kraut, Patterson, Lundmark, Kiesler, Mukhopadhyay and Scherlis (1998) found Internet users to be more depressed, more lonely and less sociable than non-users. However, this view has not been supported by all research in the area and a longitudinal study by Kraut, Kiesler, Boneva, Cummings, Helgeson and Crawford (2002) found that any negative effects were reduced over time, and the Internet can actually be a positive influence on social interaction.

Charlton and Birkett (1998) compared students on a programming course with those of an application based, business IT course. They found that students on the programming course were mostly male, had previously used a greater number of programming languages, were more involved with computers, and used them more often. They were also more introverted. Their results confirmed those of Shotton (1989) who found subjects who had a heavy involvement with computers were introverted and did not regard the computer so much as a tool as a companion.

There is therefore some evidence that the so called 'programmer personality' and this has become the stereotype for all heavy computer users.

6.3 Stereotype of heavy computer users

Judd, Ryan, and Park (1991) define stereotypes as cognitive frameworks, or schemas, formed using knowledge and beliefs about groups in society. These schemas assign characteristics or traits to all members of the group regardless of individual variation. They are then used as a heuristic or shorthand method to make assumptions about people's character and predict their behaviour. Once a stereotype is formed we are more likely to look for confirming evidence of its accuracy than contradictory evidence.

Stereotypes are acquired through interaction with members of the group, through listening to the views of others about the group, and through portrayals in the media. Heavy computer users have a distinct stereotype that has remained static despite the changing face of computing.

At the beginning of the computer age users were professionals working in the design of computers or programs, or they were students of computing science. Here the 'subculture' of computing referred to by Serpentelli (1995) began. Interaction with computers, firstly through work and then for pleasure, led to the formation of computer based social groups competing to solve programming problems and playing games such as "Dungeons and Dragons' over the network.

Members of this subculture thought of themselves as a breed apart, not belonging in conventional society. Control and mastery of computing was the goal and this search for control and perfection they could not attain in social interaction (Turkle, 1984).

These early computer users were dubbed 'hackers'. a term which was originally used to refer to someone with expertise in computing. The definition has been revised over the years and is now commonly used to describe people who enter computer systems illegally and either disrupt data or disable systems mainly for enjoyment and to display their expertise.

Another term, often used in reference to heavy computer users, is 'nerd', defined by Saffo in Jennings (1990) as 'someone who has mastered a technological discipline and sincerely believes that the precision of the technology is more appealing than the uncertainty of social culture.' The more extreme version of a nerd is a 'technoweenie', characterised by someone who is even less sociable, and indeed finds it difficult to deal with others except through technological intermediary (Kepler in Jennings, 1990).

Much of the research carried out on the hacker culture took place at MIT. One of the best known, and most widely quoted, descriptions of a hacker emanated from there and was penned by Weizenbaum (1976). He paints a picture of an intelligent young male whose whole existence centres around computers and solving programming problems. The hacker he describes is oblivious to his own physical wellbeing and has little direct interaction with others.

In 1984 Turkle reported a dearth of female hackers due to the 'macho culture' among programmers. Temple and Lips (1989) also commented on the low number of women at the 'technological end' of computing. They concluded that this was not due to the lack of interest on their part but due to the lack of opportunities for women in a male dominated field.

This stereotype of the obsessive computer user interacting with computers for most of the day, neglecting self and relationships with others has continued to the present day. In a longitudinal study Durndell and Thomson (1997) found it was still prevalent in university entrants, most of which were not attracted by a computing career. The media portrays the heavy user as a probably dysfunctional, lonely person, happier in cyberspace than in interaction with those around him.

The common factors of the stereotype are:

- young
- male
- intelligent
- isolated
- obsessive
- introverted

(for example, Jennings, 1990, Barnes, 1974, McClure and Mears 1984, Cross 1972, Miller, 1970)

A recent study by Schott and Selwyn (2000) found that high computer users in a sample of students did not conform to the stereotype. Males and females were equally represented in both the high and low user categories. High users were also found to be just as sociable as others. The authors also found, however, that the stereotype of a heavy computer user still remained in the perceptions of their sample, particularly in students less involved with computers.

Many changes have taken place over the years and now the number of women in computing has risen; the hardware has become more user friendly; software is more abundant; and computers are used for many more purposes than previously. As computers advanced and microcomputers entered the home as well as the workplace a new type of computer user has evolved. These users are not professionals and do not require the same level of skill to maintain their involvement with computer technology. Sigurrdson (1991) categorises computer involvement into two levels:

1. Lower level where no expert knowledge is needed and use is restricted to off-the-shelf software packages such as word processing and computer games

2. Higher level where mathematical skill is required to carry out software design and programming.

The new breed of computers makes it easier for novices to enter the world of computing. The increase of communication mediated by computer may also have changed the type of person who becomes a heavy computer user. Still the stereotype of the heavy user (hacker or nerd) pervades the literature, still referring to the early professionals whose 'rites of passage' according to Jennings (1990) was the hacker phase leading to their acceptance as computer experts. The world of computing has moved on as heavy users today, sometimes referred to as 'mouse potatoes', may not resemble the stereotype of the past. Their involvement with computers is likely to be more recreational, playing games or using the Internet to access information or communicate with others.

6.4 Traits in Personality

The trait approach to personality is based on the assumption that individuals have broad predispositions towards behaving in a particular way. These predispositions, or traits, may be prevalent to a greater or lesser degree and the individual may be described as being high or low in, for example, sociability. The main trait theorists are Allport, Cattell, and Eysenck, all of whom agree on a hierarchical structure to personality which involves traits and groups of linked traits termed 'types' by Eysenck (Pervin, 1989).

Cattell describes three kinds of trait; ability, temperament, and dynamic, and these involve skills, emotional style, and life goals respectively. Cattell also distinguished between surface and source traits, the source trait being a basic structure of personality. Using a factor analytic approach to reduce a large number of variables to just sixteen, Cattell developed a questionnaire known as The Sixteen Personality Factor Questionnaire, or 16PF.

6.5 Measuring Personality

Introversion-Extraversion is the personality dimension most commonly measured in computing research, and this is done using a variety of instruments. These include the Eysenck Personality Questionnaire (EPQ) and the Myers Briggs Type Indicator (MBTI), both of which directly assess introversion/extraversion. Other instruments include the California Psychological Inventory (CPI), Thurstone Temperament Schedule (TTS), and Cattell's Sixteen Personality Factor Questionnaire (16PF) which assess the construct indirectly by measuring traits contributing to the introverted or extroverted personality type.

Jung defined the construct of introversion-extraversion in 1921. Extroverts are said to have an interest in people and the outside world. They are 'outgoing, sociable, talkative, lively, expressive, enthusiastic, impulsive, understandable, accessible, with low tolerance for slower routine tasks" (Pocius, p.105). On the other hand, introverts are more involved with their inner world and have an interest in concepts and ideas. They are "quiet, reflective, introspective, reserved, questioning, subtle and impenetrable" (Pocius, 1991, p.105). Individuals lie somewhere on a continuum between the two extremes.

An individual would be placed somewhere on a continuum from introversion to extraversion depending on their score on one of these tests (Eysenck, 1964) Other studies have reported introversion as an important factor in computer use. Barnes (1974) described computer programmers as 'introverted, youthful, single males', while Cross (1972) found a similar group to be 'interested in technology but not in social interaction'. In a study by McClure and Mears (1984) video game users displayed similar characteristics to programmers, the brighter subjects being those most comfortable with computers.

6.6 Personality and Computer-related attitudes

6.6.1 Subjects

Subjects were those of Cohort 2

6.6.2 Materials/Procedure

Personality was measured using the 16PF5 version of Cattell's personality questionnaire (see appendix E for a list of the 16 factors). Higher scores indicate higher levels of the personality factor. The test consists of a paper and pencil questionnaire of 185 items and takes between 35 and 50 minutes to complete. The 16PF questionnaire was first developed by Cattell in 1949 and has been widely used in a variety of settings including research, assessment, clinical, and educational situations. It is one of the most commonly used personality questionnaires in the UK as it provides a depth of analysis and comprehensive assessment (Lord, 1996). Revisions have taken place (1956, 1962,1968) and the latest began in 1988. This was undertaken in order to update the questionnaire items and improve the form, while at the same time re-standardising using a current population. 76% of the items were from the existing 16PF edition, and the new, revised version, known as the 16PF5, was found to have similar validity as previous forms of the test (Cattell and Cattell, 1995).

The test was chosen as it includes the Higher Order Factor, Extraversion – Introversion. In computing research Jungian typology is the most commonly used, and there is therefore an empirical basis for using a personality inventory with this dimension. Charlton and Birkett (1998) used the 16PF to distinguish traits in undergraduates. The 16PF5 test has fewer items than some other inventories and therefore takes less time to complete. This was an important consideration as the subjects completed a survey questionnaire (Q2) at the same time.

The Higher Order Factors of the scale are used here. These are:

- Extraversion

Factors loading on to this Higher Order Factor are Warmth, Liveliness, Social Boldness (all positive loadings)

Privateness and self-reliance (negative loadings)

- Anxiety

Factors loading on to this Higher Order Factor are Vigilance, Apprehension, Tension (positive loadings)

Emotional stability (negative loading)

- Tough-mindedness

Factors loading on to this Higher Order Factor are Warmth, Sensitivity, Abstractedness, and Openness to change (all negative loadings)

- Independence

Factors loading on to this Higher Order Factor are Dominance, Social Boldness, Vigilance, Openness to change (all positive loadings)

- Self-Control

Factors loading on to this Higher Order Factor are Liveliness and Perfectionism (positive loadings)

Liveliness and Abstractedness (negative loadings)

Subjects also completed a questionnaire (Q2) and from this attitude scores were taken (see appendix D for details of the questionnaire)

6.6.3 Hypothesis

Positive attitudes towards computers will be associated with low scores on the Higher Order Extraversion dimension of personality.

6.6.4 Analysis

Pearson product-moment correlations were calculated for the higher order factors of the 16PF5 (Extraversion, Anxiety, Tough-mindedness, Independence, Self-Control) and the three Computer-Related Attitudes, Computer Anxiety, Perceived Usefulness, and Indifference towards computers.

The results showed that there was a relationship between the personality factor Extraversion and the computer-related attitude Computer Anxiety ($r = 0.08$, $p<0.04$), and Perceived Usefulness ($r = -0.08$, $p< 0.05$).

There was also a relationship between the personality factor Anxiety and the computer-related attitude Computer anxiety ($r = 0.09$, $p<0.02$).

Another relationship was found between the personality factor Tough - Mindedness and the computer-related attitude Indifference towards computers ($r = 0.09$, $p<0.02$).

A relationship was found between the personality factor Independence and the computer-related attitudes Computer Anxiety ($r = -0.11$, $p<0.003$) and Perceived Usefulness ($r = -0.10$, $p<0.01$).

The last personality factor, Self-Control, was found to have a relationship with the computer-related attitude Indifference towards computers ($r = 0.10$, $p<0.008$).

6.6.5 Discussion

The results show a relationship between personality and computer-related attitudes. Although the relationships shown are significant they are not strong.

6.6.6 Further analysis

As there was some evidence of a relationship between personality and computer-related attitudes a further study was undertaken.

6.6.6.1 Subjects

Subjects were drawn from Cohort 2.

Higher Order Factor Extraversion

Group 1 (High extraversion scores) consisted of 122 subjects with an extraversion score at least 1 S.D. above the mean, drawn from the sample of 657 subjects. Group 2 (low extraversion scores) consisted of 114 subjects with an extraversion score at least 1 S.D. below the mean, drawn from the sample of 657 subjects. The mean for the sample of 657 subjects was 6.71 and the standard deviation was 1.73.

Higher Order Factor Anxiety

Group 1 (High anxiety scores) consisted of 113 subjects with an anxiety score at least 1 S.D. above the mean, drawn from the sample of 657 subjects.
Group 2 (low anxiety scores) consisted of 114 subjects with an anxiety score at least 1 S.D. below the mean, drawn from the sample of 657 subjects.
The mean for the sample of 657 subjects was 5.87 and the standard deviation was 2.02.

Higher Order Factor Tough-mindedness

Group 1 (High tough-mindedness scores) consisted of 113 subjects with a tough-mindedness score at least 1 S.D. above the mean, drawn from the sample of 657 subjects.
Group 2 (low tough-mindedness scores) consisted of 105 subjects with a tough-mindedness score at least 1 S.D. below the mean, drawn from the sample of 657 subjects.

The mean for the sample of 657 subjects was 4.08 and the standard deviation was 1.83.

Higher Order Factor Independence

Group 1 (High independence scores) consisted of 111 subjects with an independence score at least 1 S.D. above the mean, drawn from the sample of 657 subjects.

Group 2 (low independence scores) consisted of 105 subjects with an independence score at least 1 S.D. below the mean, drawn from the sample of 657 subjects.

The mean for the sample of 657 subjects was 5.83 and the standard deviation was 1.70.

Higher Order Factor Self-Control

Group 1 (High self control scores) consisted of 116 subjects with a self-control score at least 1 standard deviation above the mean, drawn from the sample of 657 subjects.

Group 2 (low self-control scores) consisted of 115 subjects with a self-control score at least 1 standard deviation below the mean, drawn from the sample of 657 subjects.

The mean for the sample of 657 subjects was 3.84 and the standard deviation was 1.74.

6.6.6.2 Analysis

A t test was calculated on the computer-related attitude scores for the two groups, high and low in each of the Higher Order Factors of the 16PF5.

Table 6.1 Means and SD for Higher Order Factor groups

Higher Order Factor	Factor	Mean	SD
Extraversion	Perceived Usefulness	High -0.09 Low 0.17	0.76 1.0
Anxiety	Computer Anxiety	High 0.15 Low –0.11	1.0 0.91
Independence	Computer Anxiety	High –0.19 Low 0.10	0.95 0.98
Independence	Perceived Usefulness	High –0.15 Low 0.21	1.17 0.85
Self Control	Indifference towards computers	High 0.12 Low –0.14	0.85 1.05

6.6.6.3 Results

The results show that personality plays a part in computer-related attitudes. Introverts had a more positive attitude towards the perceived usefulness of computers [t (233) =-2.24, $p<0.02$]. This may be attributable to the qualities of computers that appeal to the introverted personality. Introverts are more interested in technology than in people (Cross, 1972) and they enjoy the solitude of working alone, interacting with a machine where they have more control of the situation than they would have interacting with others.

Subjects with a high score in the higher order factor anxiety display a greater degree of computer anxiety [t (225) =1.98, p<0.04]. Farina, Arce, Sobral and Carames (1991) and Mahar, Henderson and Deane (1997) also found that trait anxiety influenced anxiety towards computers.

Independence is also a factor in computer anxiety, those with a low level of independence being more computer anxious [t (214) =2.21, p<0.02]. As individuals with a low level of independence are characterised as deferential, timid, trusting and more at ease with the familiar than innovations, it is perhaps unsurprising that they display computer anxiety. Perceived usefulness is also higher for individuals low in independence and this may be a reflection of their accommodating nature [t (214) =2.56, p<0.01]. They may be more likely to give positive answers to questions about the usefulness of learning about computers when in an educational setting where they know that using computers will be expected of them.

The last higher order factor, Self-Control, influences Factor 3, Indifference towards computers. Individuals with high scores for Self-control display more indifference [t (229) =-2.08, p<0.04]. There is no obvious explanation for this result.

6.7 Gender and personality

Feingold (1994) conducted four meta-analyses of studies on gender differences in personality. He concluded that males were more assertive, less anxious, less trusting and less tender-minded than females. Females were found to be more extraverted than males.

Whitley (1996b) found evidence that psychological type has more influence on computer-related behaviour for females. Introverted females spent more time in recreational pursuits on computers and females with a 'thinking' preference spent more time working on computers than males with the same preference. These results may be explained by the view that personality is a more salient feature in 'weak' situations; that is situations where social norms are either non-existent or not strongly established (Snyder and Ickes, 1985). There may be stronger pressures to adhere to norms for males than there are for females and thus there are fewer constraints on attitudes and behaviour towards computers for females. Further investigation was therefore undertaken to discover if gender and psychological type interacted in e-mail behaviour. Before the e-mail use and gender study was undertaken, a small study was carried out in order to confirm the findings of Feingold's meta-analysis that personality differs between males and females. It was also useful to know along which of the dimensions males and females differed.

6.7.1 Gender differences in personality scores

6.7.1.1 Subjects

237 males from Cohort 2 formed group 1. The second group consisted of 237 females systematically selected from the 420 females in the sample.

6.7.1.2 Materials

Subjects completed the 16PF5 version of Cattell's personality questionnaire.

6.7.1.3 Hypotheses

1. There will be gender differences in the 16 personality traits measured.
2. There will be gender differences in the Higher Order Factors of the 16PF5.

6.7.1.4 Analysis

A t test was calculated on the male and female scores for the 16 personality traits measured as well as the higher order factors.

6.7.1.5 Discussion

The results show that the majority of the 16 personality traits measured reveal gender differences. There are also gender differences for all of the higher order factors. The results can be found at Appendix F

6.8 E-mail use and gender

6.8.1 Subjects

54 non-users of e-mail drawn from the original sample of 657 subjects compared with 54 subjects who sent more than 100 e-mail messages, systematically selected from cohort 2. The non-user group consisted of 30 females and 24 males while the heavy user group consisted of 25 females and 29 males.

6.8.2 Materials/Procedure

Scores for the16PF5 personality questionnaire, number of e-mail messages sent obtained from log of e-mail traffic in the sample.
2 way ANOVAs were calculated on the Higher Order Factor scores to discover if there was any interaction between e-mail use, personality factors and gender.

Table 6.2 Means and SD for Higher Order Factor, Tough-Mindedness for Males and Females, Heavy and Non-users of e-mail

Group	Mean	S.D.
Female Heavy Users	4.4	1.57
Male Heavy Users	2.85	2.14
Female Non-Users	3.78	1.71
Male Non-Users	4.71	1.80

The only Higher Order Factor with a significant result was Tough-mindedness as a dependent variable, and heavy versus non user interacting with gender as the independent variable [$F(1,104) = 4.27$, $p < 0.04$].

6.8.3 Discussion

The result is surprising as females are generally regarded as more tender-minded than males. The female heavy e-mail users were therefore a distinct group of creative, impulsive, risk takers who embraced change.

Katz and Offir (1991) found in their study that teachers who were more likely to use computers were risk takers. It appears that personality factors for females do have some impact on e-mail use.

6.9 The stereotypical heavy computer user – true or not for e-mail?

6.9.1 Subjects

54 non-users of e-mail formed Group 1. Systematic selection was carried out choosing approximately every fourth subject from an alphabetical list of 194 non-users. 54 subjects with a total of more than 100 e-mail messages sent formed the second group.

6.9.2 Materials/Procedure

E-mail use was measured using a log of all e-mail traffic in the sample over a period of approximately 22 weeks. The number of messages sent was the measure of use. This measure was chosen as some of the subjects received e-mail but never accessed it and so it was likely to be a more accurate reflection of use than a total of e-mail usage.

Personality was measured using the 16PF5 version of Cattell's personality questionnaire. Subjects also completed a questionnaire (Q2, found at Appendix D) and from this demographic details (age, sex) and computer knowledge and attitude scores were taken.

6.9.3 Hypothesis

Heavy users of e-mail will be male, young, intelligent, and introverted. They will have more computer experience and have more positive attitudes towards computers.

Table 6.3 Means and SDs for Group 1, non-users and Group 2 heavy users of e-mail.

VARIABLE	MEAN	SD
Age	Gp1 19.33 Gp 2 17.74	Gp1 3.9 Gp2 0 .87
Extraversion	Gp1 7.11 Gp2 6.46	Gp1 1.65 Gp2 1.77
Reasoning Score on 16PF5	Gp1 6.94 Gp2 7.35	Gp1 1.70 Gp2 1.54
Knowledge Total	Gp1 9.48 Gp2 12.35	Gp1 3.74 Gp2 3.57
Software packages	Gp1 2.0 Gp2 3.6	Gp1 2.3 Gp2 2.6
Computer Anxiety	Gp1 0.24 Gp2 –0.74	Gp1 0.92 Gp2 0.91
Perceived Usefulness	Gp1 –0.28 Gp2 0.04	Gp1 0.64 Gp2 0.98

Table 6.4 Males and females in Group 1 heavy users and Group 2 non-users of e-mail

Heavy users		Non-users	
Male	29	Male	19
Female	25	Female	35

6.9.4 Results

Heavy and non-users were contrasted using between groups t tests and the following results were found. Age was significantly different between the groups [t (106) =-2.86, p<0.005]. The extraversion measure was also significantly different [t (106) =-1.99, p<0.04]. The groups did not differ on the reasoning score. Computer experience was significant, both for knowledge [t (106) =-4.0, p<0.001] and number of software packages [t (106) =3.29, p<0.001]. Factor 1, Computer Anxiety [t (106) = -5.64, p<0.001] and Factor 2, Perceived Usefulness also showed a significant difference [t (106) =2.0, p<0.04]. When sex was the dependent variable a Fisher Exact test was used and a significant result was found (p<0.04, one tailed).

