The Social Construction of a Scientific Community: CAQDAS

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Declaration of Authorship

I, Urszula Wolski, hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly stated.

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Abstract

Using and adapting a social worlds perspective, the thesis looks at the history and development of a scientific community: the CAQDAS (Computer Assisted Qualitative Data Analysis Software) community. CAQDAS have been around for over 30 years, but since its inception little empirical work has been done on the effects of CAQDAS. The development of CAQDAS was the result of the intersection of two social worlds, the computing world and the social science world. The thesis identifies three main interrelated processes that led to the development of the CAQDAS world: initial conception, propagation and reception.

The thesis also examines how knowledge of CAQDAS was propagated to the wider social science community via informal and formal social networks. Informal social networks, also known as 'invisible colleges' were paramount in the early propagation of CAQDAS. However, the development of interactive technologies such as email and the internet enabled further expansion and diffusion of CAQDAS, resulting in an online world.

As social worlds expand and segment with other worlds, different groups with differing opinions will emerge. Reception to new technologies is often not without controversy but is seen as an essential part of a social world, one that is necessary for the world to evolve. Reception of CAQDAS was and remains mixed. Some researchers welcomed the use of the tools to assist with data analysis, whilst others were more sceptical, resulting in a number of debates surrounding the software. The thesis discusses these debates in detail and argues that some debates are not approaching resolution, nor are they likely, instead they have re-emerged on an online discussion list; Qual-software: a list set up specifically to discuss issues relating to CAQDAS.

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Chapter 1 Introduction

Introduction

This thesis looks at the history and development of a scientific community: the CAQDAS (Computer Assisted Qualitative Data Analysis Software) community from the perspective of social worlds theory. The CAQDAS world was the segmenting of two other worlds, the social science world and the computing world. Development occurred in the early 1980s simultaneously in a number of different countries. CAQDAS emerged because researchers were interested in finding ways of improving qualitative methods and so developed software to address their own research needs.

To study the CAQDAS world is important as it has brought about change in the way research methods can be carried out and as such has had a significant impact on the wider social science community. The overall aim of the thesis is to identify how the CAQDAS community was socially constructed, to understand its origins and the processes that led to its development and propagation as well as its reception in the wider scientific community. Three stages of development of the CAQDAS world are identified and examined in detail in the thesis; initial development, propagation and reception. The thesis also examines the roles of formal and informal social networks in diffusing knowledge about CAQDAS and how the CAQDAS community was transformed by technological innovation.

Since its inception, little empirical work has been carried out on the effects of CAQDAS and the development of the community. In fact, as Leahey (2008) suggests, only a small number of social scientists have examined their own research practice. According to Leahey (2008), the sociology of science traditionally focused on the natural sciences in terms of research practice but has become more open to the study of social science. However, the number of researchers studying their own practice is growing (Leahey 2008), slowly. In fact as Mair *et al.* (2013:1), in a recent National Centre for Research Methods (NCRM) Working Paper, argue the "social sciences are currently going through a reflexive phase, one in which studies approach the discipline's own methods and research practices as their empirical subject matter." This phase is driven partly by a growing interest in knowledge production and partly by a desire to make the social sciences 'fit-for-purpose' in the digital era. Nonetheless, empirical studies of social scientific work and the role of methods within it remain relatively scarce (Mair 2013) and more remains to be done in the sociology of social research practice (Leahey 2008).

In particular, Leahey (2008) asks how technology is shaping research practice. Are such new technological tools changing the way we collect and manage data, test theories, report results and permit the development of new methods? By examining the origins, developments and impact of the CAQDAS world on the wider scientific community, the thesis also looks at research practice.

Theoretical framework

The thesis draws on literatures dealing with scientific communities, the diffusion of innovations and social worlds theory. There are a number of different schools of thought within the sociology of science that attempt to explain the nature of scientific communities. Within the sociology of science, two parallel research traditions can be identified, the 'Institutional Sociology of Science' and the 'Sociology of Scientific Knowledge' (SSK) (Hess 1997). Those adopting a SSK approach argue that the only way to study science is by 'opening the black box' (Whitley 1972, cited in Hess 1997, p81) and examining the contents inside, something which was ignored by the Institutional Sociology of Science. Over the years, numerous strands of SSK have evolved. Two dominant approaches were the 'Edinburgh School' and the 'Bath School'. The first approach was based on the 'hard sciences' (Pinch and Bijker 1984) and adopted a macro approach, emphasising the use of historical methods. The second approach was based on Collins's (1981) 'Empirical Program of Relativism' (EPOR) and emphasis was on micro approaches and observational methods looking at empirical studies of contemporary scientific developments, in particular scientific controversies (Pinch and Bijker 1984). The EPOR program was extended by Pinch and Bijker into what they called the 'Social Construction of Technology' (SCOT).

However, as Schroeder (1996) argues when examining change in relation to new technologies, both macro and micro approaches should be combined, thus examining wider structural influences on the one hand but also micro-interactions between groups and individuals on the other hand. The social constructivist approach criticised the institutionalised approach for failing to 'open the black box' and examine the content inside. Yet, they too are one-dimensional. In fact, as Winner (1993) suggests, the social constructivist approach may have opened the 'black box', but the box this approach reveals is still hollow.

For this reason, social worlds theory was seen as the most appropriate approach for understanding the construction of a community such as CAQDAS. Social worlds theory uses both macro and micro approaches, which are essential as both the technical and social factors that were significant in the development of CAQDAS needed to be examined. There is a multitude of social worlds, which can be classified into three main types; production worlds, communal worlds and social movements and these may be local, regional, dispersed, or social world systems. CAQDAS can be seen as both a production world (a scientific world is primarily a production world) but also as a communal world because the knowledge produced by this world is dispersed via social networks. The development of CAQDAS was the result of the intersection of two social worlds, the computing world and the social science world. Therefore, social worlds theory does 'open the black box' and examines the contents inside. However, to ensure that the contents of the box were fully examined, the thesis adopts a pluralistic approach which also draws on other theories and concepts found in the Sociology of Science, such as the work of Merton (1975) on 'multiple discoveries' and the 'norms of science'.

The thesis outlines the processes of how the CAQDAS world emerged, from initial conception to propagation and reception. The overall aim of the thesis is to identify how a scientific community like CAQDAS is socially constructed and to understand its origins, the processes that led to its development and propagation and its reception in the wider scientific community. In doing so, it aims to address the following:

- What are the roles of social networks, both formal and informal, in diffusing knowledge within the scientific community?
- How is a scientific community transformed by technological innovation?
- What are the impacts and reception of CAQDAS in the wider scientific community?

In order to answer these questions, three forms of data collection were used, in-depth interviews, documentary analysis and content analysis. Twenty in-depth interviews were carried out with developers and propagators of CAQDAS in order to obtain the history and development of the CAQDAS world. Documentary analysis was used to verify and provide historical information as well as assist and prepare for the interviews. A content analysis of the discussion list Qual-software provided a users' perspective of CAQDAS. The discussion list can be viewed as an arena for users to discuss issues surrounding the software. By analysing the content of the list, the conversations surrounding the software could be explored.

Data collection and analysis were carried out using a grounded theory approach (Strauss and Corbin 1998), which is a method associated with the social worlds framework (Clarke *et al.* 2008). According to Bryant and Charmaz (2007), grounded theory methods can be seen as a way of trying to encourage, support and guide researchers who want to work outside 'normal social science' to develop new conceptual insights based on direct hands-on-research. Therefore, the social worlds theory/methods package (Charmaz 2006) enables the researcher to open the box and examine the contents inside.

The thesis argues that the development of the CAQDAS world was socially constructed and was the result of three main processes; initial development, propagation and reception. Each chapter will examine these processes and sub processes that resulted in the formation of the CAQDAS world. In the words of Strauss (1991: 242), in order to study a social world, "the history of that social world, its origins, and the changes it has undergone need to be examined". Using and adapting the social worlds perspective, this is what the thesis has attempted to do.

Structure of the Thesis

The next chapter looks at existing literature on scientific communities and social networks, the sociology of scientific communication, the sociology of scientific knowledge and social worlds theory. The third chapter discusses the methodology and ethical issues that arose during the research process. The fourth chapter examines the social, technical and intellectual processes that led to the initial development of

CAQDAS. These include a brief history of the development of computer technologies and how the intersection of the computing world and the social science world came together. This chapter also examines the early reception of CAQDAS. Chapters five and six discuss the propagation of CAQDAS and the social networks that emerged. These chapters discuss early propagation such as word-of-mouth and later propagation through interactive technologies. Chapter seven investigates the reception of CAQDAS, identifying the different groups that emerged around the software, both the types of adopters and sceptics and their reaction to the software. The impact on the wider social science community is also addressed in this chapter. Chapter eight is a study of the Qual-software discussion list which provides a user's perspective on the software and identifies the discussions that emerge in this arena. The debates and contestations that emerged in response to CAQDAS are discussed in chapter nine. The final chapter is the conclusion which brings together a summary of the key findings and re-addresses the aims of the thesis, as well as considering future directions.

Chapter 2: Technological Innovation and Scientific Communities

Introduction

This thesis looks at how a particular technological innovation, the computer analysis of qualitative social science data, was received by a particular social scientific community, qualitative researchers. To understand the processes involved it draws on literature dealing with scientific communities, the diffusion of innovations, and the development and maintenance of social worlds. The development of a scientific community is complex and involves a variety of technological and social processes. This thesis looks at how a scientific community like CAQDAS is socially constructed and attempts to identify and explain the processes that led to the development of the scientific community.

This chapter consists of three sections. The *first* section will examine the view that science is a communal social activity, involving formal and informal networks, the latter of which can be referred to as 'invisible colleges' (Crane 1972). These networks are important for the development of that activity. One of the key processes involved is the role of networks in the transformation of knowledge within scientific communities. This section will discuss the role of social networks in diffusing knowledge within the scientific community.

Within the Sociology of Science, over time a number of different schools of thought have emerged to explain the nature of scientific communities; these are discussed in the *second* section. Two dominant schools can be identified; the 'Institutional Sociology of Science' and the 'Sociology of Scientific Knowledge' (SSK) (Hess 1997). From the latter approach there emerged a number of different strands, each adopting a differing perspective to studying scientific communities, generally applying either a macro or micro methodological approach.

However, it will be argued that the most effective framework for studying what I will call here the 'CAQDAS' (Computer Assisted Qualitative Data Analysis) community is Social Worlds Theory, which aims to combine both macro and micro approaches to the study of communal social activity. This *third* and final section provides an explanation of this theory and examines its usefulness as a framework for studying scientific communities. Furthermore, with the advent of interactive technologies, online social worlds have emerged, bringing with them numerous opportunities for the further development and diffusion of a scientific community.

Scientific Communities and Social Networks

Science is a communal social activity. Kuhn (1962) developed the idea of a 'scientific community' arguing that scientists in a particular discipline form a closed community, in which they develop shared definitions of their work and paradigms that interpret findings and guide new research. They adjust to the problems of dealing with knowledge in their fields by forming social collectivities of various kinds, which are based upon shared communication and a shared interpretation of the situation. Scientific knowledge, therefore, is the social knowledge (Longino 1990) that each scientific community produces through its activities. This knowledge must then be diffused in order for the field to grow. In other words, as Crane (1972) suggests, disciplinary growth is a diffusion process and occurs in the following way. Each scientific community concentrates its attention upon a particular set of problems and a few scientists are attracted to these problems. Diffusion occurs when they in turn convince others to join them, perhaps through recruitment and training as collaborators, or by the indirect influence of their publications. Thus, a social network with a distinctive structure appears and for a time expands rapidly while producing a considerable volume of work. The result is the development of a scientific community.

Wellman (1996:1) defines a social network as "a group of people or organisations connected by a set of socially meaningful relationships". "New ideas and ways of doing things... often spread gradually through social networks. In the first stage a few innovators adopt, then people in contact with the innovators adopt, then people in contact with those people adopt, and so forth until eventually the innovation spreads throughout the [community]" (Young 2002: 2). According to Abrahamson and Rosenkopf (1997), potential adopters find out information about innovative ideas, techniques or products resulting in further diffusion as news of these innovations spread within their own networks.

The diffusion of innovations can be seen to have two fundamental dimensions, the innovation itself, and the diffusion process by which that idea or technology is transmitted (Fennel and Warnecke 1988). The process of diffusion can be defined as the "acceptance over time of some specific item, idea or practice, by individuals, groups or other adopting units, linked to specific channels of communication, to a social structure and to a given system of values, or culture" (Katz *et al.* 1963: 237, 240). The diffusion process is therefore a social process, without which a scientific field cannot develop.

There are numerous theories and models of diffusion, particularly as diffusion is not a single idea (McMaster 2000). Models of diffusion processes were originally developed to explain why some farmers in the rural United States in the 1940s were more likely to adopt new technologies than others (Murdock, Hartmann and Gray 1995). According to such models, "an innovation originates from some expert source [which then] diffuses [the innovation] to potential adopters" who either accept or reject it (Rogers 1995: 364)." "Diffusion was believed to originate at a single point and to spread outward" (Ryan 1969, cited in Ferrence 2001, p67) and as a result such models tended to be based on a linear, one way model of communication (Shannon and Weaver 1949). They were therefore more appropriate for investigating the effects of one-way mass media communication (Rogers 1995), in that once the innovation was adopted, the adopter would stick with it (Young 2002). Such models assumed that innovations originated from a centralised source and then diffused to others, as a result ignoring the complexities produced by decentralised diffusion systems in which innovations originate from numerous sources and then evolve as they diffuse via horizontal networks (Schön 1967).

Later models focusing on the diffusion of innovations have been adapted and modified to deal with the emergence of innovations. These models have been built up gradually through multidisciplinary research and investigation of a wide variety of innovations, including the spread of home computers in the early 1980s in the United States (Rogers 1995). According to Lyytinen and Damsgaard (1997: 2) diffusion of innovation theory draws upon rational theories of organisational life adopted from economics, sociology and communication theory. Rogers (1995) expanded on these earlier models and identified four main elements in the diffusion of innovation; the innovation itself, the communications-channel involved, time and the social system.

“An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption”(Rogers 1995: 36). Communication channels in the diffusion process occur where information is exchanged through which one individual communicates a new idea to one or several others in their social networks. The process occurs over time and involves five steps; knowledge, persuasion, implementation and confirmation, and additionally the rate of adoption. The diffusion of an innovation can be affected by the social structure and norms of a social system, and by the roles of opinion leaders and change agents, as well as the types of innovation-decisions and the consequences of the innovation.

According to Rogers, the diffusion of innovations is reflected by the rate of adoption of an innovation in a community. At the start, only a few individuals adopt a new idea, but once a large number of individuals begin to accept the innovation, then the rate of adoption increases rapidly. At this point, the adoption rate will slow down as fewer and fewer individuals are left to adopt. Five adopter categories can be identified according to Rogers: ‘innovators’, ‘early adopters’, ‘early majority’, ‘late majority’ and ‘laggards’. Early adopters are relatively few in number and it is this group that takes the risk of adopting a new idea, product or behaviour before anyone else, whereas late adopters form the majority and are the least reluctant to adopt a new idea or product, preferring to wait until others have tried it first. Integral to the rate of adoption is an individual’s ‘threshold’ level. A threshold is the number of other individuals who must be engaged in an activity before a given individual will join that activity (Granovetter 1978; Markus 1987). Innovators tend to have a low threshold and will therefore adopt innovation relatively early, early innovators and adopters help other later adopting individuals to reach their adoption threshold. When the critical mass in the rate of adoption of an interactive innovation is reached, the rate of adoption will increase.

Early diffusion models may be useful in explaining how knowledge is spread, but they do not fully account for innovations spreading from a number of different sources within social networks. Later models, such as the one put forward by Rogers, do discuss the role of social networks in fostering and sustaining new practices (Murdock, Hartmann and Gray 1995) and therefore provide an insight into the processes of diffusion. However, with regards to certain scientific communities it is the social networks, particularly the informal networks that are particularly important communication channels. Members of social networks have easy access to other members who can offer advice, encouragement and practical support (Murdock, Hartmann and Gray 1995). Furthermore, complex and networked technologies are socially constructed, learning intensive, complex and networked (Pinch and Bijker 1987); therefore not all innovations can be characterised with the same set of attributes (Lyytinen and Damsgaard 1997). Different innovations have their own distinct characteristics and furthermore may be viewed differently by early adopters and late adopters (Lyytinen and Damsgaard 1997), particularly as the innovation can change over time. Therefore, it is the analysis of social networks that is of paramount importance when looking at the diffusion of a particular innovation.

According to Brown (1969), research on the diffusion of innovations has tended to focus upon diffusion among small groups residing in a small area or a single community. However, Brown argues, there should be a greater focus on diffusion among particular places, or what he called 'central places', which affects several communities nearly simultaneously. Hägerstrand (1952), although writing at the same time as other traditional diffusion models were being developed, offers an interesting alternative. Hägerstrand suggests that there exist networks of social communications which connect particular places. He proposes that there is a hierarchy of such networks, one operating on the local plane, another on the regional plane, and a third on the international plane. Thus, diffusion among individuals would occur through a local network; diffusion on a greater level of aggregation would occur through a regional network; and diffusion through levels of aggregation such as among central places, would occur through a hierarchy of networks of social communication (Brown 1969: 189). Therefore, he argues further, examination of an actual interpersonal contact field (network of social communications) associated with the adoption of an innovation should disclose a set of 'regional type contacts', at least for some of the early adopters (Brown 1969: 190). Hägerstrand, a geographer, constructed a mathematical model of the diffusion process as it would theoretically occur over time and through space. With a map of Sweden on his computer, he identified the location of the first adopter of an agricultural innovation and from this he was able to simulate the diffusion process of that innovation (Rogers 2003: 90).

As Berge and Collins (1995) suggest, scientists and researchers in every field develop, and depend on, informal networks of colleagues with whom they share ideas and information. An understanding of how new research areas come into being is central to the sociological study of scientific development (Mulkay *et al.* 1975). Mulkay *et al.* (1975) argue that in order to understand fully the evolution of a particular network, it is necessary to identify the processes occurring in that network from which initially it drew its members, its problems and its methods. Therefore, in order to understand how scientific research is actually carried out, it is very important to examine both formal and informal communication between scientific research communities (Tuire and Erno 2001). As suggested by Ben-David and Sullivan (1975:208) formal scientific organisation ranges from laboratories, departments, and institutions to central national or international scientific agencies, whilst the informal can include teams, research groups, disciplinary and interdisciplinary elites, as well as the whole scientific community.

Informal networks can be referred to as 'invisible colleges' which can be characterised as 'informal communities of scientific specialists' (Price 1963) working on similar problems (Hess 1997). They can be found in a variety of different disciplines within the natural sciences, the social sciences and humanities (Matzat 2004). In Price's words, an invisible college is;

> *A sort of community, circuit of institutions, research centres, and summer schools giving scientists an opportunity to meet piecemeal, so that over an interval of a few years everybody who is anybody has worked with everyone else in the same category* (1963: 85).

According to Koku *et al.* (2000), an informal network may occur when the members of a set of scholars get used to seeing each other at conferences and in journals and develop the habit of discussing each other's work and perhaps collaborating. As a result, all or part of their network becomes crystallised as an amorphous invisible college, one that is defined by a shared interest in a specialty and by friendship ties (Koko *et al.* 2000). Such invisible colleges "function as a scholarly in-group within a given specialisation"; [their research is] facilitated by informal exchange of information through contacts within this social network at conferences and other forums" (Gresham 1994: 38). Koku *et al.* (2000) argue that the informal nature of invisible colleges affords flexible, adaptive structures for exchanging and evaluating new ideas. As a result, an idea gets transmitted more quickly and innovatively than in formal journals constrained by publication lags and a process of refereeing that tends to promote orthodoxy. Invisible colleges emerge around a small nucleus of major active researchers functioning through personal contacts (Gresham 1994) who regularly exchange information and papers relating to the newest progress on the research front (Matzat 2004). A corollary of this is that those outside these informal networks or invisible colleges are disadvantaged (Crane 1972; Matzat 2004) as they have limited or no access to these ties.

The concept of ‘invisible college’ was adopted by Crane (1972) in her work on the diffusion of knowledge in scientific communities. She found that research specialties were characterised by a core group of scientists who collaborated with each other and generated a disproportionate volume of new ideas. She found that a small number of very prominent scientists form the core of each specialty’s collaboration network and that most others are connected to the rest of the community through these highly active individuals. In her view, it is this central position that helps to explain why core scientists were able to diffuse their ideas so rapidly through the community.

Social networks and the impact of technological change and technological diffusion are processes that need to be examined when looking at the construction of a scientific community like CAQDAS. How is knowledge propagated within the community? There are a number of different schools of thought within the sociology of science that attempt to explain these processes. The literature is vast and so what is discussed here is a brief overview.

Sociology of Scientific Communication

The Sociology of Science deals with the social conditions and effects of science and with the social structures and processes of scientific activity (Ben-David and Sullivan 1975). How these conditions, effects, structures and processes work, however, is viewed differently by different groups of social scientists. Within the Sociology of Science, two parallel research traditions can be identified, the ‘institutional sociology of science’ and the ‘sociology of scientific knowledge’ (SSK) (Hess 1997). The first approach, strongly shaped by the work of Robert Merton, focuses on the institutionalisation of modern science as a social system (Restivo 1995). Whereas the latter approach, a constructivist approach, argues that it is technology itself that is shaped by social factors. “Constructivism is the study of how scientists and technologists make socially situated knowledge and things” (Sismondo 2004: 64). According to Hess (1997: 82), constructivism can be seen as;

> Any social studies approach that attempts to trace the ways in which social interests, values, history, action, institutions, networks and so on shape, influence, structure, cause, explain, inform, characterise or co-constitute the context of science and technology.

With regards to scientific communication, the institutional sociology of science has tended to focus on issues such as citation patterns and scientific productivity. While these are useful topics to consider when examining the development of a scientific community, Robert Merton’s work on ‘multiple discoveries’ and ‘priority disputes’ is of more direct relevance here. Merton (1961: 477) argued that the pattern of independent multiple discoveries in science is the dominant one, whereas ‘singletons’, that is discoveries made only once in the history of science are the residual cases. He hypothesised that all scientific discoveries are in principle multiples, including those that on the surface appear to be singletons. In his view, once science has become institutionalised and when significant numbers of scientists are at work on scientific investigation, the same discoveries will be made independently more than once. Therefore singletons can be conceived of as ‘forestalled multiples’. Merton was also interested in disputes over priority of discovery. He stated that, “we begin by noting the great frequency with which the history of science is punctuated by disputes, often by sordid disputes, over priority of discovery” (Merton 1957: 635). He argued that priority disputes have practically become an integral part of the social relations between scientists (1957: 636). In his view, struggles over priority do not result merely from the traits of individual scientists but from the institution of science. Once the scientist had made a contribution, he or she no longer has exclusive rights of access to it; the discovery becomes part of the public domain of science. According to Merton (1973: xxiii) there is an institutionally reinforced drive for professional recognition, which is acquired in return for priority in scientific contributions and a prescribed reward for scientific achievement.

Brannigan (1980) argues that most authors in the last twenty years (i.e. the twenty years prior to 1980) have directed their energies to the question of *how* discoveries are made and not to the question of *why* these discoveries have been made simultaneously. According to Brannigan (1980) some discoveries are accidental, while others are sought after and achieved. Discoveries do not simply 'occur' or 'happen' naturalistically, but are socially defined and recognised productions. So, the question is not what makes them happen, but rather what makes them discoveries. Brannigan (1983) suggests that because scientists vary in the resources that are available to them and in the degree to which they are linked to the networks of scientific communication, any change over time in the number of scientists working on specific problems will change the probability that any particular discovery will be made. The concept of 'multiple discovery', as discussed by Merton (1957, 1961) and Brannigan (1980), will be discussed later when looking at the origins of the specific scientific community described in this thesis.

The Sociology of Scientific Knowledge (SSK)

Prior to the 1960s, the institutional approach dominated the sociology of science. However, during the 1960s the sociology of science developed a new emphasis (Hess 1997). One important area was the study of social units beyond formal organisations such as laboratories, disciplines, departments and research organisations.

The Sociology of Scientific Knowledge (SSK) emerged during the 1970s and early 1980s and initially was an almost exclusively British practice (Collins 1983). It was developed on the basis of a form of methodological relativism that David Bloor (1976: 4-5) dubbed the 'symmetry principle', where scientific beliefs held to be true should be analysed in the very same socially constructivist terms as those held to be false (Demeritt 1996). According to SSK, technology is a product of social or cultural forces and technological change should never be seen as an independent agent, but rather in its social context (Ebersole 1995). Critics of technological determinism argue that the technology is not the sole determinant of change; rather, it is the technology working within a complex social structure (Ebersole 1995) which needs to be examined. The only way to examine the social structure is by studying the *'content'* of science, sometimes referred to as 'opening the black box' (Whitley 1972). The term ‘black box’ in social science terminology is a device or system that is described solely in terms of its inputs and outputs (Winner 1993). The aim of SSK was to open the ‘black box’ and examine the contents, to look carefully at the inner workings of real technologies and their histories to see what is actually taking place (Winner 1993). In their view the institutional sociology of science fails to do this. It does not examine how social and cultural factors play a contributory role in technological change, examining only the exogenous, institutional aspects of science and technology, thus leaving the content of the ‘black box’ unexamined (Hess 1997).

However, researchers in the SSK tradition have themselves disagreed about the ways of doing this. As a result, over time a number of different strands within SSK have been developed. A number of authors have attempted to define these types of ‘constructivism’ (for example, Hagendijk (1990); Hess (1997); Sismondo (2004)). However, as outlined below, Hess (1997: 34-35, 82) identifies three broad, but useful descriptions of constructivism; ‘radical constructivism’, ‘moderate constructivism’ and ‘conservative constructivism’.

The first approach, ‘radical constructivism’, is one that asserts that “scientists do not discover the world, but impose a structure on it or in some sense ‘make’ the world. There is no material reality that constrains or structures sensory observations and the world is made or constructed, rather than discovered” (Hess 1997: 35)

An alternative to this is ‘moderate constructivism’ which holds the position that “scientific theories are realistic maps or explanations of a real world and at the same time vehicles that encode culture-bound linguistic categories and cultural values (‘cultural constructivism’) and/or are shaped by social interests and other social variables (‘social constructivism’)” Hess (1997: 35). Hess (1997: 34-35) argues that “in the social studies of science and technology, the term ‘social constructivism’ is often used as a general label for studies that examine how social variables shape the patterns of choices about what research gets done, how it is done, how choices among theories are made in controversies, and the extent to which observations, laws, theories, and other knowledge claims become accepted in wider scientific communities.” Sismondo (2004) states that social constructivism is based on three assumptions. First, science and technology are social. Second, science and technology are active, as the term ‘constructive’ implies. Third, that “science and technology do not provide a direct route from nature to ideas about nature, that the products of science and technology are not themselves natural" (Sismondo 2004: 51).

A third type that Hess (1997: 35) identifies is 'conservative constructivism' which argues that scientific theories are shaped by social interests and cultural values as the result of bias. In time, this bias is removed as the theory evolves and becomes objective and free from cultural values and categories. According to Abraham (1994: 731) "many relativist and constructionist sociologists of science either eschew the suggestion that their work implies bias in science (Collins 1983: 99, 1985: 159-160; Woolgar 1982: 484), or believe that the removal of bias in science is a misguided goal because all science is necessarily biased by values and interests (Martin 1979; Richards 1991; Schwartz and Thompson 1990)." For example, in his analysis of the safety evaluation of the arthritis drug Opren in the elderly, Abraham (1994:732) showed that institutional biases exist as the result of discovering technical inconsistencies and convergence with certain interests.

Hess (1997) argues that many researchers would adopt a moderate constructivist approach as they believe that scientific theories are the result of not just the real world, but by social and cultural values as well. According to Mangabeira (1999), the social constructivist framework sees science as a contingent product of various social, cultural and historical processes. Therefore for some scientific communities, their development is a social construction created through social networks; however, other processes, such as technology, are also involved.

By the 1970s social constructivism started to become common in science and technology studies (Sismondo 2004) and the study of scientific controversies became the methodological focus of SSK (Knorr Cetina1995). Drawing on work in the philosophy and history of science, SSK was further developed through the work of the British researchers Michael Mulkay, Harry Collins, Barry Barnes and David Bloor (Hess 1997). Studies in this area take the actual content of scientific ideas, theories and experiments as the subject of analysis, which contrasts with the institutional sociology of science which was concerned with science as an institution and the study of scientists' norms, career patterns, and reward structures (Pinch and Bijker 1984). From this period, two moderate constructivist approaches of SSK can be identified.

The first approach, known as the 'Edinburgh School', comprising philosophers, sociologists and historians[1], set out to understand the content of scientific knowledge in sociological terms (Sismondo 2004). This approach was focused on the 'hard sciences' (Pinch and Bijker 1984). Their idea was to develop the 'strong programme in the sociology of knowledge' which was based on Bloor's 'four tenets' for the sociology of scientific knowledge. These tenets were, according to Sismondo (2004: 42): "firstly, that it would be causal; concerned with the conditions [which] bring about beliefs or states of knowledge. Secondly, it would be impartial with respect to truth and falsity, rationality and irrationality, success or failure. Thirdly, it would be symmetrical in its style of explanation; "the same types of causes would explain true and false beliefs. Fourthly, it would be reflexive. These tenets represent a naturalistic and scientific attitude toward science and knowledge (Sismondo 2004), in which "all knowledge and all knowledge-claims are to be treated as being socially constructed", where "explanations for the genesis, acceptance and rejection of knowledge-claims are sought in the domain of the social world rather than in the natural world" (Pinch and Bijker 1984: 401). Scott *et al.* (1990:475) argue that "instead of looking only at the side considered wrong by scientific authorities, the knowledge-claims on both sides of the controversy are examined and an attempt is made to explain those using social categories."

The second approach was known as the 'Bath School'[2] and was based on Collin's 'Empirical Programme of Relativism' (EPOR). The emphasis was upon the empirical study of contemporary scientific developments and in particular of scientific controversies (Pinch and Bijker 1984). Unlike the Edinburgh School, proponents of SSK, based at the University of Bath, proposed micro studies of scientific controversy as the best way to expose the social construction of scientific knowledge; that scientific controversies cannot be resolved by reference to data alone (Demeritt 1996: 492). This programme had three stages (Hess 1997: 94-95). The first stage "demonstrates the 'interpretive flexibility' of experimental results, that is, their ability to be subject to more than one interpretation." In the second stage, the mechanism by which closure is achieved is analysed. 'Closure' is reached when the controversies surrounding a scientific development are resolved. In the third stage, the mechanisms

[1] This group comprised of David Bloor, Barry Barnes, David Edge and Donald MacKenzie.
[2] This group included Harry Collins, Trevor Pinch and David Travis.

of closure to the wider structure are linked. However, according to Pinch and Bijker (1984), this has yet to occur in any study of contemporary science.

To understand the mechanisms of closure in the second stage, Collins (1981) highlighted the importance of the 'controversy group' in science by his use of the term 'core set'. This core set of scientists can be seen as the central group in an invisible college and will play a clear role in disseminating knowledge within their networks. According to Collins (1981) it is the 'core' group that will be most "intimately involved in a controversial research topic", as it is this group of scientists who "will experiment and theorise at the research frontiers and as a result will become embroiled in scientific controversy." The same 'core set' can be studied in both the first and second stages of the EPOR programme (Pinch and Bijker 1984: 410).

With regards to technology, social analysts within the EPOR programme study technological artefacts and their uses. According to Winner (1993), who is critical of SSK, people in different situations interpret the meaning of a particular artefact in different ways. Therefore, analysts must locate the relevant social groups involved in the development of a particular technological device, system or process, and how each group interprets and attaches meanings to that particular artefact. As a result of different interpretations, a possible consequence of a technological innovation is controversy and as such when examining the development of a scientific community, it is something that cannot be overlooked.

The EPOR programme was extended by Pinch and Bijker into what they called the 'Social Construction of Technology' (SCOT). They adopt a moderate social constructivist approach as they argue that both social and cultural factors are important in the study of scientific knowledge (Hess 1997). According to Pinch and Bijker, previous studies on science had separated science from technology, but they argue that the study of science and the study of technology should be examined together. In their view, "science and technology are both socially constructed cultures and as such, bring to bear whatever cultural resources are appropriate for the purposes at hand" (Pinch and Bijker 1984: 404). They argue that the social groups that constitute the social environment play a critical role in defining and solving the problems that arise during the development of an artefact. However, they also contend that scientists and technologists can be regarded as constructing their respective bodies of knowledge and techniques with each drawing on the resources of the other when and where such resources can profitably be exploited. They suggest that "failure to take into account the context of technological innovations results in the widespread use of simple linear models to describe the process of innovation" (Pinch and Bijker 1990: 22).

Similar stages were followed as the EPOR programme, but some of the terms were replaced, for example, 'relevant social group' was replaced with 'core set' and 'stabilisation' of a technology was replaced with the 'closure' of a scientific controversy (Hess 1997). Pinch and Bijker (1990: 28) explain;

> In SCOT, the developmental process of a technological artefact is described as an alternation of variation and selection. This results in a 'multi-directional' model, which contrasts with the linear models explicitly used in earlier studies on the diffusion of innovations as well as implicitly in much history of technology. Such a multi-directional view is essential to any social constructivist account of technology.

The concept 'relevant social group' is used to signify "institutions and organizations... as well as organized or unorganized groups of individuals" (Pinch and Bijker 1984: 414), such as invisible colleges.

Pinch and Bijker (1990:14) recommend that scholars interested in the development of technology should choose controversy as an important site for research. Controversies can be seen as 'an integral part of the collective production of knowledge; disagreements on concepts, methods, interpretations and applications are the very lifeblood of science and one of the most productive factors in scientific development' (Nowotny 1975: 37, cited in Mendelsohn 1987, p93). For without controversies, a scientific community cannot be expected to evolve, for once a controversy reaches closure, there is no more to be said about the topic (Pinch and Bijker 1990).

Closure, according to Pinch and Bijker (1990: 12-13);

> Occurs in science when a consensus emerges that the 'truth' has been winnowed from the various interpretations; it occurs in technology when a consensus emerges that a problem arising during the development of a

> technology has been solved. When the social groups involved in designing and using the technology decide that a problem is solved, they stabilise the technology and so the result is closure. Closure and stabilisation however, are not isolated events; they occur repeatedly during technological development.

Therefore, closure in technology involves the stabilisation of an artefact and the 'disappearance' of problems, but closure needs only for the relevant social groups to see 'the problem as being solved' (Pinch and Bijker 1984).

Pinch and Bijker (1984) argue further that by following the developmental process in this way, it is possible to see the growing and diminishing degrees of stabilisation of the different artefacts. The degree of stabilisation is different in different social groups and furthermore, invention is not an isolated event, but a process over time. Thus, each social group will have a different interpretation of a technological artefact, some of which may be radically different (Pinch and Bijker 1984). Unresolved controversies are particularly rewarding sites for SSK research, for they allow the analyst to study science that is still in the making (Martin and Richards 1995).

Although both schools have examined scientific controversies, the Edinburgh School's focus is on macro-sociological interests and uses historical methods, whilst the Bath School's focus is on micro-sociological approaches and observational methods (Hess 1997). However, it can be argued that what is more appropriate when studying a particular scientific community is an approach that combines both the technical and the social, and as such combines both historical and observational methods.

The Edinburgh and Bath Schools were not the only perspectives within SSK, although both would be influential for future strands. From the late 1970s and early 1980s, another alternative to the historical accounts of the Edinburgh school was the observation of scientists in the laboratory, referred to as 'laboratory studies' (Hess 1997). The emphasis here was on observational research that focused on what scientists do in the laboratory (Hess 1997) and how social factors enter into decisions about what scientific knowledge gets produced, in other words, which problems are 'doable' (Fujimura 1987: 257).

The laboratory approach differed from Bath's micro level studies. Knorr Cetina (1995: 140) defines laboratory studies as "the study of science and technology through direct observation and discourse analysis at the root where knowledge is produced, in modern science typically the scientific laboratory". It is "through direct observation and discourse analysis at the root of where knowledge is produced" (Knorr Cetina 1995: 140), thus, "the process of knowledge production is constructive rather than descriptive" (Knorr Cetina 1995: 141). However, according to Hess (1997: 100-101), those adopting the laboratory approach were not anthropologists and their methods did not correspond to standard ethnographic methods in anthropology, although their observational methods were attuned to theoretical questions in the philosophy and sociology of knowledge.

This emphasis on what scientists do was continued into the late 1980s and early 1990s, some of which took on a more radical, variable approach within the social constructivist approach. For example Bruno Latour and Actor Network Theory (ANT) where the emphasis was on 'science-as-practice'; Karin Knorr Cetina's Ethnographic Laboratory Studies and Woolgar and Ashmore's 'Reflexive Program' (Van Den Belt 2003). As before, the emphasis on opening the 'black box' and examining its contents as well as the controversies remained. For example, according to Latour (1987:258) we should study "science-in-action and not ready made science or technology; to do so, we either arrive before the facts and machines are black boxed, or we follow the controversies that reopen them".

By the 1990s, further changes within the SSK field had occurred in which "technology had taken on a new lease of sociological life in the form of 'social studies of science and technology'' (Hutchby 2001: 441). These changes coincided with changes in computer technologies, with the widespread diffusion and adoption of interactive technologies and, as a result, scientific communication using these technologies became an interesting topic to study. These studies aimed to identify a better understanding of the way scientific communities are organised and particularly the processes of communication in science (Caldras 2003). However, the arguments, concepts, and empirical research produced from the earlier laboratory studies remained an influence within SSK. These new transformations within SSK are particularly relevant to the changes that occurred within the CAQDAS community, as the interactive technologies were paramount in furthering its development.

Those working within the later SSK traditions, in a similar style to the Bath School, have focused predominantly on micro-level action and interaction between groups and actors within the scientific community, thereby ignoring broader structural influences in the constitution of scientific knowledge, which can be seen as a serious limitation (Martin and Richards 1995). As Schroeder (1996) points out, there are different types of interplay specific between technological and social forces on different levels, which means that in order to understand the social implications of new technologies, these levels must be combined. He suggests that what is necessary when examining change in relation to new technologies, is that both macro and micro perspectives need to be addressed, and as such combining the original approaches used by both the Edinburgh and Bath Schools. At the micro level, what can be examined is how particular technological artefacts become embedded in specific social contexts, how users experience these new tools and how the users' social relationships change as a result, something which is applicable to new technologies. From a macro perspective, society is looked at as a whole and what can be identified is how particular technologies fit in with other technologies, in which social settings the technologies become more prevalent and how they transform these settings or become transformed by them.

Winner (1993) criticised the social constructivist approach, arguing that although it has opened the black box and shown a colourful array of social actors, processes and images, the box they reveal is still remarkably hollow. A fundamental problem with this approach is that there are many different strands, each adopting a slightly different approach, as those identified by Hess (1997) – radical, moderate, conservative. A moderate constructivist approach may seem the most relevant out of these, as it examines both cultural and social aspects of innovations, and certainly some of the claims put forward by those that adopt this approach, as has been outlined above, are appropriate. However, when examining the social construction of a scientific community, what is most useful is an approach that examines all possible aspects, that is both the content of science and the controversies within them, yet at the same time combines both macro and micro sociological approaches. A suitable approach is Social Worlds Theory.

The social world perspective bridges the macro-micro gap as well as placing emphasis on both structural and cultural elements (Becker and McCall 1990). It is therefore useful for studying the processes of social change in scientific communities (Gerson 1983, Kling and Gerson 1977, 1978), the organisation of scientific work and the making, distribution and use of technology as forms of work (Clarke and Star 2008). As a result the social world perspective provides an effective framework for looking at the development of one particular specialism; the development of computer software for the analysis of qualitative data, for as Becker and McCall (1990) suggest, academic disciplines, specialties and research traditions are social worlds. The social worlds approach is discussed next.

Social Worlds Theory

Social worlds can be defined as groups with shared commitments to certain activities, sharing resources of many kinds in order to achieve their goals (Becker 1974, 1982; Strauss 1978), cited in Clarke (1997, p68). A social world consists of "common or joint activities or concerns tied together by a network of communication" (Kling and Gerson 1978: 26). Social worlds are interactive units (Shibutani 1955), not "bounded by geography or formal membership but by the limits of effective communication" (1990: 19, cited in Hess 1997, p104). Becker and McCall (1990) argue that the idea of a 'world' comes into use anywhere people are connected through their joint involvement in a task or event of a repetitive kind and wherever social events happen routinely, a world can be found. According to Becker and McCall (1990), in each social world, people's collaborative activity ties them into a set of direct relations that have meaning for them, resulting in a cluster of individuals interacting with each other to produce a relatively stable aggregation of relations. This pattern of meaningful aggregated relations represents a social world.

Many social worlds can be identified, which can be categorised into three main types (Gerson 1983; Kling and Gerson 1977, 1978). *Production* worlds are where activities produce something, for example music worlds produce different kinds of music, lyrics and songs. Scientific specialisms can also be thought of as production worlds. *Communal* worlds occur where the activities focus on the establishment and maintenance of communities of people committed to each other and to shared goals (e.g. hobby worlds). *Social movements* occur where the activities focus on shared commitments to alter the larger world in which they are embedded. They therefore seek change in the society beyond the borders of that world (Gerson 1983).

For example, Becker (1982: 150) looked at ‘art worlds’, which he defined as a “production system comprised of producers, distributors and consumers, whose cooperative activity, organised via their joint knowledge of conventional means of doing things, produces the kind of art works that the art world is noted for.” He found that art world participants arranged their cooperative activity through networks of exchange that routinely formed coalitions of like-minded producers, distributors and consumers. As a result such routine collective activity created relatively stable patterns of interactions that acted as social referents which guided future collective activity. Becker’s work on ‘art worlds’ is useful as a comparison to the CAQDAS world, as CAQDAS is also a production world consisting of developers (producers), propagators (distributors both of software and knowledge about software) and users (consumers). The CAQDAS world can be seen as both a production world (producing software) and a communal world (sharing and exchanging knowledge of CAQDAS). As such, mixed worlds are both possible and common and in fact, according to Clarke (1997: 68), society as a whole can be conceptualised as consisting of a mosaic of social worlds that both touch and interpenetrate. In some cases, social worlds collide.

Furthermore, social worlds can exist at different levels. Unruh (1980) identified four levels, which, interestingly, parallel Hägerstrand’s theory of diffusion; local social worlds, regional social worlds, dispersed social worlds and social world systems. Local social worlds consist of small groups of actors, organisations, events and practices which are densely situated in geographical space. Regional social worlds are larger in scale than local social worlds and are more dispersed in space. Centres of communication, subworlds and geographical centres are more apparent within these worlds. Dispersed social worlds tend to be more spatially diffuse but larger in scale than regional worlds. Examples include the aforementioned art world studied by Becker (1982), invisible colleges (Crane 1972) and the computing world (Kling and Gerson 1978). Social world systems are the largest of worlds and consist of numerous segmentations and intersections of various social worlds, thus making analysis difficult. However, Becker (1976, cited in Unruh 1980, p291) recommends starting with the ‘product’ and then tracing back to all who contributed in its production.

The structure of each social world is highly fluid and a very complex social world has subdivisions or subworlds (Becker 1982). Strauss (1991) identified two major processes in the development of a social world, which are seen as both inevitable and consequential. Firstly, social worlds intersect and do so under a variety of conditions. For example, technology, inherited (derived from other worlds) or an innovative (constructed within that world) mode of carrying out the social world's activities, is always involved. This technology may be borrowed from other social worlds where technical skills are taught and learnt. The second process is the segmenting of social worlds, the endless division into subworlds (Gieryn 1995) which makes analysis complicated as these activities may result in never-ending segmentation. Segmentation occurs as the result of the evolution of technology, differential experiences within the world by different groups, the evolution of new generations of members, the recruitment of new members and the impinging of other worlds. Segmentation results in the development and traversing of subworlds (Strauss 1991).

Two or more worlds may intersect to form a new world, or one world may segment into two or more worlds. Such structural changes generally derive from processes of negotiation, conflict and exchange. Therefore, social worlds are structured units within which the negotiated social order is itself constructed and reconstructed (Strauss 1979). Important activities within social worlds are establishing and maintaining boundaries between worlds and gaining social legitimation for the world itself (Strauss 1982). These processes involve the social construction of the particular world and a variety of claim-making activities (Becker 1974). As a result, as Strauss (1982) observes, the very history of the social world is a community constructed or reconstructed in the process of its development.

Boundaries are objects which can be ideas, things, people or processes (Gieryn 1995). These objects inhabit several intersecting social worlds and satisfy the informational requirements of each of them (Star and Griesmer 1989). According to Clarke (1997), Fujimura (1987) and Star and Griesmer (1989), science is the intersection of bounded social worlds, and what needs to be asked is how do people from distinctive social worlds, with commitments to activities and interpretations that differ, come together to get something done? Fujimura (1988) refers to this as a 'scientific bandwagon'. The development of CAQDAS was the result of a number of intersecting worlds; the chapter on the reception of CAQDAS will examine in detail the impact of these different worlds.

These features of social worlds can be converted analytically into subprocesses. The discovery and study of such subprocesses and of their relationships, including conflict and ‘power’ relationships, are essential parts of research into social worlds. A further feature of social worlds is ‘arenas’. Both within and across social worlds, an ‘arena’ may form where all the groups that care about a given issue come together. In this arena “various issues are debated, negotiated, fought out, forced and manipulated by representatives of the worlds or subworlds” (Strauss 1978: 124). Arenas are internal to the social worlds, where representatives of their different segments attempt to persuade, negotiate, manipulate and coerce others to their points of view. Arenas are also external to social worlds (Strauss 1991). According to Clarke and Star (2008), arenas form when social worlds segment over time into multiple worlds, intersecting with other worlds with which they share substantial/topical interests and commitments. They merge if and when the number of social worlds becomes large and crisscrossed with conflicts, different sorts of careers, viewpoints and funding sources. As a result, the whole is analysed as an ‘arena’. How does the concept of ‘arena’ relate to the CAQDAS world? This will be examined in the chapter on the online discussion list, Qual-software.

In the same way that the structure of social worlds is highly fluid, participation in social worlds usually remains highly fluid also (Strauss 1991). Some participants cluster around the core of the world and mobilise those around them (Hughes 1971: 54). These entrepreneurs (Becker 1963, cited in Clarke 1997, p 69) typically remain at the core over time, whilst others move in and out of participation or situate themselves more peripherally. There are clear parallels here with sociological understandings of ‘invisible colleges’, in that the same concepts ‘core’ and ‘periphery’ are used. In the traditional view of invisible colleges they are advantageous over more formal channels of scholarly communication such as; currency of information, specialisation of information, opportunity for feedback and input at formative stages of idea development, and potential for interdisciplinary transmission of ideas (Cronin 1982). Because of their nature, they are limited in size and have restricted access opportunities, resulting in an unequal distribution of communication possibilities (Matzat 2004). Those few at the centre of an invisible college have the most possibilities to develop informal channels of communication (Price and Beaver 1966; Price 1971), whereas a large number of researchers who do not have access to any member of an invisible college, have fewer opportunities to access these informal channels (Garvey and Griffith 1966). Those more advantaged in the invisible college are seen as the 'core' scientists, whilst the 'others' are at the 'periphery', such as younger researchers or those at less prestigious institutions and are therefore disadvantaged (Maztat 2004).

However, with the emergence of interactive technologies, such as email and the internet, scholarly communication and social networks have moved online, resulting in the development of online social worlds. As a result, the boundaries between those at the 'core' and the 'periphery' of an invisible college have increasingly become blurred. The last section of this chapter provides a brief outline of how online social worlds blur the boundaries of a traditional invisible college.

Online Social Worlds

> When computer networks link people as well as machines, they become social networks, called computer-supported social networks (Wellman *et al.* 1996: 1).

The internet is a network, a 'network of networks' (Craven and Wellman 1973, cited in Garton *et al.* 1999, p86): "network groups connected to other network groups by actors sharing membership in these groups" (Garton *et al.* 1997: 86). These networks link people and information through computers and other digital devices allowing person-to-person communication and information retrieval (DiMaggio *et al.* 2001). With regard to scholarly communication electronic networks have become invaluable. According to Walsh and Bayma (1996), scientists use these networks to communicate with distant colleagues, to gain access to remote databases, to share computing resources and to distribute research results to others in their field. Thus what was once done before via traditional 'snail mail', has transferred online in which delivery is instantaneous and information can be electronically stored. Before the internet, travel costs and limited communication channels meant that scholars communicated more with colleagues in other fields at their own universities than they did with specialists in their own field at other universities (Carley and Wendt 1991; Friedkin 1982). The internet's characteristics affect, but do not determine, how scholars communicate (Koku *et al.* 2000).

Researchers with an interest in science and communication and science practice have begun to talk about 'cyberscience': a new form of scientific research in which ICTs (Information Communication Technologies) are integrated with and transform research practice (Nentwich 1999; Wouters 2000; Beaulieu 2001). The term 'cyberscience' suggests the generation of new forms of knowledge through collaboration and interaction between information technologists and scientific researchers and through the development of digital resources. This technology has promoted human-to-human interaction that may benefit scholarship throughout the world (Berge and Collins 1995).

As a result, interactive technologies have permitted the development of online social worlds. Gresham (1994) argues that the use of interactive technologies for informal scholarly communication has expanded rapidly and has moved from physical locations in conference and research centres into *'cyberspace',* the virtual space created by electronic networks. As a result there has been a shift from an invisible college to what he calls a *'cyberspace college'*, a new form of informal research network, one that will exist alongside traditional invisible colleges. Participation in informal communication systems through the use of computer-mediated communication (CMC) tools will enable those at the periphery to extend their communication networks (Walsh and Bayma 1996). They will allow researchers to make contact with experts in their research field and research community and through this they will be able to increase their opportunities, for example, their work can become more visible to others in their field (Matzat 2004). As a result, invisible colleges will increase in size (Matzat 2004), because all researchers, both 'core' and 'peripheral' are able to communicate regularly with known and unknown colleagues who share similar interests (Kovacs 1996; Mailbase 1997). For example, Hesse *et al.* (1993) found that the frequency of CMC use by researchers of oceanography was correlated with higher productivity which also included researchers at peripheral, i.e. less prestigious institutes. Laboratory experiments comparing face-to-face communication with electronic mail found that computer networks have a status equalisation effect (Dubrovsky, Kiesler and Sethna 1991). A few field studies have confirmed that organisational electronic mail reduces social differences and increases communication across social boundaries (e.g. Sproull and Kiesler 1986), thus, breaking down the boundaries in invisible colleges. As Hiltz and Turoff (1993) suggest, this type of electronic network might lead to a more open form of invisible college with wider participation and faster exchange of information, something which all researchers and interested parties can engage in. Research on computer-mediated communication (CMC) has found that it can lead to a more decentralised or reduced status differences in an organisation or group (Sproull and Kiesler 1986; Rice 1980).

Online networks may vary in structure, but they share common functions. They keep participants informed of current trends and new developments within their area of specialised interest and they provide a forum for the sharing and testing of new ideas through feedback and discussion (Gresham 1994). These networks allow for greater interdisciplinary communication between specialties (Hiltz and Turoff 1993), as well as practical information about research and funding opportunities (Gresham 1994). It has also been suggested that online networks may lead to more rapid paradigm development within specialties and an expanded rate of research breakthroughs (Hiltz and Turoff 1993). However the extent to which this is true is debateable. This proposition and the functions outlined above will be examined in greater detail in the chapters on interactive technologies and on the discussion list, Qual-software. It will examine how interactive technologies have played a significant role in furthering the development and diffusion of CAQDAS. It will also investigate how a scientific community (CAQDAS) is transformed by technological innovation and what have been the impacts of these innovations.

Summary

Science is a communal social activity where scientists form various networks, both formal and informal, as a means of sharing and exchanging information. This information is diffused throughout the scientific community via the means of these networks. Two parallel traditions within the sociology of science, the Institutional Sociology of Science and the Sociology of Scientific Knowledge have sought different, opposing ways of studying science. However, both have their weaknesses. The Institutional approach has been accused of failing to open the ‘black box’ of science leaving the contents unexamined, whilst, the SSK approach attempts to do this; there is disagreement amongst its researchers of how this might be done, whether using a macro sociological approach as advocated by the Edinburgh School, or a micro sociological approach favoured by the Bath School. However, both approaches have their limitations.

Researchers in the SSK tradition have themselves disagreed about the ways of ‘opening’ the black box and examining the contents and as a result over time, a number of different strands within SSK have been developed. These have been identified as radical, moderate (or social) and conservative constructivism. This thesis adopts a social constructivist approach as it views the development of scientific communities as a social construction created through social networks but also acknowledges that other processes such as technology are also involved. Winner (1993) argues that SSK failed to explore the political content inside the black box. Other scholars, e.g. feminists, might argue that it fails to open other kinds of boxes (Hess 1997: 81).

Richards (1996:330) argues that what SSKers can do inside the box is fairly restricted. Inside the box, analysts understand that all science is social, but they leave this scientifically gained knowledge behind them when they quit the box. She argues that “the most they may do with their inside knowledge is to inform outsiders that those inside the box are much the same as those outside the box, that scientists are only a superior kind of plumber, travel agent or property surveyor” (Richards 1996: 330). According to Richards (1996: 342), there is a two-sided model of scientific controversies assumed in most SSK controversy analysis which is far too simplistic. Rather it should be many-sided, in the same way that the analyst is many-faced and inhabits many intersecting social worlds. Furthermore, in aiming to obtain a fine-grained sociological analysis of disputed knowledge claims, SSK researchers have focused almost exclusively on micro-level action and interaction between groups and actors within the scientific community. As a result they have avoided the roles of professional and social power and broader structural influences in the constitution of scientific knowledge (Martin and Richards 1995: 514).

The development of other strands within SSK has meant that the very term ‘social constructivism’ can itself be deconstructed. In the same way that constructivism can be defined in a number of ways, social constructivism too has its variants. Brey (1997) suggests three possible broad approaches; strong social constructivism, mild social constructivism and actor-network theory (ANT) which is sometimes referred to as only 'constructivism'. However, according to Law and Singleton (2000), some approaches would not call themselves 'social constructivist' because it is a hybrid of material and social performances that explain change and stability, not social factors alone. In fact, Kuhn (1992: 8-9, cited in Shapin 1995: p294) was of the opinion that SSK was 'an example of deconstruction gone mad.'

Those more critical of SSK have even gone as far as to suggest that SSK is 'sociologically irrelevant' and a 'failure' (Ben-David 1981: 41-47, 54-55). Cole (1992: 81) argues that it had 'failed to generate a single example or case study' that shows that social processes 'actually influence the specific cognitive content of science'. Mulkay (Gilbert and Mulkay 1984; Mulkay *et al.* 1983) criticised SSK as a form of overenthusiastic sociologising (Shapin 1995: 309). For Mulkay, a discourse analyst, sociologists could never produce 'definitive' descriptions or explanations of science, rather sociologists should document and classify scientists' accounts (Shapin 1995). SSK is considered to be insufficiently curious about the methods by which both scientists and those who study them produce accounts (Shapin 1995).

Therefore, when examining the social construction of a scientific community such as CAQDAS, an approach is required that can address both social and technological aspects, and at the same time draw on both macro and micro approaches. One such approach is Social Worlds Theory, as it provides a framework for examining the processes of social change within a scientific community. There are a multitude of social worlds, which can be classified into three main types; production worlds, communal worlds and social movements and these may be local, regional, dispersed or social world systems. CAQDAS can be seen as both a production world, as a scientific world is primarily a production world that produces knowledge, but also a communal world, as this knowledge is dispersed via social networks. Thus CAQDAS originally may have been predominantly a local world, but as knowledge of its existence diffused throughout the community, via formal and informal networks ('invisible colleges'), this changed and the extent to which is examined in subsequent chapters. This is particularly significant because it has been argued that those outside or on the periphery of an 'invisible college' are disadvantaged as they have little access to these informal networks. However, interactive technologies have permitted the development of online social worlds, in which the boundaries between those in the 'core' of the world and those on the 'periphery' are broken down, thus providing the need for the analysis of online social worlds.

Sociologists of science have largely neglected the social sciences with little empirical work done in this area. In this respect, it is also useful to look at methodological communities as well as theoretical ones. Using, and extending the social world perspective, the thesis looks at the social construction of a scientific community, the CAQDAS community. It examines the processes that led to its initial conception, its diffusion and reception. Reception to new technologies is often not without controversy but is seen as an essential part of a social world, one that is necessary for the world to evolve. Some disputes may be resolved over time, whilst others remain or new ones present themselves, which may be the result of change due to technological diffusion. In order to study a social world, "the history of that social world, its origins and the changes it has undergone, and where it is heading needs to be examined" (Strauss 1991: 242).

The next chapter discusses the methods used in studying the CAQDAS world as well as addressing any ethical issues that arose during research. The remaining chapters discuss the origins, propagation, transformation and reception of CAQDAS, as well as its impact on the wider social science community. The final chapter, the conclusion, summarises the key findings of the thesis and considers future directions of CAQDAS.

Chapter 3 Methodology

Introduction

This thesis looks at the history and development of a scientific community: CAQDAS (Computer Assisted Qualitative Data Analysis Software) adopting a social world perspective. According to Strauss (1991) in order to study a social world, the history of that social world, its origins, and the changes it has undergone and where it is going, needs to be examined. Clarke (1997) suggests a number of reasons as to how social world theory can be useful.

Firstly, it provides an open but strongly structural framework for conceptualising scientific work and its organisation into disciplines and sub-disciplines. It advances sociological conceptions by permitting the researcher to analyse scientific worlds as the units of analysis. But at the same time, it enables the ability to combine both macro and micro approaches, rather than adopting one or the other as found in the various disciplines and strands within the Sociology of Science. The thesis also draws on other theories and concepts that are of use, such as the work of Merton (1957, 1961, 1973, 1975) and Goffman (1959). The social worlds framework seeks to examine all the human and nonhuman actors and elements contained in a situation from the perspectives of each (Clarke *et al.* 2008). Secondly, it allows the researcher to keep track over time, not only what is being done but also what is not. Thirdly, social worlds theory promotes comparative analysis so social worlds can be easily compared. The CAQDAS social world evolved over time and was the result of the segmenting of other worlds, the social science and computing world, starting from the late 1970s and early 1980s and is still going but with significant differences. Finally, social worlds theory generates new areas of sociological concern, and “promotes sociological insight by providing a framework for discovery and makes one think and keep thinking” (Clarke 1997: 87). Interactive technologies have permitted the development of online social worlds which also need to be examined as part of that history and future.

Academic disciplines, specialties and research traditions are social worlds. Therefore, social worlds theory is an effective framework for studying a scientific community such as CAQDAS. The social worlds framework has also been especially useful in studies of controversy and of disciplinary emergence. The use of computers in qualitative research was originally seen as somewhat controversial. Adopting a social worlds perspective enables the examination of the processes that led to its initial conception, propagation and reception.

This chapter discusses the methods and the choice of methods used in

- Trying to capture its origins, development and impact on other worlds, most notably the academic community
- Exploring how scholars have used and constructed these new technologies in producing knowledge and in doing so how this maintains, organises and changes the structure of their own community

Interviewing an 'elite' group (Zuckerman 1977) can present several practical problems and ethical issues. Therefore the chapter also addresses the practical issues involved when carrying out this research, such as research design and any unforeseen problems, as well as the ethical issues that needed to be taken into consideration before, during and after the research process. Issues such as privacy, anonymity, confidentiality and informed consent will be discussed in the final parts of the chapter. But first it will discuss how data was collected and analysed.

Data Collection and Analysis

Three forms of data collection were used: in-depth interviews, documentary analysis and a content analysis of the discussion list, Qual-software. The former involved intensive interviewing in order to obtain the history of CAQDAS. At first it was decided to interview only the developers but later on it was realised that the propagators would also need to be interviewed, thus ensuring a more detailed and comprehensive history of CAQDAS. This would provide a users' perspective on CAQDAS as well as exploring the 'conversations' surrounding the software. Data collection and analysis was carried out using a grounded theory approach as outlined by Strauss and Corbin (1998). The grounded theory method is one with which the social worlds framework has long been associated (Clarke *et al.* 2008).

The social worlds framework constitutes a 'theory/methods' package rooted in grounded theory and symbolic interactionism (Clarke *et al.* 2008). For most using the social worlds framework, the 'methods' end of the theory/methods package has been grounded theory, an approach to analysing largely qualitative ethnographic (observational and interview) materials (Clarke *et al.* 2008).

The development of grounded theory by Barney Glaser and Anselm Strauss was seen as a response to the dominance of positivistic quantitative research which saw qualitative research as 'impressionistic, anecdotal, unsystematic and biased' (Charmaz 2006: 5). It is an abductive approach in which the analyst tacks back and forth between the empirical materials and conceptual means of expressing them (Clarke *et al.* 2008). The grounded theory tradition, since its initial development by Strauss and Glaser, has changed and become more complex but put simplistically, it could be seen as the merging of two divergent disciplinary traditions: Columbia University and Positivism and Chicago School Pragmatism and Field Research (Charmaz 2006).

Their book *The Discovery of Grounded Theory* (1967) has three main aims (Fielding and Lee 1998: 28-29):

(1) To provide a rationale for theory that was empirically derived, i.e. grounded.
(2) To 'legitimate' careful qualitative research (Strauss and Corbin 1994: 275, cited in Fielding and Lee 1998, p29)
(3) To provide researchers with a guide to the methods and procedures by which a theoretically grounded analysis could be produced

Charmaz (2006) argues that since its creation, grounded theory has taken on two different forms, Constructivist and Objectivist grounded theory. Constructivist grounded theory is part of the interpretivist tradition and objectivist grounded theory derives from positivism. Constructivist grounded theorists take a reflexive stance toward the research process and products and consider how their theories evolve. This involves reflecting on interpreting meanings and actions. They assume that both data and analyses are social constructions that reflect what their production entailed. Objectivist grounded theory resides in the positivist tradition and thus attends to data as real in and of itself and does not attend to the processes of its production. It assumes that data represents objective facts about a knowable world. The data already exist in the world, the researcher finds it and 'discovers' theory from it. Careful application of methods produces theoretical understanding.

Charmaz (2006) argues that critiques from within grounded theory debate what should stand as grounded theory and which directions it should take and therefore as a result grounded theorists from different variants have critiqued each other's approaches. Charmaz (2006: 140) contends that "each of the theories' [on grounded theory] published in the 1980s mirrors the form and style of the era." Van Maanen (1988, cited in Charmaz 2006: 140) suggests Glaser and Strauss (1967) created methods that emulated the natural sciences and provided researchers with a defence against accusations of subjectivity." Grounded theorists follow Glaser or Strauss or develop their own variant. For example, "Hood was influenced by Glaser and..., like other grounded theorists of the early 1980s, her analysis has an objectivist's cast", in which she undertook a systematic approach to data gathering, making comparisons and theoretical sampling, seeking explanations, offering predictions and developing hypotheses (Charmaz 2006: 140).

The grounded theory debate has perhaps been fuelled by the fact that the authors, since their initial work, have taken grounded theory in divergent directions (Charmaz 2000). Glaser remained consistent with his earlier exegesis of the method and thus defined grounded theory as a method of discovery, treated as emergent from the data, relied on direct and often narrow empiricism and analysed a basic social process (Charmaz 2006). However, Strauss (1987), along with Juliet M. Corbin moved the method toward verification (Charmaz 2000). Glaser (1992) contends that Strauss and Corbin's procedures force data and analysis into preconceived categories, contradicting the fundamental tenets of grounded theory, therefore abandoning the constant comparative method which was at the heart of grounded theory in favour of a system of analyst-generated, rather than data-generated conceptual development (Charmaz 2006).

Over the last twenty years, a more Straussian version of grounded theory that is more constructivist, interactionist, and reflexive has been generated (e.g. Strauss 1987; Charmaz 2006). Strauss was also generating his social worlds framework at the same time (Clarke *et al.* 2008: 117). Researchers in Science and Technology Studies (STS) drew upon both of these (Clarke and Star 1998) and they have recently been synthesised by Clarke (2005) (Clarke *et al.* 2008:117). According to Charmaz (2006: 64) Strauss's (1978, 1993) work on social worlds and social arenas influenced Clarke (1998) who subsequently developed the concepts. In the following passage, she offers an explicit rationale for the theoretical concepts that emerged early in her research as an integrating coding family:

> *Social worlds and arenas analysis offers a number of analytic advantages in studies of disciplinary formation. First, and of special import in historical research, social worlds analysis bridges internal and external concerns by encompassing the involvement and contributions of all the salient social worlds. Both internal and external topics may be relevant. Social worlds are genuinely social units of analysis, elastic and plastic enough to allow very diverse applications. One can avoid misrepresenting collective social actors as monolithic by examining diversity within worlds, while still tracking and tracing their overall collective perspectives, ideologies, thrusts, and goals. One can comfortably analyse the work of particular individuals as important to the arena, without being limited to an individual approach. Perhaps most important, in the very framing of an arena, one is analytically led to examine the negotiations within and between worlds that are most consequential for the development of the arena over time. (p.265)*

However, there are those that criticise grounded theory for its methodological problems and positivistic assumptions, "they have challenged presuppositions and prescriptions that they find in grounded theory, concerning preconception; pure induction and procedures" (Charmaz 2006: 133). Nonetheless, as Fielding and Lee (1998: 39) argue that "while there are significant controversies, they represent disputes about particular emphases and components of what is now a highly developed approach to qualitative data analyses." Recent debates have resulted in reassessments of grounded theory (Charmaz 2000: 521), one that has extended to the use of computers in analysing qualitative research and was examined in the chapter 'debates and contestations'. Also discussed in this chapter was how the computer makes the coding process easier and as grounded theory emphasises the use of coding, a link was made between the two suggesting that the use of computer software advocates grounded theory.

Interviews

Method and sample

In order to develop a historical account of CAQDAS and to outline the key events and processes in its development, I conducted in-depth interviews with developers and propagators of CAQDAS. The recorded in-depth interview is compatible with a huge range of theoretical approaches and as such can be analysed and interpreted in numerous ways. Intensive interviewing was also thought to be appropriate to obtain first-hand accounts of the history and development of CAQDAS.

The sample consisted of those who had been there since the beginning of CAQDAS development and are still around now. This meant that those who had since left the market for reasons that are discussed elsewhere were not included in the sample. The number of interviewees that were approached was 20, none of whom declined. It was felt that, should it become necessary, I could interview those that had left the market at a later stage. There is also the possibility that software may have been developed in other countries that neither I, nor the community, are aware of. For example, social scientists somewhere may be developing software for their own needs but are not diffusing it to colleagues nor outside their social networks. Furthermore, other software exists that was not specifically aimed at the social sciences (for example business or marketing) and has therefore also been excluded. I am only interested in the development within one scientific specialism. To look at other fields would mean another thesis – but perhaps a useful comparison for further study.

A list was developed containing the names of interviewees provided by my supervisor who was a member of the CAQDAS community and so had the contacts and knew the interviewees (the implications of this are discussed later). The interviews were carried out over a couple of years, which involved travel to Germany and the United States. The interview process was a lengthy one for a number of reasons. Firstly, I was doing the research on a part time basis; therefore travel could only occur outside term time. Secondly, it took a while to secure funding to assist with travel costs. Thirdly, waiting for an opportune moment to interview propagators and developers, for example when they happened to be giving a seminar or workshop in the U.K., which was the case with several of the developers.

Interviewees were contacted by email; some were initially contacted by one of my PhD supervisors acting as gatekeeper who was also part of the community I was studying (the implications of which will be discussed later) and as a result had the means by which to contact them. It is possible that without his involvement I may have had more difficulty in obtaining some interviews and indeed may have had some refusals.

Documentary Analysis

Before each interview, background information on each interviewee and the software was obtained, which informed the development of the interview guide. This helped in developing specific lines of questioning in the interviews, to ensure familiarity with any technical jargon (Zuckerman 1977) as well as demonstrating a professional approach. Zuckerman's work on Nobel Prize winners provided some useful comparisons with my own research. According to Zuckerman (1977: 3) the value of the interviews increased when she reviewed the scientists' work and biography beforehand; the preliminary work became increasingly elaborate as the study progressed. Certainly I felt that preliminary work was invaluable; without it, the interviews would have been of a lower quality. Furthermore, having done some of the preparatory work beforehand assisted with the interview guide proving beneficial where interview time with developers was short so I could be more specific with my line of questioning. It also helped with verification of interviewee's accounts as a lot of the information they provided was reliant on memory and recall (an issue discussed later in this chapter).

According to Zuckerman (1977: 262), intensive preparation facilitated the process of interviewing in two ways. Firstly, it provided testimony to the seriousness of the interviewer and helped to legitimate demands on the laureate's time – 'you've done your homework, haven't you?' Similarly, I was able to refer to papers that the interviewees had written, for example in one interview I said;

> *'I'll just bring out one of your recent papers that you talked about'*

This demonstrated that I had 'done my homework', but at the same time I could use it as a reference guide when asking specific questions.

Secondly, Zuckerman found that questions based on materials gathered in preparation often called forth responses that would otherwise not have been elicited, particularly if an entirely standardised interview guide had been employed. Similarly, using a standardised interview guide would not have been beneficial as each interviewee was telling their own story and so would be different, with the need for a slightly different set of questions.

As the interviews progressed, the interview guide was modified. Each guide differed slightly for each interview depending on who was being interviewed and to coincide with emerging themes from previous interviews. Although similar questions were asked to everyone; for example, 'Where do you see the future direction of CAQDAS?' Other questions varied as allowance was made for further lines of enquiry where necessary and often topics were returned to or dealt with more deeply. Sometimes during the interview, I added extra questions. After a few interviews the data was transcribed and analysed to identify any emerging themes that could then be used in further interviews. All the interviews were recorded and with the exception of one interviewee, all were comfortable with this. However, as the interview progressed, the interviewee became more relaxed. After each interview I adopted a reflexive process and wrote memos on how I thought the interview went and if there had been any problems, something that I could learn from and improve on for the next set of interviews.

I felt that the ordering of who was interviewed first in the early interviews was important in helping to develop my interviewing skills and in order to gain confidence. My supervisor suggested whom I might want to interview first[3] (the first few). Some interviews were carried out as and when the developers were available, for example, were in the UK. The ordering was important for two main reasons. The ordering was important to initially avoid interviewing those who were perhaps seen as less forgiving of any incompetency I may have displayed as an interviewer; it would not have been beneficial to either party if I had interviewed such a person before I had developed the relevant skills. Furthermore, some interviewees had limited time, and so therefore I wanted to be 'on the ball' with my questions. In addition, the ordering would have been important in assisting with developing the story. Although clearly

[3] My supervisor suggested those 'outside' the community, i.e. not a developer, but someone who could provide a critical discussion; someone who knew about and had written about CAQDAS

this was not always possible, as at times I needed to interview who was available at the time, as well as needing to consider other practical considerations such as funding, travel and so on. In other words, those deemed the most difficult to interview in terms of sensitivity, caution and practicality wherever possible, was left towards the end.

During data collection, a number of problems occurred, such as distance and time constraints, location, memory and recall, and my own role as ‘participant-researcher’. These are discussed next.

Practical Problems

Distance and Time Constraints

Time constraints and geographical location were particular problems. A demanding and busy schedule by developers and propagators, particularly as some were still employed in full time academic posts, made availability problematic, particularly as they were geographically distributed across the globe, such as Australia, Germany and the United States.

A number of possible solutions were available. A first option was to attend conferences where it was expected that several developers would be present. Whilst this might mean that I could interview a number of developers in one visit, this would be dependent on whether they were available but also that it would mean travelling to various destinations, including Europe, and thus would be costly. A second option was to conduct telephone interviews, whilst this would have eased the problem of distance, it would not have necessarily improved time constraints as they would still have to set time aside for the interview. Also, it was felt that with this kind of topic, with the possibility of covering some sensitive issues meant that a face-to-face meeting would be more beneficial. For similar reasons, a third option was to conduct email interviews. However, it was felt that in the end the disadvantages outweighed the advantages that a face-to-face interview provided, for example, establishing trust and rapport, although it would have been useful and interesting for research purposes to evaluate the effectiveness of such a relatively innovative method. A fourth option was to combine most, if not all, of the above methods.

However, fortunately, all interviews were conducted face-to-face with some being interviewed in the U.K., whilst, with the help of some funding, I was able to travel to Germany and the U.S.A to interview others. A consequence of this was that the interviewing process took longer than anticipated, with some lengthy gaps in between. Nevertheless, this did mean that whilst waiting for an opportune moment to interview, time could be devoted to analysing the data that I had already collected.

The trips taken to Germany and the U.S.A. were seen as economically viable and cost effective as there were a number of people in both countries that I could interview, some of whom would not travel to the U.K. Travel to Australia would have been far too expensive, but fortunately the Australian developers were amongst those that travel to the U.K. on a regular basis and as such I was able to interview them in the UK. The issue was addressed by looking at the CAQDAS Networking Project (CNP) website for a list of training events which enabled me to see 'who was in town' and contact them well in advance. However, although the developers frequently came to England for conferences and seminars; this may only be for a day or two; as a result arranging a time for an interview was difficult.

Despite their busy schedule, all those that I approached agreed to be interviewed, although at times this meant that a few of the interviews were short (three out of the twenty interviews - two of these had taken place after a workshop or seminar); duration of interviews ranged from 45 minutes to over 3 hours. However, for all interviews, it was agreed that should I need to follow anything up, this could be done by email. I had no need to do this but a couple of interviewees helpfully sent me further information after the interview.

Location

Some of the interviews were carried out in the respondents' homes or offices, although several had to be carried out in public places. Where this was the case, most of the interviews went undisturbed, with the exception of a telephone call. A couple of interviews had been carried out after a seminar and although we were given a private room, with one interview there was a minor disruption as a conference attendee wanted to speak to the interviewee. One interview was carried out in a hotel bar.

Nonetheless this proved to be convenient as it was morning and the bar was unoccupied. Another interview took place in a cafe, which despite it being lunchtime was not busy, although the waitress had a bemused look on her face. For one interview, I even stayed at the home of the interviewee, for whose convenience and hospitality I am extremely grateful. Many of the interviewees were very accommodating, directions were given and on a few occasions coffee, lunch or dinner was offered or bought.

Memory and Recall

For the most part of the interviews, respondents were asked to think retrospectively as I was asking them about the history of their involvement and as a result were relying on memory and recall. Therefore, the accuracy of these accounts was undetermined, as a couple of interviewees pointed out; 'I can't remember the actual dates':

> *"I haven't a clue whether what I'm saying is consistent with it but I wrote something about it, you can take a copy of it."* (D3)

However, such accounts could be verified by consulting other sources. In the case of CAQDAS these sources included other interviewees, existing literature including articles written by the interviewees themselves and developers' websites and brochures. As indicated in the above quote, sometimes these documents were presented to me during or after the interview.

My role as 'participant researcher'

Throughout my research I needed to take into consideration my own role as participant researcher; I was 'studying my own tribe'. This has both advantages and disadvantages.

Firstly, the advantage was that I had some familiarity with the field, therefore knowing which questions to ask and being able to use and understand the technical language. This was useful, as it meant that if interviews were short I would be able to ask the necessary questions and obtain the information I needed. Aside from gathering background information on respondents, little time was needed to learn the field. If there were gaps in my own knowledge, these were generally filled with relative ease, for example, by attending a software demonstration, seminar or conference. A disadvantage was that there may have been areas that it was expected I would have knowledge about as it was in my area, for example a detailed knowledge of all the software.

Secondly, an issue identified by Wiles *et al.* (2004) concerns the difficulties of conducting research with a group of people who are expert in the practicalities of conducting research. In their research it was found that researcher-respondents were keen to demonstrate their knowledge of the research process by, for example, checking that the tape recorder was on and was running. Although these actions were undoubtedly intended to be helpful to the fellow researcher who is collecting data, at the same time they can be experienced as rather undermining of a researcher's skills and to provoke anxiety about performing appropriately in the researcher role in the presence of peers. With some participants I did experience this, particularly in the early interviews, although some in later interviewing, I found their comments helpful and not undermining. Some interviewees were helpful and supportive, particularly early on, when they realised that these were my first interviews and offered advice, for example, as one propagator discussed:

> *"I think that's an interesting path for you to try to maybe map out, there is a lot of interesting research I think you could do. There are possible things that you may like to look at, but again we can come back to this conversation - once you've done more interviews, you'll understand better what you really want to focus on. Because it's a lot to reconstruct, this whole issue is a lot, you have to decide which things you really want to focus on"* (P8)

Most of the interviewees were very helpful when it came to the interview and some expressed an interest in my work. For example,

> *"I'm very excited about your project. It's so fascinating that it's almost as if now we're closing a loop, that now we'll have a dissertation studying the community, which in a sense reveals how far the community has developed and how visible and significant it is."* (P8)

"When the thesis is ready, I would like to have a copy." (D1)

Thirdly, having a supervisor that was a member of that group was beneficial. Aside from what I had read in the literature he was able to provide some background information on some of the interviewees, as well as guidance on what I might want to ask in the interviews.

Fourthly, Wiles *et al.* (2004) suggest that power dynamics are inherent in relationships between researchers and participants. For as Moyser and Wagstaffe (1987: 20) suggest: "information and knowledge is a resource for power and influence in modern society, therefore, how it is presented, disseminated and stored is of interest to people in power, especially when it is information and knowledge about themselves". However, perhaps because I was someone who was associated with the field, I did not feel that I was put in a powerless position by those I interviewed. Their interest seemed mostly to be academic, for example one interviewee enquired about my theoretical framework.

According to Zuckerman (1977) when interviewing an 'elite group', the interviewer may be subject to a number of 'tests' that assess the interviewee's competence. These 'tests' can take a variety of forms, one of which is testing the seriousness of the interviewer and legitimising the demands of time, such as 'you've done your homework'. Another type of 'test' was determining the extent of the interviewer's knowledge. I did have a similar experience with a number of propagators and developers asking what I had read, had I read their article, or did I know about X or Y, as demonstrated in the following quote:

"I don't know if you are familiar with the literature, but there is an opinion..." (D7)

Any practical issues and limitations were overcome in one way or another; what was more difficult to address were the ethical issues concerning a community of this nature. These issues are addressed later.

Supervision

Another problematic area was that one of the interviewees was also my PhD supervisor, a well known figure in the community. At times, this meant that there were some things that couldn't be discussed. For example it was not possible to discuss some of the content of the interviews, even though most of the interviewees had said that they didn't have a problem if he was to see the transcripts. Despite this, we had agreed prior to interviewing that he would not see any of the transcripts. Although this may have been an ethical approach, practically, this presented a number of problems, especially in the early stages of research and analysis.

A particular concern was that of coding and I questioned whether what or how I was coding was right. I soon learnt that this was a normal dilemma for a novice and one that I would learn to deal with myself. Although not looking at the transcripts in their entirety, he did look at the list of codes that I had generated from the first few interviews and so was able to comment on those. Beneficially, being part of the community meant that he would have some idea of what possible themes may emerge from the data and so was able to provide guidance on this. Nonetheless, during those early stages, I felt that I would have preferred it if he had seen at least some of the transcripts with my codes attached in order to discuss and identify any emerging themes. As data collection and analysis progressed, my concern lessened, but never completely disappeared. It is only once writing had commenced and themes discussed that I was reassured that the codes I had generated were valid.

After each interview or batch of interviews I met up with my supervisor for a debriefing and any issues that had arisen were discussed. On a couple of occasions, interviewees had confided in me. Although I was certain that my supervisor probably knew these issues, such as conflict between developers, and he knew that I probably knew or would find out, it was something that we could not discuss amongst ourselves.

Sometimes in the debriefing sessions, it was difficult to maintain a distance and discussions became informal and chatty, which was not a problem in itself, but it may have meant that we were both finding it difficult to distance ourselves. Certainly I felt that at some stage, it was hard to maintain a critical and analytical focus on my research, a problem that is associated when studying your own group (Delamont *et al.* 2000).

Interviewing my supervisor as a member (propagator) of the CAQDAS community also presented some problems. Firstly, it felt strange interviewing someone I knew, not well, but not a stranger either. Initially I had been nervous and concerned about the interview with regard to feeling that I would be assessed, a similar issue when interviewing other methodologists. However, this was not the case. Although he may have assessed me in his supervisory role, there was no need for concern. In fact, it was advantageous, as I could obtain feedback on my interviewing skills and technique, which I did. It still didn’t take the strangeness away and even now as I write this piece knowing that I will be discussing my supervisor and my supervision with my other supervisor, makes it all the more strange! My second supervisor played an important role as he was not part of the community being studied and as a result was able to provide a more distant and critical review of my thesis.

Secondly, for the same reason that he did not look at the transcripts of my other interviews, my supervisor was not able to divulge any sensitive material and so be careful of what he said, making clear that some comments were for private consumption only. This made it difficult, because any sensitive material, either from the interview with my supervisor or other interview, meant that I had no one to confide in. Furthermore, it may also have been the case that his dual role of community member and PhD supervisor meant that these roles came into conflict. For example, he may have wanted to discuss something as a supervisor but could not as a participant. This was resolved to some extent by my other supervisor, as someone that I could confide in. However, some sensitive and private issues from the interviews could still not be discussed, as guarantee had been given that these would remain confidential.

Analysis of Interviews

The first two interviews were transcribed and analysed before further interviews were undertaken. This was to identify any broad themes that were emerging. The ordering of the interviews was partially determined by what themes were transpiring from the data, the other reason was due to the availability of participants. Any initial themes that were identified formulated the grounds for further research and questions. As discussed by Glaser and Strauss (1967) and Charmaz (2006) from the beginning of the research, the processes of collecting, coding and analysing data should go on at the same time. This is to enable the 'constant comparative method, where one begins constant comparison by examining 'incidents' recorded in one's data' (Fielding and Lee 1998: 29). Incidents are defined as "complete verbal expressions of an attitude or complete acts by an individual or group" (Becker and Greer 1960: 281, cited in Fielding and Lee 1998: 29). Codes from each subsequent interview were compared with the previous to further explore and identify recurring themes**.** Once I had transcribed the data, it was divided into 'chunks' or loose themes, referred to in grounded theory as 'open coding' (Strauss and Corbin 1988).

Analysis was assisted with a computer program, MAXQda (formerly WinMAX) and this was used for two main reasons. Firstly and quite simply, I had used the software before and therefore was familiar with it. Secondly, it was suitable for my needs such as data management, code and retrieve, finding links between the data. Therefore, I did not feel the need to explore and learn other software packages, although I had attended a number of other seminars on different software and had looked at demos. It was most certainly not used because it would help me 'do grounded theory', a frequent misconception found in literatures and discussions concerning CAQDAS. In fact, it was almost certain that the software would be used to assist with the analysis of data, before ascertaining the process of analysis. I found little problem in using the software, what was more problematic was getting to grips with the analytical process, something which I am sure is common amongst most PhD students and other less experienced researchers. I adopted my own process of analysis that involved switching between manual and electronic methods, although most of it was done using the software. For example, I would use the software to code-and-retrieve and write memos and then I might print off bits of the coded text to look through manually. This is no reflection on the software, rather an indication of my own preferential method of analysis; being able to scan through the papers and not be limited by what is on the computer screen. Once I moved away from open coding to more refined analysis, i.e. working with core categories, I was able to use the software to find links between these categories, as search and retrieval was easy to perform.

According to Glaser and Strauss (1967) coding should be periodically interrupted to record a memo on the present state of theoretical understanding associated with a category. MAXQda enabled me to code with relative ease and attach memos to codes, thus enabling a constant comparison between the data and the ability to write and attach memos.

Although analysis had been fairly continuous, after eleven interviews, time was taken for a more in-depth analysis again comparing data and addressing themes. Then the next batch of interviews was carried out and the process was repeated. After the interviews were complete, analysis continued but was more detailed and coding was centred around the core categories that had emerged, known in grounded theory as 'axial' coding and 'selective' coding (Strauss and Corbin 1998). The process may appear as if it was done in separate stages, so first open coding, and then axial and selective, but rather at times it was a mixture of all, for example, as new data emerged this may have started with open coding. But as themes were identified, the data was analysed again to look for relationships between data and categories. In time, as core categories were identified, these were dealt with more selectively, i.e. looking for relationships or subcategories that were relevant. When new data emerged, in this case further interviews, this process was repeated.

Analysis was not separate to writing. Writing the storyline and putting the pieces together was also continuous. This would help first of all with analysis so I could contextualise the themes that were emerging, but also identify any gaps in the story and seek to address these, so whether it was further interviews, or consulting certain literatures.

These combined processes; data collection, analysis and writing continued until 'theoretical saturation' were reached (Strauss and Corbin 1998), to ensure that the study into the history and development of the CAQDAS world was grounded.

Content Analysis of Qual-software Discussion List

The in-depth interviews were essential in order to obtain the history and development of CAQDAS, as this provided the opportunity for developers and propagators of CAQDAS to tell their story. However what was missing was a user's perspective. By user I mean those that were only users, for developers and propagators were users also. Previous research in the form of surveys and focus groups (for example see Fielding and Lee (1998), Mangabeira *et al.* (2004)) had been carried out on users, so in order not to replicate this, but build on it, it was decided to carry out a content analysis of the discussion list Qual-software, a list dedicated to the discussion of CAQDAS.

Analysis was carried out from the start of the list in 1994 until 2002. Unfortunately some of the data was missing in the first few months of the list's existence as the technology to permit archiving was not in place at the time. However, luckily, a couple of early users of the list had saved all the messages and were very kind in passing this information on, for which I am extremely grateful. Even so, there is still some material that is missing (data was missing from August 1997 until March 1998). As all messages that were available were in electronic format they were imported into MAXQda for analysis. Codes were attached to identify main themes of discussion as well as to obtain a count of the number of threads per month and per year, the number of respondents and from which country. Details of the analysis and findings are discussed in the chapter 'conversations about CAQDAS'.

Ethical Issues

Informed consent, sensitivity, confidentiality and anonymity are regular issues found in social research methods, but when studying a community such as CAQDAS where respondents know each other, some of these issues are amplified. For as Wiles *et al.* (2004) suggest, studies conducted by academic or professional researchers of their peers raise specific ethical issues which are not distinct from those inherent in all research but which arguably places researchers in a situation where they have increased sensitivity to some ethical issues. Therefore, researchers are particularly sensitive to the ways that participating in research may be detrimental to them.

Confidentiality

Issues of confidentiality needed to be considered. As Wiles *et al.* (2004) suggest, conducting research within one's own community means that researchers often have knowledge about individuals outside the data collection context. As a result, it is necessary to distinguish between: what is public knowledge in terms of what views participants have expressed in their presentations and research; what data is generated in the study for public consumption but which must be anonymised; and what was private knowledge that was gained from the research or from personal knowledge of an individual that the individual had not given consent to use. As discussed by one propagator:

> *"I think it will be easy to identify the people behind certain positions, we know each other from conferences etc over the years. It might influence the interview situation, as I know that others will read."* (P5)

The option of viewing a transcript of the interview, in order to make amendments, add or omit data was presented to the participants. Those who requested it were sent a copy of the transcript. This potentially may have been problematic, as it may have affected the outcomes. My response was that, should this have happened, I would have tried to negotiate and validate my reasons for including the information, for example, by rephrasing the information or omitting the parts that were problematic. Fortunately, for those to whom I had sent transcripts, (those that had requested it) no-one demanded any changes. Everyone had been given a consent form to sign (see appendix for copy of consent form). All signed the form and for the majority this was 'without strict preservation of anonymity'. Because interviewees realised that there was a possibility of being identified, it was made clear in the interview when certain information provided was considered private or public. A couple of interviewees specified that they would not divulge any sensitive information. The following quotes provide an example of these responses:

> *"That's O.K., we won't say anything that we don't want you to know."* (D8)

> *"This is public knowledge now."* (P7)

At first some developers were sceptical of my intentions, perhaps thinking that I was a new competitor and was seeking information before developing a new software package, as the following extracts indicate:

> *"Are you working together with CAQDAS and Qualidata?"* (P10)

> *"I was actually wondering whether this was something that Ray Lee was doing, but this is totally separate your work."* (P4)

However, I had made my intentions clear before and during the interview and as most knew my supervisor or had heard of him, any mistrust was soon alleviated. It was made apparent that Ray would not read the raw transcripts. For example, as clarified by one propagator:

> *"I'm the least concerned about Ray Lee."* (P5)

A further problem was that, as some of the participants knew each other, in some cases I needed to be careful of what was said so as not to divulge any information that had been given in confidence by a previous interviewee. Needless to say, some were very forthcoming with their information, others less so.

A lot of the data that I dealt with was of a sensitive nature and as a result could not be included in my research. These included conflicts between individuals and material of a commercially sensitive issue. Some issues, however, were public knowledge, and where this was the case, the data were used, but still with caution. As Zuckerman (1977) suggests some questions may be perceived as threatening, especially regarding details of conflicts. I never asked any of the participants to disclose details of any conflict; if it arose, it did so because the interviewee chose to discuss it. There were, however, on a few occasions when the topic was of a sensitive or confidential nature, that respondents made it clear that they would not answer:

> *"I wouldn't be able to comment on that at all and I wouldn't like to."* (P8)

Due to the nature of this community, the issue of anonymity was problematic and not always possible due to the small size of the group and the relationships that exist, some of which are friendships, and for others a more friendly rivalry exists. Each of the participants will be known to the other, if not in person, then certainly by name and reputation, not only by the 'wider community', but also as individuals.

Participants were asked for informed consent and were guaranteed anonymity as much as possible. Any quotes that I have used I have labelled the interviewee as either Developer (D) or Propagator (P). Further information, such as country of origin, was not given, as this might help to reveal who the interviewee was. There were some instances where the revealing of the respondent was necessary, such as when talking specifically about a software program or organiser of a conference, all of which was public knowledge. Any information that would have been too revealing and deemed too sensitive or confidential, has been left out. The implications of this are that some information regarding the details and history of CAQDAS have been left out, as some of the conflicts are part of it. Wherever possible, I have attempted to include as much data as feasible.

Nevertheless, despite doing this, it is not absolutely certain that the interviewees' comments would not be identified by those who knew them. Again, it was imperative that when using comments I did so with caution. In their research, Delamont *et al.* (2000) used pseudonyms and where absolutely necessary falsified biographical details of their participants and made plausible changes in their accounts of their research. This was an option I could use should it be necessary to do so, however, some of the respondents were aware of the anonymity issue and said that as long as the comments were not used in a harmful or detrimental way, then it was fine for their identity to be potentially revealed.

However, as Raab (1997) suggests, the interview can be seen as offering an opportunity to tell one's own story, which may be appealing to some and therefore some 'narrators' may want to be identified (Yow 1994). There is a possibility and it is a problem identified with this type of research, that some of my respondents may have held back any vital information for fear of it becoming public, rather than confined as private knowledge. There was some indication that this might have been the case. In some instances, understandably, holding back of information was necessary, as client confidentiality was required. This particularly relates to Sage Scolari, whose representative stated:

> *"There are areas that I need to be a little careful because there are sensitive issues."*

With some respondents, on the other hand, it was felt that this was not the case and they openly discussed any sensitive or confidential issues, either specifying that it was confidential and not to be used, or that I could use it but cautiously. In my research I have done my utmost to respect my interviewees' wishes and any comments deemed too sensitive or confidential will remain in my memory only.

Of particular importance was commercial sensitivity, involving the relationships between Sage Scolari and the developers and as a result was the most difficult to contend with. Again, some developers and propagators were very open with their information but I knew it was something that could not be used as it would have negative consequences on the various parties involved. Those less forthcoming and understandably so, not only for ethical reasons, but legal reasons too, were the representatives from Sage. It is also these interviews that I found the most difficult. First of all, despite doing my 'homework' (Zuckerman 1977), I knew little of the publishing business and I only knew of the role of Sage from what I heard from my supervisor and other interviewees and from what I had read. All was useful information, but was second-hand knowledge, not something that I had learnt or experienced first-hand. The interviews were difficult because certain areas were out of bounds and could not be discussed, either by myself or the interviewees, for example, the contracts that Sage had with each of the developers. This would have been interesting as it would have emphasised the relationships between certain groups in the community, which after all is part of that community's development and evolution.

A number of ethical issues also arose when analysing the discussion list.

Ethical issues concerning analysis of qual-software

Analysing the content of discussion lists raises ethical issues as the debate between what constitutes public and private knowledge is open to dispute. As suggested by Kling (1996), ethical guidelines for reporting results from internet research are still being contested. Even to this day there are no clear guidelines on internet research, as indicated by the BSA (British Sociological Association'[4] which states:

> *"Members should take special care when carrying out research via the internet. Ethical standards for internet research are not well developed as yet. Eliciting informed consent, negotiating access agreements, assessing the boundaries between the public and the private and ensuring the security of data transmissions are all problematic in internet research. Members who carry out research online should ensure that they are familiar with ongoing debates on the ethics of internet research, and might wish to consider erring on the side of caution in making judgements affecting the well-being of online research participants."*

However, following the BSA's statement on internet research is not so simple. For example, as Lee (2000) suggests, it is not always clear where the boundary between public and private lies in cyberspace. For instance, emails sent between two individuals is clearly bounded and considered to be private (Lee 2000), but postings to listservs, bulletin boards and newsgroups are considered by some as public and intended for public consumption (Pacagnella 1997). With regards to the qual-software discussion list, I regarded it as public and available for analysis. In particular, those posting to newsgroups have the option of sending a private email, rather than posting to the whole group and it was clear by looking at the threads that this had occurred, as there appeared to be gaps in the flow of conversation, or posters had simply said 'I'll send you a message off-list'.

Although there are no established guidelines for conducting online research, many communities have developed a 'netiquette', which can be "described as a loose set of standards for behaviours on the internet, particularly directed at preventing aggressive and insulting behaviour" (O'Dochartaigh 2002: 81). There are informal rules of do's and don'ts, for example, not posting personal messages or putting an 'out of office' message on so that it gets sent to every person on the list. Posters that do not comply with these rules are soon reminded of them, as was the case with Qual-software.

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[4] http://www.britsoc.co.uk/equality/Statement+Ethical+Practice.htm (accessed 7th January 2011)

Conclusion

In order to study and capture the history and development of the CAQDAS social world, two forms of data collection were used; in-depth interviews and a content analysis of the Qual-software discussion list. Both involved examining occurrences and events that had transpired over a number of decades. In addition, documentary analysis was used to verify historical information provided in the interviews, as well as assist and prepare for the interviews. As a result, it was possible to trace its history, origins, development and changes. Data collection and analysis was carried out using a grounded theory approach.

As I was studying my own group (Delamont *et al.* 2000) there were a number of practical and ethical issues that needed to be considered, of which particular significance was anonymity and confidentiality; as participants knew each, other anonymity was difficult to maintain. A small proportion of the data was sensitive and so had to be dealt with cautiously and in some cases was too sensitive that it had to be excluded from the research all together.

Analysis was carried out using MAXQda. It was deemed unnecessary to look at other packages as I was already familiar with it having used it for my Master's dissertation and because it was seen as suitable for my needs in my PhD research.

CAQDAS has been around since the early 1980s. It has undergone numerous changes and will undoubtedly continue to evolve; I hope to continue studying its development and progression.

Chapter 4 Initial Development of CAQDAS

Introduction

Traditionally, qualitative researchers in the social sciences analysed their data by manual means, for example, by creating multiple copies of interview transcripts which could be cut up into segments and sorted, or by colour coding relevant bits of text on single transcripts. From the early 1980s, however, computer packages for analysing qualitative data began to transform the nature and practice of qualitative research. During this time, computers were treated with caution by many qualitative researchers and in particular programs for qualitative data analysis were met with some scepticism, as traditionally data analysis software was orientated to the needs of quantitative researchers (Fielding and Lee 1998). Yet, despite this concern, some researchers saw the potentiality of using computer technologies for the analysis of qualitative data and, for a number of interrelated reasons, began to embark upon the arduous task of software development.