6.9.5 Discussion

The stereotype of a heavy computer user (young, male, intelligent, introverted) was partly supported in this study. Members of the high user group were younger and more introverted. Livingood (1995) argues that e-mail is ideal for the introverted user as it allows them time to compose replies, the ability to read and respond to e-mail when they want to, and to avoid interruptions from extroverts in synchronous communication situations. Younger students may be more likely to adopt new technology according to Gist, Rosen and Schwoerer (1988). As expected, the heavy user group had significantly more males. The only measure for intelligence in this study was the reasoning score on the 16PF5 Personality

Test. As the sample consisted of first year university students we would not expect there to be great variation in the scores for this factor. The heavy user group had more computer experience as measured by their computer knowledge total and the number of software packages they had been trained for. The heavy user group also had more positive computer-related attitudes.

6.10 Conclusions

Personality factors were found to have an impact on computer-related attitudes. However, the relationship, although significant, was not particularly strong. Significant results of this magnitude are not unusual in this type of research. Pocius (1991) cites several studies with similar correlation coefficients.
Despite gender differences in almost all of the 16 personality factors, and all of the Higher Order Factors, the only Higher Order Factor showing an interaction with gender was Tough-mindedness. This factor was therefore predictive of heavy e-mail use in females.

The stereotype of a heavy computer user, or nerd, was confirmed in our group of heavy users on most of the features. The class consisted of a much higher proportion of females than males, and interaction between females would be expected to take place to a greater degree. However, the heavy user group was male dominated, supporting the stereotype of the heavy computer user despite the computer use measure being a communication medium. Our heavy e-mail users were more experienced both in their knowledge of computers and in their training for various computer packages. Heavy e-mail users were found to be heavy users of computers for other applications by Mitra et al (1999). There was no significant result for intelligence but this was at least partly due to the measure used. The reasoning score on the 16PF5 is not a comprehensive test of intelligence.

Since computing has widened to a more diverse group of users, less expertise is required to use computers, and computer mediated communication is available to most, it is perhaps surprising that some of the original features of the stereotype are found in our heavy users. Where our group of heavy e-mail users appear to differ most from the stereotypical computer "nerd" of Weizenbaum (1976) is on interaction with others. However, the original stereotype was based on computing science students or professional programmers who found it difficult to communicate directly with others, preferring to use computers for interaction. As our measure of heavy use was e-mail, that aspect of the stereotype may still be salient in our sample.

6.11 Transition to contextual influences

Before moving on to contextual influences, the overall influence of the individual differences examined in the thesis needs to be address, and the reasons for the change of focus explained. While significant differences were found in most of the measures, and a profile of a heavy e-mail user, similar in many respects to the stereotypical heavy computer user of the past, was developed, nevertheless some comment has to be made about the contribution of individual differences.

Many criticisms have been levelled at individual differences research in CMC. Rudy (1996) argued that e-mail studies of individual differences lacked generality and were guilty of ignoring important contextual influences. He cautioned researchers to restrict their measures to "well established psychological characteristics" while realising that they would not provide a comprehensive model of media choice when other, contextual issues were not included. Whitley (1996b) points to inconsistent results in studies of personality and attitudes due to methodological problems such as small sample sizes and the population under investigation often being students on computer courses.

In this study some of these problems have been avoided. The samples were drawn from large undergraduate Psychology classes containing students from Arts, Science and Social Science faculties studying a wide range of subjects alongside Psychology. The sample sizes were large and no one single measure was expected to give a comprehensive insight into e-mail adoption and use. Measures included demographic factors such as age and gender, as well as computer experience, computer related attitudes and personality.

Computer experience, as measured by computer knowledge, was shown to influence computer-related attitudes. The strongest relationship was between experience and Computer Anxiety, those with high levels of experience displaying lower levels of anxiety. Experience was also a predictor of e-mail use: those with high levels of experience being heavy users of e-mail.

A relationship was found between computer-related attitudes and e-mail use. Those with more positive attitudes were heavier e-mail users. However the coefficients were relatively small, computer anxiety having the strongest relationship but still only explaining around 7% of the variance.

Gender differences were found in computer experience and for computer anxiety, females having less experience and more anxiety. However, controlling for experience meant that these differences disappeared. Results of correlations, explaining 59% of the variance for males and 50% for females, showed that computer experience is predictive of the computer-related attitude, Computer Anxiety in both males and females. However, we have to be aware that correlational research does not allow us to come to causal conclusions about relationships, and there may be alternative explanations to be tested. E-mail use did not differ significantly between males and females.

A relationship was also found between personality factors and computer-related attitudes. Gender differences were found for all of the 16 personality factors measured, and an interaction between the Higher Order Factor Tough Mindedness and e-mail use, showing that personality is more indicative of computer-related behaviour in females. Whitley (1996b) explains this in terms of the different sex role norms for males and females. Behaviour will be influenced by personality in what he refers to as "weak situations" where social norms are less strong. Computer norms are stronger for males and thus females are less constrained, allowing personality to influence computer behaviour. The profile developed of a heavy e-mail user had some similarities with the stereotypical heavy computer user or "nerd" of the early days of computing

Despite finding evidence that individual differences influence computer-related attitudes and e-mail use, the effects were fairly marginal and in most cases explained only a small amount of the variance. The reliance on individual differences as an explanation for adoption and use of e-mail was weakened by the longitudinal nature of this study. As accessibility rose over the years covered in the study, the almost universal adoption of e-mail now shows that individual differences may not be as influential as they were believed to be in the past, except perhaps in the early stages of a new technology.

Individual difference studies fail to take into account social context, a failing pointed out by several authors (Mitra et al, 2000, Rudy1996, Wilson, 2000, Selwyn, 2000). A paradoxical drop in e-mail use at a time when access was rising warranted a closer look at the e-mail situations since an e-mail community had formed in earlier cohorts.

Chapter 7: COHORT 2, 1994/95: SOCIAL / SITUATIONAL FACTORS IN THE ADOPTION AND USE OF E-MAIL

7.1 Aims of the chapter

As we have found in previous chapters, individual differences do play a part in the adoption and use of e-mail. Previous computer experience is the strongest predictor and computer attitudes, especially computer anxiety, are involved. Results showed that personality traits were related to attitudes towards computers, and heavy users of e-mail were found to be more introverted than non-users. Features of the stereotypical heavy computer user of the past were found in heavy e-mail users. However, communication does not take place in a vacuum, it is a process, taking place in a continuously changing cultural and social environment. Context is therefore important, whether that is in terms of the situation in which the communication is occurring, where norms and social influences play a part, or in the purpose of the interaction, another factor that has to be considered.

This chapter will address the e-mail situation of cohort 2 whose experience of e-mail took place at a time when the technology was novel, when few others had open access to an easy to use system, and whose e-mail use was mainly confined to the particular setting of the Psychology computer laboratories. Evidence will be presented of how the network formed in the cohort and examination of e-mail messages will provide information about style and content as well as the formation of norms within the group. The chapter will go on to discuss the part played by humour and playfulness in the evolving e-mail community.

7.2 Social influences

When a communication medium is introduced it will only be used under certain conditions. Some of these apply to the system itself, such as ease of use and availability. However social influences may also affect adoption. If a network of users is not formed then the system will not be a success as there will not be a large enough number of users to make it viable, either in terms of cost or in terms of usefulness. "Critical mass" theory (Culnan 1985, Markus, 1990, and Rice and Shook, 1988) addresses this aspect of social influence on use. Reaching critical mass is often dependent on an organisation encouraging use of a new technology, either as a direct instruction to use or by establishing a culture of use within its members.

The choice of media in communication is not always a matter of individual preference, but may be affected by many factors. Group behaviour is one such influence and, for instance, Fulk, Schmidt, and Steinfield (1990) Social Influence Model of Technology Use predicts similar patterns of use across and within groups. Interaction and social support among members of the group act to influence choices.

Groups within organisations can be formal or informal. Formal groups include all within the unit, while informal groups develop within and across formal groups via voluntary association. Communication between group members may be task oriented or social, or a mixture of both elements.

Since the early studies of five person simple structures (such as Guetzgow, 1965), communication network analysis has been an important part of organisational communication research. Many levels of analysis are possible, including individual, group, inter-group, and organisational structure, as well as inter organisational communication. The focus here is on relationships among two or more members of an organisation.

7.3 Networks

Fulk and Boyd (1991) discuss features of networks and identify the five most commonly studied properties.

1. Properties of links

- Whether the link is direct or indirect.
- Whether communication is equal between levels of a hierarchy.
- Agreement among members about their communication ties.

2. Roles

- Categories of group membership e.g. linker (gatekeeper etc.) or isolate (has few ties)

3. Position

- Range of ties in network and centrality of members.

4. Content

- Differences in networks depending on which type of information is exchanged (social/task based)

5. Properties of network

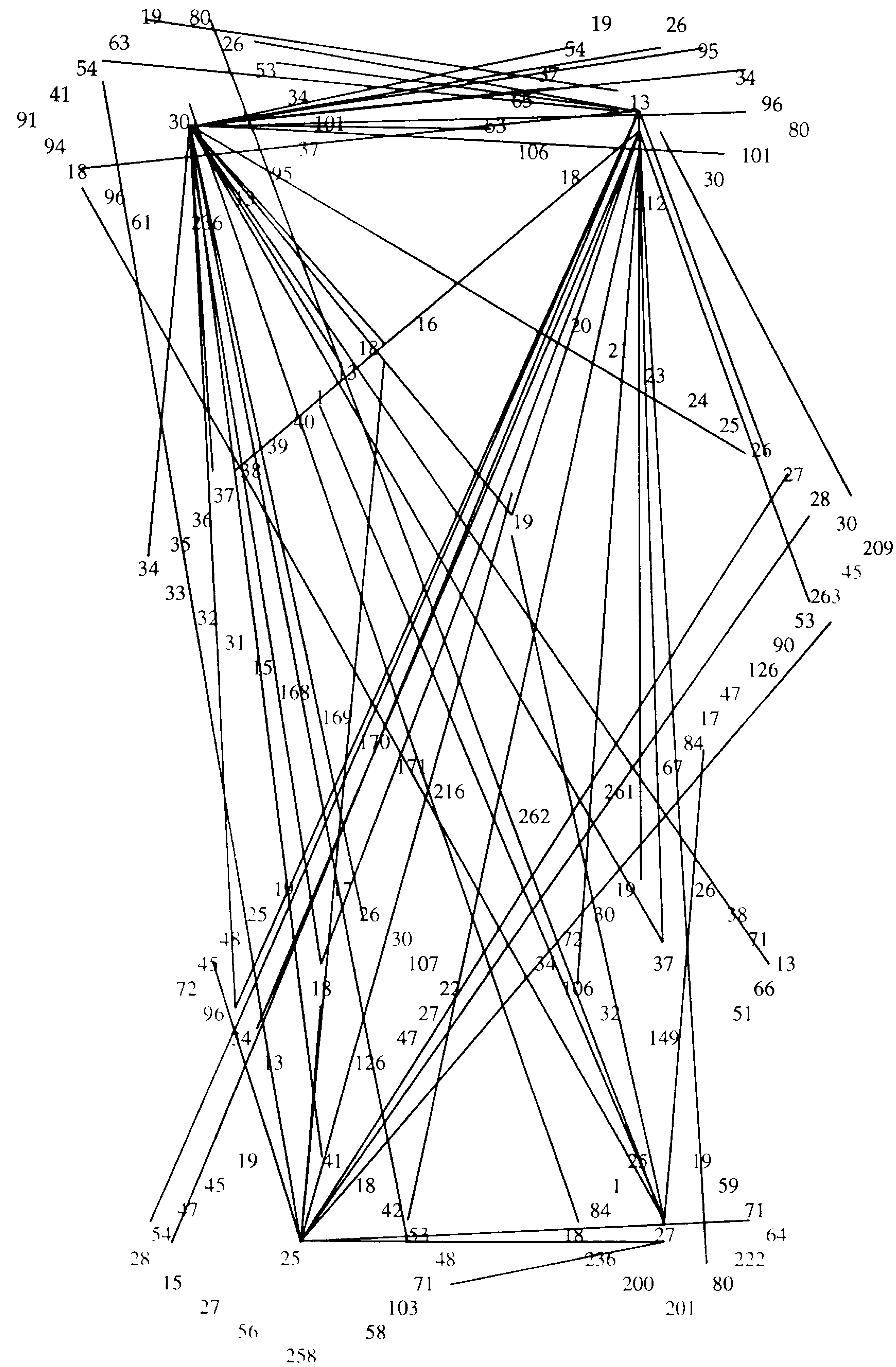
- Connectedness, or interaction among members.
- Density, or amount of linkage.
- How easy it is to reach a member without going through intermediaries.
- Openness, or external linkage.

The authors discuss how network analysis is useful in studies of media choice. For example, media patterns in cliques can be compared within and across groups. Similar patterns within but not across groups support theories of social influence, where similarity of use across groups would be indicative of task factors as an explanation.

7.4 Network formation in Cohort 2 – evidence from system log

The data collected was unsuitable for a full network analysis, especially since the first term's system log was not available and this was presumably when the majority of initial links were formed. The network analysis used here is relational, that is it identifies clique groups. Figure 7.1 overleaf is a representation of a small section of data taken in snapshots of four-day periods, bi-monthly, for three months (January to May). The figure shows an example of 7 clique groups of varying sizes, although these are only the members of the clique contacted on the days chosen for the study. The numbers are identifiers and the higher the number the later the person appeared in the log on the days sampled. There is no indication of the strength of the links in the figure but the number of exchanges can be seen in the full data set at Appendix G. Links are shown between clique groups, and despite the fact that this is a very small section of the class it shows that cliques had formed and expanded beyond small groups to form a larger network.

Fig.7.1 Example of 7 Clique Groups in Cohort 2 Network



7.5 Social Networks

Networks are not just links however. They are also social networks as they connect people. Humans actively seek interaction with others for social support and friendship. People are attracted to others with similar interests, beliefs and attitudes (Festinger, 1954). Choosing friends not only involves similarity and support for personal views, but is also dependent on there being potential partners to choose from (Miell and Dallos, 1996).

However, people differ in the number of friendships they need and decisions to expand their network of friends may depend on the number of existing friendships they have. Individuals have a choice whether to accept or refuse an approach and will respond in either a positive or negative way depending on their need (Zeggelink, 1995). Although there is an element of choice in friendship formation, some authors argue that the choice is not always deliberate and other factors such as proximity are involved. For instance Murstein (1977) mentions the "forced interaction" of college life where friends are made with those nearby in an almost effortless manner. Social networks in a student population are also closely related to social integration and retention. Thomas (2000) discovered that friendship with other students provided social and academic resources, especially when the network ties extended beyond the immediate peer group. Thomas also points out that there is an optimal size for networks as an excess of connections can be detrimental to academic performance.

Since CMC evolved, computer supported networks have formed and provided other media in which to form friendships (such as lists, chatrooms, e-mail, MUDs and MOOs). Robinson, Kestnbaum, Neustadtl, and Alvarez (2000) concluded that individuals with online relationships might have more active social lives than those with no access to CMC might have. As networked computers become more and more common in the home some of the conclusions in the early studies have to be revisited.

Early e-mail studies focussed on the workplace where the majority of exchanges took place. Despite the primary purpose of work-related e-mail in these situations, the use of e-mail for personal communication, support and enjoyment in these studies was apparent (Parks and Floyd, 1996). Since then the Internet has become a part of everyday life for an increasing number of people, within the workplace and at home. Networked home computers are used mainly for social interaction (Moore, 2000, McKenna, Green and Gleason, 2002). Opinions regarding the social consequences of this new communication medium, and its effect on interpersonal communication, vary between researchers.

Much of the early research was based on communication bandwidth and the belief that reduced social cues must have a negative effect on social interaction (for example Kiesler and Sproull, 1992). Lack of cues and anonymity were cited as the reason for the perceived difficulty of forming relationships online and relationships in CMC were seen as "casual, temporary, false, and lacking in deep (or any) emotion" (Chenault, 1998). Perceived anonymity and the informal nature of e-mail is a possible explanation for "flaming" (emotional online exchanges or conflicts). In a study by Castella, Abad, Alonso and Silla (2000) uninhibited behaviour, including flaming, was found to be more prevalent in CMC than in face-to-face or video-conferencing. However, the authors concluded that context and personality factors have to be taken into account in order to explain these differences. Extraversion and familiarity of group members were two of the variables said to affect communication behaviour. An assumption was made that in order for relationships to be formed online certain conditions had to be met. These include factors such as physical nearness of communication partners, some information about their physical appearance, frequent exchanges, and information about group membership (Parks and Roberts, 1998). There has been some criticism of this view due to the nature of the tasks involved in some studies as these took place in laboratory settings, not real life situations (Parks and Roberts, 1998). According to Lea and Spears (1995) these assumptions may also be due to the formulation of theories before CMC technology became so widespread. Computer scientists tended to adopt this mainly quantitative view of electronic communication, while more recently social scientists have taken a wider perspective.

Tyler (2002) argues that the Internet has had less effect on social life than has been suggested. While people have a wider network of contacts and the amount of interpersonal communication undoubtedly increased, Tyler also reported drawbacks such as the reduction in high quality communication media such as face-to-face contact and telephone. Tyler concludes that people are basically doing the same thing (communicating) but they are using different means to achieve this, actively interacting with technology and expanding their range of communication media. Walther (1996) found that the differences between face-to-face and computer mediated communication reduced over time as lack of cues are compensated for by increasing the frequency of interaction. He argues that CMC may be just as effective as face-to-face communication, although not as efficient due to the time taken to achieve similar tasks.

Walther (1996) developed the Hyperpersonal Model. He argues that CMC can be a more social medium than for example face-to-face interaction. This is due to the medium giving users the time to create an impression of themselves that they want the communication partner to respond to positively. Users who are unknown to each other before the interaction form a view of the communication partner based entirely on what is presented to them in the CMC exchange. Communication can be controlled and planned and disclosure increased due to the anonymity of the medium.

Social Identity Deindividuation or "SIDE" theory (Lea and Spears 1995) also takes an optimistic view of personal relationship formation in CMC. Because of the lack of cues and knowledge about the communication partner, any information about personality is given more weight and over attribution occurs.

Parks and Floyd (1996) found that 98% of those who had formed relationships through newsgroups online also used direct e-mail as well as other media such as telephone (35.3%), mail (28.4%), and face-to-face (33.3%). In other words, the researcher concluded that relationships could be formed via computer but they are continued in interactions using various media.

In a study of couples meeting online, Baker (2002) concluded that there were several factors involved in continued success in relationships founded online. Shared interest and meeting in an online situation that supported a common interest was seen as important. Before meeting offline it is better to have a great deal of communication between partners, but this should not be of a highly intimate nature. Being able to work through problems together was also deemed to be important as well as being able to put aside difficulties allowing closeness to develop.

In a more recent study McKenna, Green and Gleason (2002) also found that those who meet online also interact in other ways. 63% of their sample used telephone, 56% exchanged pictures of themselves, 54% communicated by letter, and 54% met face-to-face, averaging eight meetings. Face-to-face meetings were unlikely to take place in those who had not been in contact via telephone. They also concluded that relationships were formed online that may not have been possible in other situations as features of the Internet, such as anonymity, lead to personal details being revealed more readily. A study by Joinson (2001) confirmed that self-disclosure is more likely in CMC than in face-to-face interactions.

7.6 Subcultures

Another form of social network is a subculture, sometimes referred to as an online or "virtual" community. Since the arrival of computers, subcultures have formed. These consist of groups of people with something in common – interaction with and between computers (Serpentelli, 1995).

The first of these subcultures were the hackers whose interaction with computers was based on technical expertise in programming. When networked computers became available, the same group used them as a means of communication with others with similar interests.

Schofield (1995) describes what might be considered to be a subculture in a school in the U.S.A. Computing Science classes were available but boys were over-represented in the subject. As well as formal classes in computing, a room was set aside for use by 'gifted children', with no compulsion for anyone to use the room. The majority of software available in this room was games (not arcade games although these were sometimes brought in and used illegally). The users were mainly boys who used the computer room as a social facility, for enjoyment while there were few girls who were motivated enough to use the computers. Those who did were isolated, not part of the social group and they largely used the computers for word processing rather than for pleasure. Schofield explains the discrepancy between males and females both in computing science classes and in the informal setting of the computer room in several ways. The school had few computing role models for girls as males formed the majority of computing teachers. The course materials were also male-oriented as were the games available in the computer room. She concluded that cultural norms excluded females from the computing subculture of the school rather than inherent gender differences.

Hellerstein (1985) surveyed 236 CMC users at the University of Massachusetts (Umass). She divided them into heavy users and light users based on their weekly contact with computers. Heavy users were found to use computer communication to form and maintain friendships. Light users also formed friendships but they did this by other means of communication. Heavy users were therefore choosing to use the computer for social purposes. Observation of the subculture at Umass revealed several features. Nicknames and special greetings were created by members, and used on computer and in face-to-face encounters. Norms of computer behaviour were established and a paralanguage developed. The group was also found to use computers for long periods of time. Being part of this subculture sometimes had an affect on academic work as members spent a great deal of time online, choosing to use computer to interact rather than other forms of communication. Members also became annoyed if the system was unavailable and tended to check for e-mail very often.