This chapter identifies the social, technical and intellectual processes that led to the initial development and social construction of the scientific community that grew up around CAQDAS (Computer Assisted Qualitative Data Analysis Software). Three areas will be discussed. Firstly, as CAQDAS would not have been possible without it, the first section provides a brief outline of the history and development of computer technologies[5]. Secondly, the chapter will look at the development of CAQDAS and how the intersection of two social worlds, the computing world and the social science world came together; examining the reasons behind its conception and how its evolution was possible. Thirdly it will explore the early reception of CAQDAS within the wider social science community. It was possible to obtain a detailed account of the history and development of CAQDAS and its early reception as the result of interviews with developers and propagators of CAQDAS.

[5] The literature on the history of computer technologies is vast; what is presented here is a very brief insight, highlighting only significant aspects and those of relevance to CAQDAS.

The development of computer technologies – computer worlds

Originally, the word 'computer' meant a person who solved equations and it was not until 1945 that the name carried over to machinery (Ceruzzi 2002). Yates (1997) describes the period after the Second World War as the 'classical era' of computing. According to Castells (2010), it was during the Second World War and its aftermath that major technological breakthroughs in electronics took place, such as the first programmable computer and the transistor, the source of micro-electronics.

The first generation of modern programmed electronic computers was built in 1947 (Winston 1998) and involved vast calculating machines for large organisations and scientific projects (Ruhleder 1995), used predominantly by the military. With the advent of the Second World War, a military need arose for large-scale calculations in relation to navigation, ballistics, and code-breaking (see e.g., Yates 1997: 12). This led to the production of a number of early computational machines. Examples include the 1943 British Colossus which was applied to deciphering enemy codes and the German Z-3 reportedly produced in 1941 to help aircraft calculations (Hall and Preston 1988). Subsequently, Mauchly and Eckert produced the ENIAC (Electrical Numerical Integrator and Computer) (Winston 1998), at the University of Pennsylvania in 1946 (Castells 2010).

According to Castells (2010), the first commercial version of the ENIAC, the UNIVAC 1, produced in 1951 by the same team, then under the Remington Rand brand name, was extremely successful in processing the 1950 U.S. Census. During this time, IBM, also supported by military contracts and relying partly on MIT research, overcame its early reservations about the computer age, and entered the race in 1953 with its 701 vacuum tube machine (Castells 2010). Despite military dominance, the IBM Corporation continued to concentrate on the commercial market (Ceruzzi 2002). It was only in 1964 that IBM, with its 360/370 mainframe computer, came to dominate the computer industry. Its success, according to critics, was that it was never an innovator, but always waited until another smaller company took the technical risks, and then swept in and took over by questionable marketing practices (Ceruzzi 2002: 68).

These early computers were known as 'batch-processors'. Naughton (2005: 67-68) described how they were used; a user submitted a program to be run on encoded decks of punched cards, the programs were then typed line by line on a QWERTY keyboard (something which has remained to the present day) and at the end of each line, it spat out a completed card. Then, at periodic intervals, an operator would appear and take the decks to the machine room, emerging hours later with the deck and a computer printout of the results. The technology of punched cards is now obsolete, but in its day it was a powerful and versatile tool which provided the only means of bulk data processing (Yates 1997).

However, computers at this time were extremely expensive, there was relatively little interest outside the military in exploiting their use (Winston 1998) and as a result diffusion was minimal. Nonetheless, this was to change, albeit slowly at first. By the late 1950s and into the early 1960s, advances and reductions in costs of circuit technology, such as the maturing of transistor technology[6] and the development of reliable, high capacity memory units transformed the computer, resulting in increased reliability, lower maintenance and lower operating costs (Ceruzzi 2002).

It is also at this time that computer science began to emerge as a discipline. It first appeared in the late 1950s at pioneering universities such as Stanford and Purdue, although under different names and often as a division of Mathematics or Electronic Engineering departments (Ceruzzi 2002). By 1968 computer science had gained respectability and an undergraduate could obtain a degree in it at one of a hundred U.S. universities (Ceruzzi 2002). Across the Atlantic, a similar trend was occurring in the U.K. In 1963, the Department of Science and Industrial Research (DSIR), a government department, announced the establishment of the Advanced Computer Technologies Project (ACTP), a new initiative to support the UK computer industry and the National Physical Laboratory (NPL) acted as the centre for the technical direction of the project (Yates 1997: 62). The next generation of computers included the Project Whirlwind, the Minuteman Ballistic Missile and the Advanced Research Project Agency's ARPANET, which would later morph into the Internet (Ceruzzi 2002).

[6] The transistor was originally invented in 1948 by William Shockley, for which he received a Nobel Prize (Winston 1998). The transistor made possible the processing of electronic impulses at a fast pace in a binary mode of interruption and amplification, thus enabling the coding of logic and of communication with and between machines, commonly called 'chips' (Castells 2010).

Despite computer science growing as a discipline, computers remained expensive and were treated with suspicion by much of the academic community, hence diffusion stayed low. However, this would change within the next decade: for example, in 1965 there were only 31,000 computers worldwide, most of which were mainframes, but by 1976 with the emergence of microcomputers, the number had risen to 200, 000 (Winston 1998).

According to Castells (2010: 41),

> *The advent of the micro-processor in 1971, with the capacity to put a computer on a chip, turned the electronics world and indeed the world itself, upside down.*

One of the first small-scale computers built with microprocessor[7] technology was the Altair built by Ed Roberts in 1975, which formed the basis for the design of Apple I, followed by Apple II, the first commercially successful micro-computer, developed by Steve Wozniak and Steve Jobs (Castells 2010).

During this time, computer technologies evolved further and diffusion was beginning to increase, providing ample opportunity for experimentation, both amongst computer scientists and social scientists. Prior to the 1970s, computer systems were designed to be used by trained people, either computer specialists or those in jobs which called for computer use (Yates 1997). However, technology was now becoming more 'user-friendly' so that non-computer scientists could use it. For example, computer screens displaying pictures as well as words and the use of a pointing device (a mouse) were all novel ideas in the late 1960s (Yates 1997) but in due course would become more common. These areas saw further developments during the 1970s, as well as the creation of early versions of menu-based graphical user interfaces (GUIs) (Strate *et al*. 1996).

Developments such as these led to what perhaps is one of the most significant commercial growths in the history of computing; that is the development of the personal computer in the late 1970s. It was in 1981 when IBM introduced its own

[7] The invention of the microprocessor in 1971 by Ted Hoff, an Intel engineer, putting the computer on a chip, meant that information-processing power could be installed everywhere (Castells 2010).

version of the micro-computer with the name the ‘Personal Computer’ that ‘PC’ then became a generic name for all microcomputers (Castells 2010).

Furthermore, improvements in programming languages such as ‘C’ and ‘Pascal[8]’, which replaced the old dominant ‘Fortran’ program and the development of a new breed of widely available programs in 1978 such as Microsoft BASIC and the CP/M Operating System (Ceruzzi 2002), meant that programming became less cumbersome and specialised.

These improvements and developments coupled with a further reduction in the price of both computers, materials and storage devices, such as the development of the first floppy disk drive by David L. Noble at IBM (Ceruzzi 2002), provided hobbyists and enthusiasts an affordable way to experiment with the software, for example, by building their own computers, which in time could be done from home. According to Winston (1998: 236, 237, 330), a semantic shuffle occurred. He explains, initially, the computers’ essential value in the home, was at first only as a computer, a device upon which to study or play. However, eventually the home computer became the personal computer which, while it existed at home, could also function as a tool in the workplace. It was only with the coming of accessible word-processing which turned the home PC into an effective typewriter (Winston 1998) and the arrival of the modem which permitted email and internet access that meaningful domestic uses were found.

As a result, there was a major shift in how computers were used; what was once confined to the military, large corporations and select universities was now available to any computer enthusiast. The social worlds of hobbyists and enthusiasts have a long history of technical innovations. For example, as described by Ceruzzi (2002: 224), radio enthusiasts “opened up the high frequency radio spectrum for long-distance radio communications after WWI and after WWII the hobby expanded beyond amateur radio.” Ceruzzi (2002) suggests that the community of hobbyists provided a key role in creating the personal computer as they provided an infrastructure of support, which included, for instance, a variety of electronics magazines. For example, in 1975, readers of the hobbyist magazine ‘Popular

[8] Pascal, developed by Niklaus Wirth in Zurich between 1969 and 1970, became one of the most popular languages in use world-wide (Yates 1997: 219).

Electronics' could purchase materials and instructions on how to build their own home computer (Winston 1998), the 'Altair'; this bare-bones computer could be purchased for less than $400. It resulted in an extensive development of user groups, newsletters, magazines, local clubs and conventions, creating an "open and informal [environment, that] offered more to the neophyte" (Ceruzzi 2002: 231).

By the late 1970s, the advent of small, cheap computers had revolutionised the opportunities for computer interaction by non-specialists (Yates 1997: 232). This "revolution in interpersonal computing [began to encourage] researchers to study CMC [computer-mediated communication] on the interpersonal, group, and organisational communication levels ... (Chesebro and Bonsall 1989; Sproull and Kiesler 1991; Gumpert and Cathcart 1986, cited in Strate *et al.* 1996: p8)

By the 1980s, the period of commercialisation was under way, with "rapid expansion of computer-related industries and an increased emphasis on networks, supercomputers and workstations" (Kidwell and Ceruzzi 1994, cited in Strate *et al.* 1996, p7). The advancements and improvements in computer-related technology and programming for non-specialists from the 1970s continued during the 1980s. For example, the Macintosh, HyperCard[9] made the development of complex applications available to non-experts, thus providing developers with an increasing choice of complex tools and programming languages to use (Fielding and Lee 1991).

A technological innovation, one that would have a huge impact on not only the CAQDAS world, but the entire computing community, was the emergence of Microsoft Windows. PC software had emerged in the mid 1970s out of enthusiasm for the Altair: two young Harvard drop-outs, Bill Gates and Paul Allen, adapted BASIC for operating the Altair machine in 1976. Having realised its potential, they went on to found Microsoft. Within three years of the 1981 launch, 40% of all personal computers were running its programs. By 1986, Microsoft had become a public company (Winston 1998: 237).

It was not until 1990 that commercial software came to the fore of personal computing, as hardware prices dropped and computer systems became more reliable,

[9] Hypercard is a hypertext program developed by Bill Atkinson for the apple Macintosh and is based on the idea of having stacks of virtual index cards that can be linked to one another by programming (Naughton 2005: 314)

compact and standardised (Ceruzzi 2002). During this decade, Microsoft released Windows 95, a much more user-friendly version compared with earlier editions and one which incorporated a GUI (Graphical User Interface).

It is also in this decade that another significant development in the history of computing would emerge: the World Wide Web. According to Castells (2010: 51-52), the development of the internet alongside "new advancements in telecommunications and computing induced [a] major technological shift; [moving] from decentralised stand-alone microcomputers and mainframes to pervasive computing by interconnected information-processing devices." By 1995 the internet was in universal use by the technical and scientific community, both academically and commercially (Yates 1997: 281). The impact of the World Wide Web is discussed in detail in the chapter on interactive technologies.

This brief account of the history of computing illustrates the significance it had in the development of and formation of the CAQDAS world, as CAQDAS would not have been possible without the development of these technologies. There were a number of conditions that enabled the CAQDAS world to emerge and develop as discussed by one propagator:

> "*The early packages developed partly because, not exactly by accident, but by contingency. What I mean by that is if you think about it, computers and qualitative research is a strange thing to put together. For that to happen, there had to be a set of conditions, which allowed software to emerge. People were sitting down, writing little programs, or if they knew about databases, they were building a little database, people were using what they could, and in the circumstances they could and in the context they could. In my view, CAQDAS developed in a way because there were always 'happy accidents', at the beginning, which meant that somebody knew about qualitative research and also knew about programming."* (P1)

The next section identifies and examines the conditions that enabled CAQDAS to develop the way it did, how it was possible and why it was done.

Development of CAQDAS

Prior to the 1960s, qualitative researchers tended to rely on using manual methods to analyse their data as computer technologies at this time were not available. Many researchers developed their own techniques for analysis such as using coloured pens and literal 'cut and paste' methods in order to code data relating to each category in a separate file folder (Taylor and Bogdan 1984).

According to Lee and Fielding (1991), biblical scholars, who dealt with very large bodies of textual material, had early on shown an interest in the usage of computers with non-numeric data. When mainframe computers appeared in the 1960s, these began to be used by researchers interested in traditional quantitative content analysis (Fielding and Lee 1998). Although the first content analytic studies date back to the nineteenth century (Barcus 1959), the method became prominent in the 1930s and 1940s (Tesch 1990), where it was associated with the analysis of propaganda. In 1963 the first dedicated content analysis program was developed called The General Enquirer (Stone et al. 1966), which ran on a large mainframe computer. The reason for its development was clearly specified by its authors who stated:

> *Since 1961, we have been investigating computer-aided content analysis as a research technique, the use of computers has allowed us to circumvent some of the tedium and limitations of manual coding and to explore research procedures that had previously been neglected* (Stone et al. 1966: xi)

This statement provides an illustration of why some academics decided to embark upon the arduous task of software development, a sentiment shared by all the developers interviewed and that is to alleviate some of the tediousness that comes with qualitative data analysis (this will be discussed later). During the 1970s as computer technologies were advancing and becoming more affordable, qualitative researchers were able to experiment with these technologies and by the end of the decade rudimentary CAQDAS programs were beginning to emerge. According to Fielding and Lee (1998) these experimentations involved crafting do-it-yourself approaches using word processors and text retrievers. For example, as Werner and Schoepfle (1987) suggest, the search and indexing functions of word processors, multi-window editing and the special concordances and indexing programs that were often developed first for mainframe computers, made the researchers' work more efficient. As explained by one CAQDAS developer:

> *"From the very beginning I had always used computers, and I'd never been trained in software, I just developed the skills, because in the early computers I had, there wasn't any word-processing software. So I learnt how to program and I wrote a little word processing program and that's how I got to start writing software."* (D3)

He discusses trying out different programs:

> *"It was before Windows came out, it was in DOS. The first one I fully remember trying to do was when WordPerfect first came out and version 5.1 had macros in it and I worked out a system of programming using these macros. Somewhere along the way, Windows came out and then Visual Basic came, and I started to write [own software] using these programs."*

These DIY approaches led to the realisation of what was possible with computer technologies and as a result researchers set about achieving these potentialities and software development commenced. However, it wasn't until further developments in computer technologies, such as disk operating systems (DOS) which replaced the tape-based systems and the diffusion of microcomputers in the early 1980s, that qualitative computing in the social sciences was able to emerge in a serious way (Fielding and Lee 1993). It was at this time that the pace of development picked up and a number of dedicated qualitative computer packages appeared. Since initial development, a few programs no longer remain[10]; those that have survived and are in production today are presented in Table 1:

[10] Some were only developed for a short time without the intention of taking development further, or perhaps as a hobby, whilst others did not make the necessary changes as computer technologies evolved and as a result their products became obsolete.

Table 1: CAQDAS Packages

Software	Date	Developer(s)	Country	Operating System
LISPQUAL	Est. 1980	Kriss A. Drass	USA	Mainframe
Intext TextQuest	1980 1987 1989 1999 2005	Harald Klein	Germany	Mainframe PC – MS DOS Commercial release Windows
Code-A-Text CI-SAID	c.1980 2003	Alan Cartwright	UK	MS DOS Windows
The Ethnograph	c.1980 c.1982 1985 c. 1990	John Seidel & Jack Clarke	USA	Mainframe PC Commercial release Windows
NUD*IST NVivo NVivo 9	1982 c. 1982 c.1989 1995 1999 2010	Tom & Lyn Richards QSR International formed	Australia	Mainframe Commercial release Windows Macintosh [RML]
MAX WinMAX WinMaxPro MaxQda MAXQda2 MAXQda 2007 MAXQda 10	1989 1994 1997 2001 2004 2007 2010	Udo Kuckartz	Germany	MS DOS & commercial release Windows
Atlas.ti Atlas.ti v. 5.0	1989 1993 2004	Project Atlas – Thomas Muhr & others Thomas Muhr	Germany	DOS Windows
HyperRESEARCH	1989 1991	Sharlene Hesse-Biber, T.Scott Kinder & Paul Dupuis Researchware Inc. Formed	USA	Macintosh Commercial Release
Qualrus	2002	Ed Brent	USA	Windows

From the table, it can be seen that developers came from different countries, predominantly from Australia, Germany, the U.K. and the U.S.A. Some were sole developers, whilst several were developed as part of a team. What is common to the group is that all started off as academics in their respective fields. Whilst some have remained in their academic roles and continued developing alongside, others have left their posts to concentrate solely on development[11]. Developers have tended to be male, whilst the social scientists have been female. For example the Nudist packages were developed by a husband and wife team, Tom Richards the computer scientist and Lyn Richards the social scientist. Similarly with HyperResearch, the sociologist is female and the developer is male. Yet, interestingly, it was the social scientists' ideas to computerise their research practice and to seek the expertise of those who would know how to do this.

Table 1 shows that a number of packages were developed in the early 1980s with a few emerging towards the end of the decade. It is an interesting coincidence that CAQDAS emerged at the height of the 'paradigm wars' between qualitative and quantitative approaches. CAQDAS provided a way of addressing some of the difficulties and issues associated with qualitative data, such as being anecdotal and 'cherry-picking' research findings. What follows next is a brief account of the paradigm wars and why CAQDAS can be seen as an important development during this time.

Paradigm Wars

According to Bryman (2008:17), "the emergence of the paradigm wars was a product of the way in which philosophical issues became attached to research methods and the domination of social research by quantitative research." From the 1930s onward, survey research and statistical methods had dominated social research methods (Alasuutari *et al.* 2008:1). However, there is evidence to suggest that by the end of the 1960s qualitative research was emerging out of the shadows and becoming closer to the mainstream (Bryman 2008:17). For example, *The Discovery of Grounded Theory*

[11] Full details of 'Who's Who' can be seen in the appendix. A social network map of the core group was considered but it was decided not to include one as some of the nature of the linkages between some people was considered too difficult.

published by Barney Glaser and Anselm Strauss in 1967, was one of the first textbooks on qualitative methods to appear (Alastalo 2008:33). Just over a decade later, journals dedicated to qualitative research such as *Qualitative Sociology* which started in 1978 (Bryman 2008:17) were published. The result of qualitative methods coming to the forefront helped to encourage the so-called paradigm wars. This was in part because, according to Denzin and Lincoln (2000:15, cited in Alastalo 2008, p34-35), "qualitative researchers had a full complement of paradigms, methods, and strategies to employ in their research." As a result, "discussions on research methods became structured by the qualitative-quantitative distinction ... in which strong epistemological assumptions were made about methods ... which were described as being in contradictory epistemological traditions" (Alastalo 2008:31). Put simplistically, the positivist paradigm supports quantitative methods, and the interpretivist paradigm supports qualitative methods (Howe 1988). The main argument between the two paradigms is as Gage (1989:4) suggests;

> *The most fundamental explanation was the antinaturalist position that human affairs cannot be studied with the scientific methods used to study the natural world. Interpretive researchers regard individuals as able to construct their own social reality rather than having reality always be the determiner of the individual's perceptions.*

As a result, the two paradigms were seen as incompatible. The concept of paradigms was, according to Bryman (2008), used with reference to the work of Thomas Kuhn, who had first published his book *The Structure of Scientific Revolutions* in 1962. Bryman (2008:14) argues that "construing quantitative and qualitative research as paradigms in Kuhn's sense and therefore as incompatible approaches implied that it was not appropriate to combine them in an investigation." Howe (1988) refers to this as the *Incompatibility Thesis*, which "posits that qualitative and quantitative research paradigms and their associated methods cannot and should not be mixed" (Johnson and Onwuegbuzie 2004: 14). As a result, two dominant research cultures have emerged, "one professing the superiority of 'deep, rich, observational data' and the other the virtues of 'hard, generalisable, data'," (Sieber 1973: 1335).

However, there are those who argue against the incompatibility thesis (Kelle 2005). At the beginning of the paradigm wars, the "quantitative and qualitative traditions had been defined as incompatible, but by the end of the 1980s, this juxtaposition was questioned and the possibility of mixing methods was considered" (Alastalo 2008). According to Kelle (2005:97), one explanation;

> *Is that qualitative and quantitative methods are not exclusively tied to a specific epistemological standpoint and that the epistemological positions often connected to different methodological traditions (for example, 'postpositivism' and 'constructivism') converge at several points ... proponents from both 'paradigms' accept the theory-ladeness of empirical observation ... Consequently, many researchers and a growing number of methodologists adopt a pragmatic perspective on paradigm wars which may be described as 'take whatever seems adequate from each paradigm or methodology for your research questions and leave the rest'.*

Howe (1988:10) also presents an alternative, the *Compatibility Thesis*, "which supports the view that combining quantitative and qualitative methods is a good thing and denies that such a wedding of methods is epistemological incoherent ... rather there are important senses in which quantitative and qualitative methods are inseparable."

According to Bryman (2008:15) the emergence of mixed methods research was a crucial stage in the paradigm wars and offered some respite in the hostilities. He defines mixed methods research as "a mixing of research methods that cross the quantitative-qualitative divide." Some authors have even gone as far to propose that mixed methods research can be seen as a third paradigm. For example, Johnson and Onwuegbuzie (2004: 14-15) argue, "We hope the field will move beyond quantitative versus qualitative research arguments, because, as recognised by mixed methods research, both quantitative and qualitative research are important and useful." According to Onwuegbuzie and Leech (2004, cited in Johnson and Onwuegbuzie 2004, p15), this third paradigm can help bridge the schism between quantitative and qualitative research." "It is a movement that moves past the paradigm wars, by offering a logical and practical alternative ... it makes use of the pragmatic method ... its logic on inquiry includes the use of induction, deduction and abduction (e.g. de Waal 2001), (Johnson and Onwuegbuzie 2004:17).

However, Bryman (2008) opposes this view and argues that mixed methods research should not be regarded as a third way of conducting social research, because, the use of mixed methods predates the paradigm wars. For example Sieber (1973) published a journal article entitled *The Integration of Fieldwork and Survey Methods* in 1973, citing earlier work that had comprised both quantitative and qualitative methods. Furthermore, as Kelle (2005:96) points out, “qualitative and quantitative researches have often been used together in the same research project.”

Bryman (2008) also argues that some researchers are opposed to the idea of combining quantitative and qualitative research. For example, Smith and Heshusius (1986, cited in Bryman 2008, p19) argue that “treating quantitative and qualitative research as compatible and therefore as combinable neglects the fact that they are based on fundamentally different and irreconcilable foundations.”

Was there an end to the paradigm wars? This in itself has been a matter of debate. According to Gage (1989:8), “the ending of the disciplinary war and productive harmony amongst the paradigms was the dawning of the realisation that if the social sciences did not get together, they would perish.” However, Bryman (2008) believes that this has not been the case; that the paradigm wars have not come to an end. He argues that the “growth of mixed methods research may give the impression that there has been an abatement in the hostilities but that is not the case ... there are lingering signs of paradigm hostilities and that paradigm disputes have not been totally resolved” (Bryman 2008:17). Bryman (2008:18) identifies three reasons as to why the paradigm wars have not ended. Firstly, what he terms as ‘intra-paradigmatic differences’, where there are differences within both quantitative and qualitative research. Secondly, there is disagreement among social researchers as to how mixed methods should be viewed. Thirdly, there is evidence to suggest that there are still the occasional paradigm skirmishes.

In Bryman’s view (2008:23), the “issue then becomes does the continued presence of paradigm divergences matter?” He argues that “some social scientists may feel uncomfortable about the lack of resolution to some of the main debates in the area of social research methodology, whilst for others, the existence of competing paradigmatic positions is a cause for celebration and offers the opportunity to examine the social world through different lenses.” (p23) Ann Oakley has suggested that the paradigm wars will continue as long as there are communities that take sides (Oakley 2000: 41-42, cited in Alastalo 2008:37) and suggests that the fundamental question is one about why social scientists (and others) conceive of different research methods as opposed in the first place (Oakley 2010: 248).

But how do the paradigm wars relate to the development of CAQDAS? Qualitative research has often been criticised for the lack of using quantitative and thus scientific methods. In fact, as Maxwell (2010:475) suggests, the use of numbers in qualitative research is seen as controversial as "Qualitative researchers often had their work evaluated in terms of a 'scientific' frame that sees numbers as a key indicator of valid and generalisable research" (Maxwell 2010: 475). Qualitative research was accused of "being largely irrelevant, weak in validity, and a waste of public funds" (Hammersley 2008:3, cited in Maxwell 2010, p476). Therefore, the use of CAQDAS provided the means of making qualitative research look more 'scientific' (Fielding and Lee 1993).

As explained by Pfaffenberger (1988:12) "social scientists that use qualitative strategies face what Sproull and Sproull (1982: 283) call a 'cruel trade-off' between the richness of qualitative data and the tedium involved in analysing it (e.g. Miles 1979: 593-595)." However, as discussed elsewhere in this thesis CAQDAS has helped alleviate some of the problems, such as the tediousness, associated with qualitative research methods. But interestingly, as Pfaffenberger (1988:12) describes;

> Prior to the advent of computers, quantitative researchers used to suffer in much the same way. Before computer statistical packages were devised in the early 1960s, quantitative studies in sociology were restricted to small data sets and simple analytical strategies ... using only totals, percentages and simple cross-tabulations ... General-purpose statistical packages such as SPSS, however, put the use of sophisticated techniques (and large data sets) within the reach of any social scientist that had access to a mainframe computer ... which resulted in an impressive expansion in the quality of the survey analysis.

After the 1980s the new production of packages was minimal as developers concentrated on refining existing products. The exception to this was Qualrus which was developed in 2002 and is seen as a new breed of program, referred to as a 'fourth generation' program (Mangabeira 1995), one incorporating artificial intelligence (A.I.). Ed Brent, the program's developer explained why he developed a new program:

> *"I realised that there were things that could be done with artificial intelligence that these programs weren't doing and I thought why don't I do it?"*

The first programs were developed on mainframe computers and then later on for the PC, at first in DOS and then later in Windows. It was the emergence of Windows that influenced further development of existing packages, as the operating system used a graphical interface which DOS did not have, thus making the software more user-friendly, as explained by one developer:

> *"Changes in technology have certainly played a role in development; back in DOS, it was a whole different ball game, you had to number the lines, have hard returns and all kinds of things. It makes a huge difference having Windows, which is pretty well established and has lots of interface." (D6)*

In time MS-DOS would become obsolete as the world increasingly became dominated by Windows and as such those developers that did not make the transition from DOS to Windows soon ceased development and left the market. An exception to this was HyperRESEARCH first established in 1989 and was designed for the Macintosh, as this was the operating system used at Boston College where the program was devised[12].

For a few, computers and initial software development were seen as a hobby. Whilst some developers have continued development into a career, others remained at the hobbyist level and either continue to do so or have stopped developing, as explained by one developer:

> *"It was just a kind of hobby to write this program, I was fascinated by this technology." (D1)*

What is interesting is that initial development (period from original conception to commercialisation) took place in a number of different countries at the same time. As

[12] A number of developers are now bringing out Mac versions of their software and iPad based tools.

can be seen in Table 1, the development of the earliest programs occurred in the early 1980s and as such the development of CAQDAS can be seen as a process of 'multiple discovery' (Brannigan 1980)[13].

As indicated by Table 1 development occurred simultaneously in a number of different countries using the same operating systems, the computer technologies that were around at the time. Several developers recognised that there were developments going on elsewhere, for example:

> *"There was this process of simultaneous invention, several people in different parts of the world came up with the same essential idea and tried to implement it."* (D4)

This recognition is also acknowledged by most of the other developers; however it is argued that the researchers were unaware at the time that there were others doing the same, for example, another developer comments:

> *"Unbeknown to us, there was a whole group of other people that were doing the same, but we didn't know about it, we were just going about our way of doing it the way we were, and we were developing our own little world of CAQDAS."* (D5)

Multiple discovery in science is not uncommon and in fact, as Merton (1961: 356) points out, "all scientific discoveries are in principle multiples." Such discoveries can be seen as serendipitous, whilst others are sought after and achieved. Serendipity can be defined as 'the faculty of making happy and unexpected discoveries by accident' (*OED,* Foster and Ford 2003: 321). According to Merton and Barber (2004: xiv) "the word [serendipity] is always about discovery and always about what Walpole called 'happy accident'."

What is intriguing is that the rediscovery of serendipity by Robert Merton, who subsequently introduced it into the vocabulary of the social sciences, was itself a combination of accident and sagacity (Merton and Barber 2004: 140). In their book *The Travels and Adventures of Serendipity: A Study in Sociological Semantics and the*

[13] It is believed by some in the community that the first software to be developed was LISPQUAL by Kriss Drass in 1980. Unfortunately, I was unable to interview Kriss Drass who died in 2001.

Sociology of Science, Merton and Barber (2004:140) provide an account of how Merton discovered the word serendipity serendipitously. Since about 1934, Merton had been interested in the 'unanticipated consequence of purposive action' and had written on this subject in 1936. Using a dictionary, which Merton viewed as a repository not just for definitions but of synopses of cultural history, he came across the word 'serendipity'. Prior to this research, he was quite unreceptive to the word and had in fact encountered it without noticing it several years earlier.

However, with discoveries, it can also be argued that there is some premeditation, as suggested by Foster and Ford (2003) serendipity can be thought of as the product of mental preparation, of an open and questioning mind, something which Pasteur called the 'prepared mind' (Barber and Fox 1958:129). "Scientific research [can be seen as] a voyage into the unknown by routes that are in some measure unpredictable and unplannable" (Barber and Fox 1958:129) and as such "the history of discovery is full of arrivals at unexpected destinations and arrivals at the right destination by the wrong boat" (Koestler 1964, cited in Rosenham 2002, p192). Merton and Barber (2004: 43) argue that "given the right circumstances, the discovery was bound to be made ... that at any given stage of scientific development certain discoveries occur almost of necessity, and that there is no need for outstandingly qualified scientists to bring them about."

However, as Merton and Barber (2004: 259) suggest, "the psychological black box of the "prepared mind" cannot itself explain the complexities of serendipitous discovery... for how is it that certain scientists rather than others take consequential note of accidents to arrive at unanticipated discoveries." They argue that, "if chance favours prepared minds, it particularly favours those at work in microenvironments that make for unanticipated sociocognitive interactions between those prepared minds. These may be described as 'serendipitous sociocognitive microenvironments'."

Therefore, according to Merton and Barber (2004: 170), "in the world of science, to be considered lucky is undesirable – it implies that achievements are really undeserved and that the lucky individual cannot be counted on to perform reliably (if he is just lucky, after all, luck might easily desert him). [As a result], luck or chance does not favour people at random, rather it is prepared minds who are able to benefit from luck." Consequently, discoveries can be attributed to a number of qualities in a scientist such as “enterprise, courage, curiosity, imagination, determination, assiduity, and alertness” (Merton and Barber 2004: 178). As a result, consequences “come only to those of proven competence, competence achieved by training and proved by achievements that had nothing whatsoever to do with chance” (Rosenau 1935, cited in Merton and Barber 2004). Thus, “happy accidental discoveries, or serendipity, occur when a trained observer encounters unexpected and unfamiliar data ... [and is thus] in a better position to make the most of lucky accidents and to evolve meaningful hypotheses” (Hilsman 1956, cited in Merton and Barber 2004: 197, 198).

Therefore, multiple discoveries emerge when ‘activity is guided in part by the existing scientific heritage and in part by their creative imaginations (Barber 1952: 265).’ Therefore, ‘discoveries do not simply ‘occur’ or ‘happen’... but are socially defined and recognised productions’ (Brannigan 1980: 571).

As a result, it can be argued that by its very nature, scientific research and those who participate in it, are already prepared for serendipitous discovery. In fact as, Foster and Ford (2003: 322-323) suggest, “in science, serendipity is an essential tool to aid the process of discovery and one for which preparation is perceived as to some extent possible.”

For example, one American developer described how in the late 1970s he had been working with computers for quantitative analysis and then later on as he started to work on a qualitative project, the idea came to him serendipitously:

> *“On one of the courses I was collecting a lot of data and was analysing it with a lot of glue, coloured pens, spreading everything out on the living room floor, cutting and pasting, and as this was simultaneous with the computer stuff I was doing, it suddenly dawned on me, why can’t I take what I do manually and get the computer to do it for me?”* (D4)

Several other developers explain similar experiences about how they were able to visualise computerising manual methods:

> *“I was concerned about trying to do some coding of my data and I didn’t want to have to go through a horrific process I had gone through with my dissertation and I decided that there had to be a better way. I was using*

'holecards' [14] *and at that time I remember there was this hypercard idea, and it looked like these holecards. I had this idea with the knitting needle, where you put the needle through the holes and once you code it, the needle would drop out – so like code-and-retrieve. As a result, I had the idea that there must be a way of computerising this process."* (D5)

The question for all developers was how was this to be achieved? How to solve the puzzle of transferring manual methods to the computer? The developers saw what was being done with computers, e.g. with quantitative methods and sought to do the same with qualitative methods, the puzzle being how to do it. For example, one developer explained:

> *"It was the paper methodology that we tried to mimic with the software. I knew exactly what I wanted, the point was how do you get it computerised, how do you get it to be electronic."* (D5)

According to Kuhn (1962), puzzle solving can be seen as something that is a normal part of academic life and that scientists solve problems by modelling them on previous puzzle solutions (Musgrave 1971). According to Merton and Barber (2004: 196) a combination of "social-psychological and intellectual conditions, such as some unexpected and puzzling data and a scientist capable of being puzzled", provide the conditions for accidental discovery.

Therefore, having a 'prepared mind' would be beneficial in doing this. This prepared mind came about as a combination of three interrelated processes; existing knowledge, acquired knowledge and previous experiences. Knowing about qualitative research and about computers and programming, whether through past experience or specifically learning about the technology, provided the formula for the creation of computers for qualitative data analysis, whether this was done by one developer or in collaboration with a computer scientist.

A common feature amongst all the developers was that they had all come across computers before, either through previous roles such as engineering, or as researchers or teachers of quantitative methods, or as a result of childhood experiences, for example, as one developer describes:

[14] Also known as McBee cards.

"Going back to my childhood does have a role to play. I was an electronics geek and played with transistors and built little radios." (D4)

A number of developers had used computers, in general or for statistical analysis whilst an undergraduate or postgraduate student, as the following developer discussed:

"From the very beginning I had always used computers and I'd never been trained in software, I just developed the skills, because in the early computers there was no word processing software, it was very basic and so I learnt how to program, and I wrote a little word processing program, followed by a stats program and that's how I got into writing software." (D3)

Therefore previous knowledge and experience stimulated an academic-driven interest in what was happening in the world with the onset of computer technologies, a means for experimentation. This was something which once software development had begun became an obsession, a welcoming one by some, as discussed by a number of developers. One developer in particular explained why:

"This was a very intellectual thing; it was a special kind of motivation and was very exciting." (D5)

As a result of this interest, some began to study computer science and learn new programming languages in order to further their existing knowledge and skills, something which was necessary to solve the 'puzzles' of programming, in particular as early programming languages were rather restrictive with new ones emerging rapidly. Indeed, as suggested by Merton and Barber (2004: 173) "the possibility that the accumulation of knowledge may lead to serendipity should motivate individuals never to cease learning." Thus the learning of new programming languages alongside other developments in computing (such as the transition from DOS to Windows for example) became something that was increasingly necessary in order to proceed further with product development. For example, as illustrated by the following developer:

"I used computers a lot and became very interested in computers. I took a sabbatical and did a postdoctorate in Artificial Intelligence". (D6)

For these developers, the challenges that came with software development were seen as welcoming and inviting, as described by one developer:

> *"I don't mind sitting in front of the computer for hours on end. Programming to me is this great adventure in puzzle solving, and every once in a while you win, you figure out how to make it work or suddenly it's not working right and it's incredibly frustrating, you spend hours trying to figure it out and then suddenly there's elation when you discover how to fix it."* (D4)

Serendipity can also be social. According to Rosenham (2002: 192), serendipity can be enhanced in appropriate group settings. This may be, for example, through social networks and attendance at conferences and seminars, but also by simply knowing the right person, being in the right place at the right time. For example as described by one propagator:

> *"CAQDAS developed in a way because there were always happy accidents at the beginning, which meant that somebody knew about qualitative research and also knew about programming."* (P1)

Social networks are crucial in spreading knowledge about new ideas and development. Usually within these networks there exists a core set of people, the early adopters of an innovation. A core person in the early history of CAQDAS was Renate Tesch, of German origin but who lived and worked in the United States until her untimely death in 1994. Therefore she had contacts in both countries and travelled extensively throughout America and Europe propagating knowledge about CAQDAS. Details of Tesch and other core people are discussed in the next chapter. What is interesting is that new technologies were used in two ways: for the development of software as discussed in this chapter but also as a means of propagating knowledge of this software, which is discussed in the next chapter.

Therefore the developers were constructing innovative ways of using newly emerging technologies in order to find new and improved ways to carry out their research. As such, CAQDAS can be viewed as a case study of methodological innovation.

But what is meant by methodological innovation? Xeniditou and Gilbert (2009:3) identified four ways in which innovative methodologies occur. Firstly, those which use a number of technological innovations, such as visual, digital or online, for example, new software or the development of online methods. A second way may be the crossing of disciplinary boundaries, for example leading to the development of new disciplines or sub-disciplines. Thirdly, existing theoretical approaches and methods may be used in different or applied ways. The fourth approach was that innovative methodologies could exist both in universities as well as other establishments, such as research centres, consultancy agencies and organisations. As has been discussed in this thesis, CAQDAS developed as the result of emerging computer technologies. Thus CAQDAS can be seen as innovative and the community of users can be seen as using CAQDAS in innovative ways, for example in mixed methods research and the use of on-line methods.

Another question to ask, is when does an innovation became defined as such? According to Wiles *et al.* (2011: 588), it is “when the ‘true’ innovations are accepted, and taken up, by the wider research community ... the process by which innovations are disseminated and how they are received and judged by the wider community is often slow and is influenced by a range of inter-personal, social, cultural and political factors (Greenhalgh *et al.* 2005; Rogers 2003; Von Hippel, 1988).” According to Rogers (2003: 1), “many innovations require a lengthy period of many years from the time when they become available to the time when they are widely adopted.” As will be discussed in detail below, this was no exception for CAQDAS.

Furthermore, when does an innovation cease to be a novelty? With regards to CAQDAS, it can be argued that since its initial development, it has become mainstream and commercial, and so can no longer be viewed as innovative. For example by 1986, “qualitative software, [had been incorporated] into the postgraduate research methods curriculum at a few centres specialising in social research methodology” (Fielding and Lee 1996: 247). For as Xeniditou and Gilbert (2009: 6) suggest, “innovative research practices in the social sciences are those that have not yet filtered through to typical research methods courses or that impact on the research process in ways which are novel (invention) or different to existing ones.”

Wiles *et al.* (2011: 594) identify three reasons for innovating; theoretical reasons, moral or ethical reasons, and for practical reasons. With regards to the initial development of CAQDAS, as will be explained in this chapter, it was predominantly for practical reasons.

The majority of those interviewed said that they thought that there had to be a better way of analysing the data rather than using manual methods, as explained by one propagator:

> *"It was always in the back of my mind, this idea, that if there was a better way of doing it, I would want to know about it."* (P1)

This sentiment was shared amongst many in the qualitative research community. As Tesch (1990: 113) suggests:

> "*Every researcher who has conducted a qualitative analysis project will tell you how they became involved in a lot of 'hand work', that to some it may have seemed that there was more handiwork than anything else."*

Qualitative data have been referred to as an 'attractive nuisance'; attractive because 'they are rich, full, earthy, real and their face validity seems unimpeachable', but a nuisance because analysis is often labour intensive and time consuming and can at times overwhelm the researcher (Miles 1983: 117). Miles (1983) argues that qualitative data has attractive qualities for both producers and consumers. However, collecting and analysing the data has serious weaknesses and problems as well, most notably the overloading of the researcher due to the sheer range of phenomena to be observed, recorded, written up, coded and analysed, all of which can be overwhelming, particularly to novice researchers. The consequence of this overload may result in poor research practice, as corners may be cut in order to reach completion and meet deadlines.

A number of propagators who were involved early on were aware of the possibility that computer technology had a useful role to play in alleviating some of these nuisances. In doing so, it has addressed some of the methodological issues that challenged qualitative researchers. A particular nuisance is the coding process, yet the frustration that manual coding presents can be alleviated by computerised processes. According to Barry (1998), CAQDAS has helped automate and speed up the coding process and has provided a formal structure for writing and storing memos to develop the analysis and aid more conceptual and theoretical thinking about the data. A number of those interviewed described how the 'nuisances' of manual coding were eased by using software. For example, as discussed by one propagator:

"You appreciate the clerical data management features that there are in the software because they do all that in a few seconds. When you're coding in the software, it forces you to think about all the dimensions of the data and it's not as tedious as doing it by hand. You can actually keep your attention span longer, because if you're using a highlighter or whatever it is to actually mark out the bits of text to which the code applies, that can be done in a few seconds. If you're doing it manually, you're literally getting out colour pens, rulers and things like that, and it takes longer to do, so there's less thinking time, more mechanical time than when you're doing it manually. It took about seven or eight months to work out the codebook and to get it all working and so it enabled me to find what I needed out of all the extent of the data that there was, otherwise I would have just been ripping through piles of paper all the time, trying to find things." (P2)

Similarly, one developer explains how they did not want to go through the manual process of coding again:

"I was concerned about trying to do some coding of data and I was working on my book and I didn't want to go through the manual process that I had done with my dissertation and so thought that there had to be a better way." (D5)

Nevertheless, not all problems have been eradicated and new ones have presented themselves, for example, the initial organisation of data remains time-consuming. It is only once the data has been organised and retrieval and analysis has begun that the computer can save time, as one propagator explained:

"On the one hand, it makes the data storage and the data organisation more cumbersome, to code all the data is very time consuming, but it offers more possibilities to work with the data, the possibility to get pieces of text by one press of a button, it makes the analysis process much more easy, to get the coded segments out of the data within several seconds, it's much more easy to find that connection or to find relations within the data." (P5)

What is evident is that the coding process was a significant feature in the development of software for analysing qualitative data, as it is a feature common to a number of different qualitative approaches and was one of the easiest tools for computerisation. The emphasis on the coding process meant that CAQDAS was misunderstood and criticised for adopting a particular approach; grounded theory. As a result what has occurred is a continuous debate amongst those advocating the use of software and those opposed to it. This reception of CAQDAS will be discussed in the chapter on 'debates and contestations'. However, what is useful to discuss next is the early reception of CAQDAS by its first adoptees and their publications on their experiences and attempts at categorising the different software programs.

Early Reception of CAQDAS

Tesch (1990) and Weitzman and Miles (1995) identified three types of packages. What they called 'first generation' programs were text based retrievers and text based managers largely applicable for language based research, such as discourse analysis and narrative analysis. Examples include Metamorph, Orbis and ZyIndex. These packages are used for finding words and phrases in a database and collecting them and have the ability to find things that are misspelled, sound alike, mean the same thing, or have certain patterns. Once found, they mark or sort the found text into new files, link annotations and memos to the original data, or launch new processes or other software packages related to work on the data. Some have content-analytic capabilities as well, for example, counting, displaying words in their contexts and creating word lists. Textbase managers (askSAM, Folio Views) also retrieve and sort data systematically into subsets of text but they can also search for and retrieve various combinations of words, phrases, coded segments and memos, with advanced packages having hypertext annotation, memoing and multi-media functions. Certain packages can deal with highly structured text organised into 'records' (specific cases) and 'fields' (numerical or text information), and some can include quantitative information.

The 'second generation' software comprised what are often referred to as code-and-retrieve software for use in descriptive interpretative research (Tesch 1990), for example, thematic analysis. These packages divide meaningful data, such as sentences or paragraphs, into segments or chunks, which are then retrieved and displayed using these codes or combinations of codes. Examples include HyperQual2, QUALPRO and the Ethnograph.

As the rapid development of new packages for qualitative analysis continued into the late 1980s and 'third generation' programs (Mangabeira 1995) of the kind that Weitzman and Miles (1995) describe became available, these can be referred to as code-based theory builders and conceptual network builders. Code-based theory builders typically have code and retrieve features but they also have special features for supporting theory building that code-and-retrieve programs lack. Namely, they include functions for building a conceptual structure, annotation, memo-writing as well as formulating and testing hypotheses. For example, they might help make connections between codes (categories of information) or develop higher-order classifications and categories to formulate propositions or assertions that imply a conceptual structure that fits the data and/or to test such propositions to see if they apply. Examples include AQUAD, Atlas.ti, HyperRESEARCH and QCA. Recent programs have the ability to incorporate graphics into the database, to code and retrieve data other than text, for example pictures, audio and video. Folio VIEWS, askSam and Sonar Professional are examples of programs that can work with video segments linked into documents, if the computer has multi-media capabilities. They will keep track of where on the videotape a coded segment is and play it when the relevant code is applied.

Conceptual network-builders aid the building and testing of theory, they help to formulate and represent conceptual schemes in a network form as a series of 'nodes' and 'links'. These nodes represent variables and concepts and are linked to other nodes by lines or arrows representing specified relationships, for example 'belong to' or 'leads to'. The networks are 'semantic networks' that develop data and concepts and identify any relationships between them. Programs like Inspirations and Meta Design are strong conceptual network builders, and include features like extended text in nodes, pop-up memos, outlining and hypertexting.

Later programs, such as Qualrus developed in 2002, can be referred to as 'fourth generation' programs. These types of program make extensive use of knowledge-based systems and artificial intelligence. However, as time has passed, this kind of generational schema has become less useful. CAQDAS packages have become more and more sophisticated and therefore can no longer be easily categorised into certain types, as each one offers a multitude of features and therefore subsequent versions are more like third or fourth generations.

By the early 1990s development of CAQDAS had slowed down. Instead, in response to growing user demand, developers concentrated on making their products more user-friendly and thus more commercially viable, being able to take advantage of further computer technologies, such as expert systems and knowledge-based applications (Fielding and Lee 1991). As Fielding and Lee (1998) suggest following the initial burst of development by academics in the 1980s, varying degrees of commercial orientation saw some packages maintain a steady pace of refinement and upgrade.

During this decade, Microsoft released Windows 95, a much more user friendly version of its operating system compared with earlier editions, one which incorporated GUI (Graphical User Interface). "Like other software, CAQDAS is increasingly dependent on mouse-driven graphical user interfaces [and as such] one might feel that present preoccupations indicate entry to a stage of refinement rather than one of radical change" (Fielding and Lee 1998: 186).

Whilst the number of programming languages that emerged in the 1980s made programming less cumbersome, by the 1990s these became more advanced and as a result became more complex. This occurred to the extent that to develop a product increasingly required the expertise of more than one programmer, an issue discussed by one developer:

> *"There's a funny transition that slowly happened over the past twenty years, back in the 1980s anybody could become a programmer, there were lots of books that you could buy that helped you to teach yourself. Prior to that with the mainframes there was no useful documentation, you learnt a cryptic secret language and if you didn't figure it out you didn't get inside the inner circle and you were lost. We're getting back to that in terms of programming, it's becoming so complicated that you go to the bookshelves and you don't find much. We have to hire specialists and work with them in order to do these things. At one point one person could write a very powerful word processing program and one or two people could do it themselves, today you need more*

people because of the complications that have been built into it. What was once simple and available to the masses has become an area of specialisation." (D4)

This period of commercialisation is discussed in more detail in the next chapter.

Conclusion

This chapter has outlined a brief history of the development of computer technologies, without which the CAQDAS world would not exist. It was the intersection of two social worlds, the computing world and the social science world. It also examined the initial development of CAQDAS, identifying the processes by which it emerged and its early evolution. It emerged because researchers were interested in finding ways of improving qualitative methods. As this was simultaneous with the developments occurring with computer technologies, the result was a mixture of serendipitous discovery, as well as intended discovery activated by the 'prepared mind'. Furthermore, development occurred simultaneously in a number of different countries and was thus a process of 'multiple discovery', a feature common in science (Merton 1961).

Another feature common to academic life is puzzle solving, as discussed by Kuhn (1962) and one of the key puzzles was how to computerise manual methods? Through a mixture of previous experience, previous knowledge and acquired knowledge, these puzzles were resolved.

The development of CAQDAS started off as the means of alleviating the 'attractive nuisances' (Miles 1983) of qualitative research. However, as with other new technologies, development of CAQDAS was not without consequence and its development has presented new problems and issues of concern in the social scientific community. As a result, qualitative methods can still be regarded as an 'attractive nuisance' (Miles 1983), however the types of 'nuisances' have changed.

By the 1990s, the development of CAQDAS packages had slowed down and instead the focus was on product refinement and upgrade. As software became more sophisticated, the 1990s can be seen as the period of commercialisation. Increased interest by colleagues and associates encouraged further development and as a result early adopters proved to be significant in its diffusion and furthering development. The process of diffusion occurred in two main ways: firstly via informal networks and then secondly via the World Wide Web. This propagation of CAQDAS is discussed in the next two chapters.

Chapter 5 Early Propagation and the Rise of Social Networks of Users

Introduction

According to Castells (2010), science is organised into specific fields of research which are structured around networks of researchers who interact through publications, conferences, seminars and academic associations. It is within these networks that groups of scientists develop shared definitions of their work, paradigms that interpret findings and guide new research (Kuhn 1962). They adjust to the problems of dealing with knowledge in their fields by forming social organisations of various kinds, which are based upon shared communications and a shared interpretation of the situation (Crane 1969). As indicated previously, social networks play an important role in this process. What are important are the structures of social networks through which potential adopters of innovations find out information about these innovations, which can cause them to adopt these innovations (Abrahamson and Rosenkopf 1997).

Propagation of CAQDAS started off relatively slowly as knowledge of its existence was diffused by early adopters primarily by word of mouth, through seminars, workshops, and conferences. However, propagation developed more rapidly through the use of interactive technologies such as email and the internet, dissemination projects and commercial software distributors, the last of which is examined in the next chapter. This chapter concerns the early propagation, the social processes that led to the emergence, diffusion and subsequent growth and expansion of the CAQDAS world. In doing so, it provides an insight into the roles of social networks in disseminating knowledge within a scientific community and how these occurred at different stages of development.

This chapter also examines the transition of CAQDAS from a 'local world' with people doing things in their own country, to a more 'dispersed world' (Unruh 1980), which occurred gradually as the community began to learn of one another as knowledge of CAQDAS spread.

In the case of CAQDAS, development occurred first and foremost through local and informal networks. Secondly, through dispersed networks as knowledge of CAQDAS spread, and thirdly, as the result of commercialisation. Each stage will be examined in detail, but prior to this, a brief discussion regarding the nature of social networks is necessary in order to provide an understanding of how networks are fundamental in diffusing knowledge within a social world.

Social Networks

Social networks are important for the development of a scientific community and one of the key processes involved is the role of networks in the transformation of knowledge within them. With regard to certain scientific communities, it is the social networks, particularly the informal networks, that are predominantly the important communication channels. Therefore, it is the analysis of social networks that is of paramount importance when looking at the diffusion of a particular innovation.

A social network can be seen as “the pattern of friendship, advice, communication or support which exists among the members of a social system” (Knoke and Kuklinski 1982; Burt and Minor 1983; Wellman 1988; Scott 1991, cited in Valente 1996: 70). However, what are also important are the ‘personal networks’, the set of direct ties that an individual has within a social system (Wellman 1988).

Toivonen *et al.* (2006) argue that social networks are organised into communities with dense internal connections. In everyday social life or professional collaborations, people tend to form communities, the existence of which are a prominent characteristic of social networks and have far reaching consequences on the processes taking place in them, such as propagation of information and opinion formation.

According to Granovetter (1973), an individual can have both ‘strong’ and ‘weak’ ties. Strong ties constitute a personal network, while weak ties serve to connect an individual’s work with that of more distant individuals. Granovetter (1973) highlights the importance of the weak interpersonal ties that supplement strong network ties. These weak ties connect an individual in one network with an individual in another network. In this way, one network is linked to another. Because individuals in a network may have weak ties to different outside networks, ideas may flow from one network through numerous others.

According to Mulkay *et al.* (1975: 190), "the research community as a whole, as well as particular disciplines or specialties, can be regarded as composed of numerous networks at various stages of formation, growth or decline." They identify three stages;

The first exploratory phase is distinguished by a lack of effective communication among participants and by the pursuit of imprecisely defined problems. At the beginning of stage one the network has a minimal social organisation, researchers at different locations and in different countries may take up the same problems but are often unaware of similar work proceeding elsewhere. Because there is little communication between those involved, there is a possibility of multiple discoveries. It is in the early stages of growth of a research area, where an interesting event occurs that attracts new scientists to the area that had previously been sparsely populated (Crane 1972).

The second phase is one of rapid growth. This is followed by a period of 'normal science' (Kuhn 1962) resulting in cumulative development of knowledge in the area during which the number of publications and of new authors entering the field grows exponentially (Crane 1972). During this stage, according to Crane (1972), a few highly productive scientists set priorities for research, recruit and train students who become their collaborators and maintain informal contact with other members of the area. Their activities produce a period of exponential growth in publications and in new members in the area. These form the 'core' group, in which a few scientists in each area play very important roles in recruiting and influencing other members.

The third, final phase that Mulkay *et al.* (1975) identify is one of decline and disbandment of the network, together with the movement of participants to new areas of scientific opportunity. According to Crane (1972), it is during this stage, where new scientists are less likely to enter the area and old members are more likely to drop out, that leads to a gradual decline in the number of new publications and in overall membership in the area. Those who remain are likely to develop increasingly narrow and specialised interests as the possibilities for research dwindle or to be divided into factions on the basis of theoretical controversies.

Propagation of an innovation can be seen as "lying on a continuum between pure diffusion (in which the spread of innovations is unplanned, informal, decentralised, and largely horizontal or mediated by peers) and active dissemination (in which the spread of innovation is planned, formal, often centralised, and likely to occur more through vertical hierarchies)" (Greenhalgh *et al.* 2004: 601). Therefore the formal organisation of science is only loosely related to the actual social relationships through which new knowledge is generated. For, cutting across formal scientific boundaries, there exists a multitude of informal networks of researchers, each of which centres around the investigation of a series of related 'problems' (Mullins 1968). According to Crane (1972: 99), "each scientific community concentrates its attention upon a particular set of problems [and diffusion occurs when a few scientists] are attracted to these problems ... that in turn convince others to join them as either collaborators or as a result of their publications." This type of process leads to the development and emergence of a social network, consisting of formal and informal networks which are crucial to the research community (Garvey 1979; Meadows 1974). Informal networks can be referred to as 'invisible colleges', in which "the exact boundaries are difficult to define, each member is usually aware of some, but not all, other members, members are geographically separated but come together on the basis of their interests and by their commitment to a particular approach or set of problems" (Crane 1972: 138).

According to Lievrouw (1989), based on the pioneering work of Price, Hagstrom and Crane, the invisible college has been widely accepted as a description of certain social relationships in science and is possibly the best-known model of scientific communication. However, a number of criticisms can be identified. Firstly, as Crane (1969) herself recognises, the existence of 'invisible colleges' has been difficult to prove. This is because scientists have many contacts with other students and other academics in their own research areas and in other fields, some fleeting and some lasting. If social organisation exists in a research area, it is of a highly elusive and relatively unstructured variety. Furthermore, collaboration can be formal as well as informal; therefore other types of ties exist between scientists (Crane 1969).

Secondly, the methods used to analyse social networks have been criticised. Crane (1969) identifies four methods: the use of bibliographies, abstracting services, citation networks and sociometric analysis, for example, if scientists who had published in a particular research area had more social ties with one another than with scientists who had not published in the area. Furthermore, Crane (1969) realises that because scientists frequently work in more than one problem area at a time it is difficult to locate all the scientists who have worked in a particular problem area.

Thirdly, as Abrahamson and Rosenkopf (1997) argue, innovations do not necessarily diffuse within social network and this is because networks are segmented by internal boundaries which can form along geographic, status, cultural or industry lines. As a result these boundaries can prevent innovations from diffusing to all potential adopters.

Fourthly, traditionally, the literature on the diffusion of innovations has examined innovations that diffused fully, meaning that every potential adopter adopted them. Therefore, these theories largely ignore the possibility that this information is channelled by social networks only to certain potential adopters. Abrahamson and Rosenkopf (1997) argue that small, apparently insignificant idiosyncrasies of these networks' structures can exert major influences on diffusion extent. This issue is examined in more detail in the next chapter.

Finally, Lievrouw (1989) argues that the invisible college construct reflects a recurrent problem in the social studies of science generally which tend to examine the products of science (e.g. the artefacts such as published documents) in order to understand the social processes of science. These are essentially communicative in nature (e.g. interpersonal contact). Lievrouw (1989: 619) points out that Crane's treatment of 'informal' communication involves the use of self-reports of scientists about their communication behaviour. According to Lievrouw (1989: 620) Crane's findings are somewhat contradictory and confusing in a number of ways. Firstly, Crane views invisible colleges as informal structures that channel both formal and informal communication, but also argues that these informal structures can only develop from already existing formal structures. Secondly, in Crane's view, it is 'institutions that produce scientific ideas'; however, Lievrouw maintains that this should be the other way round, instead it is the 'ideas that produce institutions via communicative behaviour'. Thirdly, Crane adapts Price's definition of an invisible college, which is 'informal links across existing formal structures', rather than the original definition of 'links established in the absence of formal social structures'. Therefore, argues Lievrouw, Crane's assumptions obfuscate the central role of communication behaviour and interpersonal processes and instead, emphasise the mapping of institutional structures.

Subsequent invisible college studies continued to focus on network structures among individuals, institutions or documents, rather than on communication processes or the content of those structures (Lievrouw 1989). The Institutional Sociology of Science has been criticised for failing to examine the content of science, referred to as the ‘black box’ (Whitley 1972). Therefore, what Lievrouw (1989: 622) is arguing is that the term ‘invisible college’ describes an informal communication process but researchers look for it in formal social structures and documents. As a result of this ambiguity, researchers use the term ‘invisible college’ very differently from study to study. What Lievrouw (1989: 624) suggests is that scholarship is a multilayered social world composed of and driven along by the communication behaviour of individuals. Therefore, scientific and scholarly communication might be explored in more depth using the fieldwork techniques typical of ethnographic studies such as participant observation and interviewing. Constructivist sociologists such as Knorr-Cetina (1981, 1988), Restivo (1983) and Latour and Woolgar (1979) who in their ‘lab studies’ of science assume that knowledge is a social construction of the scientists involved and that documents are data without intrinsic meaning of their own, remaining data until individual scholars make sense of them. Therefore, in this way, the ‘black box’ is opened and the contents inside are examined. In order to understand the nature of social networks in the development of CAQDAS, in-depth interviews with developers and propagators of CAQDAS were carried out, thus ensuring the examination of the contents of the ‘black box’.

Despite its criticisms, the concept of ‘invisible college’ is useful and integral when examining the development of a scientific community, as it is evident that in order to understand how scientific research is actually carried out, it is very important to examine formal as well as informal communication between scientific research communities (Tuire and Erno 2001). Informal relates to the interpersonal communication that allows theories, ideas, procedures, and methods to be socially evaluated before the formal publication process, whereas formal arenas include public communication such as conference presentations and journal articles. Informal communities of science emphasise the importance of personal discussion and allow scientists to discuss and debate ideas while they are still incomplete, current and speculative. Formal and informal communication in science can be seen as complementary and synergistic.

As discussed previously, Unruh (1980) identified four levels of social worlds, local social worlds, regional social worlds, dispersed social worlds and social world systems. Within each social world, there exists a multitude of informal networks of researchers, each of which centres around the investigation of a series of related ‘problems’ (Mullins 1968) and in order to understand the evolution of a particular network, we need to know about the processes occurring in those networks from which initially it drew its members, its problems and its methods; also about the way in which its subsequent development is influenced by neighbouring fields (Mulkay *et al*. 1975).

The next section describes how a social informal network of users emerged.

Local and informal networks

Initial propagation of CAQDAS tended to be inadvertent and was largely by word-of-mouth. As discussed in the previous chapter, researchers were initially developing the software for their own research needs as a way of alleviating some of the ‘nuisances’ (Miles 1983) or ‘problems’ (Mullins 1968) that qualitative data analysis entails. At this stage for the majority of developers, there was no intention of promoting and selling the software commercially, something explained quite adamantly by a number of developers. For example, explained one developer:

> *“More people became interested, although at this stage there was no idea of selling or producing software. That came later when more and more people had personal computers, and so therefore it was possible to move these ideas about software for qualitative data analysis to the personal computer, and at this point more and more people became involved.”* (D7)

However, whilst not pursuing commercial ventures, developers were sharing their findings and informing colleagues within their own local networks of what they were doing. As Berge and Collins (1995) argue, scientists, researchers, and professors in every field develop, and depend on, informal networks of colleagues with whom they share ideas and information. This sharing of information constitutes Merton’s norms of science: ‘communism’ in which scientists are encouraged to willingly share their findings. Participants meet in a formal arena in order to demonstrate, share and exchange information. The norms within academia mean that there are certain processes that ensure diffusion occurs, such as through seminars, conferences and publications. According to Merton (1973: 274) the pressure for the diffusion of results is reinforced by the institutional goal of advancing the boundaries of knowledge and by the incentive of recognition, which is contingent upon publication. A scientist who does not communicate his or her important discoveries to the scientific fraternity becomes the target for ambivalent responses. Therefore, the ‘institutionalisation of science’ contains norms that define permissible behaviour and reward systems that institutionalise the production of knowledge. This knowledge is then shared and diffused within the community. All researchers make use of information provided by other members of the community and attempt, more or less regularly, to communicate their results to other interested scientists (Mulkay et al. 1975). An example of the norm of ‘communism’ can be seen in the following quote:

> *“I was writing up my research and people were saying ‘gosh, how are you getting such deep insights with such incredibly complicated material’, to which I replied, ‘well, there’s this program’.”* (D8)

The result of informing colleagues of their inventions led to those colleagues expressing an interest in wanting to use the product, as illustrated by the following comment:

> *“I put this together and started telling people about it and someone heard me talking about the program and wanted to be able to use it to process data that his students were collecting.”* (D4)

This led to the emergence of the first adoptees in which propagation occurred within the developers’ own social networks, but soon began to disperse to other early adopters’ networks, as knowledge of CAQDAS spread:

> *“It was not something which was much communicated in the scientific community, it was something more local, people in my department knew about it. But, maybe two years later, a quite well known colleague at another university was working on a project and asked if he could use it. It was at this*

> *time that I came outside of the department with this idea and more people became interested."* (D7)

Therefore, for some developers, propagation occurred as others in their local social networks were interested in using their creations. For other developers, the software had been tested on their students, particularly as some packages, such as Atlas.ti had started off as research projects. For example:

> *"My class would be using it and they would be giving me feedback into what they liked and what they didn't like, what worked and what didn't."* (D5)

As a result, some students went on to use the software for later projects, thus taking knowledge of CAQDAS with them, as explained by one developer:

> *"One of my graduate students said she wanted to use the software, which she did for her doctorate; at that time it was version 1."* (D8)

This 'word-of-mouth' diffusion was an important means of communicating information and is a dominant form within informal networks, as discussed by a number of developers, for example:

> *"One of the things about the academic world is its word-of-mouth marketing, it's a diffuse market."* (D4)

What can be seen then is that the proportion of adopters in an individual's personal network increases over time (Valente 1996). Thus knowledge of an innovation spreads from local personal networks to other networks as the innovation is adopted. However, as Valente (1996: 72-73) suggests, this increase does not take place evenly in a social system, but increases according to the structure of the social system and as a result some personal networks fill up earlier than others, which is determined by the adoption pattern of their network partners.

Therefore, new ideas and ways of doing things often spread gradually through social networks and much of this is dependent on the size and nature of each social network. According to Valente (1996: 73, 82), this is determined by two key factors; exposure and integration. Exposure is the proportion of adopters in an individual's network which increases over time as more individuals in the social system adopt and integration occurs when individuals who are connected in a network influence each other within the social system.

As a result of word-of mouth diffusion, a core group of early adopters emerged and would be most influential in the propagation of CAQDAS and in the creation of a social network of users, an ‘invisible college’ (Crane 1972). These early adopters tend to have a higher social status, a more favourable attitude and are more highly connected through interpersonal networks in their social system (Rogers 1986), thus allowing for greater exposure and network integration (Valente 1996). The early adopters of CAQDAS became propagators and some became consultants creating their own consulting companies and are active on the discussion lists. As a result, it is these early adopters that come to form the ‘core’ participants of an invisible college and tend to be highly influential. For example, one propagator explains how they became involved:

> *“In 1986, whilst doing a PhD at the LSE, I was told of someone who might know of a software program that could help with analysing my data. I met with Ray Lee in 1989 who told me about the [software], which I used in my dissertation. I wrote a paper on the use I had made of the [software] to analyse my data. After that I started receiving other invitations to write more on it and was told since you’ve used it so much, why don’t you start teaching? As a result I developed two kinds of career strands.”* (P8)

Therefore, within each social network, there exist a small number of prominent researchers that form the core of each specialty’s collaboration network and it is these core individuals, the early adopters that are most influential in the propagation of new ideas throughout the community. Propagation occurs in a number of ways. They tend to have connections to other networks (Deroïan 2002) and are thus able to diffuse knowledge within those other networks (Becker 1970; Mendez 1968). This core group regularly exchange information and papers relating to the newest progress on the research front (Matzat 2004). Tuire and Erno (2001: 510) argue that shared knowledge and the links that connect separate scientists to each other that mediate novel ideas are still extremely important for the advancement of scientific communities. In scientific communities the centre (most important, visible or active members) influences the content and sets the direction that dominates intellectual work throughout the field. Mulkay *et al.* (1975) argue that over a period of time each researcher comes to recognise a number of others whose work he finds particularly significant. Each members of his network will, in turn, find the work of a number of other scientists of interest.

Thus it can be argued that in the same way that the structure of social worlds is highly fluid, participation in social worlds usually remains highly fluid also (Strauss 1991). Some participants cluster around the core of the world and mobilise those around them (Hughes 1971: 54). These entrepreneurs (Becker 1963) typically remain at the core over time, whilst others move in and at out of participation or situate themselves more peripherally. This core group are important for the development of that social world. As Crane (1972) suggests, if there was only a 'scatter' in science and no 'core', scientific knowledge would not accumulate and as a result, a high proportion of ideas would be lost. Swanson (1966) claims that an important proportion of the scientific literature is so scattered as to defy the efforts of any individual to bring all of it together. If all of the literature on a particular subject was so scattered, it would be impossible for scientists to build on each other's work. Each scientist would be working by himself and with perhaps a few other scientists whom he accidentally discovered.

An early adopter and core propagator who was seen by many in the community as one of the most influential in the history of CAQDAS was the late Renate Tesch, who was of German origin but had lived and worked in California in the United States. As a result she would provide valuable network connections in both countries. Through her own company, Business Research Management, she provided consultations to doctoral students and others using computer packages, as well as distributing software, organising and running conferences, seminars and workshops on CAQDAS both in Europe and the United States. She wrote the first book on the different types of qualitative software that were around at the time and although now a little outdated, still provides an interesting and useful insight into the earlier software. Originally she had ideas of developing her own software but discovered that someone had already done this and she came into contact with John Seidel, developer of the Ethnograph. He encouraged her to look at other software that he was aware of and to form a consultancy that would address all the products.

"I told Renate that I knew several other people that were developing similar programs and I suggested that she should get to know all of the other developers and represent all of them."

This she did and she was soon travelling widely, attending numerous conferences and seminars and meeting other developers. Before long she had set up an extensive network of contacts, and encouraged not only developers but also other members of the community. As a result, she was seen by many in the community as a key influence and invaluable propagator in the early development of CAQDAS and if it had not been for her untimely death in 1994, the field may have developed differently. Both developers and propagators discussed how significant her role had been in the early development of the community:

"She certainly was a very influential person, she had the special ability of networking, getting acquainted with people and supporting people in their work and encouraging them to go further in developing these programs. She went to a variety of conferences, making these programs known to people. This was at the beginning of the development of CAQDAS which was extremely important. Her idea was that it could really be a community with some sharing between developers. "(P5)

Tesch was not only a significant propagator of CAQDAS, but she also provided support and encouragement, as explained by one developer:

"She listened to my talk and encouraged me to write an article about the software and it was due to her initiative that I dived more deeply into this" (D2)

Tesch also attended many conferences and seminars and wrote one of the first publications on CAQDAS[15], which, although now outdated, is still important and certainly was most prominent at the time and served to further propagate knowledge of CAQDAS:

"She was a kind of travelling salesperson in the qualitative data business and also in her spreading ideas of what is qualitative data analysis and she did a

[15] Tesch (1990) 'Qualitative Research: Analysis Types and Software Tools' London: RoutledgeFalmer

very thorough categorisation of what tools for which purpose and with which methodology, which is still accepted and seen as a very important contribution. She was quite crucial for me and my product motivational-wise." (D2)

In this way, she was seen by several as being the 'centre of the universe', and so therefore the 'core' of the CAQDAS world, as described by one developer:

"She was making the original contacts and everything flowed through her, she was the centre of the universe." (D4)

As well as Renate Tesch, other early 'pioneers' came to form the 'core' of the community and became influential in the propagation of CAQDAS. These included Nigel Fielding (University of Surrey), Udo Kelle (University of Bremen), Raymond M Lee (Royal Holloway University of London), and developers such as Udo Kuckartz (WinMax and MAXQda), Thomas Muhr (Atlas.ti), Tom and Lyn Richards (NUD*IST now called N8 and NVivo) and John Seidel (The Ethnograph)[16]. According to Crawford (1970: 13), 'information generated by scientists is communicated through central persons in one research centre to central persons in another centre, thus cutting across major groups in the large network of scientists. Through the central scientists, then, information may be transferred to all other scientists in the network'.

These core pioneers were to meet as the result of a number of international conferences. This again illustrates 'communism'; a norm in science identified by Merton (1973). What is interesting is the way in which the conferences were organised, particularly the first, which was rather informal. Although some of the initial contact was at general conferences, such as the ASA (American Sociological Association), it was these early conferences dedicated to CAQDAS that were instrumental in bringing this core group together and an important process in establishing an international community.

Furthermore, in the case of CAQDAS, these early adopters began to write about their experiences on the usage of the software, with some papers being presented at

[16] Details of all the members of the CAQDAS community mentioned in this thesis can be seen in the appendix.

conferences, which are the nature of academic work, again illustrating the norms of science.

> *"We were on all kinds of international conferences and publishing papers about CAQDAS."*(P5)

Nigel Fielding explained how, after the Surrey conference, it was decided to publish a book based on the conference papers. Furthermore, these papers also began appearing in academic journals, thus propagating CAQDAS further and reaching a wider audience. For example, one propagator explained how, as a result of their use of the software, they were asked to write about their experiences in a publication:

> *"I was told that since I had been using it so much, why I don't start writing about it."* (P8)

An example of an early publication on CAQDAS is the 1984 Spring/Summer edition of *Qualitative Sociology* which was dedicated to 'an explanation of the new relationship between personal computers and qualitative data' (Conrad and Reinharz 1984: 3). Since then *Qualitative Sociology* as well as numerous other publications continue to publish new work on CAQDAS and related matters. Thus publications serve as an important way of diffusing knowledge, and were one of the means by which knowledge could spread outside local networks. For example, one propagator described how he first came across CAQDAS:

> *"There'd been some reports in journals like Qualitative Sociology about the existence of mainframe based qualitative software, which I found to be of interest."* (P2)

According to Callon (1995: 40), publication is considered to be a cornerstone of science as it enables contributions or discoveries to be identified and attributed, as well as ensuring the dissemination of these 'public goods'. This provides free access to discussion, which is a 'basic principle that is inscribed in the norms of science and its institutional forms'. For example, as discussed by one propagator:

> *"The usual scientific way of discourse and distributing knowledge, writing papers and quoting other people...scientific discourse is also very competitive,*

> *but it's more to rely and relate one's own work to the work of others, you're forced to do that in scientific discourse."* (P5)

Crane (1972: 68): found that there was a strong correlation between the date of publication of an innovation and the number of adopters. Innovations produced during the earlier periods of activity in the field were used by many more members of the area than innovations produced in later periods. Some developers found that as the result of giving a paper, or a demonstration of their software, that this led to increased interest and subsequent adoption. For example, explains one developer:

> *"I went to a conference and I needed to give a paper, so I gave a paper, actually I gave a demonstration of the program, and it went down so well."* (D3)

According to Crane (1972) scientists in research areas can have a number of different types of social relationships with one another. Many scientists discuss their on-going research with other scientists in order to obtain advice and information about similar studies and many scientists collaborate with others to publish the results jointly.

As a result of the conferences and publications, there was a transition from a 'local world' to a 'dispersed world' (Unruh 1980), from local networks with people doing things in their own country to a more dispersed network at an international level which brought together people with similar interests. The next section examines these dispersed networks that emerged in the next stage of development of CAQDAS, which was one of rapid growth and development, as identified by Mulkay *et al.* (1975).

Dispersed Networks

As well as informal networks, invisible colleges can also be seen as dispersed social worlds which are spatially diffuse and consist of a mosaic of sub-worlds incorporating actors, organisations, events and practices from many regions (Unruh 1980). As suggested by Crane (1972: 42), a research area is not entirely a face-to-face group and its members are widely dispersed geographically. Many exchange ideas by correspondence or through publications and from attending formal events such as conferences, which enable these dispersed groups/individuals to come together.

It has been argued that dispersed forms of collaboration are difficult due to physical distance between scientists which not only reduce the likelihood of collaboration but also have a negative impact on success (Allen 1977; Kiesler and Cummings 2002; Kraut *et al.* 1990). Today, however, dispersed collaborations are more feasible because communication technologies allow scientists to exchange information and valuable resources (Finholt 2002; Hesse *et al.* 1993; Kouzes *et al.* 1996). At the time of the first CAQDAS conference, these technologies were only beginning to be used widely and certainly not with the same ease as today; for example, sending electronically large multimedia files or listening to a conference presentation via *Skype.* The impact of communication technologies is discussed in the next chapter.

The first conference dedicated to CAQDAS was held at the University of Surrey in 1989 and was organised by Raymond Lee and Nigel Fielding. The way in which this particular conference was organised provides an example of how informal networks operate. So, although the conferences themselves are more 'formal', the way in which the early ones (particularly the first one) was organised was quite informal, i.e. by invitation only. Fielding, in his interview described how the conference was decided:

> *"In this department, we have a custom of holding every second year a conference we call 'Theory and Method conferences', either on an aspect of sociological theory or an aspect of social research methods and it was my turn effectively to organise one of these events and so I was thinking of a topic. I was arranging it jointly with Nigel Gilbert and he suggested that I involve Ray Lee and so the three of us had a talk about what the topic might be and I suggested qualitative software as one idea we might show.....the system with these conferences is they're invitation only, you identify a group of people that you are aware are associated with the field, usually between 25 and 50 people and you simply invite them with your idea that you can actually make some progress on the topic by picking people that are knowledgeable or influential and are doing something practical in the course of a two day conference."*

Lee had known Fielding for years. Although they had heard of some developers, an initial problem that they faced was they did not know who to invite. However, Lee had been at an ASA (American Sociological Association) conference where he met Renate Tesch, who had given a presentation on the Ethnograph. Lee asked her if she would be interested in attending the conference in Surrey. She accepted and, as she knew of others through her consultancy work, the list of invitees was extended. However, as word spread, the organisers found themselves inundated with requests. Fielding explained:

> *" We set about inviting people and we couldn't keep it invitation only, we were deluged by interest, nearly all from outside Britain, particularly from the United States, but also from Australia, so all these people were sort of besieging us, well I want to come to your conference, so we ended up with an audience of about a 100."*

It is with this conference that the beginnings of a CAQDAS network started to emerge as networks developed, not only nationally but internationally. Although a few developers may have heard of others doing the same, either through Renate Tesch or through some other means, it was only really at the conference that they were able to meet and have the opportunity to exchange information and knowledge, as explained by one propagator.

> *"I remember there being a sense of all these people doing the same thing in isolation with one another, suddenly realising that there were other people around that have been doing the same sort of things. You had the international networks, but then they started to develop at a national level, and it developed in the U.S. in many ways through Renate and a lot of what she did."* (P1)

As developers began to learn of others, they were interested and wanted to meet these others, thus illustrating a norm of science: getting together (conference) to share information ('communism'), as the following quote demonstrates:

> *"Gradually we began to learn about these other folks and being good scholars and academics, we did the thing that all good scholars and academics are supposed to do, we wanted to talk and find out about what each other were doing."* (D4)

Many believe that it was a meeting of collaboration and camaraderie. The conference had proved to be a huge success, which resulted in a book published by Sage. It was subsequently decided amongst the group to hold a series of conferences, illustrating the development of social networks. One propagator explained:

> *"At that stage it was very friendly, very open, a lot of camaraderie about it and we decided in the end that there should be another conference."* (P1)

At this point, there was a lot of collaboration and support:

> *"They had a couple of these early conferences, where they got together and they were really sharing ideas and being quite collaborative and supportive of one another."* (P9)

As a result, two more conferences dedicated to CAQDAS took place, one in 1991 at Breckenridge, Colorado, organised by John Seidel and the other in Bremen, Germany in 1993 organised by Udo Kelle, the funding for which had been provided by the German Federal Research Project on Life Course Methodology. With these conferences, the community and its social networks expanded. For example, developers and propagators that had not been at the previous conference were there, as the organiser of the Bremen conference, Udo Kelle, explained:

> *"We tried to invite most people on the scene at the time and I think most of them came. I think the conference was really successful in terms of most of the people came and after the conference a number of papers were published by Sage."*

The Bremen conference was the largest in the series of conferences as it lasted for three and a half days and thus gives an indication of how much knowledge of CAQDAS had spread and the community had grown. It was at this conference that the acronym C.A.Q.D.A.S. (Computer Assisted Qualitative Data Analysis Software) coined by Lee was first publicly used. He explains how he came up with the acronym and why it wasn't until the third conference that it was used:

> *"When we did the conference at Surrey, we had to call the conference 'Qualitative Knowledge and Computing' and I think the reason why that is, there was a session looking at artificial intelligence. I actually remember lying*

> *awake one night and suddenly thinking 'there's an acronym here, C.A.Q.D.A.S."*

It is also at this third conference that the beginnings of a transition occurred from the camaraderie of the earlier conferences to a degree of rivalry between developers. As the software became more sophisticated and commercialised, the nature of these early relationships and friendships would also change as developers realised that they were now in competition with one another. For example, as explained by one propagator:

> "*It's commercial; there is now competition between them. It's a different world from the world of the first conference, in which there was a lot of collaboration, a lot of sharing of information and exchange and help. It's interesting how it has changed now completely." (P8)*

As well as rivalry, it was also at this conference that a debate would emerge, one which would continue to the present day. This debate related to a paper presented by Markku Lonkila on '*Grounded Theory as an Emerging Paradigm for Computer-Assisted Qualitative Data Analysis'*[17]. An association was made between the packages and grounded theory because one of the earliest tools for computerisation was the coding process and coding is an essential component of grounded theory. As a result this would develop into a long-standing debate between coding and grounded theory, with those critical of CAQDAS arguing that the use of software would lead researchers to use grounded theory over other approaches.

The conferences provided a dual process of diffusion: first, it enabled the community to meet and the developers to introduce and share their products, and secondly, it diffused knowledge to a wider audience and in doing so enabled intellectual discussions to emerge concerning epistemological and methodological issues surrounding the software. For example, frequent topics included: the impact and transformation of qualitative research methods; the appropriateness of using computers for analysis; and the implications of adopting software. Some of these issues have been used by those critical of CAQDAS and as a result some of these discussions have remained to the present day. These issues and the debate on grounded theory are discussed in the chapter on 'debates and contestations'.

[17] Which later appeared in Udo Kelle's book *'Computer Aided Qualitative Data Analysis: Theory, Methods and Practice.'*

After the Bremen conference, there was a further conference in 1996 at the University of Essex organised by the International Sociological Association Research Committee on Methodology. At this time, large-scale international conferences became infrequent, although the topic was regularly a theme at methodology conferences around the world. Increasingly, some developers have held their own 'user' conferences.

Nigel Fielding explains why conferences dedicated to CAQDAS became infrequent:

> *"Unfortunately, the series didn't really carry on because it was completely ad hoc. It takes a lot of work organising a conference and it wasn't part of, like the BSA has an annual conference and it's kind of automatic, something people do, it was completely ad hoc. So, Ray and I were involved in organising the CAQDAS stream at the 1996 meeting at the University of Essex of the International Sociological Association Research Committee on methodology and we tried to present that as on-going in the series. But after that I haven't been involved in any meetings, where I've had an organising role and I think what's happened is since the mid 1990's, qualitative software has come pretty much into the mainstream of methodologies, so the methods conferences always have something on qualitative software and you don't really need to have events that are dedicated just to it. The other big thing that has happened with the conferences is if it's got a part in something like the American Sociological Association Conference, the developers will usually go for two or three days after the end of the main conference, and they will run training sessions because they know they will have an audience there."*

However, there was another conference in 2007; a conference dedicated to CAQDAS was organised by the CAQDAS Networking Project and was held at Royal Holloway University of London. This was 14 years after the conference at Bremen and in that time the CAQDAS community has changed; it has expanded and a whole new generation of developers have come on board. Since then a number of conferences have taken place around the world[18], however, the community is not the same as that small core group that first met at the Surrey conference in 1989. The relationship between the developers changed and became what Tunstall (1971) calls a 'competitor-

[18] For example the Kwalon series http://www.kwalon.nl/

colleague' relationship, in that the developers were colleagues but also competitors at the same time. For some of the developers, the friendships have remained but for others the relationships became more conflictual and less friendly. Was this an unfortunate turn of events or a necessary one in order for the field to develop? Was it the result of commercialisation of the software? These questions are examined next.

Commercialisation

Mulkay *et al.* (1975) argued that following rapid growth during stage two, a research community would experience decline and disbandment. According to Crane (1972) during this stage, old members leave, new members are fewer and the numbers of publications are reduced. However, for CAQDAS although some members have left the community, it can be argued that rather than experiencing decline and disbandment, the field has become more fragmented and specialised and not necessarily in a negative way. According to Tuire and Erno (2001), as scientific communities grow in size, subgroups may provide boundaries beyond which ideas do not disseminate. The scientific field becomes fragmented by 'schools' representing different orientations toward the area. This fragmentation has resulted in the development of a number of smaller sub-worlds and is examined in later chapters. What will be discussed in this section is the process of commercialisation and the impact on the CAQDAS community.

As discussed in the previous section, the role of communication is fundamental in the process of diffusion but a second, identified by Redmond (2004), is the role of market competition. Redmond (2004) argues that whilst word-of-mouth and observation remain relevant for later adopters, advertising has an important and continuing role in positioning the innovation to potential adopters. Advertising plays a much more significant role in diffusion, a role which is considerably longer in duration and wider in terms of direct influence (Redmond 2004: 1299). Therefore, advertising aids commercialisation, something which occurred when Sage Scolari began distributing software.

Social networks may play an important role in encouraging the adoption of new technologies. However, these networks can also inhibit or discourage such adoptions. Individuals strongly connected to networks whose members lack newer technologies, or oppose its use, are much less likely to adopt the new themselves and this can create an ongoing pattern of negative reinforcement that inhibits future adoptions (Redmond 1994). This results in some individuals becoming reluctant to adopt CAQDAS (the types of adopters are discussed in the chapter on reception of CAQDAS).

However, competition can be seen as part of scientific development where the research scientist develops knowledge that is submitted to the judgement of colleagues, such as through publications (Callon 1995). The competitive energy comes from the desire of scientists to receive credit for successful work (Restivo 1995:38), as discussed by one developer:

> *"Where there are serious awards, for example, people competing to win noble prizes, things can get really nasty."* (D6)

However, Callon (1995) argues that the motivations behind scientists' actions are not theirs alone. As described by Merton (1973) it is largely a consequence of the 'institutional norms of science', where the scientist is reminded that it is their role to advance knowledge and in so doing receive recognition. Scientists will be under pressure to make their contributions to knowledge known to other scientists and they in turn will be under pressure to acknowledge this (Merton 1973). Once the scientist has made a contribution, he or she no longer has exclusive rights of access to it; the discovery becomes part of the public domain of science. However, once this occurs, then the scientist's work is open to critique. Merton (1973) argued that there is competition in the realm of science, competition that is intensified by the emphasis on priority as a criterion of achievement and under competitive conditions there may well be generated incentives for eclipsing rivals by illicit means. According to Merton, the "history of science is punctuated by disputes, often by sordid disputes, over priority of discovery" (Merton 1957: 635). In his view, struggles over priority do not result merely from the traits of individual scientists but from the institution of science. Merton (1979: xxiii) argues, there is an institutionally reinforced drive for professional recognition, which is acquired in return for priority in scientific contributions and a prescribed reward for scientific achievement.

Therefore, competition is inevitable, academic work is competitive. To some extent competition can be seen as healthy as it encourages a field to develop and for innovation to occur. However, whilst competition can be seen as normative in science, it can be argued that this coupled with commercialisation resulted in a not always friendly nature. This issue was discussed by a number of propagators and developers, each providing their view with varying degrees about the relationships between developers; some were friendlier than others, while some were more conflictual.

The following comment from a propagator who came slightly later into the CAQDAS community explains how the community changed and suggests this was the result of commercialisation:

> *"What I understand there was a time when they were actually a fairly close community and there was still a fair amount of goodwill among them. Then I think, what happened was money, and as things really started to commercialise and take off, and I think this is probably mid 90s, I don't know when, exactly but conflicts took place."* (P9)

Another propagator explains how the initial camaraderie felt in the group was no longer there due to increased competition:

> *"Somewhere along the lines, the competition got ugly, and the community stopped and the trust and the camaraderie is not what it was."* (P7)

One developer expressed concern over how things had evolved:

> *"It's unfortunate, but that's the way that things have evolved, and it's supposed to be something where we can all learn together, and evolve our product and make it better, but we're operating in a commercial environment, as such we need to be careful. That commercial aspect of what CAQDAS has become is disturbing, that's not the spirit in which we started out, in which we have been rooted in, and I guess that's the aspect of it that concerns me, in terms of where this whole field has been moving."* (D5)

However, was some conflict seen as inevitable? Was conflict part of the commercialisation process? In order to answer this, the question can be asked; what would have happened had the software not become commercial? It appears that in order for the product's survival, the only way would be for it to become commercial, otherwise in time it would become obsolete and confined to the history books. Project Atlas is a good example; had it not have been salvaged and further developed by

Thomas Muhr, it is likely that it would have disappeared. Competition exists within academia but there is also commercial competition. Therefore, competition was inevitable and expected. According to Callon (1995: 38) researchers have no choice in being competitive: if they want to survive among their colleagues, they have to accumulate credit or credibility, which constitutes their capital. Without capital they cannot obtain support for new programs. However, as Callon (1995) argues, the more capital they have, the more they are able to carry out research, the results of which would increase their initial endowment. Yet, as discussed by one developer, conflict can also be attributable to personality:

> *"I think that some conflict is inevitable. What level it sinks to I think there is depending on who is involved, but there will be some conflict, because there is commercial competition. Whenever you have competition, if we want to get technical here, is it really conflict or is it competition, but it's a sort of competition that has grown a bit nasty and unnecessarily bile. So, it's probably inevitable that there would be some."* (D6)

However, what was not anticipated was the nature of these competitive manners. One propagator suggested that this was something which could be attributed to both personality and the nature of competition:

> *"I always think it's a copout to ascribe a conflict to personality alone. I mean certainly there are personalities involved that you could attribute a lot of what's gone on to, and people make choices, but I think that structure and nature of competition is part of it."* (P9)

Some developers discussed how, because of commercialisation and thus being in competition with other developers, they realised that they needed to be careful of what they said. The following is an example of such conflict:

> *"In this era of commercialisation, they would take a comment we made and rip it apart and it's unfortunate, but that's the way that things have evolved and what is supposed to be something where we can all learn together, and evolve our product and make it better, we're operating in a commercial environment, as such we need to be careful. Our competitors will unfortunately use everything and have used everything that we may say*

negatively about our product, even though it's said in the best of spirits and that bothers me, because that's not the spirit that we as a company operate on. That commercial aspect of what CAQDAS has become disturbs me, that's not the spirit in which we have started out, in which we have been rooted, and I guess that's the aspect of it that concerns me, in terms of where this field has been moving." (D5)

Commercialisation within CAQDAS took place for a number of reasons; developing software was time-consuming and while most developers have or did have full time day jobs, there was the need for some financial return. For those that did leave their academic posts, it is evident that they needed to become commercial in order to make a living. For some, it was a progressive direction and expansion and Sage Scolari distributing the software assisted with this. However, commercialisation made it difficult for some developers, as academics, to adapt to, as explained by one developer:

> *"We had reached a point where we had cool ideas that were crudely implemented into technology and we started selling these things and we became software hucksters, and we had this problem of being competitors and yet being competitors, we had to deal with that. You have the problem of being the promoter and entrepreneur versus being the qualitative scholar and academic. You go out there and you try to convince people to buy your product, so you cross the line into advertising and that's hard to do."* (D4)

As commercialisation increased, so did competition, which for some was quite aggressive but unnecessary, as explained by one propagator:

> *"I think it's money and I think it's what people chose to do to get money, people chose to hurt each other in ways that were hurtful, it could have got commercial without people winding up hurting each other. In the United States government if you talk to the senators and congressmen or one of your MPs, democrats and republicans who are the opposite parties, battle ferociously, people form personal friendships across party lines, they work together and it's part of how you work together. People in this community have not been able to do that. I think some of them have. I think a lot of them*

still get along well and talk with each other. Some folks have been willing to do an exchange and other people will just not participate in that." (P9)

Competition between developers was further amplified when Sage, a publishing company from the United States with a UK publishing arm, first began to publish books on CAQDAS but decided later to distribute software through its partner company Scolari[19]. The editors at Sage were initially sceptical about the potential of the field but were persuaded to publish a book based on the Surrey conference. However, the book turned out to be extremely successful and as a result Sage continued publishing material on CAQDAS, including another book and a collection of papers from the Bremen conference. Eventually, interest extended to the distribution of software and Scolari was set up.

Sage's role was pivotal as it enabled the distribution of software to reach a large audience[20]. A representative of Scolari explains the reasons for opting to sell and distribute the software:

"*We were forming the company that was best placed to reach people using qualitative and quantitative research methodologies and therefore it looked an attractive prospect for us to see if we could actually build a profile in doing software publishing in the same way that we had built a profile of doing book and journal publishing. So, we ended up setting up Scolari, in order to trial that kind of business model and see where it would take us."* (S1)

The response to Scolari's involvement was a mixed one within the community. Although Scolari was aware of other software packages, the first software to be signed up was NUD*IST (as it was called then), chiefly because it was perceived as being a viable marketable product.

"Our decision was really a commercial decision and one about having to try to build a business that was viable and starting with a product the most likely to succeed, and also had to be said, to support us in terms of, we had a product that we needed to know that we could go back to a team, either to

[19] There was already a company in the U.K. called SAGE that sold accounting software, and so they needed to use another name.

[20] The discussion of Sage's role is at times intentionally rather vague, this is because in interviews with Sage executives some topics were 'off the record' due to commercial sensitivities and as a result some discussion is difficult to talk about in detail.

refer questions or to ask and so on, and they were really the ones that was more than a one man band. So, in that sense the decision was not a difficult one. Yes, we did know about that and it did cheese off some people." (S2)

This created a problem with some of the other developers who saw NUD*IST as receiving an unfair advantage. However, after a couple of years, Scolari sought to expand further and began distributing other software. For some developers, this proved to be a profitable working relationship, whilst for others the relationship was less rewarding. For example, as one propagator explained:

*"There was a lot of dissatisfaction in how they handled it and a lot of people thought that Scolari was favouring NUD*IST over other programs and not doing their marketing properly."* (P6)

However, one view was that the distribution of software should not be something done by a publishing company, as the following developer explained:

"They didn't really understand software at this point and it was something that they should never have done in the first place, or done differently. They didn't have any idea what type of business model was appropriate." (D4)

Representatives of Sage explained their response to the developers' anxieties and explained why they thought some developers (understandably) might have felt the way they did:

"Each of them negotiated differently and had different concerns and so on, and ultimately they are not all going to be happy, but some of them can be very emotional and that was partly because of their dedication and it's the nature of who they are and what they do. Sage never wanted to take advantage of or treat any of them unfairly and I think that some of them felt that probably they were, a bum deal, or didn't get what they wanted out of Sage, but I don't think Sage behaved unprofessionally or discourteously to anyone. There are frustrations in all sorts of businesses, not peculiar to this, but it was sometimes temperatures ran a bit high because some people were living off the income from their baby and if they saw it dip in a month, then it hit them much more immediately than a publisher sitting in an office publishing journals and software, it's different. I think it boils down to one thing really, that each of

the developers wanted to be special, wanted to be the *package, wanted theirs to be the leading thing, which is quite reasonable."* (S2)

However, as with any business venture, risks are taken and Scolari took a risk and it can be argued that no matter what the final outcome was, what is evident is that Scolari did provide a number of benefits for the developers, most notably by aiding the process of diffusion. Firstly, Scolari was able to reduce the concern of promotion and advertising away from the developers, which meant that they had more time to focus on developing their products further, as discussed by one propagator:

"I think that Scolari gave people the possibility to concentrate a bit more on programming and not on packing and shipping." (P6)

Secondly, as discussed by several developers, Scolari acted as a key component in the commercialisation process:

"Commercialisation started in the middle of the 1990s and the key point was when Scolari took over" (D1)

That without Scolari, most diffusion would have remained word-of-mouth:

"Scolari was the only real channel we had other than word of mouth." (D8)

This would result in a slower, gradual progression:

"Without Scolari, we wouldn't be at this point" (D2)

It was through this early adoption and dissemination of software leading to the formation of social networks, that one can say that a CAQDAS community was created. Knowledge spread at first through word of mouth amongst local informal networks, then through publications and conferences. Once it became commercial, it was diffused through Scolari as well as through a number of consultancies.

However, despite this, as Fennel and Warnecke (1988) indicate, diffusion does not necessarily diffuse to all segments. Diffusion of CAQDAS started off initially within local networks and then gradually increased to other networks – nationally and internationally, creating a community consisting of a number of networks, with further diffusion occurring through commercial means. But it can be argued that this diffusion would still be confined to certain social networks, thus not diffusing to all potential adopters. As Crane (1972: 65) suggests, communication networks in research areas are effective in linking scientists from different countries but that scientists in some regions are less involved in these networks and, consequently, their work is less visible to their colleagues in other countries.

However, global diffusion became possible later on via the increased adoption of another new technology, the internet, thus permitting further expansion and diffusion of CAQDAS and reducing the boundaries set up by informal networks or 'invisible colleges'. The role of the internet and emergent online networks is discussed in the next chapter.

Conclusion

This chapter looked at the early propagation of CAQDAS and the social processes that led to its development, growth and expansion. CAQDAS can be seen as a production world, as a scientific world is primarily a production world that produces knowledge but also a communal world as this knowledge is dispersed via social networks. Thus CAQDAS originally may have been predominantly a local world, but as knowledge of its existence diffused throughout the community, via formal and informal networks ('invisible colleges'), this changed.

Early propagation of CAQDAS occurred via word-of-mouth, seminars, publications and conferences. Early diffusion was the result of local informal social networks, known as 'invisible colleges' (Crane 1972). This is something that is seen as part of the organisation of science (Castells 2000), which Merton (1973) views as the 'normative structure of science'. In essence, propagators were doing what their academic role requires them to do; that is the sharing and exchanging of information through their networks, as well as through publications, conferences and seminars. Early diffusion occurred in the following way.

Initial propagation of CAQDAS was largely word of mouth – developers informing colleagues in their own local networks of what they were doing or testing the software on their students. Some of these colleagues and students went on to use the software for their own research projects. These early adoptees would then inform others within their own networks, who would then inform others and so on. These early adoptees also began to write of their experiences using the software resulting in a number of publications – another ‘normal’ academic activity. These publications therefore resulted in further diffusion. Eventually a core group formed that became particularly influential in the history and development of CAQDAS. Indeed, some of these early members are still participants in the community today. A number of conferences, another academic activity, organised by this core group was significant as it enabled the community to meet as well as diffusing knowledge further. The result was a transition from a ‘local world’ to a ‘dispersed world’ (Unruh 1980), people doing things in their own country were now doing things together internationally.