In some ways the subcultures of computer users in organisations resemble the 'virtual communities' found in other communication systems such as Internet Relay Chat (a synchronous system) and the asynchronous MUDs and MOOs.

Erickson (2000) defines 'community' in the following ways. Members of a community have shared ideas or interests and membership may be restricted to individuals of a specified gender, ethnic group or location. The members form personal relationships but know only those they are in contact with regularly rather than the whole group. The community is usually long lasting and has a shared former history. While some of these are recognisable features of computing subcultures, others such as the shared history are not.

The development of friendships in the virtual communities of MUDs was the focus of a study by Utz (2000). She found that the lack of available cues in this form of communication was compensated for by the use of emoticons such as smileys, and scripts expressing feelings such as "smi iro", an abbreviated version of "smile ironically". These expressions of emotion are important in the creation of a sociable and friendly situation in which the formation of relationships can occur.

Internet Relay Chat (IRC) is another medium where relationships are formed online and a sense of 'community' can be formed. Like MUDs and MOOs the use of emoticons and nicknames is part of the culture. The use of nicknames is likened to the 'handles' used by truckers and others who subscribe to Citizens' Band Radio (Rheingold,1993, Turkle ,1995).

Danet, Reudenberg-Wright, and Rosenbaum-Tamari (1997) discuss what they refer to as 'playfulness' and 'flow' in synchronous CMC such as IRC.

The authors describe the features that contribute to the 'playfulness' found in the medium. These are the fast pace and transient nature where few messages are archived; the degree of immediate feedback involved; and the ease at which messages can be composed on a keyboard without the need for any writing materials. Playful behaviour is found everywhere in IRC with the use of rhymes, puns etc. Despite the humour, there is still a need for intelligence to be displayed by participants however.

Rheingold (1993) describes a bulletin board system he participated in called the Whole Earth 'Lectronic Link (WELL) where individuals communicated online, meeting people and forming friendships, discussing issues, or asking for help from others, in fact he describes it as a 'virtual community'.

7.7 How the network formed in Cohort 2 – evidence from mailboxes

There was no instruction given to the cohort group that e-mail was compulsory, only that they were encouraged to use it as a primary communication channel with staff members. The only task that was set was to reply to the Welcome message from the Laboratory Co-ordinator. Again there was no direct pressure to comply. Members of the group did however begin to use the medium, and as we will see this appeared to be mainly for social purposes and to meet others in the class. But how did this actually happen?

7.7.1 Subjects

Members of Cohort 2 were approached in the Psychology Computer labs and asked to give permission for their e-mail mailboxes to be accessed and the content copied. Assurances of total anonymity were given and permission was readily given by almost all of those approached. One hundred and forty members of the class signed the consent forms over the course of several days. Those who did not give permission explained that they did not keep messages or did not use e-mail. As the content of the mailboxes was copied manually from the subjects' home areas to a central file, it became obvious that the volume of data obtained was very large and no further permissions were sought.

7.7.2 Description of e-mail situation

In 1994/95 the computer laboratory was run in a similar way to the previous year but it had moved to a new, larger site with a suite of computer laboratories where first and second years were in separate, but adjoining, rooms. Laboratory 1 had a cluster of 30 computers for first year student use and Laboratory 2 a cluster of 16 computers for second year. The computers were in double booths set out in squares so that 2 students were sitting side by side and back-to back with another two. The computer laboratories were separated by a glass wall and had a connecting door. A glass sided room was central to the two laboratories and this is where the demonstrating staff had their office. Students from both years could be monitored from this room. The computers could be accessed between the hours of 9a.m. to 8p.m. Monday to Thursday, and 9a.m. to 5p.m. on Fridays. The e-mail system was Pegasus Mail, an easy to use package. It was possible to access lists of logged on users as well as class and staff lists.

In the training session at the beginning of the session the following instruction was given:

- how to log in and out of the system
- how to send and receive e-mails
- how to access menus
- how to reply to messages
- how to delete messages
- how to access user lists (class members and staff) using specified keys on the computer keyboard

Students were also instructed to read their e-mail at least once a week and use it as a primary means of contact with tutors and lecturers.

Observation of behaviour in the computer laboratories showed that despite sitting in adjacent booths, often e-mail was used as a means of communication between students.

7.7.3 Materials/Procedure

E-mail messages stored in electronic mailboxes were accessed and the contents copied to a separate file. Written permission was sought to access the mailboxes and students had several weeks in which to delete messages before they were collected. Assurances of anonymity were given to the donors. The e-mail was incoming to the students from members of the class (and others – these messages were not used in the study). The messages collected should therefore be representative, as the senders would not know their messages were being used in the study.

The messages contained in the donated mailboxes amounted to approximately 25,000, contained in 40 separate files, some of the messages being duplicates due to the number of multiple mails. This volume was too large for systematic categorisation of the full data set to take place. A subset of 750 messages, sampling all of the folders in order to ensure a spread of message senders, was obtained and the following categories were identified. As the content of the mailboxes was confidential and assurances had been made of anonymity, the researcher alone categorised the messages. The examples given later in this chapter were taken from the full dataset.

CATEGORY	%
Graphic/circulated message	3.4
Asking for or giving personal details	15.4
Conversation/ social exchange	43.6
Request or reply to request for response	8.4
Goodbye/leaving lab.	4.2
Reference to university work	3.0
Apology	0.4
Statement/giving information	4.0
Reference to e-mail	7.2
Expletive	0.6
Hello. How are you?	
Response to greeting	7.2
Reference to position in computer laboratory	1.0
Illness/ feeling	1.6

The vast majority of the messages were of a social and conversational nature although many were concerned with meeting others and finding out about them, especially physical details. The number of speculative messages may have been larger nearer the beginning of the session, although these were still being sent throughout the year. However, the mailboxes were not collected until the end and this meant many of the earlier messages had been deleted.

A request for students to CC their outgoing messages to the researcher was placed on the Psychology laboratory computers and this elicited a number of messages. These were collected but kept separate from the other data. This data was not used in the study.

7.7.4 Ethical Issues

In the past there have been studies where users' e-mail messages have been captured and used without their knowledge. For instance a study conducted by Danowski and Edison-Swift (1985) government workers' e-mail was monitored and analysed without them being informed. In other studies, such as McCormick and McCormick (1992) users were informed that their messages would be captured and they were given the opportunity to delete them within a given time span. Although the McCormick and McCormick study was more ethically sound than the Danowski and Edison-Swift investigation, the lack of confidentiality would have been likely to affect the representativeness of the data collected.

7.7.5 Multiple Mailers and Speculative Mailers

Multiple mailers (or linkers) were individuals in the class who took advantage of the class lists, and lists of logged on users, to instigate e-mail. Sometimes they e-mailed others with the same name, or e-mailed everyone with a particular name. A full set of e-mail addresses for the class was available if they were logged into a computer in the Psychology Computer laboratory. Although they could access the e-mail addresses easily, some effort was required typing these in to messages or to make up distribution lists for future use.

At other times linkers e-mailed all users who were logged on and tried to engage them in e-mail interaction. Again the addresses had to be typed in to the message individually from the list. From the evidence found in the donated mailboxes, using the list of logged on users to contact others in the class seems to have been the most common practice. The advantages of e-mailing those logged in were that there was a greater chance of a response, and it allowed a series of interactions to take place.

Example 1.

Hello, I just thought that i'd write to everyone in the lab coz I am bored so will someone please write back to me?

Example 2.

"Has anyone out there got an ounce of conversation to spare? I am afraid everyone I was talking to is leaving and I have nothing else to do at the moment due to the fact that wading through chapters of Gleitman is not very appealing. If you have a good heart go on and spare a poor sod some conversation. Please?"

Example 3.

Does anyone here live in Murano Street?

And some examples of the use of the "logged on" list.

Example 1.

I know your name because I pressed F4 – this produces a list of all users logged on. Neat. Eh!

Example 2.

Haha, I've just worked out who you are from using F4 and matching your matric no so xxxxx you seem to do a lot more talking on the E-mail that you do to peoples faces. Well, they've mostly all replied to me now..............

Another advantage of e-mailing logged in members of the class was the opportunity to discover their identity. It also gave the mailer information about the appearance of their communication partner and this seems to have been very important. There was a great deal of evidence in the mailboxes of mailers asking for details of where someone was sitting and what physical properties they had. The provision of information of self-descriptions shows that identity can be communicated in CMC, and humour can play a part in this process.

Here are some responses to a request for identity information.

Example1.

Well you should be able to recognise me by my stunning looks and build, but if that fails, I'm the fat b...... in the corner! Only joking, I'm sitting beside the window, facing the wall nearest the door. And you?

Example 2.

In the corner furthest away from the door next to the window. My hair is dark brown

Other members of the class e-mailed individuals in a speculative way, hoping for a response. This targeted e-mail may have had more likelihood of a reply, as e-mail sent to an individual is more personal. On the other hand, e-mailing a number of addresses simultaneously may bring in to play diffusion of responsibility with fewer recipients feeling that they have to respond. Barron and Yechiam (2002) found that requests for information sent to individual e-mail addresses received a higher number of responses than those sent to multiple recipients. Below are examples of e-mail sent to someone in the class unknown to the sender, as a sort of speculative opener.

Example 1.

"Hi Caroline,

I'm a bit bored at the moment so I'm calling up some people to have a chat with them. I'm Gordon Jxxxxxx and I'm studying Computing, Maths and Psychology. What do you think so far of Psychology? Oh well I'll sign of for the moment.
BYE.....

Stay hungry ...."

Example 2.

"Hi! My name is Jennifer and I thought I would write to you because I used to know a girl with the same name as you at my school. Are you sending messages to people too? No, don't answer that because then I'll probably find out that I'm the only mad person who is! Are you a first year student? What other subjects are you doing this year? I am doing Philosophy C - way beyond my intelligence, and Education which must be the most boring subject in the whole world! I have got that next, unfortunately, so I'll need to go soon.Bye. Write back if you have nothing better to do.

An interesting feature was the inclusion of references to e-mailing too little or too much, or being 'addicted' to e-mail showing that at least some of the class were avid e-mailers, spending a lot of time making contact with classmates. Some examples follow.

Example 1.

Believe it or not but there is someone out there who only writes to four people on E-mail. This is a sad affliction and as many if you may think she is quite a lonely character as such.

(Then gives name and e-mail address and asks people to write to her)

Example 2.

Aren't you sick of e-mail yet?
Nope

Example 3.

```
I'm an e-mail addict (one of the multiple mailers)
```

7.7.6 Characteristics of Multiple Mailers

A sub-section of the class was identified who could be described as instigators of the e-mail network. They contacted groups of people simultaneously, inviting responses. As well as the practice of e-mailing multiple recipients another way the network was established was though speculative e-mails to individuals. Unfortunately it was not possible to identify those who e-mailed individuals on a speculative basis as neither the log nor the mailboxes could accurately distinguish this category of e-mailer.

Multiple mailers were identified by examination of the e-mail log and also from the donated mailboxes. As the log was not complete there may be some in this category that have not shown up in the records available.
However, the group of multiple mailers identified did contact a good proportion of the class and received responses from many of their recipients thus promoting the use of e-mail in the class and the formation of a network of users.

7.7.6.1 Subjects

Group 1

32 subjects identified as multiple mailers. The group consisted of 13 Females and 19 Males.

Group 2

Cohort 2 minus Group 1 (multiple mailers). The group consisted of 407 Females and 218 Males.

An independent t test was carried out.

Table 7. 1 Means and Standard Deviations

VARIABLE	GROUP1	GROUP2
AGE	17.87 (SD 1.03)	19.71 (SD 4.91)
TRAIN	1.21 (SD 0.42)	1.33 (SD 0.49)
MAIL OUT	261.9 (SD 27.9)	21.59 (SD 70.26)
COMPUTER KNOWLEDGE	12.75 (SD 3.4)	9.83 (SD 3.86
COMPUTER ANXIETY	-0.63 (SD 0.97)	0.03 (SD 0.99)
PERCEIVED USEFULNESS	-0.12 (SD 1.01)	0.006 (SD 1.0)
INDIFFERENCE TOWARDS COMPUTERS	0.48 (SD 0.92)	-0.02 (SD 0.99)
EXTRAVERSION	6.71 (SD 1.95)	6.71 (SD 1.72)
ANXIETY	6.33 (SD 2.00)	5.84 (SD 2.00)
TOUGH MINDEDNESS	3.58 (SD 1.79)	4.10 (SD 1.82)
INDEPENDENCE	6.33 (SD 1.73)	5.80 (SD 1.69)
SELF CONTROL	3.50 (SD 1.61)	3.86 (SD 1.74)
REASONING	7.79 (SD 1.28)	7.03 (SD 1.59)
VIGILANCE	6.37 (SD 1.71)	5.24 (SD 1.95)
ABSTRACTEDNESS	7.47 (SD 2.10)	6.53 (SD 1.99)
WORD PROCESSING	0.78 (SD 0.42)	0.59 (SD 0.50)
PROGRAMMING	0.47 (SD 0.50)	0.28 (SD 0.49)

7.7.6.2 Results

There was no significant difference between the groups for training.

There was a significant difference for age [t (655)=-2.1, p<0.04]. The multiple mailers were younger.

There was a significant difference for e-mail sent by the groups [t (655)=14.5, p<0.001]. Multiple mailers sent more e-mail.

No significant differences were found for any of the Higher Order Factors of the 16PF5 personality test. However the Reasoning scores were significantly different [t (655) = 2.28, p < 0.02]. Multiple mailers had higher reasoning scores. There were also significant differences for both Vigilance [t (655) =3.19, p<0.001], and Abstractedness [t (655) =2.58, p<0.009]. Multiple mailers were therefore more trusting, easy going and attentive to detail.

Significant differences were found for word processing [t (655) =2.26, p<0.02] and programming [t (655) =2.27, p<0.02] but no significant differences for any of the other packages. More multiple mailers had word processing and programming skills than the remainder of the cohort.

Computer Anxiety was significantly different [t (655) = -3.66, p<0.005] as was Factor 3, Indifference Towards Computers, [t (655) =2.78, p<0.005]. Multiple mailers had less computer anxiety and more indifference towards computers.

7.7.6.3 Discussion

The multiple mailers differed from the whole group in several variables, as can be seen in the results above. Unsurprisingly they were more experienced with computers, shown in their computer knowledge scores and the fact that they were more skilled in word processing (and therefore familiar with text based computer use) and programming. In this they have something in common with the stereotypical heavy computer user. They also had a higher proportion of males, like the stereotype, despite the computer measure being a communication rating (e-mail sent), and were younger. Again, like the stereotype, they were more intelligent, as if we accept the 16PF5 reasoning score as some measure of that construct. Unlike the stereotype they were not introverted.

7.8 Conclusions

Both Cohort 1 and Cohort 2 had similar e-mail behaviour. The first group reported using e-mail most often for social purposes and examination of the second group's donated e-mail confirmed that they too used e-mail predominantly for communication of a social nature.

A proportion of the Cohort 1 continued to study Psychology and they were therefore in a laboratory adjacent to Cohort 2 in that year. As some of them were active e-mailers they continued to communicate in this way and included first year students in their e-mail (the address lists were available to users in both laboratories and each could access both classes as well as all students logged on, not just their own class). There was some evidence in the Cohort 2 mailboxes that there was interaction with students from the previous year. At least three of the prolific mailers from Cohort 1 e-mailed members of Cohort 2, sometimes in multiple mails. The 1994 class also contained 15% (140) students who were repeating the year. There was therefore ample opportunity for e-mail behaviour of the previous cohort to be transmitted to Cohort 2.

The evidence shows that the network in this cohort formed because of three main factors.

1. Motivation – the class was large and it was difficult to meet others. There was therefore some motivation for contacting similar others for social support and friendship.

2. The means – an easy to use e-mail system with open access was provided. List of e-mail addresses, easily accessible and including a valuable list of logged on users.

3. People to instigate the network – multiple mailers, simultaneously contacting others as well as speculative mailers, targetting individuals.

However, this is not the whole story as the content of the mailboxes revealed an even greater motivation for network formation and the emergence of what could be considered to be an e-mail subculture in at least a proportion of the cohort. The students used the e-mail for enjoyment and play and this will be discussed in the next section.

7.9 Playfulness

The "flow" construct of Csikszentmihalyi (1975) mentioned in chapter 2, concerns the pleasurable state achieved when an individual has an enjoyable experience. One of the characteristics present in "flow" is playfulness and Csikszentmihalyi (1990) concluded that this was particularly useful in the study of human-computer interactions.

Webster and Martocchio (1992) describe computer playfulness as "an individual's tendency to interact spontaneously, inventively, and imaginatively with microcomputers". They consider playfulness to be both a trait, and thus as an individual characteristic, stable across situations, and a state, influenced by the technology. Woszczynski, Roth and Segars (2002) suggest that both trait and state are involved in computer playfulness but conclude that there are difficulties measuring these constructs.

7.9.1 Why playfulness is important

The concept of play is important in the use of computers. In a study of naïve users, Carroll and Mack (1984) found, in their protocol analysis, that treating work as play leads to successful learning in adults. It seems that computers have the capacity to encourage playful interactions between user and machine if systems are simple and easy to use.

Early studies such as those by McGrath and Kelly (1986) and Levy (1983) found that high levels of playfulness result in positive interactions with computers and lead to increased involvement, more positive mood, and higher satisfaction. Computer skills are more likely to be acquired by those who interact with computers in a playful and exploratory way, according to Webster and Martocchio (1992). The authors also found that those high in computer anxiety were less playful with computers.

Playfulness was also found to be important by Anandarajan, Simmer and Igbaria (2000) in a study of Internet use. They found that individuals whose interactions with the web were more playful reported the Internet to be useful and displayed higher job satisfaction. As Internet users become more skilled their usage increases, although there is a danger in a work situation that time can be lost to non work-related use. However, Starbuck and Webster (1991) argue that a higher quality of work may follow from employees who interact with computers in a playful way.

7.9.2 Playfulness in CMC

Danet,Ruedenberg-Wright and Rosenbaum-Tamari (1997) refer to playfulness in CMC, with their study of IRC. They argue that early studies of CMC were focussed on the effects of media on organisations and emphasised lack of social cues, largely ignoring other aspects such as the emerging use of CMC for non-work purposes. The authors highlight several features of CMC that make it ideal for playful interaction, such as its text base, lack of social barriers, interactivity with the technology, anonymity and the ability for users to exist in a "virtual world".

Playfulness in computer interaction was first apparent in hackers and computer professionals. As the Internet chatrooms, MUDs, MOOs and other synchronous modes of CMC became more and more popular playful interactions became available to a much wider range of users. Playfulness is not confined to synchronous communication media however and there is some evidence that it exists in e-mail.

E-mail has its own conventions and the style is informal and similar to speech as it uses emoticons, abbreviations, and spelling variations. It is mostly run in such a way that the identity of the sender is transparent from the header. However, this is not always the case as the e-mail address can be altered, or anonymised using remailers (web based software). E-mailers can hide, for example, their gender by using only a surname or nickname in their address. Despite anonymity in CMC Baym (1995) sees humour as an important element, identity being established through headers, signatures and information about the individual transmitted in the online interaction.

7.9.3 Nicknames

Individuals using their real name in e-mail headers are being honest and transparent, while those who choose to use a pseudonym are being more creative and playful. Suler (2003) argues that the use of nicknames may make the user more mysterious, or conversely may divulge some hidden characteristic of the person or their desires. Nicknames are commonly used in school, in the workplace, at home, among friends, as well as in citizens' band radio (where they are known as "handles", as they are also known in hacker culture), in stage names, IRC and other forms of CMC. Some are chosen for us and may reflect an aspect of our physical appearance (for example "Fatso"), or personality (for example "Grumpy"), or we may choose them ourselves. Those we choose are likely to be more flattering, and according to Bechar-Israeli (1995) say more about the person than their given name does.

Using pseudonyms or nicknames to hide identity is prevalent in CMC as they can shield the user from adverse reactions to views they have expressed online. Nicknames are also used in role-playing, providing information (real or not) about the author while still masking true identity (Danet and Ruedenberg, 1994). We (1993) also emphasises the safety of anonymity felt by those using different identities while Matheson and Zanna (1990) agree that the individual feels more secure and will also be more likely to disclose personal information when hiding their true identity. Anonymity leads to more intimate disclosures in CMC.

During face-to-face interaction it is possible to provide two forms of information, the intentional and the unintentional (Goffman, 1959). This may still be true for CMC as unintentional clues may be given in the exchange through use of language, and in the textual devices used to overcome the lack of features available in face-to-face interactions. However, in CMC self-presentation opportunities exist. This allows a rich medium for creating identity and interacting in fantasy situations.

When first entering IRC a nickname has to be chosen and Bechar-Israeli (1995) argues that it is important in IRC to choose a nickname that presents the individual's identity and will also entice others to join in an Internet "conversation". In electronic media, where there is a lack of information about the communication partner, it is imperative that the nickname says something about the person. However, this "nick" can be changed at any time, as often as the individual wants to change identity. Despite this Bechar-Israeli found that names remained stable over time for the vast majority of IRC users. Bechar-Israeli categorised nicknames from data gathered from four IRC channels over a two-week period. Fourteen categories were distinguished initially and later collapsed down to seven. These are technology; using real name; self-related names; flora and fauna plus objects; puns; famous people plus names from literature, films etc.; sex and provocative names.

7.9.4 Signatures

E-mail systems can include a block of text at the foot of a message, known as signatures. The general convention is that a signature should consist of no more than four lines, although this is often ignored. Some programmes will restrict the length of a signature and others have the facility to store several signature files giving the sender a choice of which one to use in particular circumstances or when communicating with a variety of communication partners.

Signatures can be business-like, where contact information such as the address, telephone number, fax number, e-mail address and possibly website address, would be included. They can also be playful and lots of effort can be made in order to customise a signature to reflect the sender. Pictures can be produced using text characters or, more commonly, a quote, pithy saying, excerpt from a song or poem, or profound statement can be made. Quotes may be famous, may cite the author or source, may be funny, clever or serious, and sometimes individuals compose their own signatures. Although less factual information is given in less formal signatures, they add an element of originality, individuality, and perhaps even personality.

7.9.5 Content

As well as headers and signatures, other parts of the e-mail may be playful such as the subject line. Subject lines may be used in a similar way to headers, as an enticement to open and read the message. Content too is important and despite the lack of cues available in face to face exchanges, e-mail has developed ways of compensating for the more limited quality of a text-based medium. Carey (1980) refers to electronic 'paralanguage' developed to allow the inclusion of socio-emotional information in mediated communication. This includes the use of what have been described as 'emoticons', for example smiley face :-), exaggerated grammatical markers such as multiple exclamation marks (!!!!!), repetition of vowels to accentuate a word (soooooooo good), capitalisation, and use of acronyms (BTW – by the way) or by embedding words in text (just kidding – to indicate teasing). This has resulted in e-mail content, at least in social interactions, to be more similar to conversation than formal letters. It seems that at least some of the factors seen as barriers to the formation of relationships online can be overcome when humans interact with computers.

7.10 Evidence for playfulness in Cohort 2 mailboxes

7.10.1 Content

As well as running in a similar way to a closed system, the e-mail behaviour in the computer laboratories also resembled IRC (Internet relay chat) or the UNIX 'talk' program which is real time interaction. The content of the e-mail was often short and to the point, which is also true of chat programmes. Suler (2002) refers to this as "staccato speak". The vast majority of e-mail was of a conversational nature, i.e. almost synchronous due to the short time lapses between sending and receiving e-mail. E-mail systems allow replies to include a series of attached, forwarded, and previous exchanges, and this can result in so called "mosaic messages" (El-Shinnaway and Markus, 1996). These give the e-mail receiver a record of previous interactions and can be useful in tracking the thread of a discussion. Despite being cumbersome, records of previous interactions are easy to store and track. Mosaic messages were found throughout the e-mail and this meant whole 'conversations' could be tracked.

One example of a 'conversation' follows (spelling errors have not been corrected).

Thu, 19 Jan 1995 11:19:49
"JUST MOVED UP THE BACK THATS ALL!

Thu, 19 Jan 1995 11. 21.23
Ooohh, and what are U(and Lisa?!!) doing up the back?

Thu, 19 Jan 1995 11:24:28
PURLEASE!!!!!!!!!!!! ITS BETTER UP THE BACK COS THEN WE CAN HAVE A LAUGH AND SEE WHO IS COMING IN ETC AND WRITE STUFF WITHOUT PEOPLE READIN OUR SCREENS!

Thu, 19 Jan 1995 11:30:28
Ooo, you're so secretive!.. I do see the advantages however.

Thu, 19 Jan 1995 11:33:33
GLAD YOU UNDERSTAND!

Thu, 19 Jan 1995 11:36:36
glad you`re glad...

conversation`s straggling I think!

Thu, 19 Jan 1995 11:37:50
INDEED IT IS! CHANGE OF SUBJECT NEEDED - YOU CHOOSE

Thu, 19 Jan 1995 11:39:56
philosophise with me

Thu, 19 Jan 1995 11:44:45
well i would but how do i know you are really here at all? you could

just be a figment of my imagination - everything could be, even my body. i am just a brain in a vat imagining everything

Thu, 19 Jan 1995 11:49:33
how do we know things exist at all? only our sense tell us but are

they truthful? eg we sense things in dreams but these thngs arent

real. hgow do we know we are not dreaming just now - there is no way of knowing - are dreams less vivid than reality - no.#

how do we know that some evil genius has not implanted us with these

perceptions of the world? the answer? we do not!!!!!!

indeed, for all we know we could all be figments of someones

imagination, whom we know as god..he has limited control, as do we

with our dreams.. perhaps each of us `contains` inside our tiny minds

a civilisation,world,galaxy or universe

Thu, 19 Jan 1995 11:52:31
PERHAPS! ALTHOUGH IT CANNOT BE GOD WHO HAS IMPLANTED US WITH THESE

PERCEPTIONS AS HE IS ALL BENEVOLENT - THEREFORE IT MUST BE AN EVIL

GENIUS OF SOME KIND - PERHAPS THE DEVIL!

Thu, 19 Jan 1995 11:57:30
but who is to say god exists, or bielzebub, perhaps we have merely

evolved from single-celled organisms over millions of years, and the

world was created from a big bang.. but then what preceeded the bang,

and how did it all start..it is like the case of the chicken and the

egg...which came first...who `made` god

Thu, 19 Jan 1995 11:58:00
GOOD QUESTION - ONE I AM ABLE TO ANSWER - I MADE GOD!

Thu, 19 Jan 1995 12:00:55
I think we have left the bounds of philosophy and crept in to utter bullshit

Thu, 19 Jan 1995 12:01:57
WHO YOU SAYIN IS TALKING BULLSHIT?

Thu, 19 Jan 1995 12:06:49
you, thinking you`re r god....there can be only one(as the immortal

HIGHLANDER once(or twice)said)...and I an He

Thu, 19 Jan 1995 12:08:10
IN YOUR DREAMS!]

Thu, 19 Jan 1995 12:10:39
very witty.. I give you a life of 42 years, then you`re going to get run over by a car

Thu, 19 Jan 1995 12:11:22
THATS NOT NICE! IF THAT HAPPENS TO ME - YOU'LL FEEL VERY GUILTY!

Thu, 19 Jan 1995 12:13:42
god feels no guilt, yet all guilt for he is all and all are he

Thu, 19 Jan 1995 12:15:02
YEAH - LIKE YOU UNDERSTOOD THAT!

Thu, 19 Jan 1995 12:25:38
god understands all, but He must eat...and he must now...
now let me see..I fancy two australians, 1 english and a jamaican I think..will a psyc lecturer for dessert..
see you later"

Other messages included questions about classwork, hand-in dates etc. between students and classmates and with tutors. Lecturers were also e-mailed for information about the content of their lectures although this was scarce among the e-mail observed. There were some references to discovering how to do things in e-mail, such as change the colour of the text.

("look i found out how to write in colour!!!!! so where are you today????????? i enjoyed our little chat yesterday!!!!!have a nice weekend!!!!")

Some students, especially the multiple mailers, circulated jokes, poems, graphics and song lyrics. For example, one of the multiple mailers, using the nick "Fred the Barnacle"(he had many others but reserved this nick for exchanges concerning this message) circulated the words of the song "On the Waterfront". This invoked a stream of responses and discussion among members of the class.

One of the graphical messages was a series of ASCII characters depicting various humorous aspects of cows, found in many of the mailboxes showing that it had a wide circulation in the class. (a sample of the message is shown below)

```
>           (__)            (__)            (__)            (__)
  >          (oo)            (oo)            (oo)            (oo)
  >  /-------\/-*     /-------\/      /-------\/
~~~~~~~~~~~~~~~~~~~~~~
  >  / |      || \     )*)(\/* /  *    / |     ||
  > *  ||----||  *    \ |||/)|/()(    ~~~~~~~~~~~~~~~
  > \/|(/)(/\/(,,/    \)|(/\/|)(/\
  >   Cow munching    Grass munching  Cow in water       Cow in
  >     on grass          on cow                         trouble
```

Other humorous, well distributed messages included "50 fun things to do in an elevator", "The complete set of blonde jokes", "Why ask Why?, "The facts about men and women". An example from "Why ask Why?" follows.

```
Why do you need a driver's license to buy liquor when you can't drink

And drive?