Initially the relationship within the community was one of camaraderie, sharing and exchanging information. However, with widespread diffusion and increased adoption resulting in the commercialisation of the products, competition between the developers increased. Whilst competition is also part of academic worlds and can be seen as important for development and innovation, relationships exist as a ‘competitor-colleague’ (Tunstall 1971). With regards to the CAQDAS community, for a few, this relationship was one of rivalry and conflict. Tensions were further amplified when Sage Scolari began distributing the software, although the majority have seen Sage’s role as valuable.

Therefore, as the result of both informal and formal networks, knowledge of CAQDAS was spread and a community of developers and propagators emerged. However, despite widespread diffusion, propagation of CAQDAS was only confined to these networks and not diffused to all potential adopters – a consequence associated with invisible colleges. This confinement was to change with the development of interactive technologies, such as email and the internet, permitting further expansion and diffusion of CAQDAS, thus reducing the boundaries of invisible colleges. The way in which these interactive technologies have transformed the CAQDAS community is discussed in the next chapter.

Chapter 6 Later Propagation and the Development of Online Networks

Introduction

With the development of technologies such as the internet, the development of CAQDAS and its associated networks were further transformed. However, it was not until the interactive technologies had diffused and the personal computer had been widely adopted that the diffusion of CAQDAS could spread to a wider audience. The impact that the internet had on the relatively small community was immense, an impact that its members could not have anticipated at the time of development. The impacts and transformations of a new technology can have anticipated and unanticipated effects. A 'two-level perspective' on technology as identified by Sproull and Kiesler (1992) can help to identify these processes. At the first level, the effects of a new technology are the anticipated ones, such as the planned efficiency gains or productivity gains; the intended purpose of the technology. Second level effects are often unanticipated and include new uses, new ways of working and living, new skills and new ways of thinking about a technology. Therefore, the second level effects are the unintended consequences of the first level effects. The importance of these effects lies in their potential to produce further development (Castells 2010).

To illustrate, Sproull and Kiesler give an example of the telephone, which was originally intended as a more efficient replacement for the telegraph and was seen as a tool for business, a first level effect. However, over time, its usage has changed, and in today's society people use the telephone for social and personal reasons, as well as for business reasons. These new ways of using the technology are second level effects. In a similar way, the use of the mobile telephone has been transformed from business use, predominantly for the 'Yuppie' in the 1980s, to personal and social use; these days with added internet and email facilities amongst other features.

In a similar way, computer and interactive technologies have also transformed society. For example, the ARPANET once confined to the military, has according to Sproull and Kiesler (1992), presented some surprising second-level consequences. What was not anticipated (a second level effect), was that computer networks caught on almost immediately as a means of interpersonal communication, first among computer scientists in the early 1970s (Hafner and Lyon 1996, cited in Herring 2001, p613), followed by academic and business users in the 1980s and from then on into popular use facilitated by the rise of commercial internet service providers (ISPs) in the 1990s (Herring 2001). “The ARPANET’s creators did not have a grand vision for the invention of an earth-circling message-handling system but once the first couple of dozen nodes were installed, early users turned the system of linked computers into a personal as well as a professional communications tool” (Hafner and Lyon 2003: 189). As Rheingold (1993:6) suggests, ‘the communities on the internet are a social experiment that nobody planned, but that is happening nevertheless.’ One of the most important and unintended outcomes of the internet was email, whose utilisation was partly serendipitous. As Hafner and Lyon (2003) explain, electronic mail can be seen as a cultural artefact which “belongs in a category somewhere between found art and lucky accidents. Between 1972 and the early 1980s, e-mail or network mail as it was referred to, was discovered by thousands of early users... Electronic mail would become the long-playing record of cyberspace, just as the LP was invented for connoisseurs and audiophiles but spawned an entire industry; electronic mail grew first among the elite community of computer scientists on the ARPANET, and then later boomed like plankton across the internet” (Hafner and Lyon (2003: 189).

Therefore, the first level effects, the planned efficiency gains or productivity gains, are the intended use of a new technology, whereas the second level effects are the unintended use and outcome of those technologies. According to Sproull and Kiesler (1992), the full possibilities of a new technology are hard to foresee. In the early stages of development, inventors and early adopters are likely to emphasise the planned uses and underestimate the second-level effects, particularly as they can not anticipate what they will be at the time. Any unanticipated consequences usually have less to do with efficiency effects and more to do with changing interpersonal reactions, ideas about what is important, work procedures and social organisation. As a result, second level effects will often emerge slowly as people renegotiate changed patterns of behaviour and thinking. Therefore, second level effects are not caused by technologies operating autonomously, on a passive organisation or society. Instead, they are constructed as technology interacts with, shapes and is shaped by the social environment.

This 'two-level perspective' on technology can be useful when looking at the development of CAQDAS. However, Sproull and Kiesler were studying business organisations at a time when interactive technologies were only just beginning to be widely adopted and as a result some of the second level effects that they identify may have changed and new ones emerged. For example, sending an email may be easy and fast. However 'people may be tempted to speak before they think' (Sproull and Kiesler 1992: 33) or accidently send a post to all respondents in a list rather than the intended respondent. There is also the possibility of getting an email address incorrect and sending a confidential or sensitive email to the wrong person. Early email packages were less stable and fraught with problems, such as crashing, being prone to viruses and losing data and problems with sending, particularly any attachments. These problems have not all been resolved but the email packages available in present times are much more stable and reliable, enabling a more efficient process due to broadband capabilities. Thus sending a large attachment is no longer an issue.

In order to understand the propagation of CAQDAS and the development of online networks, this chapter addresses two areas. Firstly, in order to understand what impact the internet has had as a diffusing agent, a brief history of its development is useful. Prior to the internet, as discussed in the previous chapter, most knowledge of CAQDAS was spread via word-of-mouth, through journals and conferences. However, as a result of the internet, it was possible to spread information at a much faster rate through email, discussion lists and websites. Secondly, it will explore the benefits and problems that the internet has provided for the community of users and developers in furthering and transforming the propagation of CAQDAS.

Brief Overview of the Internet

Origins – ARPANET

The internet is a global phenomenon; however it is not a new one. It descended from ARPANET (Ceruzzi 2002) which was developed in 1969 by the Advanced Research Projects Agency (ARPA) of the U.S. Department of Defence (Hyman 2002). Its original purpose (a first level effect) was "to facilitate the transfer of computer programs and data between remote computers in the interests of national defence

(Levy 1984; Rheingold 1993, cited in Herring 2001: p612)”, at the height of the Cold War. ARPA was created by the Department of Defence in 1957 in response to the Soviet Union launching of the first Sputnik that alarmed the American high-tech military establishments. As a result ARPA undertook a number of bold initiatives (Castells 2010), one of which was the development of the ARPANET, a network architecture which, as its inventors wanted, could not be controlled from any centre and was made up of thousands of computer networks (Castells 2010). According to Castells (2010), the creation and development of the internet in the last three decades of the twentieth century resulted from the unique blending of military strategy, big science cooperation, technological entrepreneurship, and countercultural innovation.

The ARPANET went online on September 1, 1969, with the first four nodes of the network being established at the University of California, Los Angeles; Stanford Research Institute; University of California, Santa Barbara; and the University of Utah (Castells 2010). Eventually this would spread to around nineteen hosts (Hafner and Lyon 2003). A small group of representatives from these sites met and formed the Network Working Group (NWG) (Naughton 2005). According to Naughton (2005), the future of the Net rested in their hands, and their task was to hammer out a set of agreed conventions which would govern exchanges between computers in the network. It soon became clear to the students that they should start recording their discussions (Naughton 2005); the notes from these meetings were called ‘Request for Comments’ (RFC) and were a simple mechanism for distributing documentation which was open to anybody (Hafner and Lyon 2003). The work of the NWG was significant. For example, within the first month of its formation the NWG had created the L-O-G-I-N command and host-to-host protocols, such as TELNET, Network Control Protocol (NCP) and File Transfer Protocol (FTP) (Winston 1998). According to Naughton (2005), what this group of graduate students invented was not just a new way of working collaboratively, but a new way of creating software and as a result the fundamental ethos of the Net was laid down in the deliberations of the NWG.

According to Hafner and Lyon (2003: 189), the ARPANET was not intended as a message system. In the minds of its inventors, the network was intended for resource-sharing (a first level effect), to let researchers log on to remote computers and share scarce resources such as large programs, databases, or special hardware (Roberts and Wessler 1970). However, with the invention of networking technology, it became feasible to send data and messages to remote computers (Sproull and Kiesler 1992). Therefore, from the very beginning, it has been clear that the most unambiguously valuable facility provided by the Net is email (Winston 1998). As Sproull and Kiesler (1992) point out, this kind of linking and sharing of resources was envisioned by the creators of the ARPANET, a first level effect, but very little of its capacity was actually ever used for resource sharing (Hafner and Lyon 2003). Instead, to everyone's surprise, the most popular and extensively used feature of the ARPANET was electronic mail (Licklider and Vezza 1978), a second level effect[21].

As a result of networking, under ARPA's umbrella, a growing sense of community was emerging in computer research where researchers saw each other at technical conferences (Hafner and Lyon 2003). While ARPANET was the biggest and most influential network, other systems were being developed around this time such that, as Winston puts it, there were enough "networks in existence for the idea of a network of networks to be born at this conference"[22] (1998: 329). A conference the following year in Brighton, England in 1973 brought together scientists from several countries, some of whom had begun developing digital networks under the support of their own governments (Hafner and Lyon 2003: 187). For this conference, a temporary link via satellite and landline allowed conference participants in Brighton to use ARPANET just as if they were in the United States (Hafner and Lyon 2003).

By this time, the advantages of the ARPANET were becoming clear. For example, rapid electronic communication with colleagues and easy resource-sharing meant tasks that usually took weeks could now be finished in hours and as such the network had become as essential to computer science research as telescopes were to astronomers (Hafner and Lyon 2003). Once electronic mail was available on the ARPANET, large numbers of computer scientists in the US started to exchange ideas rapidly and casually on topics ranging from system design to programming bugs to movie reviews (Sproull and Kiesler 1992). Scientists could choose their colleagues based on shared interest rather than proximity (Lederberg 1978), resulting in the development of a large electronic community, filled with friends who did not know

[21] However, email was not something that was new. As explained by Hafner and Lyon (2003), in the decade before the ARPANET, computer scientists had already devised ways of exchanging electronic messages within a time-sharing system where colleagues could address short electronic messages to someone else's box, where only the recipient could read them.
[22] The 1972 Conference on Computer Communication in Washington

each other and collaborators who had never met in person. Electronic mail blossomed because of the influence of two economic trends that caused both technological breakthroughs and behaviour change: the declining costs of computing and of long distance communications (Sproull and Kiesler 1992).

However, diffusion was still confined to computer scientists, for two main reasons. Firstly, as Naughton (2005) points out, the emerging ARPANET was a relatively closed and homogeneous system as access to it was confined to a small elite working in the Pentagon-funded computing laboratories. Secondly, despite declining costs, in 1973 most computers were mainframes and even the minicomputers still cost thousands of dollars each, whilst the Altair was still two years in the future. As a result, email was thus the domain of a very privileged elite (Naughton 2005). According to Hafner and Lyon (2003:241), the ARPANET was threatening to split the community of computer scientists into haves and have-nots. In 1979 there were about 120 academic computer science departments around the country, but just fifteen of the 61 ARPANET sites were located at universities. Up until the late 1970s funding had been provided predominantly by the military. However, when this funding passed to the NSF (National Science Foundation), a civilian body, connecting to the ARPANET would increase significantly. It would not be until the end of the five-year period of NSF (National Science Foundation) support in 1986, that nearly all computer science departments in the United States, as well as a large number of private computer research sites, were connected. According to Naughton (2005: 170),

> *The development of the ARPANET took place against a background of increasing desire for networking in an excluded community which was possessed of great collective expertise and if Uncle Sam was not going to give them access to his precious Net, then they would build their own and to hell with the government. The story of how they did so is a fascinating case study in self-help, determination and serendipity.*

Therefore, the ARPANET's original purpose (first level effect) was to be available to research centres cooperating with the US Defence Department, however scientists started to use it for their own communication purposes, which included, for example, a science fiction enthusiasts' messaging network (Castells 2010), (a second level effect). As a result it became difficult to separate military-orientated research from scientific communication and personal chatting (Castells 2010) and the Pentagon began to worry about the security aspects of a network in which military and scientific traffic travelled under the same protocols (Naughton 2005). The result was a split in the ARPANET in 1983 into two networks, one for military uses (MILNET) and the other for research and by extension for universities (the ARPANET) (Zakon 2000). However, because users of both networks still wanted to communicate with one another, there would need to be a gateway between the two, which meant that there suddenly was an urgent practical need to implement the new internetworking protocols (Naughton 2005). Eventually, in 1989, the ARPANET was closed down, the year the Cold War supposedly ended (Winston 1998).

By the end of the 1970s and into the early 1980s, other groups outside computer science departments were developing their own networks. For example, in May 1979, a group of non-ARPANET computer departments decided to build a cheaper, slower and less redundant network called CSNET, the Computer Science Research Network (which would eventually be supported by NSF) (Winston 1998). For the first time, the advantages of computer networking were made available to academics beyond the computer science departments. By 1983, with more than 70 sites on-line, this network was financially stable. On the back of this success, in 1985 the NSF agreed to build and manage a 'backbone' linking its five supercomputing centres. Regional nets were designed to feed into what was to become the NSFNET and the remains of the ARPANET were also connected to it (Winston 1998).

However, the development of networks was not confined to the government or academic worlds, as corporations began to create their own. For example, in 1981 IBM created BITNET (Because It's Time Network) (Hyman 2002) for non-science scholars which was a cooperative network among IBM systems. Following the success of CSNET, more networks began to emerge in the mid-1980s.

Still, what is interesting is that all networks used ARPANET as their backbone communication system, but gradually, each network built a gateway to the U.S. Government-sponsored Internet and borders began to dissolve (Hafner and Lyon 2003). Eventually the internet came to mean the loose matrix of interconnected TCP/IP networks worldwide (Hafner and Lyon 2003). By now, all research scientists with NSF support – not just computer scientists - came to believe they were at a competitive disadvantage unless they had network access. The professional advantages to be gained from the ability to communicate with one's peers were invaluable (Hafner and Lyon 2003). The NSF was fundamental in supporting emerging networks. Eventually it agreed to commercial exploitation and on-line services sprang up, such as CompuServe and its rival America Online.

After the development of the ARPANET, the rapid growth of computer networks concentrated on improving the method of transmission and the development of tools for creating and transmitting messages (Hyman 2002). As Hafner and Lyon (2003) explain, the growing collection of networks gradually came to be called the 'internet', borrowing from the first word of 'Internet Protocol', where a distinction had emerged between 'internet' with a small 'i', and internet with a capital 'I'. 'Internet' meant any network using TCP/IP, while 'Internet' meant the public federally subsidised network that was made up of many linked networks all running the TCP/IP protocols. Roughly speaking an 'internet' was private, and the 'Internet' is public.

What enabled this growing conglomeration of networks able to communicate was the use of TCP/IP protocols (Hafner and Lyon 2003). These protocols were invented by Cerf and Kahn in 1973 and provided the mechanism that ushered in 'gateway' technology, allowing different types of network to be connected (Castells 2010). As Berners-Lee (1999: 20) explains, these protocols are in effect standardised conventions by which computers send data to each other. When a computer is ready to send its data, it uses special software to break the data into packets that will conform to two protocols that govern how the packets will be shipped: IP (Internet Protocol) and TCP (Transmission Control Protocol). The software labels each packet with a unique number. It sends the packets out over the phone or cable wire, and the receiving computer uses its own internet software to put them back together according to the labels.

The resulting IP/TCP protocol became the standard for computer communication in the U.S. by 1980 and its flexibility allowed the adoption of a multi-layered structure of links between computer networks, which showed its capacity to adapt to various communication systems and to a variety of codes (Castells 2010). The transition from Network Control Protocol (NCP) to TCP/IP was perhaps the most important event that would take place in the development of the internet for years to come. After

TCP/IP was installed, the network could branch anywhere; the protocols made the transmission of data from one network to another a trivial task (Hafner and Lyon 2003)[23].

Networking also mushroomed because of Ethernet (Hafner and Lyon 2003), a local area network (LAN) invented by Xerox PARC in 1973 (Ceruzzi 2003). Ethernet provided an effective way of linking computers to one another in a local environment. Therefore, it was a practical solution to the problem of how to tie computers together, either on a university campus or at a company. The initial goal for ARPANET was the sharing of computer resources by which individuals would gain access to resources through terminals that were connected to mainframes by time-sharing (Ceruzi 2003). However, local area networks made it possible for large numbers of people to gain access to the internet (Ceruzzi 2003). Although the first decade of personal computing emphasised the use of computers as autonomous, separate devices, by the mid-1980s it became common to link them in offices by some form of Ethernet-based scheme (Hafner and Lyon 2003).

Once networking had ballooned, there emerged an increase in the popularity of mailing lists, enabling communication amongst many. For example, USENET transmitted mail between individual accounts on interconnected computers using a distributed 'bulletin board' like system, where messages were stored centrally in a participating computer, and users, via a specialty program, called a 'newsreader' accessed the messages (Hyman 2002). USENET was successful, growing rapidly from just a few computers to spreading to hundreds of systems throughout the world, but predominantly in North America (Hyman 2002).

The network of networks that formed during the 1980s was called ARPA-Internet and was still supported by the US Defense Department and operated by the NSF (Castells

[23] Among other important developments, not discussed in detail here, include the UNIX operating system, which was invented by Bell Laboratories in 1969 (Castells 2010), but did not become widely used until the 1980s, when UNIX's impact on mainstream computing would occur (Ceruzzi 1998) as a result of adopting the TCP/IP protocol (Castells 2010). UNIX was not a complete operating system, but rather a set of basic tools that allowed users to manipulate files in a simple and straightforward manner (Ceruzzi 1998). It was also 'portable', meaning it could be made to work on many different computers (Hafner and Lyon 2003).
Networking was born on a large-scale as local area networks and regional networks connected to each other and started to spread anywhere where there were telephone lines and computers equipped with modems – an inexpensive piece of equipment (Castells 2010). One of the unintended consequences of UNIX was that it gave a powerful boost to the development of computer science as a reputable academic discipline (Naughton 2005).

2010). Through the first half of the 1980s, the ARPA-Internet resembled a star, with various networks surrounding the ARPANET at the centre (Hafner and Lyon 2003). In 1991, the ARPANET became known as the Internet (Hyman 2002) and by 1992 its popularity had expanded exponentially as the number of computer systems attached to it (hosts) exceeded one million (Hyman 2002). The ARPANET was eventually closed down in 1990 and NSFNET operated by the National Science Foundation (NSF) took over as the backbone of the internet. Yet, commercial pressures, the growth of private corporate networks and of non-profit, cooperative networks, led to the closing down of this last, government–operated internet backbone, in April 1995, ushering in the full privatisation of the internet. Once privatised, the internet did not have any actual overseeing authority (Castells 2010).

Due to the combination of factors outlined above, the internet made its way into general use (Ceruzzi 2002). Therefore, what made all this networking possible was advances in computer technologies, i.e. moving away from mainframes to minicomputers and personal computers, declining costs of hardware, software and communication technologies. As outlined by Ceruzzi (2002), what was of significance was the shift of financial and administrative support from ARPA to the National Science Foundation in the 1980s and then in the 1990s to entities that allowed internet access to anyone, as well as ARPA's support for the development and adoption of the TCP/IP protocol. Also important were the networking capabilities that emerged along with initiatives such as the UNIX Operating System, with its unique nature enabling the possibility for experimentation amongst those who adopted it. However, what had not been anticipated (second level effect) was how advances in personal computers brought that capability to offices and other places outside the academic and research worlds. By the late 1980s those with UNIX workstations, and by 1995 those with personal computers on a LAN, all had access to the internet, without each machine requiring a direct connection to the Internet's high-speed lines (Ceruzzi 2003).

Despite this, by 1990, the Internet was still difficult to use for the uninitiated (Castells 2010). The problem was that all these networking initiatives and schemes were still only useful for those with the technological knowhow; i.e. predominantly computer scientists. According to Naughton (2005: 212-213) on the internet, for almost two decades, email was the driving force behind the network's expansion.

Left to itself, the internet would probably have continued to grow at a healthy rate, but its expansion would have been limited by the fact that in order to use its facilities you had to master a fair amount of computerese. There was lots of wonderful stuff on servers all over the globe, but if you wanted to go beyond email and get at it you needed to know about things like FTP and Gopher and binhex and directories and filenames and a host of other user hostile stuff.

There was very limited graphic transmission capability and it was extremely hard to locate and retrieve information (Castells 2010). However, this was to change as the result of a new development, the 'World Wide Web'. According to Naughton (2005: 238), accessing the Net before the World Wide Web was akin to using MS-DOS or UNIX – 'you could do almost anything provided you knew the lingo, the trouble was that lingo was user-hostile. Computer freaks took to it like ducks to water; the rest of humanity, however, looked the other way'.

World Wide Web

The World Wide Web was developed between March 1989 and November 1990 (Naughton 2005) when a young Englishman named Tim Berners-Lee went back to work at CERN (the European Centre for Nuclear Research), the international particle research laboratory in Geneva. The WWW enables the organisation of the Internet sites' content by information rather than by location, providing users with an easy search system to locate the desired information (Castells 2010). It does this by providing an easy-to-use framework for organising files, such as documents or images (O'Dochartaigh 2002).

Berners-Lee was given the task of finding a way of helping physicists to use the NET more easily and effectively (Naughton 2005). Serendipitously he solved the problem and invented a new way of structuring, storing and accessing information (Naughton 2005). For as Naughton (2005: 233) explains:

"The strange thing is that it all happened because he has a lousy memory. 'I needed something to organise myself, I needed to be able to keep track of things, and nothing out there – none of the computer programs that you could

get, the spreadsheets and the databases, would really let you make this random association between absolutely anything and absolutely anything."

So, in the end, he wrote such a program himself, while on a six month consultancy at CERN in 1980. He called the program ENQUIRE (for 'enquire within about everything').

Berners-Lee and other members of the team also created a format for hypertext documents which they named 'Hypertext Mark-Up Language' (HTML) and was designed to be flexible, so that computers could adapt their specific languages within this shared format, adding this formatting on top of the TCP/IP protocol. They also set up a 'Hypertext Transfer Protocol' (HTTP) to guide communication between web browsers and webservers, and they created a standard address format, the 'Uniform Resource Locator' (URL) which combines information on the application protocol and on the computer address holding the requested information. URL could relate to a variety of transfer protocols, not just http, thus facilitating general interface. CERN distributed World Wide Web software free over the internet, and the first web sites were established by major scientific research centres across the world. One of these centres was the National Centre for Supercomputer Applications (NCSA) at the University of Illinois, one of the oldest NSF Supercomputer Centres (Castells 2010).

However, it would be almost a couple of years before the Web went public. The Web eventually went public on 15 January 1991 (Naughton 2005). Its diffusion, compared with radio and television, was so much quicker. According to Naughton (2005), it took radio thirty-seven years to build an audience of fifty million and television about fifteen years to reach the same number of viewers. But it took the World Wide Web just over three years to reach its first fifty million users[24].

[24] However, what made the internet and WWW more effective was the development of easy-to-use browsers such as Mosaic and Netscape in 1993 and 1994 making communication much simpler (Hyman 2002). Using Tim Berners-Lee's HTTP protocol, computer scientists around the world began making the internet easier to navigate with point and click programs (Hafner and Lyon 2003). New browsers, or search engines, developed quickly, and the whole world embraced the Internet, literally creating a world wide web (Castells 2010). The creation of the World Wide Web along with the emergence of browsers meant that by 1994 the internet had grown far beyond the research experiment initiated by ARPA, as more people discovered its utility it was becoming a household name (Hafner and Lyon 2003). For a full account of the history of browsers and the internet, see Naughton (2005), Castells (2010) and Hafner and Lyon (2003).

What has been outlined above is a brief description of the internet's history and development. What is interesting is that the internet had been originally developed for military use; however an unanticipated consequence was its subsequent widespread adoption changing the nature of scholarly communication. Many of the applications of the internet emerged from the unexpected inventions of its early users (Castells 2010), therefore the Net was unique in the history of telecommunications systems as it was in the hands of its users (Winston 1998). Sterling (1993) argues that the internet hadn't been planned, that it developed the way it did by its users because they had the courage to use the network to support their own values and to bend the technology to their own purposes.

The impact of the internet on the CAQDAS world was very substantial indeed. The next section examines the impact of interactive technologies on furthering the development of the CAQDAS community.

Online Worlds and Networks

As has been outlined in the previous section, the internet is not a single network but rather the connection of many different networks across the globe; hence its name (Ceruzzi 2002: 295). The internet is literally a 'network of networks' (Craven and Wellman 1973) linking people and information through computers and other digital devices allowing person-to-person communication and information retrieval (DiMaggio *et al.* 2001). However, when computer networks link people as well as machines, they become social networks, 'computer-supported social networks' (Wellman *et al.* 1996) providing an arena in which information can be exchanged, shared, discussed and debated, through a variety of channels, such as online journals, forums, conferences and mailing lists. According to O'Dochartaigh (2002:85) "mailing lists are probably the most popular and most useful form of group communication on the internet." He suggests that "neither the printed word, nor the Web, can ever provide as up-to-date or as comprehensive and detailed information as that which people keep in their heads" (O'Dochartaigh 2002: 78). Therefore, it can be argued that the internet has contributed to a shift from a group-based to a network-based society (Wellman 2001). Scholarly networks have moved online (Koku *et al.* 2001) and interactive technologies have permitted the development of online social worlds, in which the activities and interactions previously encountered are more pronounced.

Looked at from the perspective of social worlds theory, online worlds can be seen as 'Social World Systems', which are the largest of worlds and consist of numerous segmentation and intersections of various social worlds (Unruh 1980). As was discussed in the previous chapter, the development of CAQDAS was the result of a number of intersecting worlds. According to social worlds theory, arenas of concern form where representatives of the world or subworld come together to discuss, debate, negotiate and manipulate various issues relating to that world (Strauss 1978: 124). Originally, these arenas for academic life occurred in the form of conferences and seminars. However, as Schneider (1996) suggests, discussion lists can also be viewed as an arena. Therefore, the internet permits the expansion of existing networks and, as a result, connects widely geographically dispersed networks of scholars and researchers, thereby providing a range of possible new ways of working across a number of disciplines (Lee 2000).

This section examines the impact of interactive technologies on the CAQDAS community. Three areas have been identified. Firstly, interactive technologies have facilitated further development of the software. Secondly, they have facilitated diffusion of the technology as knowledge is able to spread more rapidly to a larger audience. Thirdly, as a result of the diffusion of the internet, it can be argued that the internet has permitted the breaking down of boundaries of invisible colleges.

Facilitating Development

Interactive technologies have facilitated further development of CAQDAS, which has occurred for a number of interrelated reasons. These include; the development of new features in the software; the development of new methods and the transformation of existing methods; it has enabled further propagation of CAQDAS by aiding testing and distribution of software as well as providing online support; the emergence of online journals (e-publishing) which is speedier than traditional print journals.

The internet encouraged the development of program features in two ways. First of all, for any given developer it made their competitors' offerings more visible. In the early history of the development of CAQDAS, most emphasis had been on product stabilisation and user-friendliness, as well as the incorporation of new features as computer technologies made this possible, a process that has sometimes been referred to as 'creeping featurism' (Fielding and Lee 1998: 35). The internet makes packages visible to other developers who then have an incentive to catch-up. 'Creeping featurism' is a common occurrence in the world of software development, as according to Fielding and Lee (1998), software companies keep on adding more and more features to a particular program to keep ahead of the competition. With regards to CAQDAS programs, creeping featurism is driven by the interpersonal relationships which came into being between developers and users.

As discussed in previous chapters, what was clear was that users had certainly had some influence on software development but this was by no means the only reason. If developers did not keep up with other developments in new technologies, then they would run the risk of their product becoming obsolete (as was the case for those failing to make the transition from MS DOS to Windows). Users are also more likely to want to have products that provide the latest tools or features, regardless of whether these get used or not. Furthermore, it may also be the result of what led some developers to develop software in the first place, playing around with new features, as explained by one propagator:

> *"There's this sort of jovial idea, sometimes called 'creeping featurism', and certainly that has happened in the CAQDAS field and in many other software fields, but I'm not so sure that's a bad thing. The other side to that is that also, since developers are often sort of 'fiddlers', that's what programmers do, fiddle round with packages and try to make things work, and say "what if I did this and wouldn't it be fun to have that". So, in the work of programming there are pressures towards adding features anyway."* (P1)

Second, the internet opened up new analytic opportunities in qualitative research that could be met by software developers adding features to their programs. As well as visibility, it also provides sources of data and research sites which encourage the provision of features that help to work with those materials. The internet provides the possibility for researchers to capture, study and analyse online phenomena. For the developers, the internet encouraged them to seek and explore new features as they emerged, something that developed alongside other new technologies; for example hyperlinks to Webpages or blog analysis is a fairly recent occurrence. As a result, developers have had to modify their software in order to accommodate and keep up with the latest technological developments/advancements.

> *"I think in a direct way, the internet has contributed in the sense that there are resources that are available on it that the developers want to be able to embed in their software. Some software now provides the possibility of capturing any online phenomenon. For example, if data is on-line and if it's electronic it can be held anywhere and it's not such a cost as having a lot of paper files in someone's library. So, it's possible to do secondary analysis and they need a tool to be able to have a look to see if there's anything that's actually going to be useful to their projects. So, I think that's one very specific thing that needs to happen next to enable people to maximise the use of on-line resources in a secondary analysis and the web's got a role in that. Secondary analysis is a very subordinate activity and qualitative compared to quantitative and I think this will assist people to do more secondary analysis using qualitative data."* (P2)

Therefore, the internet has contributed in more than one way to the development of academic discourse as it provides opportunities for the development of new methods and the transformation of existing methods, to the extent that some have referred to this as 'internet studies' (Jones 1999). For example, one innovation has been the development of e-learning environments, where users are able to learn interactively using a range of online multi-media materials as well as to communicate with other learners and their tutors via email. One propagator discussed how it was something that they were going to try out soon:

> *"If you move now into the e-learning courses, that's going to be a new opportunity that we haven't tried out yet, but which we are going to try out soon."* (P6)

New methods and transformations of existing methods include content analysis of online phenomena such as emails, discussion lists, websites, online questionnaires and focus groups, which were discussed at some length by one propagator who identified three methods; the analysis of emails, online interviews and the benefits of having digitised data and online focus groups.

> *"I've noticed that people are starting to analyse emails and I'm coming across more and more people who are analysing email discussion groups and talking to me about the best way to organise it in the software. What's nice is because they are digitalised, you don't have this transcription problem, and that's a big attraction, I know people that are doing interviews over the internet and someone was recently talking to me about that, that was simply because they couldn't get round physically to interview people from all over the world, and actually they were saying how they have interviewed less over a period of time, because then you can email back and say things, and it's all digitised as well, which is a big plus if you're going to analyse it in a package. Focus group methods using the internet, is a whole different thing and from what I've seen of it, it's interesting, it offers again new possibilities and again it changes the methodology."* (P4)

Another propagator identified the use of 'chat', explaining how they were making use of the internet tool:

> *"We are currently using 'chat', where we have little communities, little groups, for example in one group there are 8 PhD researchers from different cities and we have a mailing list, which is continuously used and every ten days, we have a chat session. Every person in the group may say "the next date I will use this and this is for my interviews and so we may talk about that". Or, for example, they are working with the paradigmatic model, they are in a special state of data analysis and they say this is my model, these are my categories I am using and could we discuss this. We have the transcripts of the 'chats' afterwards, so another researcher can use it for her/his work. This we have been doing for some years."* (P10)

This propagator believed that the qualitative analysis of data deriving from the internet would increase in the future:

> *"With regard to the future, of course there will be more qualitative data analysis of data coming from the Internet. For example, [software] are*

working towards offering a tool for making online questionnaires and analysing, so you can design an online questionnaire and the data concerning open-ended questions is prepared directly for the program and you have no pre-coding, this is all done automatically. This will become more and more so in the future, when you look at the statistics for methodology today, online and telephone interviews are occurring much more often than face-to-face, so this will also count towards the software." (P10)

Therefore, the internet has facilitated the development of CAQDAS as it has encouraged the addition of new features in response to either user demand or to keep up with other technological developments. As a result, this has led to the transformation of existing methods and the development of new methods (such as email analysis or 'chat') has meant that developers have needed to provide tools that can assist is the analysis of these. However, significantly, as the internet provides connectivity and interactivity (Rafaeli and Sudweeks 1998), it has also facilitated the diffusion of CAQDAS, which is discussed next.

Facilitating Diffusion

Writing in 1989, Tesch (cited in Lee and Fielding 1991: p11) observed, 'while there had been no lack of innovation, there has still been a lack of diffusion of qualitative analysis programs and as a result there was a lack of awareness by many researchers of the kind of software available'. However, since that time, the internet has enabled the dissemination of knowledge and information about CAQDAS to diffuse rapidly within the community and it has done this in a number of ways.

Firstly, it has aided in the testing and distribution of software for developers, in that users are able to download demos and software directly from the internet relatively quickly. The developers' sites are also able to provide software downloads, so potential users can 'try before they buy', a feature synonymous with most software packages and not just CAQDAS. The benefit of the internet enabling downloads was discussed by one developer:

"The internet has made it very fast, people can download trial versions, there were no trial versions before, therefore the internet has made it easier to

distribute programs, people know about the programs, for example, they can just type in the web address and find the website, tutorials, trial versions and discussion forums." (D7)

As a result, it has provided an easier and more effective way to distribute and sell the software. Previously, distribution had been problematic in that users were not always certain who they should contact and the process itself could take a while. For example, administrative tasks such as purchase orders and sending payments, both of which can be easily done online. This was something that was highlighted by a number of developers:

"The communication is easier and faster, much faster, and if you have some websites or email contacts, or newsletters or newsgroups, or mailing lists, I think this makes life much easier, you can distribute the same information to a lot more people and of course more information means more efforts. It is just the ease of communication and the reach; you reach a lot more people. It was not possible before."(D1)

For some developers, the distribution of their software was only available online, either directly from the websites, or a distributor's website, as discussed by the following developer:

"It's just the internet right now; it's an easier way to buy software. People would rather right now download it and then if they want a CD, we can automatically have a CD sent to them, and most people are pretty happy with that arrangement, rather than having to wait for something to be delivered by mail." (D5)

Another developer explained how with the internet, their software was able to diffuse:

"The ability to communicate electronically and that probably was a critical factor, being able to talk to the world. Because (software) wouldn't have got off the ground without the internet, because the ability to communicate electronically meant that we could keep talking to all these people all around the world." (D8)

Secondly, it has made the provision of online support more accessible and readily available for existing or novice users, an issue discussed by both developers and propagators. Prior to the internet, seeking help and advice could take some time, as explained by one developer:

> *"It makes it easier to support, if a user has a problem, then they can send an email and get support. That was not possible ten years ago, and then if someone wanted help, they would write a letter or make a telephone call, and as a result it could take a while to get an answer."* (D7)

Support is available in a number of different ways, either directly with the developers, with propagators (consultancies) or through the discussion lists, either software-specific or the more generic Qual-software. For example, as one propagator, who often provides support and advice on various discussion lists, explained:

> *"One of the advantages is that something like almost immediate support is possible, you have a problem, you write a message on the list, it's almost 24 hours somebody is there because it's a worldwide community, so often if I start my computer in the morning, now let's say if I'm still on in the evening, after 6 o' clock, I get all these American messages, so I have to sit there in the evening, or if you start in the morning you see everything that happens while you were asleep, so that's of course the clear advantage, that it's possible to give quick support."* (P6)

Several developers and propagators believed that without the internet, diffusion of CAQDAS would not have been possible. For example, one developer claimed:

> *"It would not have been possible for me to do this I don't think without email and the discussion lists, it just wouldn't happen."* (D3)

Another developer signified the importance of the internet for the diffusion of his software over other methods:

> *"The internet has played a very important role, because when I first started selling [software], the internet wasn't really available then as it is now, and it wasn't the same thing at all, it was just a small research kind of thing, and so trying to sell programs like this, we would put ads in the back of magazines*

such as PC magazines, tiny business size ads, and it costs a lot of money, we would do mailings to professional associations. We had a marketing agency for a while, but they didn't really know what they were doing, it was too different for them, it wasn't what they usually did, so we gave up on them. But it was much harder to market the program then and one of the reasons why I went ahead with this was that I thought that the internet would make it much better for marketing, and I think it has, it's still not really easy, but it's much easier than before, to get the word out for people. We get a lot of hits every week on our site and people download the demo, and I think that probably for at least people have heard about it, that's the way they contact us, and probably many people hear about it through the internet. We ask them, how you heard about it, and in many cases it's a search on the internet, if it wasn't somebody that they knew." (D6)

Some propagators have even suggested that their business would simply not exist without the internet, as explained by one propagator:

"It certainly makes it a lot easier to work with people from different parts of the world, so I can for example offer consultancy to anyone; they can send me their project as an attachment, we can communicate, so I do offer consultancy services. In terms of my business, my business couldn't have happened if the internet wasn't there, I couldn't have started up so quickly if there weren't those discussion forums. I saw this as a great way to get to users, so it's a marketing tool, I don't think my business would have worked if it wasn't just termed right when the internet and these forums weren't in existence, so I know certainly for me, I'm totally internet dependent." (P4)

Another propagator explained how their company only exists on the internet and that everything is done online:

"My company only exists on the internet, I haven't done any marketing, and I didn't have the need for it because I had done it on the side. I don't know whether in the future I would put some ads in some journals, this costs money. Also, the software, this all exists on the internet as companies and are known via the internet, nobody knows the physical office, because they are most likely some basement office or just two rooms that two programmers sit in, no

presentable office spaces and stuff like that. So, that's a way for them to exist." (P6)

However, others (both developers and propagators) thought that diffusion would have been possible without the internet but it just would have been different. Diffusion would not have been as widespread but rather more clustered and concentrated in specific areas, more localised and centralised:

> *"It would have been possible without the internet; the internet wouldn't have been crucial to the whole thing. I mean the internet comes in, in terms of various points where things like, there are user groups for different software products, exchanging information about how they are using them and that kind of thing, and what problems they are having and so on, and all of that is facilitated by the internet. But even if the internet didn't exist, I don't think it's played a critical role in this, everything that in terms of the shift towards using this kind of technology, would have been perfectly possible in a traditional environment, a lot of sales take place by other means, than through the Web."* (P11)

Initiatives such as the CAQDAS Networking Project, which was set up to take advantage of interactive technologies, would also have diffused differently claims one propagator:

> *"If we didn't have the internet, we would probably have had to rely on local dissemination; probably the best way would be to do local workshops."* (P1)

Thirdly, the internet facilitates diffusion through the development of online journals, which have proliferated across the Net in the past few years (Henley and Thompson 1997). After a print run of some 340 years, the scholarly journal has now assumed a parallel digital life (Willinsky 2003). Some of the literature discussing the software such as how to use it, would be hard to publish in a print journal but would be more suitable in an online journal such as FQS (Forum Qualitative Social Research), The Qualitative Report and the International Review of Qualitative Research.

This is because online publishing has clear advantages over traditional print for a number of reasons; it is able to reach a larger more dispersed and multidisciplinary audience; it is able to do this at a much faster rate with publications occurring more frequently than traditional print. It allows the editorial process to occur faster and with less 'space constraints' than the paper-based journal as the participants in the process, the authors, reviewers and editors, can be scattered across the world. The cost-effectiveness of electronic distribution (Baptista *et al* 1999) is also beneficial. The electronic medium and the internet bring a new set of potentialities to scholarly communication and to scientific journals (Okerson 1992; Moret 1997) and incorporate new features like hyperlinking and multimedia (Baptista *et al* 1999). Electronic publishing provides an immediate, hyperlinked, and globally accessible environment that appears to serve journals and its readers particularly well (Willinsky 2003). Furthermore, electronic journals offer readers a particular ease of access as they can readily work across different journals, find exactly where certain ideas are being discussed, or move readily from citation to source. They can copy the article's bibliographic reference, and perhaps a quote or two or press 'Print' or 'Save' the article (Willinsky 2003). Therefore, the internet is able to diffuse knowledge much faster and more widely than traditional print journals.

An example of an online journal (free access) is FQS (Forum: Qualitative Social Research). The founder of FQS, Katja Mruck explains how she came about (with some serendipity) the idea of developing an online journal:

> *"I think I accidentally used the internet for the first time in 1999, there was no purpose, just out of interest, I just surfed the web and I found extremely interesting things. This first experience with the internet made it very clear to me that there was a wide world of researchers and many things I never heard about, for example there were some qualitative researchers in Japan, Venezuela and so on. At the same time I saw that the way the internet was used in these projects, which I thought was rather limited, and so the idea came to start a journal which would provide traditional journal tasks, but combined with internet possibilities. It soon became very clear that this would be a chance to get links between different disciplines and between different countries. I was fascinated and so I started the project, something which has been developing all the time. This was something that the office [university department] realised, that if they only provide the text in the journals they*

> *have used over the years, then the audience is really limited, compared to the audience they will reach publishing with us."*

Baptista *et al.* (1999) suggest that online journals can also complement traditional based journals. Indeed, Mruck explains collaborations between print journals and FQS;

> *"We also have arrangements with many print journals, which we say we will co-operate with, we tell them that we will announce a new issue of their print journal and when it is available and they in return print one page about FQS in the print journal. So, the print journal readers find FQS and our readers find out about these journals and this is something that so far is working."*

Therefore, the power of the internet as a diffusing agent is undeniable. The internet has facilitated diffusion of CAQDAS in three ways: it has aided in the testing and distribution of software for developers and has provided the provision of online support more accessible and readily available. The internet has also facilitated diffusion through the development of online journals, which has meant that knowledge is able to reach a larger more dispersed and multidisciplinary audience at a much faster rate with publications occurring more frequently than traditional print. Therefore online journals have clear advantages over traditional print journals. As a result, it is able to break down the boundaries of traditional invisible colleges; this is examined next.

Breaking down and expanding the boundaries of invisible colleges

Kling (1997) suggests that the benefits of computer networking have provided scholars with the means to share and exchange data, organise online professional discussions, keep in touch with colleagues and distribute documents, such as conference programs and papers. For scholarly communication, the benefits have brought together previously isolated groups of marginal researchers into a wider scientific community and as a result have altered the social dynamics of knowledge production (Hine 2002). It has been hypothesised (Matzat 2004; Hiltz and Turoff 1993; Hine 2002) that interactive technologies will 'open up' invisible colleges and break down the boundaries between those at the 'core' and those at the 'periphery'.

For example, Eveland and Bikson (1988) found that peripheral people who communicated electronically became better integrated into the organisation.

Gresham (1994) argues that what is of interest is the impact of the technology on informal networks of scholarly communication. He argues that the use of email and online discussion groups for informal scholarly communication has expanded rapidly and has moved from physical locations in conference and research centres into 'cyberspace'; the virtual space created by electronic networks. As a result, there has been a shift from invisible colleges to what he calls a 'cyberspace college', a new form of informal research network that will exist alongside traditional invisible colleges. It may therefore help to counteract what is known as the 'Matthew Effect in Science' (Merton 1973) or the 'Matilda Effect' (Rossiter 1993), which postulates that those in the research system who are already recognised will cumulatively be more advantaged compared to those who are less recognised. Therefore, participation in informal communication systems through the use of CMC tools (Matzat 2004) will enable those at the periphery to extend their communication networks (Walsh and Bayma 1996). Such tools allow researchers to make contact with experts in their field, enable them to feel better informed about different aspects of their research field and research community (Matzat 2004) and through this they will be able to increase their opportunities, for example those who are marginal can become more visible to others in their field (Matzat 2004). As a result, cyberspace colleges will enable invisible colleges to increase in size (Matzat 2004), because all researchers, both 'core' and 'peripheral' are able to communicate regularly with known and unknown colleagues who share similar interests (Kovacs 1996, Mailbase 1997). For example, Hesse *et al* (1993) found that the frequency of CMC use by researchers of oceanography was correlated with higher productivity, including by researchers at peripheral institutes. Therefore, as Hiltz and Turoff (1993) suggest, this type of electronic network might lead to a more open form of invisible college with wider participation and faster exchange of information, something which all researchers and interested parties can engage in.

O'Dochartaigh (2002) argues that the internet is transforming for the better the research of people who were geographically marginal, physically isolated from others working in the same area and from important sources of information on their subject.

Communication may play a large part in bringing together previously separated groups of researchers and hence altering the social dynamics of knowledge production (Hine 2002). As Matzat (1998) comments, computer-mediated communication has been seen as the means of broadening or breaking down altogether the 'invisible colleges' that exclude marginal scientists.

The internet is able to permeate, breakdown and expand the boundaries of invisible colleges because it provides visibility as well as connectivity and interactivity (Rafaeli and Sudweeks 1998) and it does this in two interrelated ways.

Firstly, the internet provides visibility. People can search the internet and find information on CAQDAS relatively quickly, whether it's through the developer's own sites or through sites such as the CAQDAS Networking Project (CNP). As one propagator stated:

> *"The possibility of getting informed about the different CAQDAS projects via the internet, but that relates to everything, which is the internet, you can get the information from, draw the information from the internet. At least to know that there are different possibilities and software packages, and especially the newsgroups where users can get information about how to work with CAQDAS projects, what purpose is CAQDAS software and about problems with working with the software. The newsgroups and email discussion lists and the possibilities to learn about, the simple fact that there are several different packages on the market."* (P5)

Another propagator interestingly claimed that the internet not only provides visibility, but as a result, diffuses and democratises power:

> *"The internet helps because it brings information to you. The Net makes you more visible in a way and probably gives you more status, but it makes you less of an anorak. By that I mean if you didn't have the Net, the whole thing would all be a bit more 'techie' and a bit more 'yeah there's this package and I'm the only one who knows about it, so if you want to know about it, you'll have to go through me'. So, in that sense, it's also democratised things, it diffuses powers. With the internet if you don't find one way of getting there, you find another way, it does democratise, and it does diffuse our knowledge.*

What I mean by being more visible is that you know more people know you; your name is known more. I do think that that the democratisation of knowledge is something that's important about the internet." (P1)

For developers, being visible to the world was important:

"For [software] the Internet I think is a crucial factor for its success. You can reach into the farthest corners of the world. You have the chance to be present worldwide." (D2)

Visibility was important as it provided the ability to find out what is going on in other software, something which was important for developers, as one developer discussed:

"The internet makes available everything at the same time, so one point is that also the developers know every time what is new in other software. Ten years ago, we had our meetings and maybe it took two years and then we had another meeting and then we could see all these new things in other software, so with the internet you can see everything that happens." (D7)

The second way in which the internet breaks down and expands the boundaries of invisible colleges is by providing connectivity and interactivity (Rafaeli and Sudweeks 1998), in that it brought the CAQDAS community together as well as others from different disciplines. Both developers and propagators emphasised its importance in connecting and interacting with others, for a number of different reasons.