Why isn't phonetic spelled the way it sounds?
```

Why are there interstate highways in Hawaii?

7.10.2 Nicknames

The use of nicknames or 'nicks' was widespread in the class. Some examples are shown below. Nicks were sometimes changed as in the examples below with those grouped belonging to one person. The most prolific of these was a multiple mailer who changed his nick regularly (see 9). Number 9 is a good example of someone with an imagination, perhaps trying to impress with his range of pseudonyms. As can be seen in the few examples shown here, the variety of nicks is wide, even within the individuals. Some are not gender specific although others such as the "Little Miss" series are clearly female. Males sometimes used nicks that gave an impression of strength e.g. "Attila the Hun" while females tended to choose nicks portraying the sender as attractive or feminine e.g. "Aphrodite" or "Angel in the centrefold". However, sometimes a nick seems atypical as it differs from the others used by the same person. An example of this is number 2, known as Aphrodite, Victoria Plum and other feminine names but also using the nick "The Ripper, Jack". If the nickname is, as Bechar-Israeli says, chosen to represent some characteristic of the person, then this example does not seem to fit. It may of course have been used in a particular situation, mood, or in an attempt to evoke a response.

1.
Alcoholic
Beavis
Incredible shrinking combine harvester
Postman Pat & Jess the cat
Thomas the tank engine
Duckman

Love you
Sock man 'Wo'
Watch you don't get caught on a pool table
Hit with a icecream machine
Mole Twitch Twitch
Sooty
Scott the wicked tree
Psycho ee ee ee ee
Slug
Tazmanian Devil

2.
Aphrodite
La Primavera
Ribena berry
The Ripper, Jack
Victoria Plum
Peapod
Lisa the starfish

3.
Little Miss naughty
Little Miss Giggles
Little Miss bashful
Little Miss Cheerful

4.
Bat girl
Tallman

5. Suedehead
6. Rock n' roll star

7.
Psychological Sex Goddess
Power-pleasure-pain
The celestial cleanser
Sweetwater kisses
The celestial queen
Sweet lady luck
Nervous trouble
The reciprocator

8.
Contrulla Sutherland Shark
Jumpin' Jack
Monty
Saintes still alive
Timmy
Sharkie

9.
Arthur the caterpillar
Bill the galactic hero

Being for itself
Collective unconscious
Celeborn
Dave Excellent
Dirk Gently
Deep Thought
Fred the Barnacle
God
Mr Happy
Procurator Fiscal
Death
Farmer Cotton
He came dancing across the river...
Mr Topsy Turvy
Perfect circles
Dr Frog
Genestealer
Judy Hartley
Mud Slide Slim
Prometheus
Don Quixote
Gandalf the White
Just me
Mean machine angel
Ragle Gum
Eisenberg
Keeper of secrets
Morg n' throg
Sir Gawain
Faramir, Steward of Gondor
Lord Acron
Offler the crocodile God
Soldier of Fortune
Low Eggborough
Snarf
Mr Motivator
Svlad of Sylvania
Sanguinus
Special Fried Rice
Tao
The bladed fist
The Giver
Thors Provani
Zaphod Beeblebox
Mr Flibble
Mao-tse-tsung
The coiling snake
The Green Knight
Grima Wormtongue
The man in the iron mask
Slannesh, Lord of Pleasure
The aging poet
Thought, of the distinctly deep genre
Lord Aragon
the being who sold everything

The Wanderer
Tzeench, Lord of Change
Vital statistix
Mr Wong
why worry?
Six blade knife
What do Scots really wear under their kilts?
I can't really say, I'm dead you see
Special fried rice

The use of nicknames in the e-mail has some similarities with other CMC channels. The 'nicks' chosen consisted of characters from literature, films, or television, especially from science fiction and cartoons. Some other nicks were short phrases rather than characters, possibly used as a means of portraying the message sender as a particular type of person. It was not always possible to tell the gender of the nick and so they may also have been used as a sort of mask or disguise. It is possible that another reason for their use was that the more bizarre or eye-catching the nick was the more likely the receiver was to read the message. Hackers use nicks and, once the choice is made, they are normally retained. They too borrow from the same sources as our users, anti-heroes, heavy metal rock groups, and puns based on technological terms being prevalent among hackers' nicks (Meyer and Thomas 1990). Nicks in our sample were included in the header rather than the body of the text. Someone receiving a message would therefore see that it came from, for example, "Aphrodite", not from a named person. The matriculation number could not be removed from the header however and so the identity of the sender could always be traced. The use of nicknames allows relationships to form while giving the user the opportunity to reveal or conceal their identity rather than be completely anonymous. Jaffe, Lee, Huang and Oshagan (1995) refer to this as "managed ambiguity".

7.10.3 Signatures

Another feature of the e-mails examined was the addition of a signature at the end of some of the e-mail. These varied in nature but were found throughout the sample of e-mail. Like the nicks, these footnotes were added to convey some quality of the sender, such as wit or intelligence. Some examples follow.

1. "The chances of anything coming from Mars are a million to one they said"
2. "Humpty Dumpty was pushed"
3. "We sing as we march with our flags unfurled
   Today in the mountains, tomorrow the world.."
4. "It's your perception of what I'm saying rather than what I actually say that is the key"
5. "God is not dead, but alive and well and working on a much less ambitious project"
6. "If love is the answer could you rephrase the question"
7. "Stay alert
   Trust no-one
   Keep your laser handy"
8. "And my fever it gets higher desire............."
9. "Modern life is rubbish"
10. "Take it and get out of here" W.S. Burrows

Most signatures are obviously quotes but others may be original.

7.10.4 Subject Lines

Subject lines can also be used to entice people to respond to speculative e-mail messages. Examples taken from the donated mailboxes include:

1. "Is there anyone out there?"
2. "URGENT PLEASE READ"
3. "Urgent!!!!!"
4. "Hello? Speak to me….."
5. "A plea for friendship"
6. "Greetings"

These are short and to the point, the sender is looking for a quick response to their request.

7.10.5 The greeting

Examination of the mailboxes revealed very few formal openings such as "Dear….", more associated with letter writing than e-mail. "Hi" was prevalent but often the name of the recipient was missing. The absence of a greeting often indicated a flow of messages in an almost synchronous manner. The e-mailer expected an immediate response and either did not want to waste time with unnecessary greetings, or knew that there would be several exchanges and an opener was not required. The absence of a greeting gave the messages a "conversational" quality. A short example of an exchange, interesting because the e-mailers could easily have spoken to each other rather than use e-mail to arrange their meeting, follows.

Date: Fri, 9 Dec 1994 15:18:59 GMT,BST
Subject: Re:

I`m just asking, do you smoke? If so would you care to join me for a cigarette outside?

Date: Fri, 9 Dec 1994 15:24:35 GMT,BST
Subject: Re:

Cool. When?

Date: Fri, 9 Dec 1994 15:26:48 GMT,BST
Subject: Re:

quarter to?

Date: Fri, 9 Dec 1994 15:31:22 GMT,BST
Subject: Re:

The door to the lab?

7.10.6 Sign Off

Examination of the mailboxes revealed that a sign off and name at the end of a message was rare. As with the greetings the majority of e-mail had no obvious closer. If they were present they tended to be informal such as "see ya. write back", Luv..(adding the name of the sender), and one extreme example "yeh okay!!!! Bye bye!!!". The absence of a sign off is also a hallmark of the conversational quality of the e-mail behaviour in the computer laboratories.

7.10.7 Discussion

What is obvious from the evidence presented here is that e-mail was used for playful purposes. Despite being an asynchronous communication medium, e-mail was used to conduct online 'conversations' with others in the computer laboratories at the same time. Norms of behaviour were evolving such as the use of nicks and signatures, the style of message, and the use of e-mail to form friendships and this is evidence of the formation of an e-mail subculture in the class.

However, in order for these norms to evolve knowledge of the means to change headers in order to use nicks or how to add signatures is required and how this happened in the cohort is the subject of the following section.

7.11 E-mail expertise

On examining the e-mail in the mailboxes, it was clear that many of the donors had discovered how to make up e-mail folders. The messages also revealed some expertise in e-mail such as coloured text, mosaic messages, changing headers, and adding signatures. None of these functions were covered in the minimal training students received on entering the course. Demonstrators were provided in the computer laboratories at all times but they reported few questions from students on the aspects of e-mail management reported above. Students were either experimenting with the system until they discovered how to carry out a function, or they were receiving instruction from other than the demonstrating staff.
A questionnaire was therefore devised to discover how members of the cohort were learning about e-mail and its features.

7.11.1 Subjects

The subjects were a sub-sample of 100 of Cohort 2 drawn from those progressing to the second year class. Around 40% of those who continued to second year responded to the questionnaire. Administration of the questionnaire was delayed until this point to allow subjects time to use the e-mail system over the preceding session, thus having the opportunity to gain some expertise in e-mail use.

7.11.2 Materials

A questionnaire (Q3, found at Appendix H) was designed to discover the expertise level of e-mail users and how they had achieved their level of knowledge of the e-mail system.

7.11.3 Results

The results showed that asking members of the class for help was the preferred means of gaining information about the e-mail system in the majority of situations, unless the student managed to 'work it out' for themselves. As the e-mail system was fairly easy to use it was not difficult for a proportion of the class to do this. Around 2/3 of the sample had files to organise their incoming e-mail messages. 55% had 1 or 2 files, and less than 5% had 20 files. Only 10% of the subjects retained all of their e-mail.

Although nicks were prevalent in the sample of e-mail from the donated mailboxes, 73% of the subjects had not changed their header. Distribution lists were used by 8% of the subjects and 71% had received e-mail sent to a distribution list.

When asked if there were any of their classmates who knew a lot about e-mail and passed on this knowledge to others, the same four names were repeatedly mentioned. Three of these were included in our category "multiple mailer".
A full set of results can be found in appendix H.

7.11.4 Discussion

As well as providing information about the extent of knowledge in the group, the results of this questionnaire reveal how students learn about the use of a new technology. It is clear that despite the presence of demonstrators in the laboratory, the students preferred to either work out for themselves how to carry out functions, or ask a member of their class to help them. There would also appear to be a small number of students who knew how to do all or most of the functions. The remaining students knew as much as they needed in order to make use of the system but had not explored it to the same extent as the 'experts'. Four 'experts' were identified by the sample as people who disseminated knowledge about e-mail and Internet use in the class. Scull (1999) found students with computer problems, especially those high in Computer Anxiety, looked to friends for help. These relationships were referred to by Scull as "social networks" or "friendship networks". It appears then that this small study is further evidence for the formation of a social network within the cohort

7.12 Conclusions

What we have is a snapshot of e-mail use in an undergraduate group in the early 1990s when e-mail technology was novel to the vast majority of individuals involved. The computer laboratory environment allowed extended access to the system and more or less unlimited use. A section of the sample embraced e-mail as a communication tool allowing them social interaction, with classmates in particular, in a situation where "meeting" others in the class was difficult. The class was large (over 900 members) and was split into three groups for lectures. Students undertook a variety of courses so they may only have come together for a few hours per week to study Psychology.

The network properties, referring to Fulk and Boyd's classification, influenced the e-mail culture in the group. Links were direct and mainly between classmates although it was an open system and some interaction was evident with others such as family members, and with students in other universities. Most of the interaction was therefore with individuals of an equal status. There were different categories of member in as much as there was a distinctive group of multiple mailers or linkers who helped to create a network across the class.

Despite the asynchronous nature of e-mail, which means it differs from other CMC channels such as IRC, it supported social exchanges and relationships formation in our sample. There is evidence of a subculture of computing where frequent use of e-mail, mainly for social interaction and the formation and maintenance of relationships with others in the class, was carried on by a subset of the class. The subculture had similar features to others such as the one reported by Hellerstein (1985). Norms of behaviour emerged, such as the use of nicks and signatures. Like the group at Umass described by Hellerstein, the heavy users in our cohort were found to use e-mail to form and maintain relationships. Although some use was made of e-mail to contact staff and relay information, most of the exchanges were for pleasure purposes. The e-mailers enjoyed using e-mail. They took advantage of the lists of logged on users, and class lists in order to make contact with others in the class. This feature of the system allowed e-mail users to e-mail individuals they had never met but who had something in common with them.

According to Goffman's 1969 essay on "role distance", individuals have a self (identity) while at the same time performing a social role such as doctor or student. The role brings with it expectations for behaviour, but sometimes there is conflict between self and role, and the individual does not want to be seen as totally involved in that role, or "just" a doctor or student. In other words, they try to show their distance from the role. In our e-mail situation, some of the cohort may have found their expected role problematic but humour allowed unthreatening interaction to take place without cost. Salmon (2000) and others advocate the use of an e-moderator or facilitator (usually a member of staff such as a tutor) to ensure task completion in CMC. As the role is then compulsory there is no problem between self-presentation and compliance. As an alternative to the facilitator, our situation had humour or playfulness as a reason or motive for interest and involvement in e-mail communication within the cohort.

Chapter 8: COHORTS 3 (1996/97), 4 (1999/00) AND 5 (2001/02)

8.1 Aims of the chapter

Chapter 7 examined the contextual or situational influences on e-mail behaviour in cohort 2. The evidence presented showed that a subculture was forming in the class, and friendships were being formed via e-mail. E-mail playfulness was observed in both the e-mail messages examined and in observation of student behaviour in the Psychology computer laboratories. In this chapter further cohorts are examined. These cohorts had a very different e-mail experience from the two already investigated in this study.

8.2 Description of the e-mail situation

In 1996/97 there was no e-mail access in the Psychology computer laboratories as there was a changeover to the Common Student Computing Environment (CSCE) which took the responsibility for e-mail provision from individual departments to a centralised system. Students were able to access e-mail from university clusters but not in the Psychology computer laboratories. Time on university clusters had to be booked and was limited.

The computing facilities in the Psychology laboratories were the same as those for Cohort 2 in terms of layout and number of computers. However the use of computers in the laboratory was confined to completion of computer run experiments and the associated multiple-choice questions.

The students were part of a community under change this year in terms of social aspects of the environment and access to e-mail as an effective means of communication. The behaviour in the Psychology computer laboratories was very different this year. Social interaction between students was limited and there was no reason for students to be in the computer laboratory once their classwork assignments were completed. The laboratory experience was qualitatively different as network facilitation between students was missing to a great extent.

8.3 Survey of e-mail use: Cohort 3, 1996/97

8.3.1 Subjects

Subjects were 102 second year Psychology students, representing around 45% of the class. This cohort had not experienced e-mail in the Psychology computer laboratory in their first year.

8.3.2 Materials / Procedure

A questionnaire (Q4, found at Appendix I) was administered to subjects in term 2. Some of the questions overlapped with the questionnaire of the previous years, while others were there to ascertain differences in the e-mail experience of students in the absence of e-mail in the Psychology computer laboratories.

8.3.3 Results

51% of the sample used e-mail. The majority used computer clusters on campus and only 1.56% accessed e-mail at home.
The number of e-mail users who used e-mail to contact classmates was 34.13% while 36.27% of them contacted others outwith the university.

E-mail was used mainly for social chats (48.04% used it for this purpose). Although 92% agreed that e-mail was a good way for staff and students to communicate, only 10.78% of the sample used e-mail to get information.

14.61% of the sample sent e-mail daily while 25.84 did so once a week. The remainder sent e-mail infrequently or not at all.

The subjects were also asked how many people they knew in the class at the beginning of the session. 52% either knew no-one in the class or only one person. Around a year later 3% knew no-one in the class or only one person. 90% of the sample knew between 4 and 6 people. However, only 6% had met anyone "via e-mail" and when asked how many people they communicated with via e-mail they had never met, 77% replied either 'none' or 'one'.

Students were also asked to comment on whether they though it would be useful to have access to e-mail in the computer laboratories. 86% replied that they did think it would be useful. Asked why the responses varied but fell into the distinct categories detailed below.

- Easy contact with staff
- More access to e-mail
- More likely to get access to a computer as the clusters very busy
- Would be useful to contact classmates
- Quicker contact with classmates
- Might encourage the use of e-mail

Those who saw disadvantages of having e-mail in the computer laboratories mentioned the following:

- Could detract from classwork completion
- Never use e-mail

8.3.4 Conclusions

The results of the questionnaire show that e-mail behaviour was indeed qualitatively different from previous years. It appears that e-mail was used less for networking purposes. Students did get to know people in the class but it was not through e-mail for the most part. It is likely that this was due to the lack of an environment where social e-mail could flourish between a group of people with a common interest. Using various clusters scattered around campus for e-mail did not allow for the culture of e-mail, apparent in cohorts 1 and 2.

8.4 Survey of e-mail use: Cohort 4, 1999/00

8.4.1 Description of e-mail situation

In 1999 e-mail facilities were again available in the Psychology computer laboratories, with a connection to the CSCE.

The computing laboratories were laid out in exactly the same way as those experienced by Cohorts 2 and 3 and access was the same number of hours as previous cohorts. No training was given in e-mail use as this function had been taken over by the university as part of the IT course. The computers were used for completion of classwork, Internet access, and e-mail.

8.4.2 Subjects

134 first year Psychology students, representing around 20% of the class, were surveyed after one year's access to e-mail at university.

8.4.3 Materials /procedure

Subjects were asked to complete a paper and pencil questionnaire (Q5, found at Appendix J) on their e-mail behaviour over the preceding year (1999).

8.4.4 Results

Some of the main results are outlined below. A full set of results is available at Appendix J.

All of the subjects used e-mail at university in the previous year, and 57.5% had used e-mail at home over the same period.

They reported using e-mail in the university mainly in the Psychology computer laboratory (51.1%)

The most popular place other than this was the library (24.8%) although they also accessed e-mail in computer clusters and laboratories for other subjects such as Computing and Statistics.

The majority (58.2%) reported sending e-mail daily, 29.9% weekly, and 69.4% reported checking for e-mail daily, 25.37% weekly.

When asked who they e-mailed, 85.82% reported mailing classmates, 84.33% mailed others in university, 81.34% e-mailed others outwith university.

Tutors were contacted using e-mail by 70.15% and lecturers by 36.57%. E-mail was used by 18.1% to contact a classmate they had never met.

Nicks were used by 38.81% but signatures only by 11.9%.

When asked if they had ever conducted a 'virtual conversation' with a classmate in the laboratory, only 4.5% reported that they had done so.

12.7% had simultaneously contacted several classmates they didn't know

64.9% had received an e-mail message from someone unknown to them, in a simultaneous message.

E-mail addresses were not available on the system as they had been in the cohort 1 and cohort 2 situation and subjects were asked how they found addresses in order to contact individuals they had never met. The following ways were reported.

- Address from a friend, or tutor, or someone in their tutorial group
- By looking at class lists on noticeboards
- By checking on the university website of e-mail addresses

(all required the name of the person to be contacted)

36.2% knew no-one, or one person in the class at the beginning of the year, but by the end this had dropped to 0 .75%

88.7 % of the subjects had never 'met' anyone via e-mail, while 10% 'met 'between 1 and 10.

When asked if their e-mail behaviour in the Psychology computer laboratory differed from elsewhere, 93%% replied that it did not. Those who said it differed mentioned that they used the Psychology laboratory for work rather than e-mail, or they had problems accessing their mailboxes in the laboratory and therefore e-mailed from the library or home.

8.4.5 Conclusions

Cohort 4 was able to access e-mail on the CSCE, and many of them used 'hotmail' as well as their university accounts. They used e-mail more often than cohort 3. E-mail behaviour in this sample is very different to the behaviour of cohorts 1 and 2. E-mail for cohort 4 was available in a far wider variety of settings and although the laboratory was still used by many for e-mail, there was an absence of the community of e-mailers evident in the previous cohorts. The circle of contacts had widened although the majority of e-mail was still to classmates. There was still some evidence of networking by multiple mailers but at a much lower rate than that seen in either cohort 1 or 2.

8.5 Survey of e-mail use: Cohort 5, 2001/02

8.5.1 Description of e-mail situation

From the 1997/98 session to the present time, e-mail has been available in the Psychology computer laboratories, where students can access their CSCE mailboxes. They can also access these from any computer on the university system. Students also run "hotmail" accounts as the university mailbox server

supports the Post Office Protocol (POP). Since 2000 e-mail has also been accessible directly through a web gateway to the students' university mailboxes.
No formal training was given on e-mail use in the Psychology laboratories. For the past three years it has been compulsory for first year students to undertake an IT course, including instruction on the use of e-mail, and run by the university computing services. Any student having difficulty with e-mail however could ask for guidance from lab demonstrators.

First year students were the main users of the computer laboratories, as second year no longer used the facilities for completion of computer –run experiments. Although they had another laboratory for their practical work, second years still used the small computer laboratory to access e-mail and the Internet. Honours students also had some access. The computers were used to run a new set of experiments, Internet access, and a statistical package (Minitab).

The layout has changed in the large laboratory, used mainly by first year students. The booths were changed and all face in the same direction, still in units of two. The booth sides, formerly the height of a computer monitor, have been reduced to about a third of their original height. All other features of the laboratory remained the same. There is open access from 9a.m. to 7p.m. Monday to Thursday, and 9a.m. to 5p.m. on Friday.

8.5.2 Subjects

The subjects were 491 first year Psychology students, representing around 90% of the class. 23% were male (113) and 77% female (378).

The mean age was 19.0 (SD 3.2), minimum 17, maximum 56.

77.2% had received some form of computer training while 22.8% had not.

87.8% of the sample had access to a home computer, 47% of these were networked.

8.5.3 Materials/procedure

The questionnaire (Q1, found at Appendix A) used in the cohort 1 study was administered together with the computer knowledge questions from Q2 (the questionnaire used in the cohort 2 study, found at Appendix D). A new mobile 'phone use questionnaire, based on results from a pilot study carried out in the previous year, was designed and administered at the same time. A copy of the questionnaire can be found at Appendix K. Some demographic details were also collected. These tests were all paper and pencil and the students completed them after term 1.

8.5.4 Results

Some of the main results are shown here.

84% reported e-mail use before coming to university, and 89% agreed or strongly agreed that e-mail was easy to use.

The majority (84%) sent e-mail to classmates, 83% sent e-mail to people outside the university.

When asked which mode of communication e-mail resembles most, 65% thought it most resembled a personal note, while only 6% thought it was like a face-to-face chat. However, 93% of the sample reported face-to-face chat as their preferred mode of communication, while only 2.5% chose personal note.

36% sent e-mail daily, 42% sent it weekly and only 2% reported never sending e-mail.

Social contact was ranked highest in purpose by 68% and 23% ranked 'to get information' highest.

47% of the sample knew one person in the class at the beginning of term but only 1% knew one person at the end. 36% knew between 6 and 10 people, while 21% knew more than 20.

95% did not meet anyone via e-mail but 4% met between 2 and 5 people this way.

24% of the sample communicated via e-mail with 1 to 5 people they had never met, but 71% did not communicate with anyone they had not met.

8.5.5 Conclusions

E-mail access was now wider than ever. Provision in the Psychology computer laboratories was excellent, the number of computers in campus clusters had increased, access to networked home computers had risen dramatically, and students in halls had on-site networked computers.

The 2001 cohort still used e-mail mainly for social contact, and classmates were the main communication partners although e-mail to people outside of the university had increased.

A very small number still used e-mail to meet others in the class but their circle of friends within the class did increase over the course of the year.

There was a very different atmosphere in the computer laboratories in this cohort. E-mail was still being used but there was no obvious interaction between users. Now students trying to contact friends in the class are more likely to send text messages via mobile 'phone.

8.5.6 Computer experience in Cohort 5

The mean score for experience, measured in computer knowledge, was 12.11 (SD 2.6). This is considerably higher than the score in cohort 1 and is evidence that computer experience is increasing.

8.5.7 Mobile 'phone use in Cohort 5

Some of the main results are shown here. A full set can be found at appendix L.

97% of the sample had a mobile 'phone and 95% of those used it while they were in university.

The mean length of ownership was 23.6 months (SD 12.3)
15.8% of the sample contacted between 1 and 5 people regularly, 30.5% contacted between 6 and 10, 28% contacted between 11 and 20, and 25.7% contacted over 20 people regularly by mobile 'phone. Text messages made up 66.5% of mobile 'phone use.

The average number of calls made in university per week was 6.7 (SD 7.8) and 6.4 calls received. The average number of text messages sent per week in university was 18.6 (SD 19.6) and 17.9 texts were received.

The average length of calls was 8.5 minutes (SD 11.2) and text messages 134.7 characters (SD 84.3).

Friends were contacted by 99% of the sample and text messages sent to friends by 98.4%. Classmates were contacted by 69.7% and text messages sent to classmates by 72.5%

The characteristic of the 'phone reported as being the most important was 'social use', convenience (32.2%) was the second most important characteristic.

91.9% of the sample had never contacted anyone by mobile 'phone they did not know.

8.5.8 Conclusions

Mobile 'phone ownership was almost 100% in the sample. The results show that mobiles were used regularly in university both for voice and text messages, with text messages being the most common. The subjects reported social contact as the most important characteristic, mirroring their use of e-mail. Like e-mail classmates were contacted by mobile by a large proportion of the sample. The rise in student ownership of mobile 'phones seems to have taken place around 1999/00 and is likely to have impacted on e-mail use as mobiles have the advantage that they can be used to contact others at any time and wherever they may be. E-mail requires the receiver to be at a networked computer to receive the message. Results from the pilot study from the previous year showed that 66.7% of the sample thought mobiles were more useful than e-mail. 76.1% reported using mobiles to contact classmates rather than e-mail.

Chapter 9: COMPARISON OF E-MAIL BEHAVIOUR BETWEEN COHORTS 1 (1993/94), 3 (1996/97), AND 5 (2001/02)

9.1 Aims of the chapter

Chapter 8 outlined e-mail behaviour in cohorts 3,4, and 5. These cohorts had different e-mail situations from cohorts 1 and 2 and so a comparison between cohorts is made in this chapter based on questions common to the questionnaires completed by some of the groups.

9.2 Subjects

Three cohorts were chosen for comparison, as there was questionnaire data available for comparison and the cohorts had experienced differences in e-mail situation:

Cohort 1	1993/94	590 first year students Completed online QMARK questionnaire (Q1) during term 2 9% had used e-mail before university
Cohort 3	1996/97	102 second year students Completed paper and pencil questionnaire (Q4) during term 2
Cohort 5	2001/02	491 first year students Completed paper and pencil version of Q1 questionnaire in term 2 84% had used e-mail before university

9.3 Comparison of Cohorts 1, 3 and 5

There was a degree of overlap in the questionnaires and these questions were chosen for comparison.

Table 9.1 How often do you send e-mail messages?

How often	1993 (%)	1996 (%)	2001 (%)
Every day	11	37	36
Once a week	45	8	42
Once a month	16	7	5
Rarely	26	23	15
Never	6	25	2

The category 'every day' shows an increase in cohort 3 but has not increased in cohort 5. It is surprising that there is no real difference between cohorts 3 and 5 as access to networked computers has risen between 1996 and 2001. For instance, the university now provides over 200 computers with Internet access in the main library alone. Networked computers at home are increasing (88% had a computer at home, 47% of those were networked). However, 'weekly' use has risen and almost all use e-mail, however infrequently.

Cohort 3 had a higher percentage of subjects reporting using e-mail 'rarely' or 'never'. As there was no e-mail available in the Psychology computer laboratories for that cohort, and alternative sources were limited to university clusters (these required to be booked for use) then the opportunity for easy e-mail access was not there for this group.

Table 9.2 How often do you check for e-mail messages?

How often	1993 (%)	1996 (%)	2001 (%)
Every day	11	37	40
Once a week	45	8	55
Once a month	16	7	1
Rarely	26	23	4
Never	6	25	0

Once again there was little change in cohorts 3 and 5 for the category 'every day' although weekly checks had risen dramatically. Almost the entire group checked their mailboxes at least once a week and this shows that e-mail use in the class had risen. In cohorts 1 and 3 a much larger proportion of the class rarely or never checked for e-mail.

Table 9.3 To which of the following have you sent e-mail?

yes	1993 (%)	1996 (%)	2001 (%)
Classmates	85	34	83
Tutors	45	9	56
Lecturers	8	6	20
Others in university	19	29	49
Others outwith university	13	36	83

The main difference in this measure was the drop in contact with classmates in cohort 3. This may be a reflection of the lack of e-mail facilities in the Psychology computer laboratories for this cohort. The rise in contact with others both within and outside the university is probably due to the increase of provision throughout the university and the general rise in e-mail use.

Table 9.4 How many people did you know in the class at the beginning of term?

How many	1993 (%)	1996 (%)	2001 (%)
1	29	31	47
2-5	52	33	43
6-10	14	10	9
11-20	4	4	1
More than 20	0	0	0

There is a rise in the first two categories for cohort 3 and cohort 5. It would appear that these cohorts began with a larger circle of friends than those in cohort 2. There may be explanations for the apparent rise in cohort 3. Cohort 3 was drawn from second year students who already had a year to meet people in the class before the question was asked. Although not all of these friends would have progressed to second year, a proportion of them would have and therefore this cohort began the year knowing some others from their class.

Table 9.5 How many people do you know now?

How many	1993 (%)	1996 (%)	2001 (%)
1	3	2	1
2-5	13	7	12
6-10	28	31	36
11-20	34	36	30
More than 20	22	22	21

All of the cohorts showed a rise in the number of people known after some time in the class. There were no real differences between the groups, and on the face of it this indicates that students will make friends regardless of circumstances.

However, the opportunities for meeting others in the class differed across the cohorts. In the very large class at cohort 1 (over 900) there were few opportunities to meet except in lectures or the Psychology computer laboratories. Cohort 3 was a much smaller class (450) and as they were second year students their circle of friends in the class was already established and therefore easier to expand. Cohort 5 (class size 550) had the benefit of a group project as part of their tutorial programme. The instructions for the group project included tasks relating to contact with others in the group. The group, consisting of 4 or 5 members, was told to make contact with others using e-mail and to arrange meeting to discuss the project. This meant that there was both an incentive and a means for this cohort to meet others in their tutorial group to complete a task. Around 20% of Cohort 5 lived in student accommodation compared with around 10% of Cohorts 1 and 2 and so the opportunity to get to know others in the class was greater.

Table 9.6 How many people do you contact via e-mail whom you have never met?

How many	1993 (%)	1996 (%)	2001 (%)
0	15	70	71
1-5	78	26	24
6-10	3	2	3
11-20	1	0	1.5
20+	1	2	0.5

Cohorts 3 and 5 are similar in this measure while cohort 1 is atypical. This may be due to the practice of contacting others in the class via e-mail, both by multiple mailers and speculative mailers in this cohort. E-mail relationships may have remained online for many and not progressed to face-to-face meetings.

Table 9.7 Did you 'meet' any of your classmates (since you came to university) via email?

How many	1993 (%)	1996 (%)	2001 (%)
0	15	94	95
1-5	78	6	1.5
6-10	4	0	3.5
More than 11	2	0	0

Cohorts 3 and 5 had similar figures for the category zero. E-mail was therefore not the preferred means of meeting others in the class for these cohorts. Cohort 1 however, had a high figure for category '1-5' and there is evidence that the network in this cohort was established by a group who spent a great deal of time contacting individuals or sending broadcast messages to a number of people simultaneously.

9.4 Conclusions

These comparisons show that there were differences between the cohorts in the variables measured. There were also differences in context or situation between the cohorts and these affected the results of this comparison.

Chapter10: Part 1, SUMMARY OF THE THESIS' FINDINGS

10.1 Aims of the chapter

This chapter aims to provide a summary of the main findings of the thesis. Some methodological problems will also be discussed. The final conclusions will be found in part 2.

10.2 The strengths and possible weaknesses of the thesis

The thesis is essentially an extended case study, where the absence of experimental manipulation means that the evidence about causal relationships is only indirect. It depended on an opportunistic collection of data, and therefore it is difficult to make direct comparisons in, for example, measures of e-mail use and content of messages. However, it also has some unique strengths.

The thesis is real world based as the subjects were using e-mail as part of their main occupation, not for temporary experimental purposes. It has large sample sizes and covers a period of rapid technological advance. It therefore provides an insight into changes that have taken place in undergraduate computer experience, and e-mail behaviour. It also showed a drop in usage in 1996 despite the fact that access to computers was increased and the number of people using e-mail had risen dramatically. This reduction against the world-wide trend of rising usage is a striking phenomenon, allowing unusual insight into the factors determining e-mail use.

10.3 Discussion of findings

Cohort 1 (1993/94) were fortunate to have access to e-mail in dedicated computer laboratories when at that time few undergraduates used e-mail and the vast majority had entered university without experiencing this means of communication. Observation of this cohort's e-mail behaviour and examination of the system logs showed that e-mail was being used by a large section of the class although others failed to take it up despite encouragement to do so. The results of an electronic questionnaire showed that the main use was social, and e-mail was being used to 'meet' classmates.

In order to discover possible reasons for the non-adoption of e-mail by some of the cohort a search was made for research in the area. The media choice literature could be classified into three main categories, media characteristics, user characteristics, and social or situational factors. As the main focus of early research had been media characteristics, often from an organisational perspective, and our investigation centred on an undergraduate population, some of the theories of media choice would not have been an appropriate or fruitful avenue to follow. Individual differences such as previous computer experience, user attitudes towards computers, gender and personality were chosen as some of the areas that had been the focus of previous studies but not using e-mail as the measure of computer use. More recent research emphasises the importance of context or situational factors in media adoption and use, and so the context in which the e-mail was taking place was also considered.

10.4 Individual Differences

Cohort 2 (1994/95) was the most closely studied cohort in the study. Examination of the system log and observation of e-mail behaviour revealed a similar pattern of use to Cohort 1. A survey was carried out and three computer-related attitude factors were identified in the data using Factor Analysis. These were Computer Anxiety, Perceived Usefulness and Indifference towards computers. Similar factors were found in other studies. Although there had been previous attempts to assess the influence of computer experience on general computer use, Russell (1995) was one of the few who had attempted to assess its contribution to e-mail use. Previous studies had used various measures to assess the extent of experience in individuals, making comparisons between studies problematic. In this study experience was assessed using several measures including level of training, training in a number of software packages, and computer knowledge. These were found to be equivalent measures and computer knowledge was adopted as the measure of experience. Computer experience was found to influence computer-related attitudes, especially computer anxiety, and those with low levels of computer anxiety were found to use e-mail more. Experience was found to be the best predictor of e-mail use.

Gender issues are to be found in all areas of research concerning computer use. Males have been found to have more computer experience and more positive computer-related attitudes in several studies such as Chen (1986), Shashaani (1994), Schumacher and Morahan-Martin (2001). Others such as Busch (1995) found no difference in computer-related attitudes between males and females, concluding that computer experience was higher in males. A variety of reasons have been put forward for this apparent difference in experience including exclusion of females from computer-related subjects at school, lack of female role models in computing, stereotype of computer user, and less access to computers both at home and in school. In this study females were found to have less computer experience than males and also to have more computer anxiety. When computer experience was controlled for however, no difference was found in computer-related attitudes. There was no gender difference in e-mail use.

Personality traits of Cohort 2 were also measured, and some evidence that computer-related attitudes were influenced by the Higher Order Factors of the 16PF was found. However, the relationship was not particularly strong. Introverts were found to have more positive attitudes towards the perceived usefulness of computers, while those with high scores in Anxiety were found to have a greater degree of the computer-related attitude computer anxiety. Those with a low level of Independence also had more computer anxiety and more perceived usefulness. High scores in Self-Control are more indifferent towards computers. The higher order factor, Tough-mindedness was found to influence e-mail use in females, those scoring high in this factor being heavy e-mail users. This was an unexpected result and showed that personality may be more predictive of e-mail use in females than in males, at least where other more important causal factors have not led to near universal use. Hence it may possibly be useful in organisational theory for predicting early versus late adoption of a technology, but probably not say in practical higher education post 2000 where universal use has been successfully imposed.

Heavy e-mail users were found to be similar to the stereotype of the heavy computer user or nerd in several measures. They were younger, more introverted, and significantly more males were heavy users. There was no significant difference on the Reasoning score of the 16PF5 between heavy and non-users but this measure may not be an equivalent measure of intelligence to those used in other studies.

Individual differences were therefore seen to have an influence on both computer-related attitudes and e-mail use in this study. However, individual differences on their own are unlikely to be the only factors involved in adoption and use of e-mail.

Although not specifically measured in this study, ease of use was important. Before this study began e-mail was available, but it was a less user-friendly system and no training was given. This resulted in very low take-up. The new system was simple and required minimal training before use. 81% of Cohort 1 agreed or strongly agreed that e-mail was easy to use.

Availability of the medium is also an important factor. There were some changes in e-mail availability over the course of the study and these had an effect on use. Cohorts 1 and 2 had e-mail in dedicated, open access computing laboratories. Cohort 3 could no longer access e-mail there but had wider access in university clusters throughout the campus. Despite this, and the fact that e-mail was becoming more prevalent elsewhere, even in networked home computers, use dropped in this cohort. For cohorts 4 and 5 e-mail access was even wider, as more of this group had e-mail at home and the number of networked computers on campus had grown.

10.5 Social or Situational Factors

As well as availability, other factors were involved in the adoption and use of e-mail in this study. In order for a communication medium to become viable a 'critical mass' of users has to be achieved. In cohorts 1 and 2 there was a danger that this might not happen as so few people, other than members of the cohorts, had access to e-mail at the time. The classes were encouraged to use e-mail but the only tasks given were to e-mail the Laboratory Co-ordinator once, read e-mail at least once a week, and use it to contact staff. However, networks did form and this could be seen in the system log and also in the donated mailbox contents of cohort 2.

Examination of the system log and scrutiny of the mailbox contents showed that there was a group of avid e-mailers who spent a lot of time e-mailing others in the cohort. Some of these were members of the previous cohort, repeating the year. This meant that the culture of e-mail established in Cohort 1 was transmitted to Cohort 2. Members of the previous year were also in an adjacent computer laboratory, could see who was logged on, regardless of which class they were in, and there was evidence of e-mail passing between members of the two classes.

One of the ways the network formed was through multiple e-mails, that is e-mail sent to a distribution list. The members of the cohort who did this were referred to as 'multiple mailers' and they achieved contact with unknown members of the group by accessing lists of e-mail addresses for the class as well as lists of users currently logged on to the system. As well as multiple e-mails, e-mail was sent to individuals on a speculative basis. The list of users currently logged on was the most popular source of information and e-mailing those in the computer laboratory at the same time was more likely to gain an immediate response, and it was possible to discover physical properties of the e-mail partner. Virtual conversations were discernible in the mailbox contents as users e-mailed back and forth with very little time between responses. This almost synchronous use of e-mail had some similarities with synchronous media such as CHAT. There was also evidence of disclosure in e-mail as relationships grew online.

Cohort 2 also reported how they acquired knowledge of the e-mail system and the results showed that most information about e-mail was from others in the class. Several multiple mailers were named as 'experts' in e-mail use and someone classmates would turn to for advice on e-mail functions.

One striking finding in the e-mail content was the extent of playfulness evident in the messages. This was visible in the use of nicknames in headers, signatures, and content, some of it clearly meant to entertain. This playfulness is characteristic of 'flow' – pleasure achieved through an enjoyable experience – the construct first introduced by Csikszentmihalyi in 1975. Playfulness is important as it encourages interaction with computers and an increase in computer skills through exploration. To accept an innovation Rogers (1969) concludes that an individual needs to acquire skills and knowledge about it and spend time gaining expertise. If the innovation has qualities that make if an enjoyable experience then gaining expertise becomes easier and more pleasant for the individual. Playfulness is also important as it encourages a strong sense of community in a group (Chester and Gwynne, 1998).

Although there was a great deal of evidence that e-mail was being heavily used for social purposes, especially to form friendships with others in the class, not everyone took part. There was a subculture within the cohort who embraced e-mail, and norms of behaviour were established such as the use of nicknames, signatures and a paralanguage similar to that found in synchronous communication media.

Further surveys were carried out in successive cohorts. Cohort 3 (1996/97) was surveyed as the e-mail situation differed from that of Cohorts 1 and 2. There was no longer access to e-mail in the Psychology computer laboratories as the function had been taken over by the central computing services of the university. Despite provision of e-mail on a large number of computers in clusters throughout the university, and extended access at home and elsewhere, e-mail use decreased in this cohort. E-mail was still mainly social but fewer used it to contact classmates.

In 1999/00 Cohort 4 was surveyed. E-mail was once again available in the Psychology computer laboratories as well as throughout the university, and even more students had access to a networked computer at home. There was some evidence of e-mail being used to contact classmates not previously known and some multiple e-mails were received but at a lower rate than Cohorts 1 and 2. The e-mail contacts had grown beyond classmates to include a much greater number both within and outside the university as e-mail use grew. However, e-mail was rarely used as a means of forming friendships with classmates and there was no evidence of the former community of e-mailers in Cohorts 1 and 2.

The last cohort to be surveyed was in 2001/02. E-mail was now accessible in the Psychology computer laboratories, on university clusters, and through a web gateway. 84% had used e-mail before coming to university (in Cohort 1, 90% had not used it previously). A very small number (4%) had used e-mail to 'meet' others although e-mail was still used mainly for social purposes. Computer knowledge was measured in this cohort and was considerably higher than Cohort 2 showing that computer experience has increased over the years. As mobile 'phones were being increasingly used by undergraduates, and this may have been impacting on their e-mail behaviour, this cohort was also surveyed on their mobile 'phone use. The results showed that mobiles were used by 97% and 95% of those used them while in university. Text messaging was more commonly used in university than voice messages. Like e-mail, a large proportion of the sample contacted classmates.

Chapter 10: Part 2, DRAWING CONCLUSIONS

10.6 General Conclusions

When this study began e-mail was a new technology, and it was not certain to be adopted by the undergraduate population under investigation. However, a proportion of the classes in Cohorts 1 and 2 did take it up immediately. A network of users formed quickly and this was due to small aspects of the environment at that time affecting the formation of a community of e-mail users. The main impetus for this was the availability of lists of e-mail addresses allowing users in the computer laboratories to contact others previously unknown to them. This allowed a number of keen e-mailers to send speculative messages to either specific individuals or to a number of people, using distribution lists that they compiled, painstakingly from the lists available. E-mailing individuals within the class group ensured that the senders were contacting others with a common interest, at least as members of the class. The list that seems to have been the most valuable for this purpose was of users currently logged on to the system. Chapter 8 has evidence of the usefulness of this list and how it was used to contact others in the laboratory at the same time. As e-mailing someone co-present was more likely to elicit an immediate response this soon became a popular means of forming friendships with classmates.

Of course there had to be initial adopters to start off the network and those identified were found to be similar in profile to the stereotype of a heavy computer user. They were more experienced in computers and had more positive attitudes towards them and so were more likely to interact with e-mail in a creative and experimental way. Heavy users of e-mail in Cohort 2 were similar in most respects to the stereotypical heavy computer users, or nerds, a stereotype still prominent in the public's perception today. Contrary to the stereotype of socially isolated heavy computer users, in this cohort socialising was heavily stimulated by "nerds" who did their classmates a favour by leading the way in the formation of an e-mail network. The facilitators in this instance came from within the group, not imposed by outside as would be recommended by, for example, Salmon (2000). The first two stages of Salmon's 5 stage model (learning how to use the software, and introducing themselves online) were facilitated by members of the cohort without the need for e-moderation by a tutor. There was also the opportunity for the e-mail culture of Cohort 1 to be passed on to Cohort 2 via some of the keen e-mailers from that year repeating the class and the proximity of second year students, some of whom included first years in their mailshots.

So in these early cohorts there was both the means to contact classmates and also people who established the norms of behaviour and passed on the knowledge that allowed the community, or subculture to form. The fact that this was achieved without intervention by staff was important as it meant that students were able to enjoy e-mail for social use with classmates without being guided to use it in a certain way, or for other purposes. Thus "ownership" of the student e-mail system allowed the community to form in a natural way, through playful interactions.

Further evidence of the importance of the seemingly small aspects of the environment, and the unique situation in the computer laboratories for these cohorts, comes from the changes that are evident in later cohorts' e-mail behaviour. Cohort 3 had no access to e-mail in the computer laboratories and therefore no lists of addresses to consult. Chapter 9 shows how e-mail in this group dropped at a time when access was expanding and also contact with classmates via e-mail was much reduced. There was no opportunity for the previous e-mail culture to be passed on to this group and no evidence of the formation of a community.

Since then e-mail access returned to the computer laboratories and was also available in a variety of settings, including home computers, and virtually everyone uses it. However, there was still no evidence in Cohorts 4 and 5 of a community of e-mail within the classes. Without knowing the name of someone in the class it was impossible to discover their e-mail address. As there was no longer a mechanism for accessing a list of logged on users it was also impossible to make contact with someone in the computer laboratory at the same time in order to form a friendship.