For one, being able to make contact with potential conference delegates and making conference organisation easier, something which was discussed by both propagators and developers. For example, one developer discussed how prior to the internet, organising a conference was a lengthy process:

"If, for example, you are organising an international conference, ten years ago you had to use normal letters and it took you a long time and nowadays it's all done by email within hours worldwide." (D1)

Whilst one propagator involved in organising some of the early conferences on the topic claimed that it would not have been possible to find all the attendees that they wished to invite:

> *"We would never really have been able to do those conferences without email. It's just transformed the nature of academic communication, it allows you to just set things up and work with things."* (P1)

As a result, being able to communicate worldwide meant that collaboration could occur with others around the world regardless of background, thus decreasing boundaries of invisible colleges. For example, as discussed by one propagator:

> "*I think the most important impact is that it really brought us together. I have had visitors from so many countries and I am in contact with so many people all over the world. I can learn a lot from this and I can plan collaborations and we can share our resources. It is something that is also open to others, for example, quantitative researchers and there is also an increasing number from outside the universities. So, these boundaries are decreasing. So there are different parties involved and they are looking over the borders. Over the decade's, qualitative researchers fought for acknowledgement and I am absolutely sure that without the internet, they would not have been interested. Today, I am in contact with most mainstream researchers, they still do not like qualitative methods, but it's a link, and we started to talk and to establish joint projects, and I think this would not have been possible without the internet."* (P10)

However, for another propagator, a combination of meeting people offline as well as online was also seen as important and beneficial. This was because not knowing who the other person is meant that the personal interaction that is obtained with face-to-face interaction is lost and as a result, some meetings/collaborations may not work without meeting in real-life. Thus, networking may be more beneficial and more productive when meeting people face-to-face.

> "*In that community we at least know each other's faces and not only from a virtual picture, but we have actually met in person. So, I think that is also important that exists besides the internet, that you know who the other person is on the other end. I think it would also be nice for people to meet in real life, but also as we know from e-learning environments, it's not really going to work without at least one or two meetings, where people met in person and*

then you can also go off virtually, so a combination will always be desirable. At some point it would be nice to meet the people behind the messages you see especially if they are quite active on the list." (P6)

Initiatives such as the CAQDAS Networking Project (CNP), a dissemination network, can also contribute to the breaking down of the boundaries within invisible colleges. The CNP was set up to take advantage of the internet's tools, to specifically meet the increasing demand for knowledge and advice that early adopters found themselves inundated with. It has been argued that without the internet, the CNP would not have been possible or would have existed on a much smaller scale. As co-founder of the CNP and co-organiser of the Surrey conference explains, without email, the structure of the CNP and the conference would have been different:

"Email came along at just the right time to allow us, if it hadn't been around we would still have had an international network, but it probably wouldn't have been as well developed. It would have depended on people writing letters to one another, making phone calls and so on. Without it, it would have been slower, and more difficult, harder to get, I mean it was hard enough to agree on the time of the year because of all the people in the southern hemisphere. So, it helped to and allowed the international networks to grow. I suppose we're the first generation of people that have been able to use the network for academic network, the internet for academic network building processes."

The CNP further increases social relations within the community by providing a centralised location for interaction between users, developers and disseminators. The project was set up in order to provide assistance and advice to users through workshops and seminars, as well as providing the means, a discussion list 'qual-software' for the community to interact and discuss the methodological, epistemological and theoretical issues surrounding CAQDAS. The discussion list, as well as others, has been a vital influence in disseminating knowledge about CAQDAS. Through the discussion lists, users are able to obtain advice on a number of different issues, for example ranging from 'which is the best software to use,' to more specific technical questions when using a particular package. For example, as discussed by one propagator:

"A big part of the function of the discussion lists is that users can ask questions and get informed about how to work with CAQDAS, for example to identify the problems with working with the software." (P5)

Eventually developers created their own websites and discussion lists and, as a result, existing users are able to obtain support in a number of ways: websites, discussion lists or help lines. Prior to the internet, seeking immediate advice may have been problematic, as the only means may have been by telephone, or 'snail mail'. A consequence of this was that early adopters had found themselves inundated with requests for help, as one early user and propagator commented:

"It wore out a small number of people that were initially generous with their time." (P2)

The CNP alleviated this and was the main reason why the project was developed. These days, a lot of support is provided online, either directly to the user via email, through 'FAQs' (Frequently Asked Questions) on websites, or through participation in an online discussion group.

Therefore, through providing visibility, connectivity and interactivity, the internet breaks down invisible colleges as knowledge and information is able to reach a wider audience at a much faster rate. As a result knowledge is extended not only to those already involved in that scientific community but to other interested parties as well. However, the extent to which it does break down boundaries is still questionable; for example, some academic mailing lists and forums are for members only – an issue which is looked at in subsequent chapters. Nonetheless, it is without any doubt that the internet is beneficial, not only to scientific communities such as CAQDAS, but to the entire academic community. However, it is not without problems either, which are discussed in the final section.

Negative Aspects of the Internet

Although the benefits of interactive technologies are paramount, there are also negative consequences and potential problems that can be identified, both generally but also specifically for the CAQDAS community.

Firstly, the internet produces a mass of information and as a result can lead to information overload. This is a problem already associated with qualitative data analysis, for example, conducting twenty interviews each lasting for one to two hours long can generate pages and pages of transcript. Furthermore, the information may not always be accurate, or can be misleading and so should be used with caution. For example, 'Wikipedia' is an online encyclopaedia and can offer interesting and invaluable information. However it should be used with caution as anyone is able to add an entry and as such some information may not be factually correct. This problem was emphasised by several of those interviewed, for example:

> *"I'm thinking in particular of the Internet as a research medium and no matter how defective some of the information is that you might find there, at least it exposes people to scholarship, it gets them used to kind of enquiring. With the internet, you can compose a search and you might get a lot of junk back, but at least you've got something, and it encourages you to go a bit further. So I think qualitative people have been particularly open to the internet and that has actually what has helped lay their kind of technological phobia, because when we still find it with CAQDAS, we still have people saying ; 'oh, the machine is taking over'.* (P2)

Secondly, emails are open to misinterpretation, can be accidentally sent to the wrong person, or a private email can be unintentionally sent to the entire list, when the sender hits 'reply to all' rather than the 'reply' button by mistake. Simply by not knowing who your audience is in itself can create any number of problems. Although this is a problem not only found in virtual environments, as explained by one propagator:

> *"That you don't know the other people at the other end, you have these four paths that you can all end up on once in a while, that you send a message that was not intended for the list, it was private. However, this is something that can also happen in a 'real' environment, you can say something to somebody, or someone overhears and was not meant to. Also that something is understood in a different way than it was meant; of course it happens over the internet."* (P6)

Thirdly, individuals may find themselves inundated with requests for help and resultant email bombardment (although initiatives such as the CNP and various email discussion lists have alleviated some of this), as one propagator, experienced on a regular basis:

> *"What I currently experience is that there are so many suggestions to co-operate and there's so much work and there are so many requests, that I have to think about limitations of my engagement. It is necessary to strongly collaborate, but I also think this can be a disadvantage as there is so much work, so many offers and so on, it just makes things difficult."* (P10)

Fourthly, as the internet provides 'visibility' and is able to diffuse information rapidly from one part of the globe to another, any negative comments or feedback could have detrimental consequences, in particular for the developers, as one developer explains:

> *"If it's not working [the software], it may communicate in no time worldwide the negative features."* (D2)

Fifthly, interactive technologies have transformed methods as well as creating new ones and as a result have presented their own problems, which were discussed in some length by one propagator:

> *"A few years ago I was talking to a company who were experimenting with doing focus groups over the internet and there is a special technology you can have to do that. There were some methodological implications about how you run focus groups over the internet, because it's live and there is technology, so you can have the moderator who can see who's speaking. It was quite interesting, so that was going back 4 or 5 years ago when I was in this organisation teaching one of the packages, they were telling me how they had just done this, it was the first time that they had done it, and showed me how they were developing it. So, that's a new method, that the internet makes possible, it is a new methodology."* (P4)

This propagator explained further the problems with analysing emails and defining what constitutes a document:

> *"I suppose the parallel to analysing emails is analysing letters, but letters are a different phenomenon from emails, emails are shorter, the time difference and the fact that with email discussion groups, you know you send one email and you send it to a mass of people and then you can get, so the idea of a thread, I mean one of the questions at the beginning I had to work out what people were saying, I want to analyse an email. One of the questions I had to work out, well what counts as a document if you're analysing an email discussion forum, and what I've decided the best thing to count as a document is a thread, you know a particular theme, and in that document you just paste the person who started that theme and then everyone's response is underneath and that's a document. So, that was a new theme, to conceptualise, what is a document, I mean the emails are too short."* (P4)

Nevertheless, it can be argued that the benefits outweigh the problems and the internet's tools should be treated in much the same way as other research tools, with caution. However, there are some tools of the internet that are open to debate, one of which is the so-called 'internet discussion groups' (IDGs) or 'information communication technologies' (ICTs). These debates along with the criticisms of the software are examined in subsequent chapters which look at the reception of CAQDAS.

Conclusion

The development and adoption of new technologies can result in transforming a scientific community. Sproull and Kiesler (1991) identify a two-level perspective on technology; a first level effect in which the consequences of technology are intended and anticipated and a second level effect, which is often unanticipated and the unintended consequences of the first level effects. As can be seen in the brief history of interactive technologies discussed in this chapter, development and growth were the result of a combination of first level and second level effects.

The impacts and transformations of a new technology can have anticipated and unanticipated effects. At the first level, the effects of a new technology are the anticipated ones – the intended purpose of the technology. Second level effects are often unanticipated and include new uses, new ways of working and living, new skills and new ways of thinking about a technology. Therefore, the second level effects are the unintended consequences of the first level effects. This perspective, put forward by Sproull and Kiesler, is re-examined in the next chapter, which looks at the first and second level effects of CAQDAS, as well as identifying possible third level effects arising as the result of both the first and second level effects.

With the emergence of interactive technologies, an online CAQDAS world emerged which would transform and further develop the scientific community. Interactive technologies have been beneficial to the CAQDAS community in two main ways. Firstly it has enabled further development of CAQDAS packages as developers have increasingly incorporated more and more features, for example, enabling online content such as email, discussion lists and weblogs to be downloaded for analysis. Secondly, by its very nature, it has enabled the dissemination of knowledge and information about CAQDAS to diffuse more rapidly. It has done this in two ways; by aiding in the testing and distribution of software for developers and in general by providing greater visibility in that people can search the internet and find information on CAQDAS with relative ease and speed. This is something which can be done through the CAQDAS Networking Project or the developers' own sites. As a result of its diffusion, the internet expands the boundaries of invisible colleges, enabling anyone with an internet connection and interest to participate in discussions that were once confined to seminars and conferences. The extent to which this occurs however is debateable and will be examined in subsequent chapters.

Chapter 7 Reception of CAQDAS

Introduction

Predicting the potential consequences of any new technology is extremely complex (Sproull and Kiesler 1992). Since its inception, little empirical work has been done on the *effects* of CAQDAS. Aside from Tesch (1990), Fielding and Lee (1995; 1998), Mangabeira (1995) and Mangabeira, Lee and Fielding (2004), the literature on CAQDAS still contains relatively few accounts that focus in a detailed way on the different kinds of user (Mangabeira *et al.* 2004) and their reception of CAQDAS. Given that computer assisted qualitative data analysis software (CAQDAS) have been around since the early 1980s, it is now possible to examine the impacts and transformations this technology has had on the traditional craft of qualitative research methods in the social sciences.

It has been argued that computer packages for the analysis of qualitative data have brought many advantages to the traditional craft of analysing qualitative research (Fielding and Lee 1998). As a result, they have addressed some of the methodological issues that challenged qualitative researchers. It is also without question that CAQDAS has encouraged new ways of analysing data, the reception of which have been met by some with enthusiasm and interest. According to Fielding and Lee (1998), software use for analysing qualitative data largely seems to have gained 'social acceptance' amongst qualitative researchers in the social sciences. CAQDAS has substantially raised levels of computer awareness and use among qualitative researchers, a group traditionally sceptical of computer based methods (Mann and Stewart 2000).

Yet, despite widespread use amongst qualitative researchers, scepticism remains and CAQDAS is questioned with regards to methodological and philosophical issues, whether through a misunderstanding or ignorance of how computers might be used in analysis, or a certain technological conservatism (Lee and Fielding 1996). This chapter examines the reception of CAQDAS, both the social acceptance and the scepticism; the resulting debates and contestations. In doing so, it draws on the work of Sproull and Kiesler (1992) and their two-level perspective on technology, previous empirical work as well as my own empirical investigations. The impacts and transformations of a new technology can have anticipated and unanticipated effects, where the first level effects are anticipated and intended and the second level effects are unanticipated and unintended. It is also possible to talk of third level effects; ones that have occurred as the result of both the first and second level effects of CAQDAS. This ‘three-level perspective’ on technology can be useful when looking at the reception of CAQDAS, the intended and unintended consequences.

First Level Effects of CAQDAS

According to Sproull and Kiesler (1992), the first level effects of a new technology are the anticipated planned efficiency and productivity gains. These were the intended effects that the developers of CAQDAS were aiming to create with the development of their products, with the overall aim of improving the research process. It was intended that the software would provide a more efficient way of doing what a researcher would do manually, i.e. transferring the manual analysis to the computer, making it a faster, more reliable and replicable process, as explained by both propagators and developers:

> *“It’s really an old technique used with manual methods for hundreds of years, transferred to the computer, making the work much more convenient and simple, and leading to enhanced trustworthiness of results.”* (P5)

For developers, it was seen as a means of transferring what was done manually to the computer, but making the process easier, an intended purpose of developing software, for example:

> *“For me, it just made it easier to do the things I was doing anyway, because that’s what it was designed to do.”* (D3)

CAQDAS has improved the research process in a number of ways, as identified by quite a few developers and propagators.

Firstly, the software provides the opportunity for researchers to work with more data, as highlighted by one developer:

"They [researchers] couldn't do what they do now without a tool like this, they wouldn't have even tried to talk to as many people. It allows you to do more stuff that you wouldn't have been able to do previously." (D5)

According to Tesch (1990), it offers the ability to handle large quantities of data with relative ease and as such, researchers are no longer tempted to disregard new data because its incorporation would necessitate a lengthy and time-consuming process of recoding. Data management was discussed at some length by a number of propagators, as a way of alleviating the amount of data that fieldwork can produce:

"Everybody is in the same spot, you come back from fieldwork, you're overwhelmed by data, what do you do? You need some tool to help you." (P8)

Secondly, it also facilitates team research because data and fieldnotes can be shared electronically (Fielding and Lee 1993). This is something that is useful to researchers who are 'out in the field':

"We've made it a lot easier and a lot more possible to do things, made it possible to deal with large datasets and to do team work more and those kinds of things, and so incrementally we've made some advancements, and I think that some of the kinds of tools that the various packages have, to some extent are making it possible to ask new questions." (D6)

Thirdly, some software, such as MAXQda, allows for a mixed methods approach combining both qualitative and quantitative methods. Ragin and Becker (1989) argue that as both quantitative and qualitative researchers are no longer dependant on mainframe computers, the traditional gulf between 'variable-orientated' (quantitative) and 'case-orientated' (qualitative) researchers will tend to narrow. For both groups, the micro-computer encourages closeness to data and an intensive, interactive analytic style.

A fourth aspect is that the software offers a less tedious and time-saving analytical process, something which was discussed at some lengths by both propagators and developers. For example, time constraints resulting in the possibility of inadequate research, as the following propagator makes a comparison between computerised methods and manual methods.

> *"It was tedious and it was very demanding if you were going to go about it systematically, which means I think, that a lot of the time corners were cut, in particular by people that were established in the field. When you're a full time academic you realise how many conflicting pressures there are, that have absolutely nothing to do with your discipline, the thing that brought you in there intellectually, doing all these other administrative duties. What this means is that there is very little time to do things properly and I think for most people, pre-emergence of qualitative software, their PhD was their major exercise in doing it right; thoroughly and systematically. One project I was working on [using the software], took seven or eight months to work out the codebook and to get it all working and so it enabled me to find what I needed out of all the data. Otherwise, I would have been ripping through piles of paper all the time, trying to find things. Having sort of worked in that manual way, you can see what you have to do to be systematic and you can then appreciate the clerical data management features that there are in the software because it can do all do that in a few seconds. All those things that I've laboured over are seen to; you don't need all this colour coding and all the rest of it."* (P2)

For this reason, some propagators and developers claimed that they would not consider going back to manual methods:

> *"I think just knowing those packages are out there, I would be really foolish to do it manually without, there's no reason to, it's not like pushing it in one direction and forcing you to study it in a certain way, there's a lot of mechanical things, keeping track of things that the computer does a lot better than we do. I think most qualitative researchers feel that way now."* (D6)

From their empirical investigations, Tesch (1989) and Lee and Fielding (1998) did find that CAQDAS provided the opportunity for a less tedious analytic process, saving time and offering the possibility of a more refined and replicable analysis, thus increasing a researcher's productivity. For example, the computer has been typified as a tireless, endlessly efficient clerk who never forgets (Gerson 1984) and as Brent (1984) argues, a computer will do anything which is possible on paper but more easily and more efficiently.

Therefore, computers provide a speedy means of recording data in a written form and permit it to be retrieved very rapidly (Fielding and Lee 1993). For example, recorded interviews on a digital tape can be easily transferred to the computer, and so there is no need for manual transcription which is a time-consuming process. What this suggests is that the software provides an efficient way of managing vast amounts of qualitative data. However, CAQDAS can offer more than just data management as has been discussed both within the literature and by a number of interviewees. In particular, what the software has alleviated is one of the most tedious aspects of the research process and that is the coding procedure. According to Barry (1998), it has helped automate and speed up the coding process, as new codes can be added at will or material coded in several different ways at once and at the same time (Fielding and Lee 1993). Therefore the use of software alleviates the mechanical process of coding, permitting time for analytical thinking, as the following quotes suggest:

> *"It's not as tedious as doing it by hand, you can actually keep your attention span longer, because if you're using a highlighter or whatever it is to actually mark out the bits of text to which the code applies, that can be done in a few seconds. If you're doing it manually, you're literally getting out colour pens, rulers and things like that, and it takes longer to do, so there's less thinking time, more mechanical time when you are doing it manually."* (P2)

However, in contrast to this, another propagator thought that the initial coding process itself using a software package was still time-consuming, but what was an improvement was the means of retrieving the coding segments:

> *"On the one hand it makes the data storage and the data organisation more cumbersome, to code all the data is very time consuming, but it offers quite more possibilities to work with the data, the possibility to get pieces of text by one press of a button. In former times this would mean browsing through all the material and saying, 'OK, where did I put this, where was the quotation,*

and this was somewhere' and you go to the file folder and browse through 120 pages etc, so in that way it makes the analysis process much more easy." (P5)

Therefore, in this way, by alleviating some of the tediousness associated with qualitative data analysis, the analytic process is facilitated by allowing the direction of mental energy towards analytic rather than mechanical tasks, thus allowing the computer to encourage researchers to 'play' with the data, a process that fosters analytic insight (Tesch 1989; 1990). Barry (1998) supports this view, suggesting that the software also provides a formal structure with the option for writing and storing memos, enabling a more efficient analytical process as it aids more conceptual and theoretical thinking about the data. Furthermore, as discussed by Becker *et al*. (1984, cited in Fielding and Lee 1993, p3), it offers flexibility, for example, ideas which occur to an analyst some time after the data collection process can be inserted at the appropriate place such as in previously entered fieldnotes. Fielding and Lee (1993) too argue that the software provides a more efficient means for analysing data. They argue that the computer will make it easier to find deviant cases or to locate small but significant pieces of information that may be buried within a larger mass of material. For example,

> *"It can perform manipulations, it will take you hours and hours, but it can do things that you would find it very hard to keep in your head, or it'll be so tedious you'd never be able to make yourself do them and it can do that in a few seconds, so you can do a kind of analysis which is more discriminating and transparent that you wouldn't have been able to do on just paper-based methods."* (P2)

However, at the same time, it may lead to a loss of what Richards and Richards (1989) have called the 'untypable'; the notes, doodles and marginalia that grant analytical insight (Fielding and Lee 1993). However, it is quite likely that the computer is used alongside handwritten notes and doodles and some software packages provide a tool for writing memos.

Researchers carrying out secondary analyses of qualitative data are able to perform additional in-depth analysis of existing data to apply a new perspective or new conceptual focus (Heaton 1998). Also secondary analysis may be useful in research on sensitive topics or where the research population is elusive, thus omitting earlier problems (Fielding 2004). However, reanalysis of qualitative data can be seen as controversial due to a number of problems, as identified by Fielding (2004). Firstly, some data may not be accessible as the result of commercial confidentiality or legal documents, therefore resulting in 'gaps' in the dataset. Secondly, due to the context in which the data were originally produced where original thoughts and evaluations cannot be reproduced. Researchers will have entered the field and collected their data with particular interests in mind. Thirdly, most qualitative researchers will code data in rather similar ways and as a result come up with broadly similar themes. However, there is still room for disagreement and most researchers will prefer to receive data in its raw format (as would some quantitative researchers using existing datasets). Fielding (2004) concludes that researchers would prefer to carry out an original study thus enjoying the advantages of having 'first bite of the cherry' and in documenting the 'new' rather than focusing on previous knowledge.

Finally, the use of computers and software was seen by some propagators and developers as leading to more reliable research. In addition, the software offers replicability, credibility and validity to the research process. Replication was something normally associated with quantitative methods but which, as a result of the software, can also be applied to qualitative research. For as suggested by Conrad and Reinharz (1984), the computer makes easier the reproduction of analytic procedures, potentially increasing the validity of research, as well as permitting the possibility of secondary analysis. For example, in the same way that a quantitative researcher can use existing survey data to run new statistical analyses, a qualitative researcher can use previous interview data that was collected by another researcher to form part of a new investigation. The following quotes demonstrate how this could be achieved:

> *"It helps with credibility, trustworthiness, validity. You are able to structure it and work on it the same way, whereas before, it was very difficult to structure and categorise the text by hand, that could take years. It is helpful as it provides an overview; you're able to get a grasp of the different parts of text, looking for similar topics and connections between the data. You code the data and then it's very easy to get the coded segments out of the data within*

> *several seconds, so it's much easier to find that connection, or to find relations within the data."* (P5)

One developer explained how it can make qualitative data more systematic:

> *"In qualitative research, you have to talk more or you have to present your findings in a more persuasive way. This is something which these tools help to be more convincing than if somebody simply writes something down. I have analysed this field and I think that so and so and so, and with tools like [software] you can say, here I can show you step by step how I approached these theories and findings, so you have some kind of legitimisation for your findings and background."* (D2)

While these first level effects are seen by advocates of CAQDAS as offering numerous advantages to the potential users, those adopting a more critical stance disagree. These views, along with other unanticipated effects are discussed next.

Second Level Effects of CAQDAS

Adoption and Acceptance of CAQDAS

An anticipated response to a new technology is scepticism. Indeed, Winston (1988:11) has gone so far as to suggest, 'as a society, we are schizophrenic about machines'. However, what are unanticipated are the types of scepticisms that arise. In particular, academia is seen as a conservative place where new ideas are seldom accepted easily and novel ways of re-examining old findings are often greeted with scepticism (Wellman and Berkowitz 1988).

According to Merton (1973), scepticism is one of the norms of science. Merton (1973) argued that conflict habitually appears whenever science extends its research to new fields, towards which there are institutionalised attitudes or whenever other institutions extend their area of control. Sismondo (2004: 21) suggests that 'organised scepticism' is the tendency for the community to disbelieve new ideas until they have been well established. New claims are often greeted by an array of public challenges.

For example, a presentation at a conference may be followed by fierce questioning, or scientists might discriminate between work that is worth publishing and that which is best left unpublished (Merton 1973).

This scepticism can also be applied to innovations of new technologies, whereby early adopters of these technologies may be ridiculed by others as can be seen in the early reception of past innovations such as the radio and computer. For example, Naughton (2005: 11) describes how the first radio enthusiasts were ridiculed as they were seen as 'cranks with their weird equipment', and internet enthusiasts were also ridiculed as 'socially challenged nerds' or 'anoraks'. Likewise, a number of propagators and developers experienced a similar reaction when talking about 'computers and qualitative research' as the following quote illustrates:

> *"I said, maybe I could do something on computers and qualitative research and he looked at me with that look at that time people gave you when you mentioned computers and qualitative research."* (P1)

There was a belief amongst some in the academic community that computers and qualitative software were not a match, as one developer experienced:

> *"They all kind of looked at me funny and said it couldn't be done"* (D4)

Naughton (2005) suggests that there is a dichotomy in people's attitude to the internet; those who use it are, in general, pretty enthusiastic, whilst others seem hostile to, fearful about or ignorant of it. Hafner and Lyon (2003: 89) argue that computer programming in the 1950s was still so new that few people understood its intricacies and many scholars who worked in the more traditional sciences ignored (or dismissed) those who were exploring computers as a science. Even the founder of Microsoft, William Gates, whose own software had achieved widespread usage by 1990, was yet to acknowledge the internet as a useful tool (Hafner and Lyon 2003: 260). This dualistic response to technology was no exception for CAQDAS, as the following quote demonstrates:

> *"There was a long battle, a lot of angst about it; is this changing what we're doing and causing us to not do true qualitative research? I think for the most*

part those were well intentioned concerns, but it really isn't the issue I don't think." (D6)

The early adopters were enthusiastic about the use of computers, whilst others were suspicious of its suitability as a tool for qualitative analysis. It was seen as something belonging in the quantitative or positivistic paradigm. Tesch (1990: 4) argues that for many researchers "qualitative analysis was a much too individualistic and flexible approach to be supported by a computer, that a computer would do exactly what qualitative researchers wanted to avoid, a standardisation of the process that mechanised and rigidified qualitative analysis." Those adopting a more quantitative stance tend to question the reliability and validity of qualitative methods. Thus, hostility to computer approaches further divided researchers into 'sceptics' and 'enthusiasts' and still does so (Fielding and Lee 1993). As CAQDAS evolved, reception to CAQDAS varied and changed over time and as a result these groups of sceptics and enthusiasts can be further divided into a number of different groups, ranging from the enthusiast and early adopter, to the laggard and sceptic. Only by looking at the development of a scientific community over time can these different groups be more easily and clearly defined and this is outlined next.

Typology of Use

According to Pinch and Bijker (1990), different social groups are inevitably involved in technological innovation. All members within each social group share the same set of meanings that are attached to a specific artefact. Each group will have their own interpretation of what the technology is and what problem it is trying to solve (Allen 2000). However, each group will consist of 'consumers' and 'users' and as such each group will have different needs and so may influence the process of development differently (Pinch and Bijker 1990). There will also be groups that are opposed to the new technology. Each group will play a critical role in defining and solving the problems that arise during the development of an artefact because of the different meanings they attach to it. Only once the various groups have been identified can the process of development be better understood. Once the relevant social groups for a certain artefact can be identified, what follows next is to identify the problems that each group has with respect to that artefact and in doing seek solutions, which may be numerous, in response to that problem (Pinch and Bijker 1990).

The first-level effects, rather than second-level effects are more likely to reach ‘closure’ as discussed by Pinch and Bijker (1990), where, for example, technical problems, such as bugs in software, are resolved. Pinch and Bijker (1990: 13) argue that countless problems will emerge throughout an innovation as the technology is invented, developed, expanded and improved. However, it will be various groups that will decide differently not only about the definition of the problem but also about the achievement of closure and stabilisation (both concepts were discussed in chapter 2).

With CAQDAS, three broad groups have so far been identified; developer, propagator and user. However, developers and propagators can be users as well; therefore a more useful distinction is the categorisation of users proposed by Mangabeira, Lee and Fielding (2004) derived from their empirical investigations into the adoption and use and representation of computers and qualitative research[25]. These three distinct groups of users, as identified by Mangabeira *et al.* (2004) are ‘program loyalists’ (MacKenzie 1990), ‘critical appropriators’ and ‘experienced hands’. However, from my own empirical evidence, three more categories can be added to these three groups; pioneers, non-users - laggards and sceptics – late majority.

Mangabeira *et al.* (2004) found that reception of CAQDAS was related to two factors. Firstly, generational differences in terms of age, computer literacy and experience as a qualitative researcher and secondly, previous experience with non-computer based methods of analysis and/or range of CAQDAS packages (Mangabeira, Lee and Fielding 2004). This generational difference was discussed by one propagator:

> *“The way in which we use the programs has a lot to do with your own background, whether you’re a novice, IT user, whether you’re an experienced qualitative researcher, so it’s contextualised within your own background, your age, the generation you’re a part of, how much computer literate you are, which allows you to re-appropriate the software differently from a novice user.”* (P8)

[25] Research consisted of interviews and focus groups with over 60 users of different CAQDAS packages, as well as an analysis of more than 1,500 evaluation questionnaires from participants in training courses organised by the CNP.

These six categories of users are discussed next.

Pioneers

The core group of developers and early users identified earlier in the thesis can be seen as the pioneers of CAQDAS, which can be likened to Rogers's (2003) category of 'innovators'. According to Rogers (2003:22), "innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than the other members of a system." These innovators have extensive interpersonal communication networks and are at the centre of these networks, they are able to cope with higher levels of uncertainty about an innovation and so are the first to adopt a new idea" (Rogers 2003). Rogers' category views innovators as venturesome as "their interest in new ideas leads them out of a local circle of peer networks and into more cosmopolite social relationships, [some of which] may be quite geographically distanced" (P282). Furthermore, "the innovators must also be willing to accept an occasional setback, when a new idea proves unsuccessful, as inevitably happens" (p283).

However, Wiles *et al.* (2011: 593) argue that "diffusion in qualitative research methods is marked by a far greater adaptation than in Rogers' classical model: much innovation in social science research methods involves adapting established methods rather than inventing completely new methods." Wiles *et al.* (2011:596) identify a number of different claims to innovation, one of which is the 'pioneering' claim. This type of claim, according to them, is "based on the development of new methods for social research that are viewed as, to some degree, departures from, or additions to, existing methods. The opportunities to develop these new methods related to technological developments and the motivation for development was to explore how new methods afforded by technologies can be used in social research."

The categorisation by Rogers (2003) does provide an explanation for the characteristics of the pioneers of CAQDAS; they were innovators, venturesome and networkers. They were also subject to scepticism and open to scrutiny, for as Rogers (2003: 26) suggests: "the most innovative member of a system is very often perceived as deviant from the social system and is accorded a status of low credibility by the average members of a system." Nonetheless, as Rogers (2003: 283) proposes: "while an innovator may not be respected by other members of a local system, the innovator plays an important role in the diffusion process: that of launching the new idea in the system by importing the innovation from outside the system's boundaries."

The opportunity to develop software tools for qualitative data analysis was presented to the pioneers for various reasons, which was explained in a previous chapter. As Wiles *et al.* (2011:600-601) discuss, for some researchers there is an excitement about being an early adopter of methods that are perceived as new and 'cutting edge'. For the pioneers of CAQDAS, this was most certainly the case.

Program Loyalists

According to Mangabeira *et al.* (2004), 'program loyalists' were predominantly younger, most likely to be PhD students and have considerable computer literacy. They were 'loyal' to the program as they failed to acknowledge the initial investment of time required in learning the software and the problems encountered by users when trying to understand and apply computer-based methods. This therefore meant that the production of some PhD theses and research reports were delayed (Fielding and Lee 1998). In some cases, users were frequently reluctant to drop software use in favour of manual data analysis. Despite high levels of computer literacy and their perception of CAQDAS as non-threatening technologically, these users generally lacked a critical stance towards the strengths and weaknesses of the package they used.

A number of propagators found that there was a marked difference in the level of computer literacy between those coming to workshops in recent times than in the past, suggesting that it was the internet and home computers that had made a difference, as one propagator discussed:

> *"The level of computer literacy of people coming on the courses is quite different now to what it was five or six years ago [c. 1996/97] where there would be certain populations of researcher who would be extremely under-confident using computers and now there's no comparison.* (P3)

The propagator goes on further to say that it was the PhD students that have been at the forefront:

"I think I have seen a big change in the type of people, I have to say that it's the PhD students who have led the whole thing as far as I'm concerned, in any department, it will usually be the PhD students who are the people demanding the help and support and the use of the software packages, because they're much more tuned in to what's out there and what's available and they're much more possibly computer literate than their supervisors, that's not always the case of course. It's just that the PhD students will be much more ready and have the time to take on something new than those teaching the methodology or supporting their substantive subjects, so I think they've had a big role in who's used it and what type of people have used it." (P3)

It was suggested by several propagators that the reason for a generational difference was that computers were not available before and that (newer) generations who had already grown up with computers would be more confident. For example:

"By the sheer fact that they are Windows compatible, by transferring the skills that you know as a Windows user...to the package...and if we compare to the past again that now the novice user, whether he or she knows about CAQDAS, when they sit down and they start using it, they're already able to use it completely different from when my generation started using it, because you can transfer the skills that you have of other packages and you don't feel that insecure". (P8)

This propagator discussed further that the technology itself had changed, enabling transferable skills, whereas when computers first came on the scene, a user had to learn a new program as each was different:

"My generation every single program you learnt, you had to learn it from scratch. The layout would be particular and specific, so every single thing you learnt you had to learn from that particular program, if you became more confident with your own capability of overcoming problems, you took that confidence and therefore it allowed you to play and fail and then progress. But it was literally, they were fragmented pieces of skill and knowledge. Nowadays because we're all IT competent, when we sit down we learn the program from a different kind of step and that's very helpful." (P8)

However, over time, it is possible that those who may have been categorised as 'program loyalist', rather than adopting a package, may look at it more critically. This may be the result of greater awareness, for example as the following excerpt demonstrates:

> *"When I teach qualitative research methods, I mention in the field methods sessions at quite an early point, or first session that we will be doing some stuff on qualitative software and these days people don't say 'what's that' or just look blank. Many people have already heard of it or they're broadly aware that it's around and so by the time they hit postgraduate stage, they're conscious that it's part of the educational scene and I think that many undergraduate courses, not the majority, but quite a few, now includes some sensitisation training. If not actual training in use, they're at least told that there is such a thing."* (P2)

Therefore, what this suggests is that 'program loyalists' still exist but not to the extent outlined by Mangabeira *et al.* (2004) and that they may be more critically aware due to training in research methods. Those without training may adopt a less critical stance.

Critical Appropriators

According to Mangabeira *et al* (2004) 'critical appropriators', on the other hand, adopted a critical stance towards developers' claims about program capabilities and interacted with programs from within a comparative framework. As such they were highly aware of epistemological and methodological issues. It was this group that were able to find creative and innovative ways of using the software based on an understanding and thinking through of what the program could do for their data rather than the other way around[26]. It might be that this sort of orientation is important to the diffusion of many kinds of innovation but particularly in academic fields because of the norm of scepticism.

[26] All propagators in the interviews can be seen as falling into the group of 'critical appropriators' in accordance with Mangabeira *et al's* (2004) classification.

Some propagators explained how they would at times vary between using manual and computerised methods, thereby suggesting an understanding of what is most appropriate to use for certain types of research, whereas a 'program loyalist' might opt to use a software package each time. For example, as one propagator explained:

> *"When I'm in a hurry I still use manual methods, because I will have a project with very little data and I need a quick result. So, I'm not going to bother putting that into the software, just scan it through, identify possible themes and codes and I can do that on paper in an hour or so, so I'm not going to bother with the software."* (P2)

Similarly, another propagator explained how one PhD student adapted the use of software to suit his own style of working:

> *"I'm informally supervising someone, he's a mature student, he's already a professional, an academic, but he still doesn't have his PhD. I told him about one of the programs that I thought would be very helpful for him to analyse his data. He's computer literate and he welcomes IT. Nevertheless, the use that he's making of this program is totally different from all of the capabilities of the program. He's using a very specific feature of the program and I think part of the explanation is that he's already an established researcher, he knows what he wants from his data, but manually limited because there are a great number of interviews – so he just needed a kind of simple way of organising his data. Once he got that, he's not using the software any longer."* (P8)

Experienced Hands

The third group of users identified by Mangabeira *et al* (2004), 'experienced hands', were older researchers, and hence more experienced in the manual analysis of qualitative data but who had acquired their computer skills later in life. As a result, they were more hesitant than younger users in their interaction with the hardware and the software but exhibited a greater critical and reflexive awareness about package use. This was realised by one propagator who stated:

"A big resistance to this and has been so from the beginning is amongst the people that are established in the field. Whether they're frightened or they have genuine reservations about it, are quite scathing about qualitative software, they have those kinds of naïve criticisms, about the machine taking over." (P2)

This propagator put forward an explanation as to why this group may be reluctant to use software:

"I really think that the kind of people that choose qualitative methods many times are running away from numbers because they were not comfortable with statistics in their first degree, they didn't like the idea that they had to be able to do a chi-square to pass a first year methods course. They'd do anything to get away from numbers, but they still want to be researchers and contribute in that way and so qualitative is a big opening for them. So they get in there with something that relates to kind of text based skills that they do have and then someone turns round and says, yes, but, the new way to do this is with computer software and so they're right back in the same worrying situation then, feeling deskilled. Now, I can say this, because I am an example of that. I'm deeply uncomfortable about working with statistics. So I understand that background and I think it's there and in a lot of the people that we see, so you've got to have a kind of reassurance job with them, you know that it's not threatening in those ways, it's not going to tell you how to do the analysis, it just provides you with stuff which you can ignore if you want." (P2)

Another reason may be that those that were already in the field had already developed a viable means of analysing qualitative data manually and so were resistant to using computers. For example, as discussed by one propagator:

"what's interesting is that the experienced practitioners have been slower to take up software, it's really the one's new to it, who are taking it up and I think, I'm not sure why that is, it could be that people have developed their well tested methods of managing qualitative data and so they are reluctant to learn something new. It could also be that those types of people don't have to use computers much anyway and so there's a bit of computer phobia." (P4)

Another propagator shared a similar view:

> *"People that have analysed qualitatively in the past and have had to do it a certain way using traditional methods, they've worked out a system that works for them and they enjoy it. It's like any other craft, it works. Then there are those that have come into it already aware of computers and have had to take on board the methodology, but with this background of computers affecting everything they do and I think that computers do affect everything everyone does. So, the people who learn the methodology with the expectation of using computers may not bother with the manual method, and there are more and more people that are expecting to do things with the computer"* (P3).

Although, there may have been some who had tried the software but gave up and resorted back to manual methods, as explained by one propagator:

> *"In the end, it's kind of a waste of time, I mean I know people who have abandoned it and gone back to paper, because they didn't understand that they could do the thing they were doing on paper much more efficiently, but they just didn't realise it could do that, or how it could do that."* (P4)

Therefore, the generation that has grown up around computers and are used to using computers on a daily basis are less likely to think twice about using a package to analyse qualitative data and as such may fall into the first group 'program loyalists'. However, those that have used manual methods over a long period of time may be more hesitant to adopt new tools and fall into the category of 'experienced hands'. For it can be argued, if one has developed an effective manual framework for analysing data, then why change it if it works?

However, it can be claimed that the number of researchers choosing the manual method of analysis will decline. As the 'older' generation retires, they take with them the traditional craft of analysing qualitative data, as suggested by the following propagator:

> *"Gradually, the population that do it in a more traditional way will become proportionately less and less."* (P3)

This is not to say that non-computerised methods will not remain, rather the view that 'I have always used manual methods, or I used manual methods before and it works etc, will disappear, not the 'I don't agree with computerised methods for epistemological or theoretical reasons'. One propagator suggested that some of the 'older generation', whilst not adopting the software themselves, may acknowledge its benefits to younger users:

> *"As long as you have these old generation professors in departments, unless you have some people who want to see it's necessary for the young ones, they won't use technology anymore, but as soon as these move out and young people move in, who are now slowly grown up with computers and that's necessary, you'll probably see more of that. I got some more future looking people now who expect, for example, a professor who says that I'm probably not going to work with the program myself. She sits in the workshops and she wants to know how to work it, but she's probably not applying it herself in her own research, but she wants her young people, it's necessary for them to learn it so that's why she invites me for the benefit of her younger researchers, because she said that's something they need in the future."* (P6)

Therefore, to some extent, reception of CAQDAS can be seen as generational, and as these older researchers retire, scepticism and resistance becomes less, a process of attrition occurs, as the following propagator discussed:

> *"That situation is changing via attrition, I think there's a generational change happening, so I think there are still a lot of the same folks who resisted the software initially, still are, but it's been around for twenty years, and a lot of them have retired. I think there are fewer and fewer holdouts, I encounter the scepticism less and less often, and I assume without doing the empirical work, that has more to do with new generations being trained and being active in their research community, than it does people converting. But whatever the cause, I encounter the resistance and scepticism much less."* (P9)

Therefore, this third group, 'experienced hands, as identified by Mangabeira *et al*. (2004), may disappear as new generations appear. However, it can be argued that another group exists, consisting of those researchers that simply choose not to use CAQDAS, a category that can be referred to simply as ‘non-users - laggards’.

Non-Users – laggards

Laggards tend to be traditionalists and tend to be suspicious of innovations and change (McMaster 2000). They are “the last in a social system to adopt an innovation and can be seen as near isolates in the social networks of their system” (Rogers 2003: 284). According to Rogers (2003: 284), resistance to innovations by laggards, may be rational from their point of view, as they “must be certain that a new idea will not fail before they can adopt.”

With regards to CAQDAS, this group does not necessarily have certain reservations about using software, but rather see manual methods as most appropriate, whether it’s because manual methods may be a personal preferred style of working or seen as more suited for certain types of methodologies. One developer described why a colleague chose not to use software:

> *“One of my colleagues will not use a computer to analyse his data, he says ‘I really like the idea, there’s something about working with paper, and you also use a different part of your brain when you’re writing and that’s the creative part he loves to write with and think with’. But, the other thing, he’ll say to me, ‘I could be going through a lot more iterations or something, a relationship in the data, I know it’s going to take me two weeks to look at the relationship, I know if I had a computer, it would take me an hour’, and he says ‘I know that I can look at 6 or 7 relationships pretty quickly’, and he shows me the pile on the desk, it’s the mechanical aspect of literally going through all that paper is what he’s doing, manually. The sheer, mechanical aspects of going through, but he says ‘there’s something I do when I go through that paper, it’s just different, not better, not worse. The idea that the technology is somehow superior, it depends, it also depends on that person’s own way of thinking about it, own epistemology, own positionality of the researcher’. He has his own style and who is to say it’s better or worse, it is*

what it is. His notion is, it's a craft, and as a craftsperson that's his positionality." (D5)

However, non-use may also be a lack of awareness, for instance, where CAQDAS has not been diffused to that field, and/or within particular countries, (for example see Carvajal 2002; who looked at users of CAQDAS in Colombia). Also, it may be that manual methods are seen as more suitable for smaller projects or the type of analysis, e.g. conversation analysis, as discussed by one propagator:

"Qualitative research such as discourse analysis or conversational analysis; it's not very useful to use computers." (P1)

Therefore, in accordance with Mangabeira *et al's*. (2004) classification, 'program loyalists' are the most likely group to adopt a package without questioning its suitability. Whereas 'critical appropriators' and 'experienced hands' are more likely to assume a more critical stance, but not necessarily resulting in non-adoption of a package. However, 'non-user' can be identified referring to those that do not use a package because of a personal preference or not deemed a necessity for whatever reason. To this, a further group can be identified, those that do directly oppose the use of computerised methods. These can be put into the category 'sceptics'.

Sceptics – late majority

According to Rogers' adopter categories, the sceptics are (2003: 284), "the late majority [who] adopt new ideas just after the average member of a system. Innovations are approached with a sceptical and cautious stir, and the late majority do not adopt until most others in their system have already done so."

With regards to CAQDAS the category 'sceptics' refers to those who directly oppose the use of qualitative software, whether it's the result of a methodological or theoretical perspective. For example, when asked about people's reaction to the software, one propagator commented:

"I don't think we should underestimate how kind of reserved and in some cases actually hostile people are." (P2)

Similarly, another propagator replied:

> *"There is resistance, I think this is something logical, it is partly associated with statistics, and all this is not qualitative research."* (P10)

It was found by Mangabeira *et al.* (2004) and from interviews with propagators and developers that 'critical appropriators' and 'experienced hands' were the most likely groups to raise issues about using CAQDAS for qualitative research, whereas 'program loyalists' were most likely to experience problems with the technicality of using the software in carrying out their research projects. Those sceptical of CAQDAS were most likely to hold the most reservations and contest the use of computers for analysing qualitative data. This group is examined further in the chapter 'contestations and debates about CAQDAS'.

Sproull and Kiesler (1992) suggested that second level effects tend to be the unintended consequences of the first level effects. The second level effects of CAQDAS range from technological problems, some of which have been resolved, to methodological and theoretical issues. Owing to the diffusion of CAQDAS over time and the increasing diversity of the user base, some issues have not been resolved, nor is it likely that they will. However, as Pinch and Bijker (1990) suggest, some effects have stabilised whilst for some resolution has only occurred for some groups.

Technological Problems

In the early history of CAQDAS development, the first packages did have technological problems in some shape or form, such as bugs or program crashes. Whilst this might be an anticipated response initially and therefore a first level effect, (i.e. that a newly developed program has a higher risk of problems and the developers realised that there were some bugs that needed fixing), what was less anticipated were the responses by users (second level effects; the unintended consequences of the first level effects), as some were eager to help, whilst others were frustrated. The reaction to this was twofold. Firstly creating problems for those that were less comfortable with computer technologies, as the following excerpts demonstrate:

"It was probably a bit more traumatic for everybody in the sense that qualitative researchers are not a wonderfully computer literate bunch and so probably had more problems with the software than they should have had, so people were bound to moan and groan." (P1)

Secondly, frustrations occurred due to the instability of the early software:

"There were people that were very angry, by their first experience of the software and found that it wasn't stable. There were particular routines in some of the software that had claimed that it could do, but frankly it simply couldn't, or it might have been able to do on the best specification machine while operated by the developer in a precise and particular way and this wasn't adequately explained to the many, many users trying to use the software on low specification machines and simply failed." (P2)

Any program in its infancy is in the 'beta' stage of the development process, thus informing the user that it is a work-in-progress. However, as the developers originally developed the software for their own use, such technological problems were not considered a priority at the time. It was only when others began to use the products that the developers realised that some sort of product stability was necessary and part of that process would come as the result of product development, as emphasised by one propagator:

"It is the case anyway, in software development, that part of the cycle of software developers is getting feedback from users and beta testing and debugging and so on; it's a kind of fairly natural part." (P1)

The early adopters were instrumental in providing feedback to the developers and as such felt part of the developmental process, as explained by one propagator:

"They did rely on the patience of early adopters a lot and they generally rewarded these people with the status of beta-testers and they got the upgrades quicker and so they felt incorporated and patient with it." (P2)

The developers' response was a series of subsequent upgrades and new product development, resulting in the fixing of these technological problems. For example, *"With something like [software], which wasn't ready when it was released, again the changes may have been user-led because the developer would receive comments about what things didn't work and at what moments the software crashed."* (P3)

Later packages, such as Qualrus, placed advertisements on e-mailing lists seeking 'beta-testers', people to test the software for problems such as bugs.

However, even though a program may have gone through beta-testing, it is still possible for 'bugs' to remain. These 'bugs' may only be identified once a user selects a certain function or combination of commands and because the bugs are unknown at the time, are unanticipated. This phenomenon is common to most software products, the response to which is an upgrade or a patch, usually free, or sometimes a complete new version of the package, resulting in an increasing sophistication of the software, something seen favourably by some users, as one propagator explained:

"I would rather a more sophisticated package than a less sophisticated package." (P1)

However, with subsequent versions and the growing sophistication of each upgrade the problems with bugs and other technical problems was minimised and the products stabilised. As a result these problems were resolved, as discussed by one propagator:

"I think the main problems in the past were relatively straightforward overcome technical problems. Software would fall over easily, there were poor help features, some things were not installed, and products were put on the market too soon. So, there were a whole host of technical problems, and I think we're much less likely to encounter these now, certainly the fundamental operations, there is no reason at a technical level why they shouldn't be completely robust." (P2)

Nevertheless, despite the minimisation of such technical problems, it is not entirely unheard of for some current programs to experience unforeseen problems, unintended consequences that may result from incompatibilities with other products that the user may have. For example, the type of computer, the RAM, the operating system or other software, may all have an impact. As an illustration, recent versions of SPSS require a lot of space, old computers with low processing capabilities will not be able to handle the software. Similarly, an adequate computer is essential as CAQDAS has advanced and some software is able to handle audio and video files, thus requiring more space and speed, as explained by one propagator:

> *"Certainly, with the more advanced features, which is the on-line capture stuff I was talking about with [software], that is extremely difficult and all the developers when they state the requirements will indicate the minimum. But really, whatever you're planning to run, you should run it on the best machine you can possibly afford, with the most memory and everything else."* (P2)

Upgrades were necessary to get rid of 'bug' problems, but were also necessary for the product's survival to keep up with other changes, such as the emergence of Windows 95 and the internet. For example, one developer explains why it was crucial for the developers to make the transition from MS DOS to Windows 95:

> *"Each software developer which made that switch is still on the market, whilst others that did not, have vanished."* (D1)

Therefore, as technological problems have arisen, they have been dealt with and a solution found; either an upgrade or patch, or a completely new version. However, the process of software development and technologies is that it is a dynamic process, it is something that is changing constantly and as such new problems will present themselves. So, the process to find a resolution to the problem starts again[27]. So technological problems once found can be dealt with and resolved but as new ones present themselves, the end result is not one of closure. Rather as products mature and reach sophistication, the result is stability (Pinch and Bijker 1990). For the developers of CAQDAS and their products, this was no exception.