Other factors had an effect on the formation of a community in Cohorts 1 and 2. This was a new technology with the advantage of novelty and almost exclusivity as so few others had access to an easy, available system. The system allowed headers to be changed and nicks to be substituted as well as signatures added automatically and users began to play with e-mail and enjoy using it. There were few others to e-mail outside of the class and so friendships formed with classmates. This behaviour, and the use of lists for making contact with others, has some resemblance to other forms of CMC including IRC. Other behaviour, such as the 'conversational' nature of some of the messages between logged in users, was similar to synchronous media such as chatrooms.

It appears that Cohorts 1 and 2 were in a unique situation where the environment, or at least some aspects of it, allowed a subculture of e-mailers to form. The unique set-up of e-mail facilities at that time allowed this to take place. Seemingly small details of the way the e-mail system was set up had a huge impact on the use of e-mail in these cohorts.

Almost everyone now uses e-mail as it has become what Russell (1995) refers to as 'invisible', that is the technology has become familiar and unobtrusive. However, individual differences were important initially, particularly in the e-mail instigators in the early cohorts. For instance, computer experience had an effect as many of the heavy users were very experienced and they formed the network through multiple mailing and speculative messages. Others with less experience took up e-mail once they had been included in the e-mail community. Individual differences may still be important today as there are still those who use e-mail rarely (see chapter 10) and may be more likely to respond to messages than instigate them.

10.7 A unique situation or replicable conditions?

An attempt was made, in a final year undergraduate project, to replicate some of the conditions thought to be involved in the formation of e-mail community in Cohort 2. Cardwell (2003) placed first year students into groups with different access to e-mail addresses (e-mail addresses for whole class; list of those logged on to Psychology laboratory computers; logged on users plus e-mail addresses for class; no facilities). The lists were made available to the members of the groups via an icon on the desktop on the Psychology laboratory computers exclusively. The e-mail situation for those in the study was similar to that of Cohort 5. That is the students had access to e-mail on the dedicated computers in the Psychology laboratories, on university clusters throughout the campus, and via web mail from any networked computer.

No evidence was found for either the formation of friendships via e-mail or e-mail community in any of the groups. This result appears to support the view that Cohort 2 enjoyed a unique e-mail situation. Cardwell argues that the lack of e-mail novelty in her sample was the main factor. She also concluded that mobile 'phone and texting had taken over as the main means of social communication in her groups, although not for friendship formation.

Cardwell's attempt at replication failed mainly because all of the conditions could not be reproduced and this may be supporting evidence for the situational or contextual influences. As Cardwell asserts, novelty of e-mail was missing for her sample. Exclusivity is no longer felt as e -mail is now well established for all students in the institution, and is used as one of the principal means of communication staff to student and vice versa, as well as supporting student interactions.

However, individual differences cannot be ignored here, as formation of the network in Cohort 2 was dependent on those who instigated e-mail and helped produce the norms existing in the e-mail community. Without individuals who had sufficient computer knowledge to experiment with e-mail, were motivated to contact others and enjoyed using it as a means of communication, a critical mass of users may not have been possible. Cardwell's sample may not have seen e-mail as a novel challenge, or as a playful medium as it was so well established.

This is not to say that replication is impossible elsewhere. While the novel situation of Cohort 2 possibly cannot be repeated now in the highly evolved computer culture of Cardwell's sample, it may still be possible to find similar e-mail community formation in places with an emerging ICT provision.

10.8 Implications for Higher Education

Small aspects of the environment appear to have a large effect on the formation of a community of e-mail users in an undergraduate population. Draper (1997) cautions against the assumption that successful implementation of computer assisted learning (CAL) is due to something inherent in the technology. He argues that success is due to the suitability of the technology for the particular educational situation or "niche". In the same way, success in e-mail implementation cannot be assumed to be due to the technology itself as, in this study, situational factors were found to be more important than availability of an easy to use system.

If e-mail is to be encouraged as a means of bringing individuals in a large group together, then certain measures have to be taken to ensure this comes about. This view coincides with the recent focus on how a community should be set up as a key determinant of success in using e-technologies (Salmon, 2000).

Tinto (1975,1993) developed the Student Integration Model to account for the factors involved in student retention, where the emphasis was on the role of peer culture within the institution. The student's initial commitment is modified over time due to integration into the community through interaction with peers and staff. The higher the social integration, the higher would be the commitment to remain. Peer interaction is vital in a learning situation and peers are the biggest influence on students according to Astin (1993). In a virtual learning situation where face-to-face interaction is missing, Schutte (2002) argues that increased peer interaction in study groups compensates, and better grades are achieved. Sunderland (2002) found that students on a distance –learning course reported a "sense of identity" and belonging to a community where the main form of communication was e-mail. Thomas (2000) agrees that having friends in the class is good for students, as having more connections brings about a "sense of belonging". Thomas also believes that ties to those outside the peer group improve student learning. The formation of an online community such as those seen in Cohorts 1 and 2 is therefore a positive advantage for a student population and should be encouraged, especially since there was some interaction between first and second year students.

However, there is a difference between forming e-mail communities who use the medium mainly for social purposes and enjoyment, to a community where discussion and debate takes place. In our cohorts there has been no attempt to use e-mail for other than communication purposes and one of the original aims was to give our large classes a means of interacting with classmates.

E-mail is used for social interaction and for work-related queries and requests but it has proved to be difficult to get students to use it for discussion despite the academic view that it is an ideal medium for this purpose. If it is to be used in teaching then a great deal of effort has to be made by the tutor or person managing the system (Crook and Webster, 1997, Mason and Bacsich, 1998), but students are still reluctant to contribute to discussions. Crook and Webster (1997) suggest that e-mail may not be the best medium for conducting peer collaboration or academic exchanges with staff. They argue instead for a move away from e-mail as a teaching tool towards web based course support.

Perhaps then what this study has added to the debate is that e-mail can still be useful in a teaching situation, but that its strength is in bringing classmates in a large group together to form smaller cliques or groups. This can be achieved with little effort on the part of staff but requires a reliable and easy to use system with the capability of identifying current logged in users and making available lists of class e-mail addresses. As the groups have formed through choice they are more likely to have similar views and interests and they would be an ideal starting point for study groups (online or not). Studies have shown that smaller groups are best, and if the members of the group know each other that promotes participation (Tolmie and Boyle 2000). Formation of peer friendships in e-mail could therefore be a useful tool as a first step towards creating the right conditions for online discussion and debate.

10.9 Policy implications for Higher Education

As demand increases for advanced levels of education to meet the need for a wider knowledge based world economy, Higher Education increasingly looks to Information Technology for solutions. In order to keep resource input to a minimum while at the same time meeting demand, telecommunications and computers have become the focus. Increasingly asynchronous course delivery has moved away from specialist providers such as the Open University, to a much wider range of institutions. Face-to-face meetings, in physical space, can be replaced by meetings in virtual space through interactions using electronic media such as e-mail.

Policies have changed to meet the increasing demand and policy makers have recognised the importance of e-learning. An ESRC manifesto sets out a vision for the future contribution of networked e-learning where collaboration and interaction are paramount in a learning community (ESRC, 2002). The European Union Education Council also advocates computer literacy for everyone in the "information age", as well as life-long learning (Hodgson, 2002). A recent government white paper "The future of Higher Education" makes it clear that flexibility is the key, with widening access, part-time courses, distance learning and e-learning mentioned (Kraan, 2003). As higher education extends beyond the traditional student profile new methods have to be employed to meet the different needs of varied groups. If widening access is to be achieved successfully then, according to the Tinto model, outlined in 10.8, peer interaction should be one aspect that is attended to. Patrick (2001) found that dropout from university is more common in those with lower entry qualifications and with a background in a lower socio-economic group. However, Tinto would argue that retention is founded on student integration and other factors play a secondary role. The social side of student integration may be one area where ICT can play a part.

It is clear that ICT is the basis for reform of educational practice throughout the world. This emphasis on ICT makes it necessary for research in educational settings to take into account a variety of aspects. Selwyn (2000) calls for more quantitative and qualitative studies, using large data sets, focussing on social and cultural contexts of ICT use, leaving technological determinism behind. In educational literature, recent studies have been aimed at interactive learning and collaborative learning environments. Participation in computer supported collaborative learning depends on many factors, and is best achieved when those involved have a "shared purpose" according to Tolmie and Boyle (2000).

If ICT is to be the mainstay of future education then it is clear that we need to address issues concerning establishment and use of CMC based learning environments. The value of this study is that it took a wide view of e-mail adoption over a period of time and showed how students *actually* used the technology. The study revealed the possibility of student led groups, formed by members of the class rather than imposed by tutors or facilitators, and the value of shared physical as well as virtual space in the formation of e-mail community. It also showed the importance of motivation in CMC adoption and use. Enjoyment and playfulness was the catalyst that brought about the critical mass of users, as well as a group of dedicated users who had enough confidence in their use of the technology to contact others in the class and engage them in e-mail interaction. If any use of CMC is to be made in new teaching initiatives it is important that these considerations are taken into account. If students get to know others through social use of e-mail then perhaps this can be a forerunner to using it for collaborative exchanges and e-learning opportunities.

10.10 Future Directions

As virtually every undergraduate now uses e-mail, and the medium has become just another communication tool, attention can be diverted from the factors that influence adoption and use. At the beginning of a new technology it is important to know what will make some individuals adopt while others avoid, but what we are actually discovering is the profile of the initial adopters. As technology advances the lessons learned in e-mail studies can be used to inform future investigations of new communication media.

The department in this study adopted a new technology in the session 2002-03. A dynamic website portal was made available to first and second year students. Notices with class information could be placed on the portal by staff, and students could add messages to a bulletin board forum for each class. The portal had the facility to allow users to see who was currently logged on to the system. It also allowed lurkers to read messages without logging in.

Although no formal study has yet been undertaken, observation of the messages posted by students, held on a database by the portal manager, reveal interesting differences in use between the two classes. Second years used the bulletin board to ask questions about completion of laboratory reports, and questions were answered by one of the tutors. The advantage of such a system is that the answers are public and all can see and learn from them. An added bonus was that there was a reduction in individual queries to tutors on this subject. First year students, on the other hand, used the bulletin board almost exclusively as a means of meeting others in the class.

What is interesting about this development, and warrants further investigation, are the parallels with the early cohorts in this study, at least as far as the first year class is concerned. Nicks were used and requests for others to make contact were similar to those found in Cohort 2's e-mail data. It may be significant that once again logged in users could be identified.

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APPENDIX A

Q1

1. Have you used electronic mail before coming to university?

Yes	
No	

2. I find electronic mail easy to use.

Agree	
Strongly agree	
Neither agree/disagree	
Disagree	
Strongly disagree	

3. To which of the following have you sent electronic mail?

Classmates	
Tutors	
Co-ordinator	
Others in university	
Others outwith university	
Lecturers	

4. Which mode of communication do you think electronic mail most resembles?

Personal note	
Memorandum	
'phone conversation	
Formal letter	
Face-to-face chat	

5. Please rank order these modes of communication in terms of your personal preference.

Face-to-face chat	
Personal note	
'phone conversation	
Formal letter	
Memorandum	

6. How often do you send electronic mail messages?

Once a week	
Rarely	
Once a month	
Every day	
Never	

7. Do you answer your electronic mail messages immediately?

Yes	
No	

8. Place into rank order the purposes for which you use electronic mail (results are those ranked first)

Social contact	
To get information	
To contact tutor	
To contact co-ordinator	
To contact lecturer	

9. Do you think electronic mail is a good way for members of staff to keep in touch with students, and for you to contact members of staff?

Yes	
No	

10. How often do you check for new mail messages?

Once a week	
Every day	
Once a month	
Rarely	
Never	

11. Do you feel you are as careful when composing an electronic mail message as you are with a written message?

Yes	
No	

12. How many people did you know in the class at the beginning of term?

1	
2 - 5	
6 - 10	
11 – 20	
More than 20	

13. How many people do you know now?

1	
2 - 5	
6 - 10	
11 - 20	
More than 20	

14. How many of these did you 'meet' via electronic mail?

0	
1	
2 – 5	
6 – 10	
11 - 20	
More than 20	

15. Have you ever received an unwelcome electronic mail message from a stranger?

Yes	
No	

16. How many people do you communicate with via electronic mail whom you have never met?

0	
1	
2 – 5	
6 – 10	
11 – 20	
More than 20	

APPENDIX B

Q1

COHORT 1: QMARK RESULTS FOR CLASS A

1. Have you used electronic mail before coming to university?

Yes	9%
No	91%

2. I find electronic mail easy to use.

Agree	51%
Strongly agree	30%
Neither agree/disagree	12%
Disagree	5%
Strongly disagree	3%

3. To which of the following have you sent electronic mail?

Classmates	85%
Tutors	45%
Co-ordinator	34%
Others in university	19%
Others outwith university	13%
Lecturers	8%

4. Which mode of communication do you think electronic mail most resembles?

Personal note	74%
Memorandum	29%
'phone conversation	15%
Formal letter	13%
Face-to-face chat	5%

5. Please rank order these modes of communication in terms of your personal preference.

Face-to-face chat	83%
Personal note	9%
'phone conversation	4%
Formal letter	2%
Memorandum	1%

6. How often do you send electronic mail messages?

Once a week	45%
Rarely	26%
Once a month	16%
Every day	11%
Never	6%

7. Do you answer your electronic mail messages immediately?

Yes	62%
No	38%

8. Place into rank order the purposes for which you use electronic mail (results are those ranked first)

Social contact	67%
To get information	18%
To contact tutor	7%
To contact co-ordinator	4%
To contact lecturer	1%

9. Do you think electronic mail is a good way for members of staff to keep in touch with students, and for you to contact members of staff?

Yes	94%
No	6%

10. How often do you check for new mail messages?

Once a week	66%
Every day	15%
Once a month	14%
Rarely	9%
Never	1%

11. Do you feel you are as careful when composing an electronic mail message as you are with a written message?

Yes	54%
No	46%

12. How many people did you know in the class at the beginning of term?

1	29%
2 - 5	52%
6 - 10	14%
11 – 20	4%
More than 20	0%

13. How many people do you know now?

1	3%
2 - 5	13%
6 - 10	28%
11 - 20	34%
More than 20	22%

14. How many of these did you 'meet' via electronic mail?

0	15%
1	57%
2 – 5	21%
6 – 10	4%
11 - 20	1%
More than 20	2%

15. Have you ever received an unwelcome electronic mail message from a stranger?

Yes	23%%
No	77%

16. How many people do you communicate with via electronic mail whom you have never met?

0	15%
1	57%
2 – 5	21%
6 – 10	3%
11 – 20	2%
More than 20	1%

APPENDIX C

Q1.

COHORT 1: QMARK RESULTS FOR CLASS B

1. Have you used electronic mail before coming to university?

Yes	10%
No	90%

2. I find electronic mail easy to use.

Agree	48%
Strongly agree	24%
Neither agree/disagree	16%
Disagree	11%
Strongly disagree	1%

3. To which of the following have you sent electronic mail?

Classmates	86%
Tutors	42%
Co-ordinator	36%
Others in university	19%
Others outwith university	18%
Lecturers	13%

4. Which mode of communication do you think electronic mail most resembles?

Personal note	78%
Memorandum	37%
'phone conversation	8%
Formal letter	15%
Face-to-face chat	5%

5. Please rank order these modes of communication in terms of your personal preference.

Face-to-face chat	87%
Personal note	4%
'phone conversation	3%
Formal letter	4%
Memorandum	0.5%

6. How often do you send electronic mail messages?

Once a week	42%
Rarely	29%
Once a month	16%
Every day	12%
Never	5%

7. Do you answer your electronic mail messages immediately?

Yes	62%
No	38%

8. Place into rank order the purposes for which you use electronic mail (results are those ranked first)

Social contact	65%
To get information	26%
To contact tutor	4%
To contact co-ordinator	6%
To contact lecturer	3%

9. Do you think electronic mail is a good way for members of staff to keep in touch with students, and for you to contact members of staff?

Yes	94%
No	6%

10. How often do you check for new mail messages?

Once a week	67%
Every day	17%
Once a month	18%
Rarely	4%
Never	1%

11. Do you feel you are as careful when composing an electronic mail message as you are with a written message?

Yes	55%
No	45%

12. How many people did you know in the class at the beginning of term?

1	10%
2 - 5	40%
6 - 10	33%
11 – 20	11%
More than 20	5%

13. How many people do you know now?

1	2%
2 - 5	13%
6 - 10	35%
11 - 20	38%
More than 20	11%

14. How many of these did you 'meet' via electronic mail?

0	22%
1	67%
2 – 5	9%
6 – 10	1%
11 - 20	1%
More than 20	0%

15. Have you ever received an unwelcome electronic mail message from a stranger?

Yes	35%
No	65%

16. How many people do you communicate with via electronic mail whom you have never met?

0	25%
1	54%
2 – 5	17%
6 – 10	2%
11 – 20	2%
More than 20	0%

APPENDIX D

Q2

Course............... *Year*...... *Subject*.............................. Computer Experience

We are trying to establish a profile of student computer skills within different classes and course levels across the University. Please take a few minutes to complete the form below,answering all relevant questions as accurately as you can. Please PRINT your written answers.

Matric No:____________________ Date:__________ Sex(M/F):__________________

1) Have you ever received any training in computer use'? Yes ☐ No ☐

If 'yes', please give details below:- *(if possible, give course name, duration, year, and where taken - eg school, college, university)*

What areas did this training cover? *(tick as many as appropriate)* ,

Word processing	☐	Programming	☐
Spreadsheets	☐	Databases	
Graphics/draw package	☐	Statistical software	☐
Desktop publishing	☐	Image processing	
CAD/CAM	☐	Other *please specify*	

____

2) Which (if any!) computer packages/systems/interfaces have you used (eg Word, Excel, Unix, Windows). *Please list them below.*

3) Do any other classes you are taking, or have already completed, al school, college or university, provide computer-supported teaching material? *Please list any such course, and the year level, below:*

4) Did you make use of any such resources? Yes ☐ No ☐

5) If so, were they useful for your course work Yes ☐ No ☐

Why?

6) Do you have your own computer? ☐ Or constant access to one outside the university? ☐

7) How often would you say you use a computer?

Every day	☐	More than once a month	☐
Every 2-3 days	☐	Once a month	☐
Once a week	☐	Less than once a month	☐

8) What type of computers have you used in the past few years (e.g. Apple Macintosh, IBM PC, Sega)?

....

9) Do you write up your essays/reports on a word processor? Please circle the appropriate answer below:-

Always **Usually** **Sometimes** **Never**

10) Do you use a computer *for* recording and analysing data? Please circle the appropriate answer below:-

Always *Usually* *Sometimes* *Never* *Within lab classes*

Outside lab classes *Both*

11) Do you use electronic mail (email)? Please circle the appropriate answer below:-

Always *Usually* *Sometimes* *Never*

12) Do you think you would be able to do the following?	Yes	No
Prepare a new floppy disk *for* use?	☐	☐
Make a copy of a disk	☐	☐
Delete a program or file		
Create a new directory or folder		
Print out a file or document		

13) Please tick any of the following you have used:-

mouse	modem
floppy disk	laser printer
hard disk	computer keyboard
CD-ROM/CDI	dot matrix printer

Knowledge of Computers

Please answer the following questions by ticking the appropriate box:

1) The physical parts of a computer are called:

(a) Software
(b) Hardware
(c) Programs
(d) Machinery
(e) Don't know

2) What is a computer program?

(a) A set of instructions to control a computer
(b) A course about computers
(c) The main memory of the computer
(d) An electronic component of the computer
(e) Don't know

3) What does a cursor do?

(e) it gives a cursory help message on the screen
(f) it marks the place on the screen where you are working
(g) it points to where data are stored
(h) it shows the brightness of the screen
(e) Don't know

4) Which of the following translates computer signals to telephone tones and back again?

(a) Modem
(b) Cathode ray tube
(c) Light pen
(d) Mouse
(e) Don't know

5) Computer software refers to:

(a) Computer manuals
(b) Mechanical and electrical components of the computer
(c) People's expertise in computer usage
(d) Computer programs
(e) Don't know

6) What is meant by the term 'debugging'?

(a) It is a term for having problems when using a computer
(b) It is a way of setting up your computer so that no 'bugs' or errors can get in
(c) It is a method of finding and sorting out problems in computer code
(d) It is not a term that is really used
(e) don't know

7) Formatting a floppy disk is the process of:

(a) Copying a document from the hard drive onto the floppy disk
(b) Telling the computer how to set the margins for printing a document
(c) Inserting the disk into the disk drive
(d) Organising the disk to allow information to be stored on it
(e) Don't know

8) What is RAM?

(a) A computer program
(b) A type of machine ☐
(c) A type of computer memory ☐
(d) A type of printer ☐
(e) Don't know ☐

9) Which of the following is an example of an application package?

(a) Word processor ☐
(b) Machine language ☐
(c) Operating system ☐
(d) File server ☐
(e) Don't know ☐

10) Spreadsheet software is most appropriate for organising and manipulating which type of information?

(a) Pictures ☐
(b) Text ☐
(c) Numbers ☐
(d) Sounds ☐
(e) Don't know ☐

II) A computer program or file can be stored permanently on a:

(a) Monitor ☐
(e) Modem ☐
(f) Disk ☐
(g) Disk drive ☐
(e) Don't know ☐

12) In a computer lab with all the computers networked together, users access the software . and/or data from a central storage called the

(a) File server ☐
(b) Switchboard ☐
(c) System operator ☐
(d) Floppy drive ☐
(e) Don't know ☐

13) You have spent a long time writing an essay and have saved it onto a disk, Why would it be advisable to make a back-up copy on another disk?

(a) One of the disks may be copy-protected and the other not ☐
(b) You can save part of the essay on one disk and part on the other ☐
(c) The disk could be used on different operating systems ☐
(d) Something may go wrong with the first disk ☐
(e) Don't know ☐

14) What is the purpose of using directories or folders?

(a) To improve the presentation of documents
(b) To help organise your files
(c) To give you a list of all the programs that are running at that time
(d) To give the location of the computer if it is part of a network of other computers
(e) Don't know

15) If you were word processing a document and found you had spelt a word incorrectly several times, what would be the most effective way of correcting this mistake?

(a) Insert
(b) Move (or cut and paste)
(c) Delete and retype
(d) Search and replace
(e) Don't know

16) In a database there are:

(a) Fields made up of records
(b) Records made up of fields
(c) Fields but no records
(d) No fields or records
(e) Don't know

Attitudes to Computers

Please indicate the degree to which you *agree* or *disagree* with the following statements by circling the appropriate number:

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
Learning about computers is worthwhile	1	2	3	4	5
I feel intimidated if a conversation turns to computers	1	2	3	4	5
I find computers boring	1	2	3	4	5
I believe I could do advanced computer work	1	2	3	4	5
I feel confident when working with computers	1	2	3	4	5
Having computer skills would not enhance my career prospects	1	2	3	4	5
I am not the type to do well with computers	1	2	3	4	5
I do not understand how people can enjoy working With computers	1	2	3	4	5
All students should learn something about computing as part of their course	1	2	3	4	5
I would feel OK trying something new on a computer	1	2	3	4	5
I would not like a job that involved working with computers	1	2	3	4	5
I expect to use computers in many ways in my daily life	1	2	3	4	5
Figuring out computer problems really appeals to me	1	2	3	4	5
I avoid using computers whenever I can	1	2	3	4	5
If I could afford to, I would consider buying a home computer	1	2	3	4	5
It would be less important to me to do well in a computer class than in other classes	1	2	3	4	5
I feel threatened by the thought of having to use a computer	1	2	3	4	5
I would like to know more about computers	1	2	3	4	5
I am often unsure what to do when using a computer	1	2	3	4	5

APPENDIX E

16PF5

Primary Factors

A Warmth

B Reasoning

C Emotional Stability

E Dominance

F Liveliness

G Rule-Consciousness

H Social Boldness

I Sensitivity

L Vigilance

M Abstractedness

N Privateness

O Apprehension

Q1 Openness to Change

Q2 Self-Reliance

Q3 Perfectionism

Q4 Tension

APPENDIX F

Significant results for gender differences in personality traits and higher order factors of the 16PF5

Personality trait	Mean	S.D.	d.f.	t	P<
A Warmth	F 6.46 M 5.29	1.6 1.77	472	7.5	0.0001
B Reasoning	F 6.81 M 7.35	1.54 1.59	472	-3.79	0.0001
E Dominance	F 5.31 M 5.76	2.01 1.92	472	-2.49	0.013
G Rule-consciousness	F 4.55 M 3.97	1.94 1.96	472	3.27	0.001
I Sensitivity	F 6.57 M 5.65	1.59 1.75	472	5.97	0.0001
M Abstractedness	F 6.36 M 7.00	2.09 1.91	472	-3.44	0.0006
N Privateness	F 4.08 M 4.7	2.03 2.10	472	-3.15	0.002
O Apprehension	F 6.13 M 5.35	1.87 1.98	472	4.46	0.0001
Q2 Self-reliance	F 4.23 M 4.71	1.72 1.82	472	-2.98	0.003
Q3 Perfectionism	F 4.44 M 3.99	1.96 1.94	472	2.52	0.01
Q4 Tension	F 5.82 M 5.37	1.97 2.08	472	2.42	0.01
H.O.F. Extraversion	F 6.98 M 6.26	1.65 1.80	472	4.51	0.0001
H.O.F. Anxiety	F 6.11 M 5.6	2.0 2.0	472	2.87	0.004
H.O.F. Tough-mindedness	F 3.94 M 4.30	1.76 1.80	472	-2.09	0.036
H.O.F. Independence	F 5.67 M 6.09	1.77 1.63	472	-2.70	0.007
H.O.F. Self-Control	F 4.11 M 3.53	1.8 1.69	472	3.6	0.0003

APPENDIX G

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
1	2	3	2	1	2		22	2			1	
	22	1							1		1	3
	19	24										
	73	1										
	53	2	8									
	45	3	1									
	27	2	1									
	221						1					
2	1	3	2	1	2		22	2			1	
	14	1										
	175				6		1		1			
3	4	1					1					
	5	1						1				
	8	1										
	9	1			1			1	2			
	10	1			1							
	11	1		1								
	12	1						2	1			
	197							2				
	255							1				
4	3	1										
	148			1			1				1	
	229						1				1	
5	3	1						1				
	142			1								
	160				2							
	220						1	3				
8	3	1										
	142				2							
9	3	1			1			1	2			
	142				2							
10	3	1			1							
	142			1			2					
	220						1	1				2
11	3	1	1	1								
	142			2								
12	3	1						2	1			
	198					3	6	4	2			
13	19	1			2				1			
	26	50										
	54	10										
	95	1										
	34	40										
	37	25										

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
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	65	10	10									
	53	8										
	80	6										
	106	1										
	101	2										
	18	1										
	30	2										
	212								1			
14	15	11	15	12	7			1				
	2	1										
	140			1								
	158				2							
	159				4							
	236							1				
15	14	11	15	12	7							
	25	14										
	70	1										
	19	1										
	140			1								
	158				2							
	159				4							
	223						2	3	1			
16	19	9		1	2				2			
17	18	8	5		1							
	47	2	54		1							
	126		7		10							
	19		3	3	1							
	193										6	
18	17	8	5		1							
	19	17	8	3	9				1			
	25	1										
	48	1			1							
	45	1										
	72	25										
	26	25										
	30	50	7		7							
	107	2										
	96	32										
	34	1										
	13	1										
	126		9		7							
	47		3									
	27		2	2	2							
	22				1							
19	20	3	2									
	21	1	1									
	23	2	2	2	7				2			

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
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	25	35	3	3	6				1			1
	26	1		1	5				1			
	27	16		2	14				4			
	28	2	1		20				2			
	16	9		1	2				2			
	18	17	8	3	9				1			
	13	1			2				1			
	1	24										
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	31	1			2				1			
	32	1			2				2			
	33	1			2				2			
	34	1			2				1			
	35	1			4	1			2			
	36	1			2				1			
	37	1			2				1			
	38	7			2				1			
	39	2			2				1			
	40	6			28		1		2			
	15	1										
	53	1			1							
	90	4										
	126		4	3	8				1			
	47		1	3								
	17		3	3	1							
	84			2	2							
	167				2				1			
	168				2				1			
	169				1							
	170				1							
	171				1							
	216								5			
	261								1			
	262								1			
	263								1			
	45								2			
	209								1			
20	19	3										
21	19	1	1									
	236							1				
22	1	1							1		1	3
	44	1	1		14	9		2	1		1	1
	46		1		4	8					1	
	42				1							
	163				1							
	81				1							
	18				1							

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
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	165				1							
	89					1	3					
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24	19	2			3				1			
	178					2						
25	19	35	3	3	6				2			1
	41	1										
	45	14	2	2	7	3			2			
	47	1	2	1	1							
	18	1										
	42	19	10	4	4	6			4			
	53	16	4	2	2							
	54	1										
	28	1	7	1								
	15	14										
	27	14										
	56	17										
	71	1	7	2	1							
	48				1							
	103								6			
	58								6			1
	258								1			
26	19	1		1	5				1			
	53	13										
	88	1										
	30	17										
	91	1										
	13	50										
	37	90	10									
	34	45										
	66	1										
	18	25										
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	25	14										
	59	7										
	71	6		1								
	64	4	2									
	1	2	1									
	84	3	14	4	4							
	18		2	2	2							
	236							15	2	1	8	1
	200								1			1
	201								1			2
	222								1			3
	80								1			
28	19	2	1		20				2			
	25	1	7	1								

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
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	65		10									
	134					2	5					
	236							1	1			
	193								5			
30	19	1			3				1			
	80	84										
	63	2										
	54	21										
	26	17										
	53	19										
	41	5										
	91	1										
	94	1										
	34	42										
	37	21										
	95	1										
	101	44										
	18	50	7		7							
	96	17										
	13	2										
	236							24	4			
	61											
31	19	1			2				1			
32	19	1			2				2			
	89	1										
	37			1		2						
33	19	1			2				2			
	81	1	1									
34	19	1			2				1			
	48	1										
	84	5	2									
	30	42										
	26	45										
	13	40										
	96	62										
	37	35										
	54	6										
	90	48										
	106	22										
	80	1										
	116	1										
	18	1										
35	19	1			4	1			2			
36	19	1			2				1			
37	19	1			2				1			
	26	90	10									
	30	21										

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	72	30										
	71	1										
	34	35										
	13	25										
	66	27										
	106	9	1									
	32			1		2						
	51				2			1				
	149											
38	19	7			2				1			
	37	1	4	2	3							
	215						1					
	222						6	7				
	214							1				
39	19	2			2				1			
	202					1		1		1		
40	19	6			28		1		2			
41	25	1										
	30	5										
42	50	1										
	25	19	10	4	4	6			4			
	58	1	2		6	11	12	3	5			
	70	1	1									
	71	1	1									
	84	3	3									
	89	1	1									
	90	1	1									
	139			3	2	4			2			
	22				1							
	179					3		1	1			
	103								2			
43	44	1										
	46	1										
44	43	1										
	22	1	1		14	9		2	1		1	1
	89	1	1									
	190					2						
45	25	14	2	2	7	3			2			
	71	1										
	1	3	1									
	18	1										
	77	1										
	206					1						
	207					2	1	41	10			
	19								1			
46	43	1										
	22		1		4	8					1	

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
	190					2						
47	25	1	2	1	1							
	17	2	54		1							
	126		6		2							
	19		1	3								
	18		3									
	139				2							
	179											1
48	49	1	1									
	73	1										
	34	1										
	18	1			1							
	104	1	3		1		1					
	108	1	2									
	156				3							
	164				2							
49	48	1	1									
	137					2						
50	42	1										
51	52	3	2	2		1		1				
	55	1										
	57	1		2	3	4	2	11		3	2	1
	37				2			1				
	178					4	1	4				
	149					8	8	2	2			4
	182					4	2	1	1	1	2	
	207									1		
	271									2	2	
52	51	3	2	2		1		1				
53	25	16	4	2	2							
	71	15										
	1	2	8									
	26	13										
	30	19										
	65	21	10									
	66	7										
	13	8										
	19	1			1							
54	25	1										
	83	1										
	30	21										
	90	14	3									
	13	10										
	34	6										
	72	2	1	1								
55	51	1										
56	25	17										
	58	3			3	3	1	2	1			

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
	84	6										
57	51	1		2	3	4	2	11		3	2	1
58	42	1	2		6	11	12	3	5			
	56	3			3	3	1	2	1			
	25								6			1
59	60	3										
	61	4										
	27	7										
	62	13	1	2								
	68	1										
	77	2										
	82	1										
	73	1										
	183					1						
	184					3	7	3				
	185					5	1	2				
	212					3		1				
	207					1						
60	59	3										
	77	1										
61	59	4										
	71	3								2		
	72	1										
	65									3		1
	30											
62	59	13	1	2								
	151			1	2							
63	64	7										
	65	4										
	67	15	3									
	68	5										
	69	12										
	66	13										
	81	3		1								
	30	2										
	101	1	1									
64	63	7										
	66	4										
	27	4	2									
	138		1		2			2				
65	63	4										
	68	4	26									
	85	14	15	7								
	73	11	28									
	80	14										
	66	3							13			
	53	21	13									
	13	10	10									

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
	28		10									
	193								14			
	61									3		1
66	64	4										
	63	13										
	68	1										
	80	24										
	73	36										
	85	5										
	26	1										
	37	27										
	53	7	10									
	65	3							13			
	193								22			
67	63	15	3									
	89	1										
68	59	1										
	63	5										
	66	1										
	65	4	26									
	78	2	5									
69	63	12										
70	42	1	1									
	15	1										
71	42	1	1									
	25	1	7	2	1							
	45	1										
	74	1	4									
	61	3								2		
	76	1										
	53	15										
	75	14										
	72	15										
	27	6		1								
	82	2	1									
	37	1										
72	73	25										
	75	14										
	71	15										
	61	1										
	37	30										
	54	2	1	1								
	102	3										
	18	25										
73	72	25										
	1	1										
	48	1										
	59	1										

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
	66	36										
	65	11	28									
	108	1	1									
	241							1				
74	71	1	4									
	101	1	1									
75	72	14										
	71	14										
	179							1				
76	71	1										
77	60	1										
	59	2										
	45	1										
78	79	1										
	68	2	5									
	125		1									
79	78	1										
	161				3							
	133							1				
80	30	84										
	66	24										
	65	14										
	34	1										
	13	6										
	193					1	8	3	1			
	19								1			
81	63	3		1								
	33	1	1									
	22				1							
82	71	2	1									
	97	1	1	1	2							
	108	1	1									
	59	1										
	187					1	1					
83	54	1										
84	56	6										
	27	3	14	4	4							
	42	3	3									
	34	5	2									
	110	1	3									
	131		1									
	19			2	2							
85	86	1										
	65	14	15	7								
	87	1	2									
	66	5										
	28	1										
86	85	1										

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
	108	1	3									
	132		2									
87	85	1	2									
88	26	1										
	89	1										
89	44	1	1									
	42	1	1									
	32	1										
	67	1										
	88	1										
	98	1										
	22					1	3					
90	54	14	3									
	34	48										
	111	1										
	19	4										
	96	1										
	42	1	1									
91	26	1										
	30	1										
92	93	1	1									
93	92	1	1									
94	30	1										
95	13	1										
	30	1										
96	34	62										
	18	32										
	13	36										
	18	5										
	30	17										
	90	1										
97	82	1	1	1	2							
98	89	1										
99	100	1										
100	99	1										
	166				1							
	272									2		
101	30	44										
	63	1	1									
	74	1	1									
	103	1										
	112	1										
	115	1	1	10								
	13	2										
	231						1					
	236							1	2			
	212							1	1			
102	72	3										

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
103	101	1	1									
	236							1	5			
	25								6			
	42								2			
104	105	1										
	48	1	3		1		1					
	127		3		1							
105	104	1										
106	34	22										
	37	9	1									
	13	1										
107	18	2										
	22				1							
108	109	2										
	86	1	2									
	82	1	1									
	48	1	2									
	73	1	1									
109	108	2	1									
110	84	1	3									
	176				1							
111	90	1										
112	101	1										
	157				1				1			
113	114	1	1									
114	113	1	1									
115	101	1	1	10								
116	34	1										
	205					1						
117	118	2	2									
	119	1										
	122	2										
	172				1							
118	117	2	2									
119	117	1										
120	121	1	5					1		1		1
	133		2	2	2	1	2		2			
121	120	1	5					1		1		1
	236							1				
122	117	2										
123	124		1			3	2					
124	123		1			3	2					
125	78	1										
	141			1				1				
	180					5	9	2	1			
	231						1					
126	47		6									
	19		4	3	8				1			

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
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	17		7		10							
	47		1		2							
127	104		3		1							
128	129		2				1					
129	128		2				1					
	130		1	2				2	2			
	186					1						
	236										1	
130	129		1	2				2	2			
131	84		1									
132	86		2									
133	120		2	2	2	1	2		2			
	178					2	1	4				
	149						2	1				4
	79							1				
134	135		2				2					
	28					2	5					
	149											
135	134		2				2					
136	137		1									
137	136		1									
	164				1							
	49					2						
138	64		1		2			2				
139	42		3		3	4			2			
	47				1							
140	15			1								
	14			1								
141	125			1				1				
142	11			2								
	10			1			2					
	5			1								
	8				2							
	9				2							
143	144			1					1			1
144	143			1					1			1
	147			1			1	1				
145	146			1								
146	145			1								
147	144			1			1	1				
	278											1
148	149						1	1				
	4										1	
149	150			1			8	4	1			
	178					6	7	7	1			
	51					8	8	2	2			4
	204					4	1					3

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
	182					1		2	5			13
	133						2	1				4
	230						1	2				3
	148						1	1				
	233							8			3	6
	134											
	37											
150	149			1			8	4	1			
151	62			1	2							
	174				1							
152	153				1							
153	152				1							
154	155				1		2					
155	154				1		2					
156	48				3							
157	112				1				1			
158	14				2							
	15				2							
159	14				4							
	15				4							
160	5				2							
161	79				3							
163	22				1							
164	48				2							
	137				1							
165	22				1							
166	100				1							
167	19				2				1			
168	19				2				1			
169	19				1							
170	19				1							
171	19				1							
172	117				1							
	173				1							
173	172				1							
174	151				1							
175	2				6		1		1			
176	110				1							
	177				1		1	2				
	244							1	1			
177	176				1		1	2				
178	24					2						
	133					2	1	4				
	51					4	1	4				
	149					6	7	7	1			
179	42					3		1	1			
	75							1				
	257								1			

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
	47											1
180	125					5	9	2	1			
181	182					1						
	213						1			2		
182	181					1						
	51					4	2	1	1	1	2	
	149					1		2	5			13
183	59					1						
184	59					3	7	3				
185	59					5	1	2				
186	129					1						
187	82					1	1					
	218						1					
	224						1					
188	189					1	2	3	2	1		
189	188					1	2	3	2	1		
190	46					2						
	44					2						
191	192					2	1					
192	191					2	1					
193	194					2	2	2	6			
	195					2						
	196					2		3	1			
	80					1	8	3	1			
	219						2		3			
	240							1	2			
	66								22			
	28								5			
	17										6	
194	193					2	2	2	6			
195	193					2						
196	193					2		3	1			
197	198					3		3	1			
	3							2				
198	197					3		3	1			
	12					3	6	4	2			
199	200					1	1	2				
	201					1		1		2	2	
	214								1			
	222								6		1	1
200	199					1	1	2				
	27								1			1
201	199					1		1		2	2	
	27								1			2
202	39					1		1		1		
	203					2		1				
203	202					2		1				
204	149					4	1					3

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
205	116					1						
206	45					1						
207	45					2	1	41	10			
	59					1						
	51									1		
208	209					3	7					
209	208					3	7					
	19								1			
210	211					1		3		2		
211	210					1		3		2		
212	59					3		1				
	13							1	1			
	101							1	2			
	250							2	1			
	256							2				
	251							1				
	259								1			
213	181						1			2		
214	215						1					
	38						1	1				
	199								1			
215	214						1					
	222						5					
216	217						2		3			
	19								5			
217	216						2		3			
218	187						1					
219	193						2		3			
220	10						1	1				2
	5						1	3				
221	1						1					
222	215						5					
	38						6	7				
	199								6		1	1
	27								1			1
223	15						2	3	1			
224	187						1					
	24						1					
	181						1					
	121						1					
227	228						1					
228	227						1					
229	4						1				1	
230	149						1	2				3
231	232						1					
	101						1					
	125						1					
232	231						1					

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
233	149							8			3	5
234	235							2	1			
235	234							2	1			
236	30							24	4			
	27							15	2	1	8	3
	103							1	5			
	101							1	1			
	245							1	2			
	21							1				
	240							2	2			
	121							1				
	246							1	2			
	247							1				
	248							1				
	249							1				
	28							1	1			
	250							1	2			
	251							1				
	252							5				
	14							1				
	129											
	282											
237	238							2			1	
238	237							2	1			
	239							1	1			
	260								1			
239	238							1				
240	193							1	2			
	236							2	2			
241	73							1				
242	243							1				
243	242							1				
244	176							1	1			
245	236							1	2			
246	236							1	2			
247	236							1				
248	236							1				
249	236							1				
250	236							1	2			
	212							2	1			
251	236							1				
	212							1				
252	236							5				
253	254							6				
254	253							6				
	273									1	7	
255	3							1				
256	212							2				

no	no	23.1.95	24.1.95	25.1.95	26.1.95	6.3.95	7.3.95	8.3.95	9.3.95	3.5.95	4.5.95	5.5.95
257	179								1			
258	25								1			
259	212								1			
260	238								1			
261	19								1			
262	19								1			
263	19								1			
264	265								1			
	266								1			
265	264								1			
266	264								1			
267	268								1			
268	267								1			
269	270								1			
270	269								1			
271	51									2	2	
272	100									2		
273	254										7	
274	275										2	1
275	274										2	1
276	277										2	
277	276										2	
278	147											1
	279											1
279	278											1
280	281											3
281	280											3
282	236											

APPENDIX H

Survey of e-mail expertise COHORT 4

Q1. Who first showed you how to send/receive an e-mail message?

Demonstrator in lab	23.3%
Member of class	32.9%
Learned in other class	5.48%
Knew already	8.22%
Worked it out	30.1%

Q2. Have you made up files?

Yes	33.78%
No	66.22%

Q3. If yes, how many?

1 file	13.64%
2 files	40.9%
3 – 9 files	18.2%
10-20 files	27.26

Q4. Have you changed your header name?

Yes	27%
No	73%

Q5. If yes, who showed you how?

Demonstrator in lab	0%
Member of class	35%
Learned in other class	5%
Knew already	5%
Worked it out	55%

Q6. Do you keep copies of outgoing mail?

never	54.8%
sometimes	35.6%
always	9.59%

Q7. Do you know how to CC, reply, forward, extract? How many?

Can do 1 of these	30.51%
Can do 2 of these	32.4%
Can do 3 of these	18.64%
Can do 4 of these	18.64%

Q8. If yes for any one, who showed you how?

Demonstrator in lab	8.93%
Member of class	25%
Learned in other class	12.5%
Knew already	5.36%
Worked it out	48.2%

Q9. Have you made up distribution lists?

Yes	8.22%
No	91.8%

Q10. If yes, who showed you how?

Demonstrator in lab	0%
Member of class	0%
Learned in other class	16.67%
Knew already	16.67%
Worked it out	66.67%

Q11. Do you use the confirm receipt, confirm reading options?

Yes	27.8%
No	72.2%

Q12. Do you receive mail from others in the class, sent to a number of others simultaneously (i.e. distribution lists)?

Yes	70.8%
No	29.2%

Q13. Do you know how to encrypt a message?

Yes	7.81%
No	92.2%

Q14. If yes, who showed you how?

Demonstrator in lab	20%
Member of class	60%
Learned in other class	0%
Knew already	9%
Worked it out	20%

Q15. Have you accessed the Internet/World Wide Web via e-mail?

Yes	38.8%
No	61.2%

Q16. If yes, who showed you how?

Demonstrator in lab	7.69%
Member of class	19.23%
Learned in other class	30.77%
Knew already	11.54%
Worked it out	30.77%

Q17. Are you on any net lists?

Yes	11.4%
No	88.6%

Q18. Who do you ask for advice on e-mail use?

Demonstrator in lab	15.71%
Technician	4.29%
friends	58.57%
Don't ask	21.43%

Q19. Is there anyone in the class (or more than one person) who appears to know a lot about e-mail/the Internet, and who passes on that knowledge to others?
4 members of the class were identified as the 'experts' on e-mail/Internet.

APPENDIX I

Q4

Survey of e-mail use, 1996 cohort

I would be grateful if you could answer a few questions, mainly about your experience with electronic mail. The results of this survey will form part of a journal article about student use of new technology. Thank you for taking time out to help.

Margaret Martin

NAME..MATRIC...................................

What other subjects are you studying this year?...

....

Do you use electronic mail? (e-mail) YES NO (please circle)

If YES, where?...

Who do you contact via e mail? (please circle)

classmates? tutors? lecturers? others in the university?

others outwith the university?

What do you use e mail for? (please circle)

to discuss classwork? social chats? to get information about your course?

Do you think it would be useful to have email in the Psychology computer lab?

YES NO (please circle)

Why?...

How often do you send e mail messages? (please circle)

every day? once a week? once a month? rarely? never?

Do you think email would be a good way for you to contact staff in the Psychology

Dept. and for them to contact you? YES NO (please circle)

How many people did you know in the Psychology class at the beginning of term?

none (please circle)

1

2 - 5

6 - 10

11 - 20

more than 20

How many people do you know now? (please circle)

none

1

2 - 5

6 - 10

11 - 20

more than 20

How many of these did you 'meet' via electronic mail? (please circle)

none

1

2 - 5

6 - 10

11 - 20

more than 20

How many people do you communicate with via email whom you have never met? (please circle)

1

2 - 5

6 - 10

11 - 20

more than 20

Do you have any contact with other students while in the Psychology Department computer lab? YES NO (please circle)

Do you talk to Higher Ordinary students in the computer lab? YES NO (please circle)

What are your impressions of the Psychology computer lab this year?

....

....

....

APPENDIX J

Q5

Results of 1999 e-mail survey

Last year did you use e-mail

(A)	In the university?	YES	100%	NO	0%
(B)	At home?	YES	57.5%	NO	42.5%

1. Where in the university did you use e-mail the most?

Psychology computer labs	51.1%
Other department labs	15.8%
University clusters	8.3%
Library	24.8%

2. How often did you send e-mail?

Once a day	58.2%
Once a week	29.9%
Once a fortnight	3.73%
Once a month	1.5%
Rarely	6.7%

3. 3. How often did you check for e-mail messages?

Once a day	69.4%
Once a week	25.37%
Once a fortnight	2.98%
Once a month	0.75%
Rarely	1.5%

4. To which of the following have you sent e-mail?

Classmates	85.82%
Other students in university	84.33%
Others outwith university	81.34%

Tutors 70.15%

Lecturers 36.57%

5. Have you ever used a nickname when sending mail? YES 38.81%

6. Have you ever added a 'signature' to your email message, other than contact address, telephone etc.?

YES 11.9%

7. Have you ever used e-mail to hold a 'virtual conversation' with a classmate in the Psychology lab?

YES 4.5%

8. Have you ever used the option allowing you to copy the received message into the reply?

YES 67.9%

9. Have you ever used e-mail to establish contact with a classmate you have never met?

YES 18.1%

10. If you answered 'YES' how did you get the e-mail address?
answers included use of university website, from friends and tutors, in tutorial groups and from class lists on noticeboards

11. Have you ever mailed several classmates at the same time you didn't already know?

YES 12.7%

12. Have you ever received a message sent to several classmates at the same time from someone you didn't know?

YES 64.9%

13. How many people did you know in the Level 1 class at the beginning of the year?

None 30.1% 1 6.01% 2-5 51.9% 6-10 9.8% 11-20 2.3%

more than 20)%

14. How many people did you know in the Level 1 class at the end of year 1?

None 0% 1 0.75% 2-5 12.03% 6-10 36.8% 11-20 41.35%

more than 20 9.02%

15. How many of these did you 'meet' via e-mail?

None 88.7% 1 4.5% 2-5 5.3% 6-10 0.75% 11-20 0% more than 20 0%

16. Can you please give a brief description of your e-mail behaviour in the Psychology computer labs.

17. Does your e-mail behaviour in the Psychology computer labs differ from your e-mail behaviour elsewhere?

YES	27.34%

18. If you answered 'YES', how does it differ?

Answers included difficulties accessing e-mail accounts in lab, using lab for work, not e-mail.

APPENDIX K

Mobile phone use questionnaire

1. Do you use a mobile phone? Yes ☐ No ☐
   please tick box

If 'yes' please go to question 2. If 'no' please give a brief explanation for not using a mobile phone.

2. How long have you used a mobile phone? ....months
3. Approximately how many people do you regularly contact by mobile?

   1-5 ☐ 6-10 ☐ 11-20 ☐ more than 20 ☐

4. What percentage of your calls consist of text messages?.................%
5. Do you use your mobile phone while in university? Yes ☐ No
6. How many text messages do you send when in university?...............(per week on average)
7. How many calls do you make when in university?...............(per week on average)
8. How many text messages do you send in total?...............(per week on average)
9. How many calls do you send in total? ....(per week on average)
10. How many text messages do you receive while in university?...............(per week on average)
11. How many calls do you receive while in university?...............(per week on average)
12. How many text messages do you receive in total? ....(per week on average)

13. How many calls do you receive in total?...............(per week on average)

14. How long (on average) does a call you have made last?............

15. How long is a typical text message you send?...........characters

16. Who do you contact using your mobile phone?
   a. Friends ☐
   b. Family ☐
   c. Classmates ☐
   d. Others ☐
   please tick

17. Who do you send text messages to?

   a. Friends ☐
   b. Family ☐
   c. Classmates ☐
   d. Others ☐
   please tick

18. What characteristic of your mobile phone is the most important to you?
   a. social use ☐
   b. safety ☐
   c. convenience ☐
   d. other ☐ (please specify)

19. Have you customised your mobile phone in the following ways?

   a. added ring tones ☐
   b. changed cover ☐
   c. screen saver ☐
   d. downloaded graphics/logos ☐
   e. phone holder ☐
   please tick

20. Do you use the following features of your phone (if you have them?

   a. web access ☐
   b. games ☐
   c. composer ☐
   please tick

21. Do you ever contact anyone by mobile you have 'met' online?
Yes ☐ No ☐

APPENDIX L

MOBILE 'PHONE RESULTS COHORT 5

Do you use your phone while you are in university?	Yes	96.86%	No 3.14%
Do you use it more outwith university?	Yes	90.57%	No 9.43%
Do you use it to contact classmates?	Yes	90.57%	No 9.43%
Do you use it to contact tutors?	Yes	8.18%	No 91.82%
Do you use it to contact lecturers?	Yes	5.66%	No 94.34%
Do you use it to contact others in university?	Yes	76.73%	No 23.27%
Do you use it to contact others outwith university	Yes	98.74%	No 1.26%
Do you use text messages?	Yes	98.74%	No 1.26%

What percentage of your calls are text messages? %

0%	1.89%
5-20%	7.84%
21-50%	28.30%
51-90%	43.41%
91-100%	4.40%

How many calls do you receive per week (including text messages) when in university?

0%	3.77%
1 – 10	34.05%
11-20	32.07%
21-40	21.38%
41-100	8.81%

How many calls do you receive a week in total?

0	0.63%
1-10	10.70%
11-20	20.76%
21-40	37.11%
41-100	26.43%
101-300	4.41%

How many calls do you send per week (including text messages) while in university?

0	3.14%
1-10	44.67%
11-20	32.08%
21-40	13.84%
41-100	6.29%

How many calls do you send a week in total?

1-10	16.99%
11-20	23.28%
21-40	35.85%
41-100	20.13%
101-400	3.78%

How useful do you think mobile phones are?

Very useful	76.10%
Useful	21.38%
Neutral	1.89%
Not very useful	0.63%
Not useful at all	0%

How do you think mobile phones compare with email for usefulness?

Much more useful	22.64%
More useful	44.03%
About the same	24.53%
Less useful	8.18%
Not useful at all	0.63%

How easy are mobile phones to use?

Very easy	71.07%
Easy	25.16%
Neutral	3.77%
Difficult	0%
Very difficult	0%

How do you think mobile phones compare with email for ease of use?

Much easier	14.47%
Easier	35.85%
Neutral	43.40%
More difficult	3.14%
Much more difficult	2.52%

Do you use your mobile phone more than email to keep in touch with your classmates?

Yes 76.10% No 23.90%

Do you ever contact people you don't already know using your mobile phone?

Yes 41.51% No 58.49%