Technological problems are ones that affect all types of user; however, there are some problems in particular that a novice researcher may experience. These are examined next.

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[27] For example, after data collection was completed, a new operating system emerged, Windows Vista (2007), where developers had to adjust their products accordingly so that it was compatible with Vista. At the time of writing, Vista had some known problems which were subsequently resolved with the next upgrade and a patch in the interim had been released. This may have been consequential for CAQDAS, but if there are any consequences, these have yet to manifest themselves.

Novice Users

A shared concern frequently discussed in the literature on CAQDAS and in the interviews, were the problems that a user, particularly a novice, faces when coming to use a package for the first time. This type of user can be seen as falling into the category of 'program loyalist' discussed earlier. A common problem identified was confusion over choosing which package to use, a concern expressed by one developer:

> *"I think the problem that exists and existed, is the wide range of software, it's very difficult to select the software which fits one's needs, it's still a problem."* (D1)

Certainly, if a comparison is made with, for example statistical software, or word processing packages, there are only a few that can be listed as popular and holding a dominant position within the market, e.g. SAS and SPSS.

A second problem facing a novice user is a possible misunderstanding about what the software can and cannot do. For example, one of the expectations that novice users may have is underestimating the time of preparation and analysis necessary when using a program. As Miles and Huberman (1994) point out, although CAQDAS may assist with data management, a first level effect, working with large amounts of unstructured textual data may result in 'data overload' if not managed properly. This may lead to what Mangabeira (1995: 129) refers to as a 'seduction of computer operations that may easily divert attention from the logic of research design and the adequacy of the analysis'. For example, although some computer packages are considered more user-friendly than others, programs vary in how they let you enter data, either by typing the text directly into the program or the data is typed into another program, such as a word processor. Also, when formatting any data, some packages have strict formatting rules, such as singly spacing text, character limitation, and insertion of special characters. As a result, preparation requirements can be labour intensive (Weitzman and Miles 1995) and the outcome of the analysis less effective. CAQDAS was developed to alleviate these problems. However, what was perhaps not anticipated was that researchers would take on more data to analyse, as explained by one developer:

"I think people are able to analyse larger amounts of data, but I think that one of the problems is that they're not using qualitative data analysis for what it is really meant to be used for and that means going into the data in depth. What often happens is that people instead will sacrifice high volume for in-depth analysis, and they'll decide that they want to do a lot more, and they won't go in-depth." (D5)

Furthermore, the time spent on analysis also depends on the amount of data that is going to be analysed, the type of analysis the researcher is going to do and the expertise of the researcher in using the software. A consequence of this is that the user may find they are running out of time, a problem identified by one of the propagators:

"Quite a lot of them will start off with every intention of using a software package, but will then run out of time, because they haven't factored in enough time for the analysis process and the most difficult point at which to use a software package is when you have just learnt it and you haven't got enough time to apply it, so I think for many people who have just started, they may not make much use of the CAQDAS package the first time they use it. Increasingly this is changing and I see a huge difference between when I first started teaching and now in the level of readiness and also just expertise in the people that come to the courses, although there is the presumption in most cases that software will be used. It's not very clear to me that it is used effectively on that first project and the first project is usually when I see them." (P3)

A third problem that a novice or inexperienced user may experience is the technical terminology that is associated with each package, adding the possibility of further confusion, for example, the use of terms such as 'in vivo' and 'hermeneutic unit' in the packages N8 and Atlas.ti respectively. These issues tended to be highlighted by propagators, for example:

"I think the trouble with the developer's websites is that they use their own language to explain what's in the package and so you have to learn a new language when you're learning a new package. So, therefore, it's hard, because you go to the website and a lot of the terms used to explain what the

> *package does and what it features are not very meaningful. The developers could simplify their language, but I think it's hard for them to do it because they know their package inside out and I think they forget what's not obvious to someone completely new to a package."* (P4)

As outlined above, it is clear that a new user may face certain problems when choosing a software package and using it for the first time. Mangabeira *et al*. (2004) argue that the problems novice users may experience occur partially due to a lack of understanding or experience in using the software.

This is something that some advocates of CAQDAS argue can be alleviated by training in research methods and in the use of software. In the early days of CAQDAS, training sessions and workshops for users did not exist or were in limited supply. As a result, many users taught themselves how to use the software and some went on to teach others, becoming 'experts' in the field. The consequences of this are manifold, as a couple of propagators explained:

> *"I did teach myself, there was no one to teach me, I taught my first software and there were a lot of people like that, they were out there on their own teaching themselves the software, and I guess because I fell into a lot of traps and I had a lot of misconceptions, the early teaching that I did helped me become a better teacher later on because I went through all the confusions that everybody goes through."* (P3)

In particular at the time of learning the software, most were also learning to use computer technologies:

> *"It took me ages to figure out how to use the [software], partly because of my own ignorance with IT, I was a novice computer person, but partly because things were just in their beginning, you were kind of following the development and each new version you were excited about and saying well let's see how they solve this problem or that problem."* (P8)

However, an increasing adoption rate led to an increasing demand for workshops, resulting in the development of initiatives such as the CAQDAS Networking Project (CNP), as well as the gradual emergence of a number of consultancies, some of which were set up by those early ‘experts’, such as QUARC, SdG Associates and ResearchTalk. All these provided assistance to users, both the novice and more advanced user, in overcoming some of the aforementioned dilemmas.

These days, workshops are plentiful. As a result, it can be argued that some of the problems that novice users may experience are only temporary and can be resolved. Nonetheless, the problem remains for those that do not seek assistance but insist on ‘going it alone’. Whether this is because of time constraints or a lack of financial resources, or previous relevant experience, or simply deemed as not necessary, some users do not attend workshops. As a result, this may lead to poor research practice and the possibility that the use of computers might tempt qualitative researchers into ‘quick and dirty’ research with its attendant danger of premature theoretical closure (Fielding and Lee 1993: 8). This issue of the ‘lone ranger’ was highlighted by one propagator:

> *“The problem is, a lot of people try to learn it themselves, they are reluctant to do training, because I do get people who try to learn it themselves and then they come to my training because they get frustrated and there is reluctance, they think they can learn it themselves.”* (P4)

As well as workshops, help and support is also available by telephone, email and online, the latter of which may be through developers’ own websites or consultancies, as well as through internet discussion groups (discussed in next chapter). Therefore the issues outlined above can be addressed and resolved. Despite this, those more critical of CAQDAS, the ‘sceptics’, still argue that there are a number of misconceptions that a novice may encounter, which are more difficult to resolve. For instance, MacMillan and Koenig (2004) argue that as a result of the confusion that some users may experience, a number of misconceptions may arise whether through a lack of knowledge about research methods or through a lack of precision in the literature (e.g. describing the software as analytical). For example, one misconception is the belief that analysis is achieved simply by organising data into hierarchical categories within the software program (Carvajal 2002, Crowley *et al*. 2002, Thompson 2002). MacMillan and Koenig (2004) claim that within the literature on CAQDAS there is the impression that analysis is actually done by the software, referring to this as the ‘wow’ factor, rather than emphasising that CAQDAS is a tool for organising data (Coffey *et al*. 1996), not a method of analysis. This view of the 'wow' factor implies that the better the researcher is at working the program, the better the analysis. This issue was discussed by one developer, who found that some users were under this impression:

> *"You get all these newcomers coming into qualitative research and analysis that have no training, no experience, who fall into the trap of 'wow' this program does qualitative analysis. No, it doesn't, it is an extension of your scissors and your glue pot, nothing more, nothing less."* (D4)

However the assertion that the literature creates this impression can be debated. As the above quote suggests the software is only a tool and is only useful if the user knows how to use it. Rather the misconception implies a lack of training and knowledge in research methods, a topic discussed by one propagator:

> *"It's not a way in itself of doing qualitative research, it's a tool or set of tools that allows you to do what you want to do as a qualitative researcher. Which is again partly why we've always taken the view that you have to know what you're doing, you have to understand what your own stance towards qualitative research is, so that you can know how to use the tool effectively, you have to understand yourself as a qualitative researcher and what you do before you choose the tool."* (P1)

Kelle (1997) argues that CAQDAS does certain tasks for the researcher, such as data administration and data archiving but only provides assistance in the theoretical thinking and analysis itself, which is as it has always been, the job of the researcher. This view was expressed by another propagator:

> *"When we say we're using the computer, you're only using the computer to help you along with the process that's manual and mental anyway."* (P8)

For example, Carvajal (2002:4) found that when looking at inexperienced users in Colombia, when asked what they expected from the software, the reply was to 'use the program to analyse our data'. This does not necessarily indicate a problem with the literature, which aims, as it should, to provide a variety of viewpoints but perhaps a lack of training in social research methods. It was mentioned in the interviews that workshops in some countries were in limited supply. As diffusion of CAQDAS continues, this problem is increasingly being addressed and CAQDAS is diffusing to other countries, as discovered by one propagator who also found that people would travel, at times some distances, to come to a workshop:

> *"You get a tremendous range of people from all over the world. It's amazing the number of people who travel internationally to come to one of these workshops. So, at the workshop last summer for example, probably had about half a dozen students who were more from Africa, half a dozen from various countries in Asia, Latin America. A lot of people are already postdoctorate and they are coming back because most graduate programs haven't really taught people how to do this stuff.* (P9)

Therefore, as Barry (1998) suggests, each package has different effects on the analysis process and thus transforms the data in various ways, encouraging diverse ways of thinking about data and theory (Weaver and Atkinson 1994). According to Weitzman and Miles (1995: 3) there is no computer program that will 'analyse' your data, 'computers simply make it much easier for people to think about the meaning of their data'. Furthermore, Fielding and Lee (1991) argue that what is being computerised is the mechanical aspect of qualitative data and the essentially interpretive work of generating codes is a task left to the analyst.

Therefore, as outlined above, it is apparent that a novice user of CAQDAS may experience problems when first embarking on a research project, particularly if they have not received any training. But it can be argued that this is a common problem for any novice user using a new tool. For example, whether it is a statistical package such as SPSS or a word processing application such as MS Word, without training the user is unlikely to be aware of the full range of features available nor how to use these effectively. However, as CAQDAS workshops nowadays are plentiful and less costly for students, help and support is available. As well as workshops, support is provided online by developers' websites where manuals and tutorials can be downloaded, through dedicated customer support lines and consultancies. Even doing a research project for the first time creates its own problems, therefore, why should qualitative software be any different? Some of these problems experienced by novice users are also experienced by users outside the social sciences, for similar reasons.

Usage outside social sciences

Another theme found in more recent CAQDAS literature and one that was discussed at some length by both propagators and developers, is the increasing adoption by users outside the academic social sciences who tend to approach qualitative analysis in their own way. Mangabeira *et al* (2004) identify two new categories of users: those engaged in applied social science research and those involved in research that is not based in social science. This widening adoption has been seen by both propagators and developers as inevitable and an anticipated part of the evolutionary process of a developing field.

> *"The population has widened and I think that's just been a natural progression of how many different people are using computers. I think it was bound to happen."* (P3)

Health was seen as one key area where the rate of adoption had expanded:

> *"You do get the impression that far more people in business are using CAQDAS now. There's quite a big population of GPs using software because GPs will do their own research projects or team research projects. We tend to get a lot of GPs coming on courses now, and maybe more coming from slightly more unexpected areas like epidemiology and pharmacology, those sorts of areas where you'd think why would they have a need for a CAQDAS package that they're coming and obviously it's not just to do with CAQDAS, it's to do with the nature of their research projects and how they've changed, because there's much more emphasis on the usefulness of qualitative data now than there ever used to be."* (P3)

Several developers and propagators thought that CAQDAS was expanding outside academia, such as various government ministries in different countries. One developer explains:

> "*Some of the people work for companies, so I think mostly academics, but there are some people in corporations, maybe marketing firms, or perhaps*

public non-profit social sector firms. The ones who come to the beginning workshops, sometimes they are just getting into qualitative research, and so they're learning about qualitative research and about my program, and other people are very skilled, they've used something else for years, and they're thinking about ours now, or they used ours, now they really want to go to the next level. It's quite a range of people." (D6)

Furthermore, a few propagators described how fields that were once seen as predominantly quantitative were now carrying out more qualitative research, as the following quote illustrates:

" I think it's had an impact in areas that have traditionally been quantitative and wouldn't consider using qualitative methods, to use qualitative methods and to use the software because of a misperception that somehow if you're using software, that qualitative researchers know are more valid and all that and that's based on a misunderstanding, of the fact that the software doesn't do the research, you do it and you can do poor qualitative research using the software just as the way you can do poor qualitative research not using the software. So, I think in those areas like in health research in particular and management research, I think it's had an impact in encouraging more people to do qualitative research. I mean it's an interesting chicken and egg question; because there certainly has been an increase in the popularity of doing qualitative research. I think certainly in areas that have been traditionally quantitative like health, management, psychology, it has had an impact, because certainly, I know people tell me this, that their professors are quite happy that they are using a package and somehow that makes it OK to do this kind of research now." (P4)

Similarly, another propagator argues that as a result of the software, qualitative methods have expanded and become more popular. In some cases a reversal has occurred; where qualitative methods were once used as a pilot followed by more rigorous quantitative research, the opposite is now happening.

"Qualitative software has undoubtedly helped extend the practice of qualitative methods into applied and evaluation work where it had a role, but

a very subordinate role in the past, rather like surveys will usually have a qualitative pilot stage, many evaluation projects had a small amount of qualitative research and one of its major functions was to provide juicy quotes to illustrate what was coming through from the statistical data and so it was quite a subordinate role, now you get proposals to government departments which will actually be to do with evaluating major policies or programs which are purely based on qualitative methods, or you'll get a reversal of the old situation, where quantitative work is used in the pilot stage to identify the variety of types of participation in a program and then each having been identified as a group through the quantitative stage will be studied in detail using qualitative methods, so the convention of research design has been stood on its head." (P2)

The implications of this widening user pool were discussed at some length by both propagators and developers. One of the issues arising was the need or lack of training in qualitative methods for this group. In particular, there was disagreement among propagators and developers about training for this new diversified generation of users. On the one hand, the argument was that if no training was given and the user had no previous training then the user would have difficulty in using the software appropriately and be able to carry out good research. On the other hand, the argument was that the user would make their own use of it according to their background and skills. It could be that they might be using it in new ways (second level effect). For example, as illustrated by one developer:

"I would have to say yes and no [to training]. Yes, I think it's certainly important if they're going to be doing qualitative research and I think for the most part, that's what we want them to do and that's what they want to do and so they need to learn how to do that, and then pick a tool to do it. But, I think there are some people who may be using these programs, who aren't social researchers, who are dealing with unstructured data, but it's not necessarily the same thing we're doing, and to the extent that there are people out there who have other tasks that are worthwhile tasks, that involve keeping track of large amounts of unstructured data, why not let them use the tools, even if they have a different agenda. I don't think that we want to have them calling it

qualitative research, but I think some of them honestly don't hear about that and don't want to do that, they just want to do what they need to do in their company and to make sense of the data." (D6)

Nonetheless, it was still viewed by some that, regardless of background, some training continued to be necessary in order to make appropriate use of the software, for example:

"If you don't have previous training as a researcher what sort of use are you going to make of the software and you tend to use the software as a method rather than use it as a tool." (P8)

A further issue, as discussed by another propagator, was the risk that those not trained in qualitative methods may be under the impression that training is not necessary, that qualitative analysis can just be done fairly easily, particularly by those from a quantitative background:

"There's a notion out there unfortunately, that there is a general bias I think that qualitative research is unscientific and people who have been trained in quantitative methods generally assume that we'll get this qualitative data and then we'll figure out what it says, it doesn't cross their mind that there are systematic, valid and reliable ways to analyse qualitative data, the concepts of reliability and validity apply in qualitative research and people just don't realise that. So, many people just assume that they can just go and do it without learning the methods." (P9)

The disagreement about whether training is necessary to users outside the social sciences suggests that regardless of whether CAQDAS is being used 'appropriately or not' or how it was initially intended, or the purpose for which it was intended, is perhaps irrelevant. The software is a tool and can be used for whatever the user requires. If they are familiar with their theoretical framework, then they are able to see how the software can be used, regardless of field, particularly as research is increasingly becoming more multidisciplinary and less confined to one discipline. However, what can be argued is that a user may not be aware of the full potential that the software can provide as a result of lack of training. One propagator thought that because usage was expanding to other areas, the developers should modify their software accordingly and make it more user-friendly, such as the interface. For example, changing the nature of the package to suit the business world, as current terminology does not mean anything:

> *"I think maybe the software has to be developed differently for that market, it has to be more user friendly, it has to have a better interface and to be easier to set things up, if it really wants to succeed in those markets. It's also I think people recognising that the kind of work they are doing is qualitative analysis. I was talking to a freelance market researcher in this country who was a bit suspicious of the packages, but when I showed her what they could do and also a paper I wrote that sparked off in her mind about how companies keep a lot of documentary information, in an ongoing way, needing ways of analysing that information and using these packages are a good application. So, it's sort of like thinking across applications of how the packages could be used and I think she's right. I think basically it's down to the developers to show the applications to the business world of these packages, because unless you show them, they're not going to make that leap themselves, and calling it CAQDAS or qualitative software packages, doesn't mean anything to them, so you have to find a new form of words that describes what it does, that relates to what they do."* (P4)

This propagator saw the increased usage of software by others as the next stage in the process of evolution, of development, with researchers finding new ways of working with the software:

> *"I began to see experienced qualitative researchers using the software in new ways and seeing new possibilities and it's only happened fairly recently. The software has been around long enough for those people to learn it and become involved, to be confident to test it and to play around. It's only just happening now and still it's a minority. I actually now see people using it in new ways that has methodological implications, because the software allows you to do things that you can't do manually, like every technology, like when I started to do qualitative research, we were taught that you took notes, you went into the toilet to take down notes, you remembered everything and you had a little notebook. It was relatively new to have tape recorders. The technology of*

having tape recorders has had an impact on the type of qualitative research you do, so you have to have transcripts and now qualitative research is mainly focused on interview methods, but there are other qualitative approaches, like observation. With the technology in video becoming more developed and more accessible, I think that we're going to go back to observation because it's going to be something that the technology will make it easier for us to do. So the technology does have an impact and the same with qualitative analysis that, although originally their design is based on some manual methods, there are things that the computer does, that you can't do manually and that affects methodologically what you can do." (P4)

Whilst it may be evident that technological problems occur which can be dealt with and the dilemmas faced by a novice user can be alleviated, what are more difficult to resolve are the methodological and philosophical debates that arose with regards to CAQDAS. As diffusion of innovation spreads, it becomes open to criticism as well as adoption. Criticism can be of various types; such as constructive criticism and academic debate, which is most likely to be put forward by the 'critical appropriators' and 'experienced hands', or it can be directly in opposition to the use of software in qualitative methods, and this falls under the category of 'sceptics'. As suggested by Tesch (1990: 2), 'research does not take place in a neutral environment. It is guided by assumptions about the nature of knowledge, and it has political antecedents and consequences.'

Methodological and philosophical debates have existed since the early development of CAQDAS and, despite a lessening scepticism, still continue to the present day. Although some of these debates could be anticipated, such as scepticism towards using computers in qualitative research, others were not anticipated and only became apparent as knowledge about CAQDAS increased to other social worlds, for example, those outside the academic social sciences. These effects were used by those who were sceptical as further ammunition regarding the use of software for qualitative analysis and can be seen as third level effects of technology which are a combination of anticipated and unanticipated effects. These are the effects that occur as the result of the original first and second level effects and are examined next.

Third Level Effects of CAQDAS

The third level effects can be defined as those that have occurred as the result of both the first and second level effects of CAQDAS and are of a more methodological and theoretical nature. If the first level effects are planned and intended uses of a new technology (for example, the development of CAQDAS was to alleviate some of the problems associated with qualitative research), the second level effects are the unanticipated and unintended consequences (such as the type of scepticism and type of user), then the third level effects, which are also unanticipated and unintended, are the philosophical debates about how CAQDAS should be used or whether it should be used at all to analyse data. The third level effects could not occur without the first or second level effects.

The debates and contestations about CAQDAS vary in intensity and are an indication that some groups are simply cautious of using CAQDAS, such as the 'critical appropriators' identified by Mangabeira *et al.* (2004) and so may or may not become involved in the debates, whilst others directly oppose the use of computers in qualitative data analysis: the 'sceptics'. Each of these groups will have a different view of CAQDAS. As Richards and Richards (1993) and Tesch (1990) suggest, there are many varieties of qualitative researchers from different disciplines in the social sciences and increasingly outside it, each with differing approaches to drawing conclusions from qualitative data and thus different needs for software features. A consequence of this is that qualitative methods pose different theoretical questions and operate within different theoretical frameworks. Different problems will also arise for different groups.

The third level effects of CAQDAS are transformation of methods; usage of all features of a software package; and issues relating to closeness to data and coding and grounded theory. This last will be discussed in the chapter 'debates and contestations'.

Transformation of Methods

Despite differing views, one effect commonly addressed amongst certain groups of the qualitative community is 'to what extent will the adoption and usage of computerised methods change the craft of social research in unanticipated ways'

(Fielding and Lee 1993: 6) and if so, what are the implications. This was something discussed amongst the interview respondents, who held differing views. One developer argued, perhaps somewhat controversially and in contradiction to the others, that it had completely changed social research methods.

> *"In my opinion, this is indeed a new technology, a new method of data analysis and I would say that ten years ago or five years ago, I would also have said that this is only a tool. You can do completely different types of analysis with these programs. This is something new and something else. For me, an indicator is, if you take a handbook, any handbook, psychological methods, sociological methods or whatever, if the hypothesis is that this is only a tool, the tool should be or would be treated in each chapter, you would have a chapter on grounded theory, and there would be a section about using software to make grounded theory. But, in most of the handbooks you find a chapter in qualitative software, so I'm coming more and more to the idea that it is a new method and a quite popular method, more popular than the other methods that are treated in these handbooks."* (D7)

One propagator took a slightly different stance, arguing that it had created new methods and was a part of the evolution of methods, rather than being a method in itself:

> *"I actually now see people using it in new ways that have methodological implications, because the software allows you to do things that you can't do manually, like every technology. I see methodology as constantly evolving, I find it quite exciting, that's why I like being in this field."* (P4)

Contrary to this, another propagator argued that it had simply been a matter of computerising manual methods:

> *"Most improvements I've seen in the last few years in my opinion are technical improvements, but not basic methodological improvements. It's really an old technique used with manual methods for hundreds of years, transferred to the computer, making the work much more convenient and simple, and leading to enhanced trustworthiness of results, but not really changing in my opinion."* (P5)

Similarly, another propagator argued that the software has enabled manual methods to be carried out more efficiently, more rigorously, and in general speeding up the manual process, which were the planned first level effects, rather than transforming or creating new methods:

> *"I don't know how much it's changed what people do or what people teach and in terms of people developing new methods since they know that the program is available. I don't know how much of that happens. I haven't seen a text that says 'here's a new way that you can analyse your data because software exists.' I've not seen such a thing. But, what I think it does mean, is that you can do more of what you're supposed to do, when you code all your data in a program, you don't have to worry about losing track of the fact that something was coded in a particular way."* (P9)

What is clear is that from the outset, developers set out to computerise their research practice, a first level effect. But along the way changes occurred, either by adopters of the software or by new technologies, a second level effect. However, as new technologies have themselves been transformed (e.g. the internet had made possible the creation of new methods), this can be seen as a third level effect.

Usage of all features

Another issue was whether respondents made use of all the features available to them. This was seen as debatable, as on the one hand it was argued that users were not using all the features to their full extent and as a result were not reaching full analytical potential. On the other hand, it was seen as not necessarily essential for all features to be used:

> *"The suspicion is that people are still under using these advanced analytic features and the reason for thinking that is, I referee for several qualitative methods journals and I don't see any evidence of those more sophisticated strategies being used in the articles that I referee and I referee research proposals for the ESRC and as far as they'll get is they will sometimes say and we intend to analyse the data using a CAQDAS package, sometimes they'll*

name it. But, they never go into detail about the retrieval strategies they're thinking of using and I think these quite often are left to a kind of unsung research fellow type staff.....that don't get a credit, when the publication comes and so, it's just my suspicion that the things that thrill the developers and the advanced workshops, everybody makes a fuss over the wonderful new features that are there and I think that a lot of it just isn't being used." (P2)

However, for some not using all the features was not seen as problematic; that if features are there, then a user has a choice in whether to use those features or not. It was thought by one propagator that it was better to have more features available and choice, rather than not to have them:

"That might not be a problem, because I think the reason for adding on new facilities is partly a competitive one. People put these features in whether they use them or not, and I suppose my own view about that is, well that's fine, because if the feature is there, you don't have to use it, but if you decide you need it, you can use it. I'm not sure adding features are a bad thing. The other side to that is that also, since developers are often sort of 'fiddlers', that's what programmers do, fiddle round with packages and try to make things work, and say what if I did this and wouldn't it be fun to have that, and I've got this nice little routine here and if I use it I can put something...So, in the work of programming there are pressures towards adding new features anyway." (P1)

Another propagator suggested that this was something common to most software, that not all of the features are always used:

"I think that's common with all software, look at Word, people only use word for what they need to use Word for. They're not aware of the many powerful features it has. You see with qualitative software I think it is important to have a big picture of what the software can do, because these packages are more than just coding aids, which a lot of people just use it, just to code and that's it, and you're not really gaining much if you use it that way, because coding on screen takes as long as coding on paper and what really, the big difference is the way you can retrieve information on computers and so if you don't have

> *a big picture of what it can do, it might take you a while to learn how to do it, but if you don't have a big picture then you're just using it in a very limited way and also not understanding, a lot of people don't understand what they can do it with it."* (P4)

As the previous comment suggests, one of the issues regarding the software was the coding process and this was something discussed in relation to grounded theory, something which has been debated intensely within the literature and at some length in the interviews. These topics are examined in a later chapter.

Conclusion

Since its inception, little empirical work has been done on the 'effects' of CAQDAS. This chapter examined those effects, both the social acceptance and the scepticism. Using Sproull and Kiesler's (1992) two level perspective on technology, a third level effect was identified, one that emerges as a result of the first two level effects.

CAQDAS provide many advantages to the craft of qualitative research methods. However, as with other new technologies, they are not without consequences and have presented their own problems and issues of concern within the scientific community. A two-level perspective on technology can help in identifying what some of these problems and solutions are. At the first level are the planned efficiency gains, which for CAQDAS included speedier retrieval and analysis of data and data management. Therefore, the problems associated with qualitative data analysis that developers sought to alleviate with the development of software, were the first level effects. The second level effects were the effects that arose from these and how each group responded. Although some second level effects, such as technical issues with the software, have largely been resolved, others have not, particularly amongst the group most critical of CAQDAS. Instead, with the advent of interactive technologies and tools such as discussion lists, some of the debates have been extended or have re-emerged. CAQDAS has been around since the early 1980s and therefore various groups can be identified, each with their own response and reaction to the software packages. These groups range from those most accepting of CAQDAS ('program loyalists') to those who still oppose the use of software for qualitative analysis (‘sceptics’). As a result, third level effects of CAQDAS can also be identified; these are transformation of methods and feature use; coding and the grounded theory debate (discussed in a later chapter).

Methodological and theoretical contestations have been around since qualitative methods were recognised and defined as such. For example, there are disagreements between what is the most appropriate way to carry out research; scholars from different disciplines and even within the same discipline cannot always agree with one another about the best approach to use. Bryman (2008:17) has referred to this as ‘intra-paradigmatic’ differences, which he explains as differences *within* quantitative and qualitative research methods. The response to CAQDAS was simply another dimension of this: what happens to the research process once computerised techniques are introduced.

There are a number of different types of qualitative methods in the social sciences and as the numbers of users continue to grow in other disciplines, this range is extended. Therefore, this brings with it an increasing variety of theoretical perspectives, thus producing the potential for further debate. Therefore, over time, as more and more users adopt CAQDAS and the user-base continues to grow and expand beyond the social sciences to other disciplines, new ways of working with CAQDAS will no doubt emerge and with it different viewpoints – third level effects.

The CAQDAS Networking Project (CNP) was set up to alleviate some of these problems; to provide help, assistance and training to users and potential users of CAQDAS, as well as to encourage discussion about the debates surrounding CAQDAS. As part of this initiative, an on-line discussion list, Qual-software, was developed which provided the opportunity for the developers, propagators and users as well as other social groups to engage interactively in conversations about CAQDAS. The list offers a useful insight into some of the discussions surrounding CAQDAS and, as will be discovered in a later chapter, some of these debates, as well as others, have re-emerged in the discussion lists and therefore are not approaching resolution.

Chapter 8 Conversations about CAQDAS

Introduction

Kuhn (1962) argued that groups of scientists develop shared definitions of their work and paradigms that interpret findings and guide new research. They adjust to the problems of dealing with knowledge in their fields by forming social organisations of various kinds which are based upon shared communication and shared interpretations of the situation (Crane 1969). As discussed in a previous chapter, one form of social organisation in science is an 'invisible college' (Crane 1969, 1972). Invisible colleges emerge around a small nucleus of major active researchers (Gresham 1994) and have advantages over more formal channels of scholarly communication. They are advantageous to those few that are at the centre of an invisible college as they have the most possibilities (Price and Beaver 1966; Price 1971) but restrict access of opportunities to those outside the invisible college, resulting in an unequal distribution of communication possibilities (Matzat 2004). Therefore, a large number of researchers who do not have access to any member of an invisible college have fewer opportunities (Garvey and Griffith 1966). Those more advantaged in the invisible college are seen as the 'core' scientists, whilst the 'others' who are at the 'periphery', include younger researchers or those at less prestigious institutions (Matzat 2004). This is known as the 'Matthew Effect in Science' (Merton 1973) which postulates that those in the research system who are already recognised will receive more rewards (Matthew 25:29 – '*To he that hath shall be given'*), compared to those who are less recognised. The earlier informal networks that developed around CAQDAS can be seen as an 'invisible college', with a core group of developers and propagators.

However, with the arrival of the internet, scholarly networks moved online (Koku *et al.* 2000), transforming the nature of academic communication and with it the possibility of extending the barriers of invisible colleges. For the internet is a network of networks (Berners-Lee 1999) and when these networks link people as well as machines they become social networks (Wellman *et al.* 1996). Such networks incorporate e-conferencing, mailing lists, computer conferences, listservs[28], online, email or internet discussion groups or special interest groups (Gresham 1994). Collectively these purposes can be referred to as computer-mediated communication

[28] Named after the software used to produce them.

(CMC) or computer-mediated discussion (CMD) (Schneider 1996) and can be defined as ‘the use of a computer to create, address, route, distribute, or receive messages sent from one individual to another, from an individual to a group or from one group to another group’ (Murphy 1994). Thus a first level effect of these technologies is that they can overcome temporal and geographical barriers to the exchange of information, connecting anyone with anyone on the same communication network (Sproull and Kiesler 1991). Participants may be geographically dispersed and can interact simultaneously or at times of their own choosing (Schneider 1996).

One form of CMD is email mailing lists or discussion lists, of which there are several types. O’Dochartaigh (2002) distinguishes between those that are controlled by a moderator who plays a role in filtering or editing messages posted to the list and those that are unmoderated and so there is no control over email content. Academic mailing lists are one type of mailing list and are often moderated. The first level effects of academic lists are to provide a more specific set of purposes than general discussion lists, as Matzat (2004) identified, they provide a forum for initial research queries, a point of contact with other researchers, information about academic happenings relevant to the subject and a forum for more specialised research queries. This was certainly the intention and purpose of the setting up of the discussion list Qual-software by the CAQDAS Networking Project (CNP), the primary aim of which is to provide ‘an academic discussion list that provides an on-line forum for the debate and information concerning the general use of qualitative data analysis software packages’[29].

Discussion lists can offer a number of potential benefits for a research community, for example, as identified by Hiltz and Turoff (1978). Firstly, they can allow the informal exchange of research results or of other helpful information between researchers. Secondly, they can generate new research ideas or proposals for research among academics. Thirdly, they may be a remedy for existing problems and disadvantages within the informal communication structures of research fields. For example, novice users may have questions over the use of the software and are able to seek the help of those more experienced. Finally, as Matzat (2004) points out they may create new links or intensify existing ties between researchers.

[29] http://caqdas.soc.surrey.ac.uk/qualsoftware.htm (date accessed November 2008)

The use of computers for discussion is a relatively recent phenomenon (Schneider 1996) and as Gresham (1994) points out relatively little research has been carried out on the uses of computer mediated discussion groups in the academic community, although such use has increased somewhat rapidly in recent years. The setting up of the Qual-software discussion list was an important advance in the development and expansion of CAQDAS and its community and provides an illustration of an academic discussion list. Discussion lists exist in a 'virtual' environment, one that is not confined by time and space but nonetheless provides a 'laboratory' setting, as described in ethnographic practice as it enables research to be carried out in a 'natural setting' (Wellman *et al.* 1996). Such a 'setting' can be understood as a social arena and will be discussed next.

Social Arenas

As discussed previously, a social arena is a feature of social worlds, where groups from different worlds come together to discuss and debate various issues. As Schneider (1996) suggests, discussion lists can be viewed as an arena, a public sphere that includes the 'conversational arena', the 'posters' and the 'conversation'. The 'conversational arena' is the forum or space in which the conversation takes place, the 'posters' are the participants engaging in discourse in the public sphere and the 'conversation' is the actual discourse that takes place in the conversational arena.

It is this conversation in the arena that is of interest here and how the arena is structured in terms of what takes place inside and outside of it. This can be seen as similar to Goffman's (1959) concepts of 'front region' and 'back region'. The front region is where a performance takes place in the public arena and the back region is one which is closed or hidden from the public. These concepts can be illustrated in a restaurant setting, where waiting staff attending to customers are 'front of house' and therefore in the front region. But once in the kitchen away from the customers, they are in the back region. Goffman (1959) argued that front and back regions are everywhere in society and as such can also be applied to academia, in the sense that academic work is also divided into regions. For example, informal discussions with colleagues can all take place in the back region but once this work is published or presented at a conference or seminar, it enters the front region, the public arena, where it becomes open to criticism.

These notions of front region and back region can also be applied to discussion lists, although discussions that were perhaps once held in the back region, such as the departmental corridor, can now emerge to the front region and as a result can provide an insight into the kinds of questions and issues being raised by people within a particular field. The discussion list therefore functions in a way that it provides a means of asking backstage questions in a front stage arena. For the CAQDAS community, the Qual-software discussion list provided an opportunity for users to find help with any problem they had, whether it was software-related or otherwise. However, it also brought to the surface some of the earlier debates and issues about CAQDAS. In this way the discussion list provides a forum for reflexivity as one propagator discussed:

> *"It makes reflexivity possible because you can look at the questions that people ask and why they ask the questions, the thing until now has always been hidden; you know the stupid questions that people ask. If we didn't have the internet that would all be invisible, so the Internet is important in that sense, in that it's 'cultural memory'."* (P1)

Goffman (1959: 135) also identified a third region, an 'outside region', one that is "neither front nor back with respect to a particular performance", but one in which "individuals, who are on the outside of the establishment are called 'outsiders'." According to Goffman (1959: 135-136),

> *Those who are outside will be persons for whom the performers actually or potentially put on a show, but a show different from the one in progress. When outsiders unexpectedly enter the front or the back region of a particular performance-in-progress, the consequence of their inopportune presence can often best be studied not in terms of its effects upon the performance-in-progress but rather in terms of its effects upon a different performance, namely, the one which the performers or the audience would ordinarily present before the outsiders at a time and place when the outsiders would be the anticipated audience*.

With regards to the discussion list, these 'outsiders' relate to the novice user or those who have only posted once or twice to the list, or the 'lurkers' – that sphere of the list's activity populated by people who read messages but do not offer any of their own postings. The consequences of this are that they may have something useful to say but, for whatever reason, do not and as such their potential contribution does not enter the front region.

Within each region, different roles are performed. According to Goffman (1959) there are three roles in a performance; those who perform, those being performed to and outsiders who neither perform in the show nor observe it. Performers appear in the front and back regions, the audience appears only in the front region and the outsiders are excluded from both regions. Those on the periphery of an 'invisible college' (Crane 1969) can be seen in a similar manner to Goffman's 'outsiders'. Conversely, those who perform in the discussion list can be both performers and the audience and outsiders can have access to the front region and therefore are also part of the audience. Therefore, the distinctive regions identified by Goffman become less distinctive with CMD where performers, the audience and outsiders are not confined to certain regions. As a result, the boundaries set by invisible colleges are expanded and the discussion lists enables all actors to participate in an online social network, one in which regions and boundaries are indistinct.

As a result, it has been argued that academic discussion lists provide an array of opportunities for both those at the core and the periphery of the invisible college. Gresham (1994) argues that the use of email and online discussion groups for informal scholarly communication has expanded rapidly and has moved from physical locations in conference and research centres into 'cyberspace', the virtual space created by electronic networks. As a result there has been a shift from an invisible college to what he calls a 'cyberspace college', a new form of informal research network, one that will exist alongside traditional invisible colleges. Participation in the 'cyberspace college' will enable those at the periphery to extend their communication networks (Walsh and Bayma 1996) and will allow researchers to make contact with experts in their field, enable them to feel better informed about different aspects of their research field and research community (Matzat 2004).

Through this they will be able to increase their opportunities, for example their work can become more visible to others in their field (Matzat 2004).

Berge and Collins (1993), in their study of the discussion list 'Interpersonal Computing and Technology List' argue that through computer conferencing co-authors and books are discovered, researchers with similar projects can be found, as can employment, funding and research opportunities. Similarly, Hesse *et al* (1993) found that the frequency of CMC use by researchers of oceanography was correlated with higher productivity including by those researchers at peripheral institutes. Hiltz (1984) surveyed participants in four scientific discussion lists and found that participation in a list encouraged clarification of theoretical controversies, expanded networks of professional contacts, greater awareness of information sources and scholarly activity in the subject areas as well as increased communication both within specialisations and across disciplines. However, Matzat (2004) argues that the transmission of already existing knowledge is much more common in discussion groups than the actual production of new knowledge; they have a general informative potential for academic communication such as the transfer of information rather than providing the potential for solving controversies through discussion. He asks the question: does the information available on lists enhance the theoretical knowledge of researchers about their research field or is it advice related to practical problems that the researchers have?

As a result of discussion lists, invisible colleges will increase in size (Matzat 2004), because all researchers, both 'core' and 'peripheral,' are able to communicate regularly with known and unknown colleagues who share similar interests (Kovacs 1996, Mailbase 1997). Hiltz and Turoff (1993) suggest that this type of electronic network might lead to a more open form of invisible college with wider participation and faster exchange of information, something which all researchers and interested parties can engage in. Informal networks may vary in structure; however they share common functions, such as keeping participants informed of current trends and new developments within their area of specialised interest, they provide a forum for the sharing and testing of new ideas through feedback and discussion (Gresham 1994), greater interdisciplinary communication between specialties (Hiltz and Turoff 1993), as well as practical information about research and funding opportunities (Gresham

1994). Hiltz and Turoff (1993) propose that they may lead to more rapid paradigm development within specialties and an expanded rate of research breakthroughs. However, this is debatable and will be examined in this chapter.

What follows is a discussion identifying the main usages of the Qual-software discussion list by its members in order to address how far it can be seen to offer the benefits as outlined by Hiltz and Turoff (1978) and Matzat (2004), as well as identifying if and how the list has changed over time but first an overview of the discussion list.

Overview of Qual-software

The Qual-software discussion list was set up in 1991 by Ann Lewins, administrator of the CAQDAS Networking Project. Its main purposes were originally envisaged as an area for the community to interact and discuss the methodological, epistemological and theoretical issues surrounding CAQDAS.

The content of the discussion list was analysed for the period from 1994 when it first began until December 2005[30]. Over this period the total number of threads was 2473. A thread can be defined as a chain of interrelated messages (Rafaeli and Sudweeks 2004). The analysis provides a breakdown of the list, identifying the country of origin, occupational background of posters and the number of posts per poster. It also examines the content of the postings in the conversational arena.

Country of Origin

Over the twelve year period, there were 1087 subscribers[31] and as can be seen in Table 2, the majority came from the U.K. (37.9%) and the U.S.A. (26.6%), with a fair number of posters from Canada (5.1%), Australia (5.0%) and Germany (3.6%)[32]. The

[30] When the transmission was made from mailbase to jiscmail, the archives only went as far back as April 1998. Fortunately, I was able to obtain the archives prior to this courtesy of an employee at mailbase and an early user of the list. However, some of the information received was incomplete; as a result data was missing from August 1997 to March 1998. Furthermore, as data was received from multiple sources, there was the issue with duplicates, sometimes triplicate emails.
[31] This figure includes new subscribers as well as unsubscribers
[32] 64 (5.9%) country unknown

table illustrates an international social network extending over numerous countries, but with a higher concentration in certain countries, typically those countries from which CAQDAS packages originated. In some countries, for example in Colombia (Carvajal 2002) and Brazil diffusion was minimal, if at all, and as a result CAQDAS was almost unknown, as one propagator explained:

> *"In some countries, like Brazil for example, a lot of people are still using the manual style of analysing, because it hasn't been disseminated or people don't have the resources or the universities can't purchase the programs."* (P8)

However, with interactive technologies, it is anticipated that knowledge of CAQDAS will increasingly diffuse to other countries. The extent to which this will occur remains to be seen and will perhaps only be identified with future analysis of the discussion list. Therefore this suggests, as discussed by Hiltz and Turoff (1978) and Matzat (2004) that the informal networks of the invisible college are expanding.

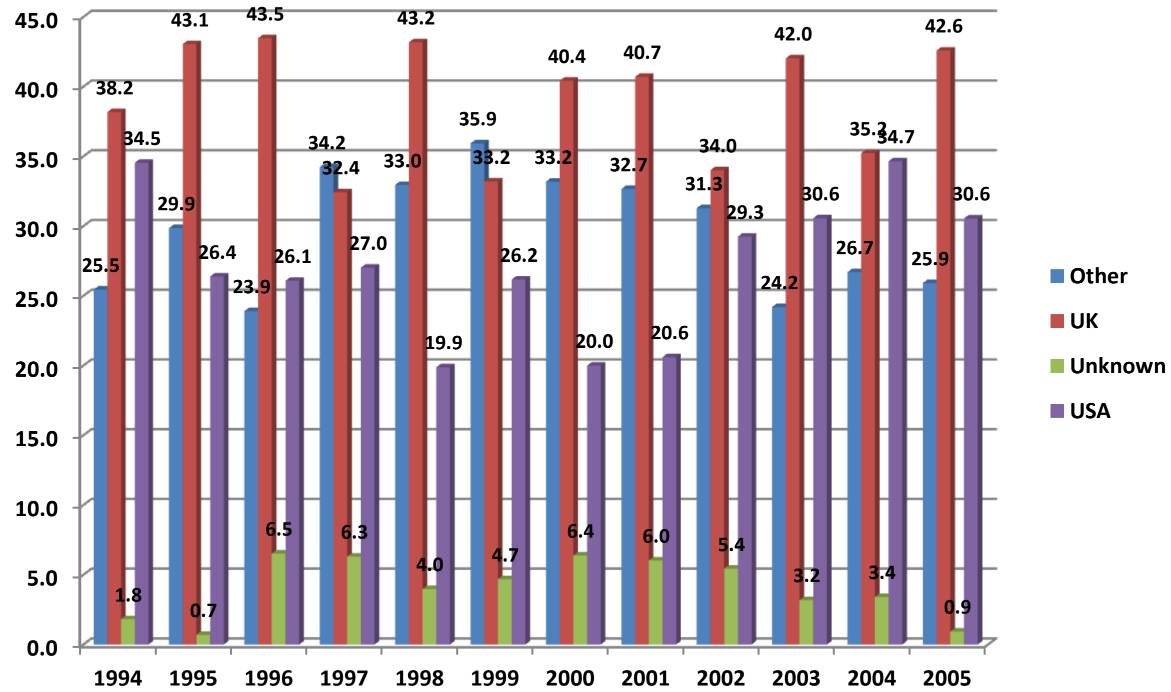
Fielding and Lee (1998) hypothesised that in the case of CAQDAS, an international community developed prior to a national community, that development, dissemination and use of software initially took place independently in a number of countries with participants being unaware of developments elsewhere. If the distribution of posters from the UK and the USA are compared over time (Figure 1), it can be seen that in 1994, the majority of subscribers were from the U.K. (38.2%), followed by the US.A. (34.5%), with 25.5% from other countries. Although there are slight fluctuations over the years, it can be seen that overall since 1994 the number of UK subscribers has remained fairly constant but the percentage of subscribers from the USA has decreased, although there is a slight increase again from 2001. However, in comparison, those from other countries remain between 23% and 35% during the twelve year period. In 1999, those from other countries exceeded the total numbers from U.K. and the U.S.A.

Therefore, this would suggest that perhaps prior to the discussion list, the community as Fielding and Lee (1998) suggest, was predominantly an international one but through the diffusion and dissemination of the list, the community has maintained its international links but at the same time has increased its national associations.

Table 2: Country of Origin of Poster

Country	No of Posters	%	Country	No of Posters	%
UK	412	37.9	Venezuela	2	0.2
USA	289	26.6	Greece	2	0.2
Unknown	64	5.9	Bolivia	2	0.2
Canada	55	5.1	Pakistan	2	0.2
Australia	54	5.0	Singapore	2	0.2
Germany	39	3.6	Iran	1	0.1
Netherlands	19	1.7	Columbia	1	0.1
Spain	13	1.2	West Indies	1	0.1
Finland	12	1.1	Malawi	1	0.1
Ireland	12	1.1	UAE	1	0.1
Sweden	11	1.0	Malaysia	1	0.1
Switzerland	8	0.7	Israel	1	0.1
New Zealand	8	0.7	Mexico	1	0.1
Italy	7	0.6	Colombia	1	0.1
Belgium	7	0.6	Chile	1	0.1
Hong Kong	7	0.6	Taiwan	1	0.1
Denmark	5	0.5	Puerto Rico	1	0.1
France	5	0.5	Uganda	1	0.1
South Africa	5	0.5	Czech Republic	1	0.1
Portugal	4	0.4	Cyprus	1	0.1
Zambia	3	0.3	Angola	1	0.1
Norway	3	0.3	Argentina	1	0.1
Brazil	3	0.3	N.Ireland	1	0.1
India	3	0.3	Fiji	1	0.1
Austria	3	0.3	Sri Lanka	1	0.1
Japan	3	0.3	China	1	0.1
Phillipines	2	0.2	**Grand Total**	**1087**	**100.0**

Figure 1: Distribution of Poster over Time



Background of Poster

The distribution of users' backgrounds was also analysed. Mangabeira, Lee and Fielding (2004) argued that CAQDAS had its origins in the academic community but increasingly it is diffusing beyond its traditional base within that community to a wider spectrum of users. They identified two new categories of users: those engaged in applied research and those involved in non social science research. They claim that the growing diversity of the CAQDAS user base is partly a reflection of the growing institutionalisation of CAQDAS within social research. A possible explanation is the steady increase in demand for training, including demand from non-academic users. For example, they found that between June 1998 and June 2000, the CAQDAS Networking Project ran 76 training activities, in which participants came from a variety of disciplines, including medical and dental schools, charities and voluntary agencies and government departments. These findings were also identified by a number of propagators. For example, one propagator explained:

> *"The type of user population has widened which was a natural progression of how many different people are using computers. The impression is that far*

more people in business are using CAQDAS now and there is a lot of interest from business schools. For example, six years ago it would be a rarity to get GPs coming along using the software and now there's quite a big population of GPs using the software because GPs will do their own research projects. They also come from more unexpected areas such as epidemiology and pharmacology." (P3)

Another propagator agreed that the user base was expanding but that it was still very much based in academia and that changes were necessary in order for it to expand into the business sector:

> *"It still hasn't really moved away from academia. It's starting to move from academia into the commercial sector but the trouble is there isn't awareness, so it's not quite, it's just starting really. These packages have been around long enough for people to have been exposed to them when they've done training at university, so that when they go and work in an organisation, they know about them and that's how it is, if people are exposed to them, but you see there hasn't been any direct marketing to these commercial organisations. I think maybe the software has to be developed differently for that market, it has to be more user friendly, it has to have a better interface I think, it has to be easier to set things up, for if it really wants to succeed in those markets. I think basically it's down to the developers to show the applications to the business world of these packages, because unless you show them, they're not going to make that leap themselves, and calling it CAQDAS or qualitative software packages, I mean doesn't mean anything to them, so you have to find a new form of words that describes what it does, that relates to what they do."* (P4)

Mangabeira *et al.* (2004) identify possible developments that may explain this change in user diversity; a growing application of CAQDAS in the analysis of focus group data in the market research and social research sectors (Abbott 1998); an increasing use of multiple method studies, in which efficient means of analysing qualitative data are needed to warrant their place in the research design and the nature of internet-based research, in which qualitative software is used to analyse downloaded data. The internet provides visibility as described by one propagator:

"The internet exposes people to scholarship, it gets them used to kind of enquiring, in a way that a library can be quite forbidding if you don't know anything and you go in there, where do you begin? Whereas with the internet, you can compose a search and you might get a lot of junk back, but at least you've got something and it encourages you to go further, so I think qualitative people have been particularly open to the Internet and has actually helped with the technological phobia they may have." (P2)

Figure 2[33] indicates that the majority of respondents (73.3%) were from the academic or academic-related occupations. Whereas only a small percentage was non-academic; these included commercial companies (3.6%), non-profit organisations (3.4%) and government (2.6%). From within the academic/academic-related category, posters came from a variety of different disciplines, such as geography, sociology, psychology, IT and health and social care. However, when looking at how the distribution has changed over time (figure 3) it can be seen that as Mangabeira, Lee and Fielding (2004) suggest, the number of non-academic subscribers has increased, although somewhat marginally. In 1994, the number of non-academic subscribers was 14.5%, in 1995 it was almost 10% and by 2005 it had more than doubled to just over 20%. Nevertheless, it is important to highlight the fact that this analysis of Qual-software only provides a partial explanation for the wider changes in the CAQDAS community and can only be fully understood with further investigation.

[33] 12.2% background unknown

Figure 2: Background of Poster

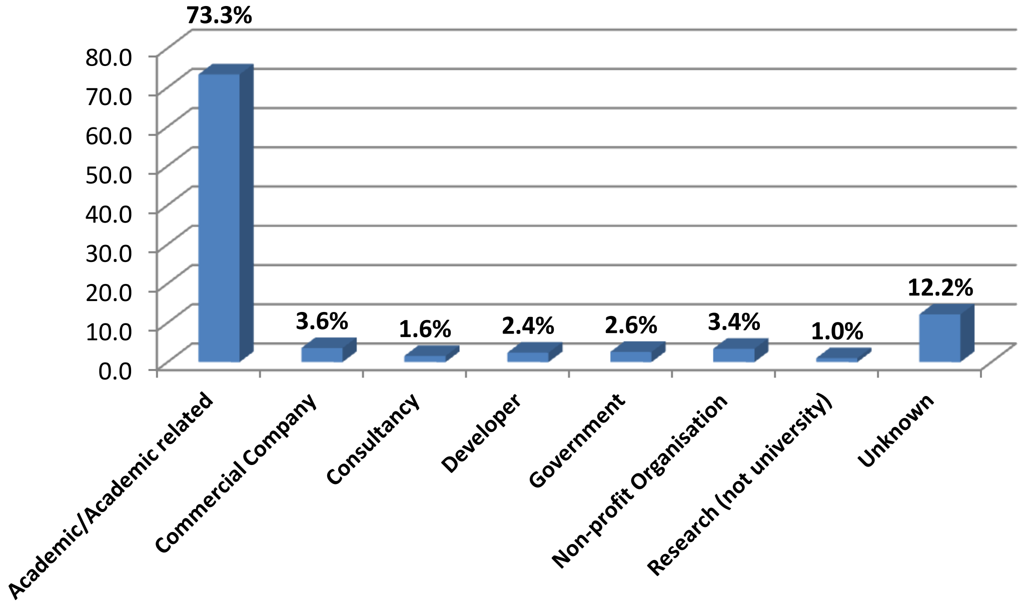
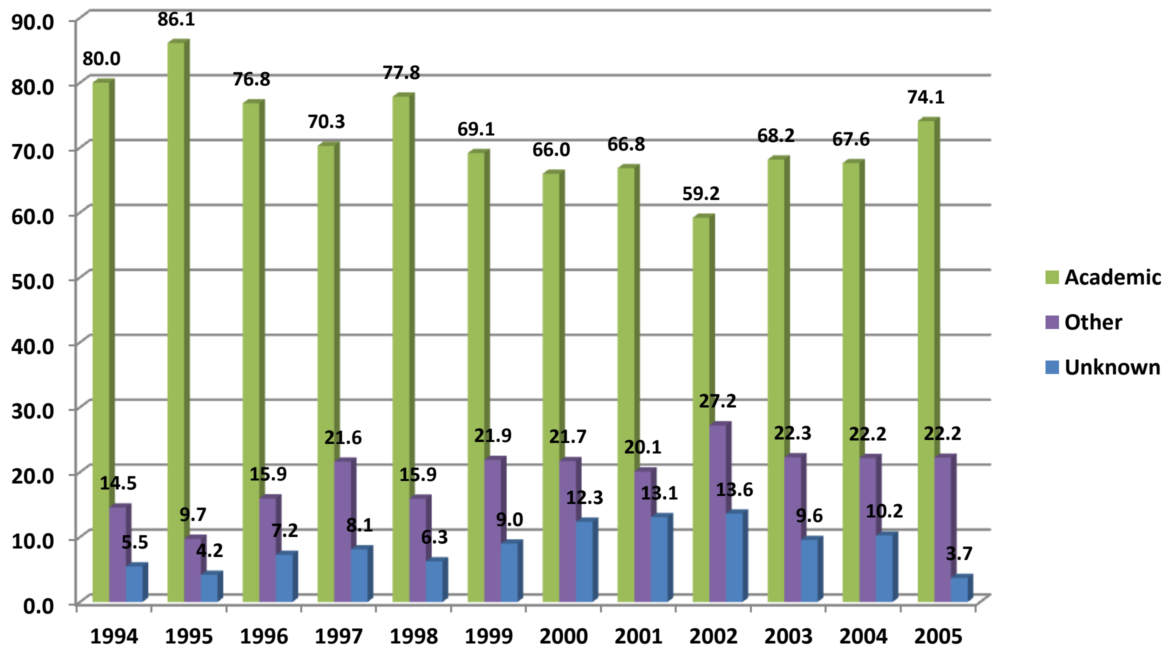


Figure 3: Background of Poster over Time



Number of Posts per Poster

Figures 4 and 5 show the total number of posts sent from each subscriber to the list. Over the period 1994 to 2005 the total number of subscribers was 1087. These numbers have fluctuated over the years and recent figures show that the current total number of subscribers (accessed 9th October 2008) was 793.

Schneider (1996), in his analysis of participants of a controversial topic in the newsgroup 'talk abortion,' identified a categorisation of authors by frequency of contribution. These were; 'fanatic' (483 or more postings), 'frequent' (78 to 482 postings), 'occasional' (33 to 77 postings), 'infrequent' (14 to 32), 'rare' (6 to 13), '3-5 timers' (3-5 postings), 'two timers' (two postings) and 'one timers' (one posting). He found that that a small percentage of posters accounted for a high number of postings. However, when looking at Qual-software results, the exact opposite has occurred and this may be a reflection of the type of discussion list.

The majority of posters (43.1%) sent just one email (one-timers) or two emails (19.6%, two-timers). Therefore, a high percentage of posters accounted for a low number of postings. Only a very small percentage sent over 100 emails, which included the list moderator, developers and consultants (most of which were from the original 'core' group). There are those that do not contribute anything to the list and are usually referred to as the 'lurker', which according to O'Dochartaigh (2002) is a typical list subscriber. Rafaeli and Sudweeks (2004) state that the vast majority are a silent portion of participants about whom speculation can only be made and whose preference is passive attention over active participation. Despite 'cyberarchaeological' excavations (Jones and Rafaeli 2000), lurking is hard to track and although it is possible to record the number of 'hits' a site gets, finding information about this silent majority is difficult.

Several explanations have been put forward to explain lurking. Nonnecke (2000) suggests that this is what people enjoy doing or because they have nothing to say or because they are just learning about the community. Katz (2003) suggests that some are just waiting for the right moment to contribute, either because of their character or because of the community atmosphere and so in some cases, respondents transfer from passive attention to active participation (Rafaeli and Sudweeks 2004). For others, it might be a matter of learning about the community beforehand (Nonnecke and Preece 1999, cited in Rafaeli *et al*., p3) or about learning a new topic (Kraut *et al* 1992, cited in Rafaeli *et al*., p 3). Whatever the reason, the implication of this is that those who do not contribute may in fact have something useful or interesting to say. Furthermore, it may be possible that posters take their discussions away from the public arena and exchange emails privately. As a result, such discussions remain in the back region. Nevertheless, discussions that are in the front region can be analysed to identify what discussions are taking place within the conversational arena.

Figure 4: Total Number of Postings per Posters - Count

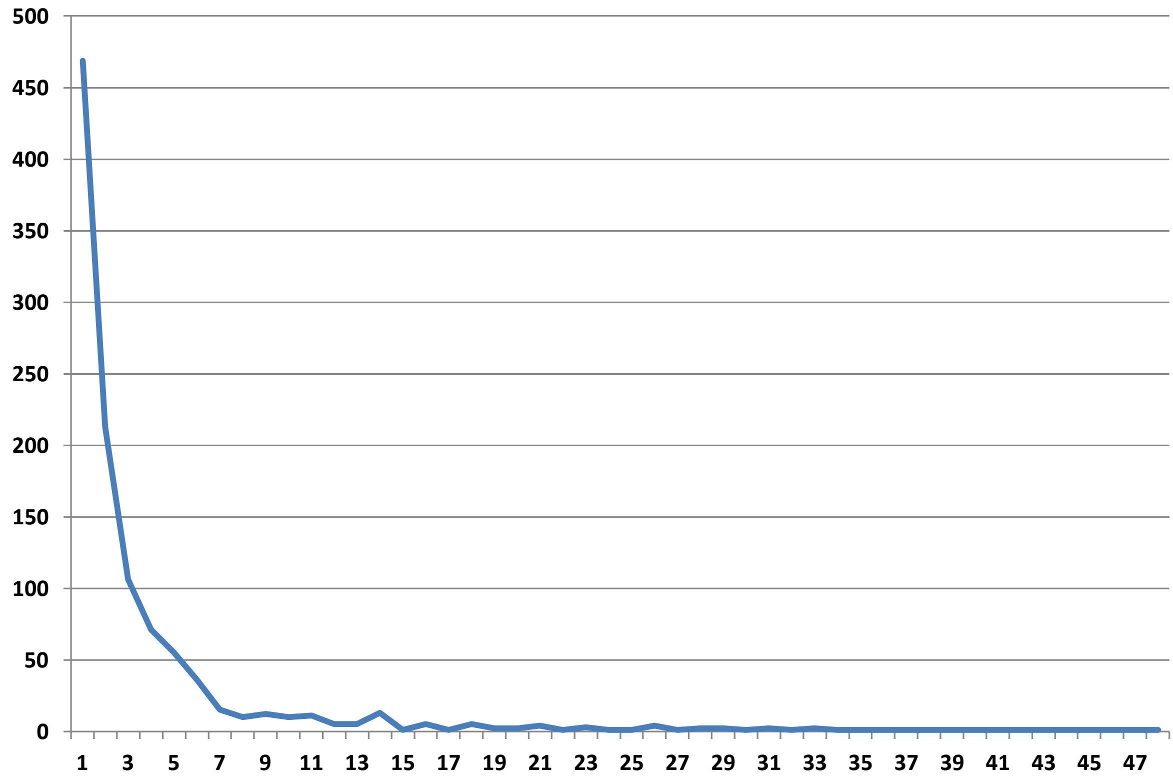
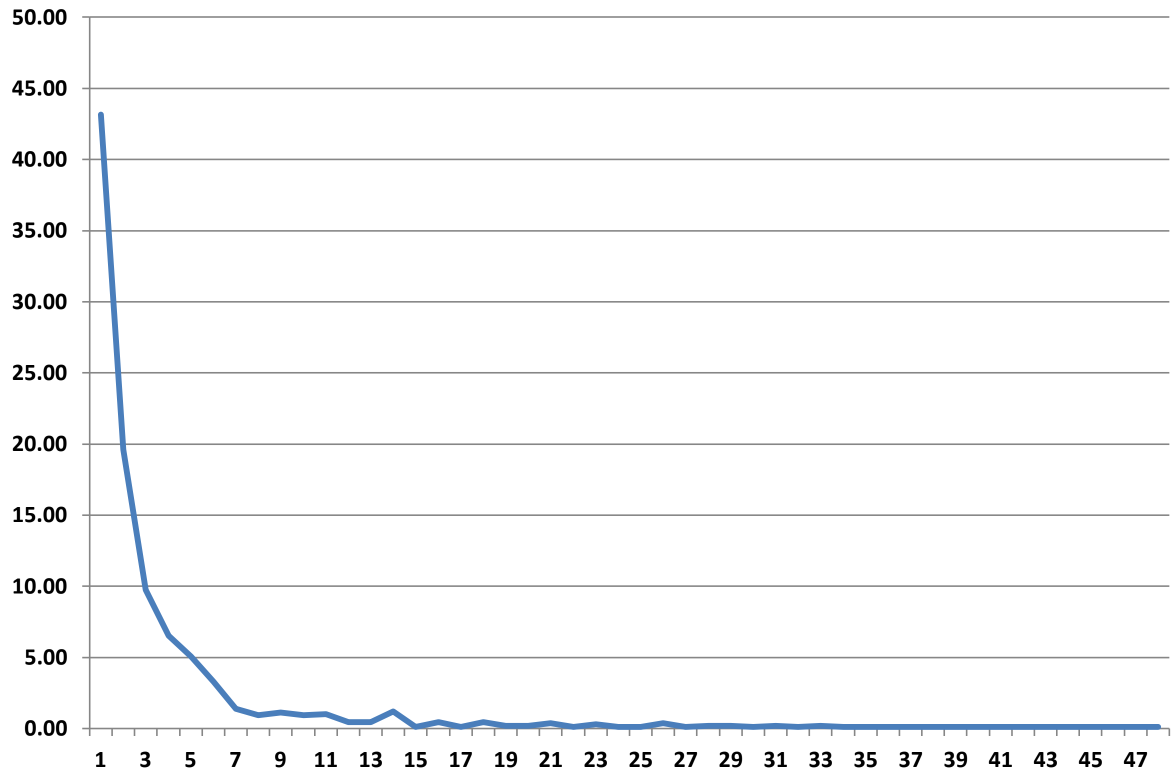


Figure 5: Total Number of Postings per Posters - %



The Conversational Arena

According to Rafaeli and Sudweeks (1998), interactivity varies along a continuum, where at one end is declarative one-way communication and at the other end is reactive two-way communication where one side responds to the other side. Fully interactive communication occurs when later messages in any sequence take into account not just messages that precede them but also the manner in which previous messages were reactive. In the Qual-software discussion list, interactivity was both declarative and reactive, with some threads exhibiting full interaction. Declarative postings consisted of mostly informative messages advertising a conference or workshop, whilst reactive and interactive threads consisted of intense discussion surrounding the usage of CAQDAS.

What follows is an analysis of Qual-software identifying the main usages of the list by its participants, who used the list in a variety of different ways. First and foremost, whatever the usage, whether it was a query about a particular software program or a more in-depth debate about the usage of software, the list acted as a means of disseminating knowledge and information about CAQDAS and CAQDAS-related issues. For example, a large proportion of posts sought information on the various literatures on CAQDAS, such as books, journals and on-line articles. Secondly, the list was used as a means for advertising such as conferences and workshops, something which increased steadily in the twelve year period. Thirdly, users, particularly novices, would seek the help and advice of more experienced users. These initial enquiries about CAQDAS led to the list functioning partially as a support system, as one propagator stated:

> *"The network became a network of support, the more skilled or clever user would help the one stuck with the problem"* (P8)

Fourthly, the list enabled developers to promote their products by providing support to users, informing the community of news and upgrades, as well as obtaining feedback about current versions and correct any misunderstandings about their software or openly deal with criticism. Increasingly, and as developers developed their own discussion lists, such discussion moved to and was directed to the relevant software-specific list.

Finally, Qual-software provided the opportunity for members to participate in debates about the use of CAQDAS, debates which, as will be discussed later, were predominantly an extension of existing debates found in the literature on CAQDAS. In fact, throughout the twelve years of its existence, the same questions reappeared on the list at regular intervals, and as one propagator suggested:

> *"It's almost as if each new generation that comes in replays the same old debates."* (P8)

The uses outlined above will now be examined in detail.

Advertising

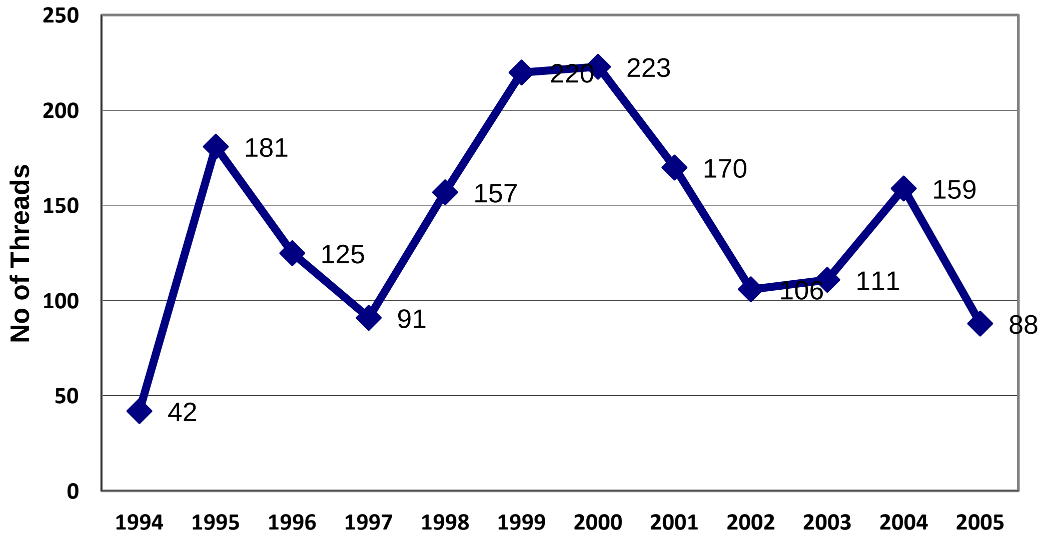
Such postings were declarative as communication tended to be one-way. Initially, these types of posts came from the list moderator informing the community about workshops being held by the CAQDAS Networking Project. This was a partial reason for the development of the list, in order to inform the community of the availability of workshops and to meet the increasing demand.

However, over time, once the list became more established and the membership rate increased, such posts were also increasingly posted not only by the list moderator but from other members as well, predominantly other consultants. O'Dochartaigh (2002) argues that over time the lists become more heavily used to distribute information about conferences, publications and job vacancies. Often referred to as 'noise,' such posts can be a useful and interesting area for study as informing the academic community about academic happenings, provides an insight into how such information is disseminated and how effective it is. Nonetheless, 'noise' also includes notifications such as 'out of office' and virus alerts (there were not too many of these in the discussion list). Table 3 provides a breakdown of the number of threads each year, as well as the number of 'noise' posts. In accordance with O'Dochartaigh (2002), it can be seen that over time the number of 'noise' posts has increased in relation to the number of threads. Table 4 provides a breakdown of the 'noise' which shows that by far the total number of these kind of posts were about conferences, seminars and workshops, mostly relating to the software or, if not, qualitative research.

Table 3: Total Number of Threads per Year[34]

Year	Threads	Noise	Total threads (minus noise)
1994	49	7	42
1995	207	26	181
1996	150	25	125
1997	121	30	91
1998	220	63	157
1999	328	108	220
2000	327	104	223
2001	268	98	170
2002	188	82	106
2003	197	86	111
2004	243	84	159
2005	175	87	88
Totals	2473	800	1673

Figure 6: Total Number of Threads per Year



[34] 'Noise' includes notifications including workshops, seminars and conferences, job adverts, as well as out of office and similar alerts and virus alerts.

Table 4: Types of 'Noise'

Year	Conferences, workshops and seminars	Job adverts and PhD Opportunities	Out of office and virus alerts
1994	7	0	0
1995	25	0	1
1996	24	1	0
1997	27	1	2
1998	54	6	3
1999	96	13	0
2000	97	6	1
2001	92	5	1
2002	72	5	5
2003	80	6	0
2004	79	1	4
2005	76	7	4
Totals	729	51	21

Initial Enquiries about CAQDAS

Initial enquiries about CAQDAS were predominantly of five types: which software – the suitability of software to particular methods, software comparisons and software-specific discussions, although the latter were also raised by users experiencing problems with particular software and were seeking solutions. These posts were mostly sent by novice researchers and those at the start of their research projects. For example, such a post would begin 'I am new to this' or 'I am a beginner' and it was emphasised by one developer that the list was useful for novices, who argued:

> *"The CNP and the discussion list are quite useful for people who are beginners. If analysing the traffic on the list, there are questions from people new to the list and want to know which the best software is. This is quite a*

popular question and so by having this mailing list, the community has a lot of customers." (D7)

What is interesting about these types of posts is that the discussions were not confined to CAQDAS packages only but various other tools for assisting with the research process, such as transcribers, mini-discs, voice recognition software and in later years issues surrounding digital data. Hence, the discussion list functioned as a 'help and advice centre', somewhere that an inexperienced researcher could turn to for help and another developer went as far as to say that:

> *"The mailing list can be seen as a kind of virtual seminar, or virtual classroom or virtual university, with professionals from different fields giving help to students just starting and things like this. One can connect to a society of colleagues, virtual colleagues, and if you have questions, technical or methodological, you're not alone"* (D2)

A frequently asked question was 'which software is best suited for my research needs?" Such a question provided the opportunity for developers to discuss their own software, which they did, and for others to compare packages, highlighting the strengths and weaknesses of each. For example, one poster asked the list:

> *"What has been your experience? Are there any particular problems which arise with this sort of material? Is there any software that works particularly well or badly?"* (1995)

A possible consequence of asking these types of questions in a public arena is that the responses, whether negative or positive, may influence the adoption of one package over another. However, the developers were able to deal with negative responses and in some cases responded to the criticism constructively and incorporated the necessary changes in the next upgrade. For example, as one propagator discussed:

> *"There was a definite 'reflexive' process, whereby people's wishlists or criticisms had an effect on what happened next with the software. They were influenced by the users because of the discussion lists and the feeling that users wanted certain things and sometimes you'd see that wish list embodied in the next free upgrade. "* (P3)

It was clear on the list that certain software packages were mentioned more frequently than others; however lesser known ones were also occasionally discussed from time to time. For example:

> *"Good to see that there are [software] users on the list; I was thinking the universe of qualitative researchers was restricted to [software]"* (1998)

Thus, this demonstrates that the list also 'gives voice' to developers who may be on the periphery, as the following post illustrates:

> "*I've not heard of that one, how do you find it?"* (1998)

Whether a well-known package or a lesser known one, the discussion list enabled knowledge of CAQDAS to diffuse more rapidly within the academic community. In the earlier years of Qual-software, discussions were very much about the introduction of various packages and making demos available to users. Increasingly, support became a regular theme. Yet, despite the tremendous amount of support currently available, selecting a package for some is still a daunting process. This is something which is clearly reflected in the discussion on the lists with the constant comparison between products. Software evaluation and comparison were something that featured quite frequently on the list and was often related to the 'which software shall I use' question.

Software comparison can be of benefit or detrimental to the developers and their products, as the discussion list provides an arena in which members can constructively criticise (or praise) the software. Occasionally, researchers were compiling reports about the software to present to others and would therefore ask the list for information. For example, one poster asked:

> *"I'm due to be talking to an informal discourse discussion group about using computers for discourse analysis - where can I find information about this?"(*1995)

Software comparison was usually made in terms of user-friendliness – how easy and quick the program was to learn. Sometimes, researchers were aware of what it was they wanted to do and wanted to find the software that could do it, for example, this poster enquired:

> *"I don't have much time and thus can't do anything with a high learning curve. I have read the reviews of the programs, but cannot see how they would do much more for me than filing does. Could someone tell me what software might help me get a 'big picture'?"* (1995)

As mentioned previously, posters would enquire as to which was the 'best software to use', but in some instances they were particularly interested in how others had used the software for a particular method. In response to these, the developer or other 'experienced' users would explain and demonstrate how the software could be used.

Often, people would make a comparison between manual and computerised methods and this type of question was perhaps initially a reflection of the initial scepticism about CAQDAS and perhaps in general 'computer phobia'. For example, one poster asked:

> *"Is it worth embarking on learning the technology at all, or am I better with scissors and paper?"* (1995)

The response to this directed the enquirer to various literatures on the topic, as well as offering advice:

> *"Whether you can use a computer program for the qualitative analysis and which program is the best for you, can only be answered if you know what kind of analysis you plan to perform and what is the objective of your analysis"* (1995)

Initial enquiries about CAQDAS provided the opportunity for participants to discuss and make comparisons between software. However, those that were already using a program and experiencing problems, either technical or methodological used the list as an attempt to find solutions to problems or to share their experiences with others.

Problems and Solutions

Software-specific discussions were largely from users experiencing problems or wanting to find out how to do something in the software. In the early development of CAQDAS, technical problems were a regular occurrence; often these were unanticipated and hence unavoidable. The types of technical problems reported during these years were mostly about software demos and compatibility issues or the result of 'insufficient memory', i.e. the computer did not have enough memory space. For example, one of the earlier issues that arose was the availability of software for the Macintosh, which in some cases produced quite lengthy interactive threads. Another problem occurring in 1995 was that demos were put on to the then newly developed website of the CNP so that people could download these using 'FTP' (File Transfer Protocol). This innovative feature was too problematic and tricky to do, unlike now, where one simple click on a link enables an effective and easy 'download' of the required files.

However, as the software advanced and became more sophisticated, these types of technical glitches were resolved, although later ones emerged which coincided to some extent with changes in other technologies used to support them. Technical problems of this sort are the result of unforeseen consequences of new technologies and although tend to be resolved, others in time will present themselves. An illustration of this is the transition to Windows 95, where many of the problems associated with DOS programs disappeared, as highlighted by one poster:

> *"These problems will vanish with the Windows version"* (1995)

However, upgrading software was a time consuming and costly process, the consequence for developers failing to upgrade their software meant that some of them had to leave the market.

Therefore, what this suggests is that technical problems of software development are an unintended consequence particularly in early development. Such problems cannot be anticipated prior to the product being released; no matter how many times a product is rigorously 'beta-tested' and will only occur once it is on the market. This issue was discussed by several developers and propagators, one of whom said:

"Although the software was tested before it went on the market, it never quite finds out what the user needs or what the users found tricky." (P3)

The matter is usually resolved with a subsequent upgrade or patch, which are often free. This process is cyclical and not confined to CAQDAS only, but other software products, for example Windows Vista had a number of technical problems that were resolved with a patch.

Using beta-testers was an approach that developers increasingly adopted and one which has become more effective through using interactive technologies where a message sent to the list will enable the selection of a number of beta-testers from different countries. For example, one developer sent this post to the forum:

"We are seeking beta-testers for a new qualitative analysis program" (2002)

The very process of software development, with its continuing refinement and modification, most of which coincides with the other technological developments used to support it means that there is little doubt that future technical problems will also present themselves. It is expected that the unexpected will happen.

Technical problems were just one type of problem that users discussed on the list, another problem that posters frequently discussed and exchanged ideas on, were discussions about methodology. As suggested by a number of authors (Rice and Love 1987; McCormick and McCormick 1992, Haythornthwaite et al 1995; Walther 1996; Wellman and Gulia 1996), it can be argued that discussion lists provide more than just information exchange and the quest for solutions to problems, in that people find social support, companionship and a sense of belonging, even when they are composed of persons they hardly know. For instance, the sharing of problems on the Qual-software discussion list may function as an outlet in which researchers can share their frustrations with others and perhaps find others who have experienced similar problems and more importantly are able to provide a solution. Such posts tended to come from novice or less experienced researchers seeking advice from those more familiar with the field and as such were advantageous to novice users as highlighted by one propagator:

> *"One of the advantages is that something like almost immediate support is possible, you have a problem, you write a message on the list, it's almost 24 hours somebody is there because it's a worldwide community and so it's possible to give and receive quick support."* (P6)

What is interesting in the discussion list is the willingness of people to share and exchange information, something which Sproull and Kiesler (1991) call 'electronic altruism', in which computer conferencing enhances information exchanges in the same way that the old style invisible college was based on the free exchange of information among persons in the social network. However, the ease of responding to information requests in a computer conference accelerates this process.

Nevertheless, such interaction can provide unintended consequences. For example, the discussion lists can also be used by those wanting to find a quick and easy answer and will post their question to the list without having to find it themselves. Traditionally, people learnt research methods as a craftwork – they learnt through experience and practice, however, through the discussion lists, learning has become more informal. The implication of this is that some users seeking help from the list may have little or no qualitative research experience, therefore resulting in the encouragement of poor research practice. This issue of whether users should have prior experience and training in research methods before using software has frequently been contested both in the literature on CAQDAS and on the discussion list. Researchers themselves may highlight their lack of training. For example, one poster explained:

> *"I guess I do not have any clear qualitative method. I have no formal training in qualitative research. Is there a website or book I should read to learn about the qualitative research methodology?"* (2004)

The discussion list enabled those who may have found it difficult to break into a traditional invisible college, such as graduate students (Gresham 1994), to gain easier access to a variety of scholarly experts in their area of study and, as a result, increasing the probability of finding someone that can help to solve problems (Kraut and Attewall 1993). With Qual-software a small minority of experts, and not just consultants, could be identified. These were regular contributors to the list offering help and support in the altruistic style that Sproull and Kiesler discuss. As one propagator pointed out:

> *"Feeding into these discussion lists is a core of rather more interested people who maybe have a certain level of confidence with software and they often answer these questions. There's always a few people in each software who form a core who know a bit more about what's going on and aren't afraid to answer the questions and then eventually users will become confident. It's very often that you get the same people answering the questions and providing this sort of lateral thinking that helps people out."* (P3)

Earlier discussions on the list and subsequent archiving of these posts meant that, for future users, the solutions to their problems may first be looked for in the archives. For as Markus (1987, 1990) suggests, the diffusion of interactive media like email within communities can be seen as a kind of public good, where early users solve initial problems that might exist for later users. This is only beneficial if users actually look in the archives first, and there were several threads where an annoyed response to a question was: 'this question was answered not so long ago, why don't you look in the archives'. The failure to look in the archives may explain why some of the questions were repeated on the list but it may also suggest that a solution to a problem was not resolved. According to Matzat (1998) discussion lists may only provide a partial means to solving a problem and that providing an answer in a discussion group may not solve one's own scientific problems. Some problems re-emerged on the list at various times, thus indicating either that the solution had not been resolved, or had presented itself in a different way, or simply because people did not look at the archives.

An example of a frequently discussed problem on the list was coding, which in some cases produced quite lengthy threads. For example table 5 provides a count of the number of threads and emails posted in relation to coding. Whilst the number of threads is fairly small when compared to the total posts for the list, it can be seen that some of these threads had quite a large number of stems.

Table 5: Frequency of posts relating to coding

Year	Threads	Emails
1994	2	5
1995	3	12
1996	3	3
1997	1	5
1998	2	4
1999	13	55
2000	14	58
2001	13	56
2002	6	18
2003	6	20
2004	0	0
2005	2	7
Totals	**65**	**243**

An example of a posting about coding was:

> *"I am in need of sharing my experience of coding; I had forgotten how much it wrecks my head"* (2000)

This was seen as a common problem and not one confined to coding with software, as was discussed by a number of interviewees, one of whom stated:

> *"Often in early usage, people are using software for the first two or three months and they hit the same problems over and over again. With regards to methodological issues, coding dilemma is probably one of the principal discussions."* (P3)

Frequent questions on the list and some that echoed those found generally in qualitative practice were 'how do I do it' in relation to a particular methodology or theory or 'how do I know when I have finished coding'. A common response to this was that there were different ways that coding could be carried out depending on the methodological and theoretical underpinnings, for example, they can be descriptive labels relating to themes of topics in the text or they may be more analytical (Fielding and Lee (1998). There were explanations that researchers would often adopt their own procedures for coding; Fielding and Lee (1998) state that initially the term 'coding' and the procedures associated with it emerged in a haphazard and unplanned way (something which qualitative methods in general are often accused of). Some comments on the list suggested that using the software can help with this haphazardness. One poster described how coding was unique to each individual:

> *"Everyone has somewhat of an individual approach on how to go about it"* (1994)

Coding of any form is a part of the analytic procedure and therefore it is not surprising that it should form a significant part of the discussion list. The confusion perhaps arises because of the different ways that coding can be carried out, dependant on which theoretical perspective is adopted, for example, coding may consist of first-level and second-level coding as described by Miles and Huberman (1994). The aim of first-level coding is to produce a working set of codes, which are merely descriptive. Second-level coding marks regularities in the data and identifies patterns, are more explanatory and identify themes emerging from the data. However, this differs to a grounded theory approach where codes emerge after data collection has begun (Lee and Fielding 1998).

Other discussions about the different types of coding included 'double-code' technique, coding in grounded theory (which will be discussed in depth in the next chapter), or pattern coding, and the misunderstandings that occur, as coding can mean different things depending on the paradigm. For example, as one poster stated:

> *"The term 'double coding' could be misleading"* (1996)

Issues were raised about falling into the 'coding trap', such as when to stop coding or how much coding should be done.

> *"I keep on coding because there's always something else to be found"* (2000)

In a focus group conducted by Fielding and Lee (1998) users described the ways in which they approached coding. For example some coded off-screen and then on-screen; some adopted a grounded theory approach where coding emerged from the data; others built up a series of codes beforehand from the existing literature or from firstly generating descriptive codes and then using these to generate further codes. People often commented that the length of time spent coding was often due to time constraints, as a result of the project duration or length of funding. A consequence of this might lead a project to be rushed, resulting in poor analysis.

In the focus groups, Fielding and Lee (1998) found that part of the pressure arose not from the length of the contract but from delays in agreeing codes. However, a possible influence on coding might result from the sponsors who may have already identified certain broad themes, for example, "when qualitative researchers see themes 'emerging' from the data, sponsors are apt to regard research as going out to find the 'answer' to an issue they have already identified, this issue then comprises the main theme of the analysis in the sponsor's view" (Fielding and Lee 1998: 112-113).

These issues surrounding coding that Fielding and Lee discuss were also present on the discussion list suggesting an area that remains problematic, particularly for those with little or no experience in qualitative methods.

Most postings were comprised of the 'how do I' questions, but some discussions were verging on a controversy and what was interesting is that some posters would present a topic for debate, an example of which was the 'auto-coding' feature available in some of the packages and the implications of using it.

> *"A nice debate about 'auto-coding' because it raises all the issues of what computers can and cannot do"* (1999)

This particular thread was a lengthy interactive discussion about the pros and cons of auto-coding, sometimes there was friendly banter, but on several occasions the discussion became slightly 'heated'.

A huge thread (36 posts in total) spanning over five days highlighted a problem experienced by most qualitative researchers and as a result may be why so many people contributed to it. It highlighted the problems of coding using software, as well as the problems occurring regardless of whether doing it by hand or on the computer. For example:

"When I used paper and scissors I was constantly chasing scraps of paper, now I am a zombie in front of a 'confuser' (2000)

Some discussions regarding coding were software specific, i.e. how do I code in X, Y and Z. People were helpful in providing suggestions, such as a 'suitable' package, or giving advice on how to address these issues. In later years, threads like this continued but users were increasingly directed to the corresponding software discussion lists. It was mentioned on several occasions that coding was different in each package:

"Every implementation of a coding procedure in a software program is also a theory of coding and it should be quite easy to find out by looking at a given program how coding is being understood" (1994)

However, it was also argued that coding influenced the development of some software, particularly in terms of grounded theory. For example, one developer demonstrated how the program's features for coding were useful for a grounded theory approach.

"The program supports a style of coding" (1997)

Questions about how to code were not restricted to one or two software packages but numerous, therefore suggesting a common problem.

Another frequently re-occurring topic in relation to coding was second coding and inter-coder reliability in team research. The main discussions involved the advantages and limitations of inter-coder reliability, or the problems of multiple coders from different backgrounds.

"I do think inter-coder reliability can be a useful thing, depending on your methodological approach" (1995)

One of the problems identified was the inability of software to account for multiple coders and team work and it was suggested that this was something that should be addressed by the developers for future upgrades:

"This should be on top of the to-do list for all QDA software developers" (2000)

As Fielding and Lee (1998: 108) describe from their focus group research, “the business of coding in team research can be described as a difficult ‘negotiation’ as no two people can approach the data with precisely the same perspective and where teams comprise people with different disciplinary backgrounds, interests and levels of research experience, there are bound to be differences of interpretation”.

The discussions changed since 2000/2001 where the threads became less discursive and shorter and a larger proportion of responses to questions directed the enquirer to literature, websites, on-line journals and other discussion lists. A possible reason for this is that perhaps some of the traffic moved away from Qual-software to more software-specific lists. What has clearly remained and re-emerges on the list, even if the proportion of such posts has reduced, are some of the problems and debates highlighted in this chapter that are not necessarily confined to the use of software but are applied in general to qualitative methods. Even when new software emerged, e.g. Qualrus, the same discussions were repeated, thus suggesting that certain problems are not necessarily easily resolved, nor will reach closure.

Some problems may be resolved but others will not, what is less likely to reach closure are the debates and contestations in a scientific community and it is an essential part of the developmental process of the social world and for CAQDAS, this was no exception. This is discussed in the next chapter, ‘debates and contestations’.

Summary

It has been argued that interactive technologies will break down the boundaries of a traditional invisible college, providing a number of opportunities for those at the periphery. Analysis of the discussion list Qual-software has shown that it has been beneficial to both the core and peripheral group. Benefits included: further diffusion of CAQDAS; connectivity of developers and users; a support system for users particularly novices to contact more experienced scholars; and discussion about technical, methodological and theoretical issues. Often technical problems were resolved but future problems presented themselves, which would nonetheless eventually reach resolution. However, resolution of controversies and paradigm development as hypothesised by Hiltz and Turoff (1993) was not evident on the list as certain questions and debates re-occurred on the list, suggesting that a resolution had not been found. An explanation for this may be because qualitative methods themselves are very complex and there are numerous different approaches and sub-disciplines. People on the list came from various different backgrounds and so will approach qualitative analysis in their own way. The computer is a tool, one that aids analysis, and the way that it is used will be dependent on the researchers own way of working. As a result, people will favour one package over another, not necessarily because it is seen as the most sophisticated or the best (although this may be the reason for some) but simply because it may suit their style of working. In the same way that there are controversies and debates surrounding qualitative methods as there are in other fields, the controversies also surround the tools that are used. There are controversies surrounding the computer: for example closeness to data - does it lead to doing more of a grounded theory approach because of the software's ability to provide a coding function? It is perhaps, because of all the different approaches to doing qualitative analysis, some of these debates and controversies cannot and never will be resolved, unless qualitative researchers accept that there are only a couple of ways of doing things but this is unlikely to happen and qualitative researchers will continue to work in a number of smaller fractured disciplines. This in itself is something that occurs as the result of controversial debates in the field which leads to its development.

Chapter 9 Debates and Contestations

Introduction

Merton (1973) argued that science is governed by a set of norms. One of these norms, 'communism,' encourages scientists to share their findings. This knowledge is then shared and diffused within the community. As diffusion of innovation spreads, it becomes open to criticism. According to Merton (1957), once the scientist has made a contribution, he or she no longer has exclusive rights of access to it; the discoveries become part of the public domain of science and open to scrutiny and debate.

Methodological and philosophical debates have existed since the early development of CAQDAS and despite a lessening scepticism, still continue to the present day. Although some of these debates could be anticipated, such as scepticism towards using computers in qualitative research, others were not anticipated and only became apparent as knowledge about CAQDAS extended to other social worlds, such as those outside the academic social sciences. These effects were used as further ammunition regarding the use of software for qualitative analysis by those who were sceptical. Criticisms can be of various types, such as constructive criticism and academic debate which are most likely to be put forward by 'critical appropriators' and 'experienced hands' (the groups identified by Mangabeira *et al.* (2004)) or they can be directly in opposition to the use of software in qualitative methods – the 'sceptical' group (these categories were discussed in a previous chapter).

This chapter discusses the debates and contestations that occurred as a result of using computers for the analysis of qualitative data. These issues are closeness to data, coding, and the grounded theory debate. Furthermore, it will also be discussed how these issues re-emerged on the discussion list, Qual-software. Prior to this, it is useful to look briefly at the literature on scientific controversies.

Scientific Controversies

According to Engelhardt and Caplan (1987), a scientific controversy becomes identified with a particular scientific community and can be understood as a group of stakeholders in a scientific debate who at a particular point in history share common rules of evidence and inference. Nowotny (1975:37, cited in Mendelsohn 1987, p 93) argues that "controversies are an integral part of the collective production of knowledge; disagreements on concepts, methods, interpretations and applications are the very lifeblood of science and one of the most productive factors in scientific development." The most common source of controversy in science is theoretical difference, in which two or more theories are put forward to account for the same problem situation (McMullin 1987). This plurality of theories was regarded by Popper as a normal situation in science, that controversy between those with different views is at the heart of scientific advance and so it is from such controversy that progress derives. Therefore as Kuhn argues, although conflict is an unwanted externality, it is a natural outcome of the structures of the scientific enterprise (McMullin 1987).

In order to understand these norms, what is necessary to ask is not why disagreements or disputes arise but what makes them become long-standing debates or controversies (Mendelsohn 1987). According to Mendelsohn (1987: 98), there is a social nature to controversies in the sciences, therefore the social and political procedures and forums by which debates and controversies are carried on are of interest, in particular the use of scientific and professional authority and the limits of this authority when a disagreement erupts into a controversy.

As outlined above, controversies are seen as a natural occurrence of a scientific community, but an important issue that is raised by academics is how they end. Mendolsohn (1987: 101) identifies two possible outcomes: resolution and closure. 'Resolution' of a controversy represents a coming together of the conflicting parties and the emergence of a consensus and 'closure' is a more formal structure for ending a controversy or debate that permits a partial resolution but not necessarily a dissolution of the disagreement. However, resolutions are not always found and therefore scientific work is able to continue. The knowledge and explanatory modes used by both parties of a conflict become a part of the broad body of knowledge and technique in the sciences and can be and often are used even while disagreement persists.

As discussed in a previous chapter, Pinch and Bijker (1990) suggest that looking at controversies is useful when looking at the development of a technology and whether closure of a particular controversy is achieved. In accordance with Sproull and Kiesler’s two-level effect perspective, it can be argued that the first-level effects, rather than second-level effects are more likely to reach ‘closure’ as discussed by Pinch and Bijker (1990), where, for example, technical problems, such as bugs in software are resolved. Pinch and Bijker (1990: 13) argue that countless problems will emerge throughout an innovation as the technology is invented, developed, expanded and improved. However, it will be various groups that will decide differently not only about the definition of the problem but also about the achievement of closure and stabilisation. Therefore, closure of a problem occurs when the social groups involved in designing and using the technology decide that it is solved. Furthermore, the degree of stabilisation is different in different social groups and as invention is not an isolated event but a process over time, each social group will have a different interpretation of a technological artefact, some of which may be radically different (Pinch and Bijker 1984). Unresolved controversies are particularly rewarding sites for SSK research, for they allow the analyst to study science that is still in the making (Martin and Richards 1995). As Pinch and Bijker (1990) point out, closure occurs repeatedly during technological development, and whilst closure may appear for some groups, it does not for other groups. Pinch and Bijker (1990) suggest that there are differing degrees of stability, where some groups see certain problems as being resolved or not a problem in the first place, whereas for other groups the issues have not been resolved, nor are they likely to reach resolution.

The debates and contestations about CAQDAS vary in intensity and are an indication that some groups are simply cautious of using CAQDAS, such as the ‘critical appropriators’ identified by Mangabeira *et al.* (2004) and so may or may not become involved in the debates, whilst others directly oppose the use of computers in qualitative data analysis: the ‘sceptics’. Qualitative methods pose different theoretical questions and operate within different theoretical frameworks. Different problems will also arise for different groups.

For example, there are disagreements between what is the most appropriate way to carry out research; scholars from different disciplines and even within the same discipline cannot always agree with one another about the best approach to use. The response to CAQDAS was simply another dimension of this: what happens to the research process once computerised techniques are introduced. There are a number of different types of qualitative methods in the social sciences and as the numbers of users continue to grow in other disciplines, this range is extended. Therefore, this brings with it an increasing variety of theoretical perspectives producing the potential for further debate.

What follow next are the debates and contestations that arose with regards to CAQDAS. These effects arose as the result of the first level effects of CAQDAS (e.g. design of software) and second level effects (adoption or non adoption) and can be seen as third level effects (the responses).

Closeness to Data

A frequently discussed issue in the literature, and one which the interviewees discussed in some length, was the issue of closeness to data, which is seen as a strength of qualitative research methods and one which distinguishes it from quantitative research. Getting close to the data enables the researcher to gain an in-depth insight and understanding of it. Does the use of the computer and the software come between the researcher and their data? According to Denzin and Lincoln (1994), using a strong 'text-based manager' may encourage the user to collect far more data than is needed because it is so easy to retrieve, thus distancing or alienating people from their data. One propagator discussed how physically, rather than mentally, the computer does actually come between the researcher and their data:

> *"The business about being close to data, 'I want to be close to my data, I don't want the computer to come between me and my data'. I would always say that's a romantic idea. But, having said that, the computer does actually sit in between you and your data and you need to understand what the implications of that are, it does shape, for example, what you can see of your data, it doesn't allow you to pick up and ruffle through it."* (P1)

Another propagator suggested that those critical of the software would argue that there was no need for complex software, that it would distance the researcher from their data:

> *"Some users in the debate would claim, why create these so sophisticated software –programs when we just use, what we really want is something very simple to allow us to code and retrieve. There was the issue about distance or closeness to data, that if you're using a program you become more distant from your own data, greater common ground between programs allowing you to transfer more easily data from one to the other."* (P8)

Another propagator raises the issue of 'technophobia', something that an 'experienced hands' (Mangabeira *et al*. 2004) researcher may have, arguing that some software which is easier to use and enables you to see your transcript all the time, may let the researcher overcome their fear of working on the machine:

> *"In the software, you should be able to keep your attention up, so I can understand the closeness to data issue, but it's rather like the technophobia that, once you actually use the software, that worry falls away. With some software in terms of closeness to data, you can see the transcript, it never goes away. So you can overcome your fear about working on the machine with a piece of software. So someone approached it with fear, or with this suspicion that they weren't going to be keeping close to the data, could entertain that sort of naive fear much longer with a more forbidding, more difficult package, the moment you have that, you're comfortable with it, that's fine, the crisis is over and you're going to use it."* (P2)

However, whilst maintaining closeness to data was a frequent debate, it was actually less important than what may have originally been perceived. The computer may physically come between the researcher and their data, but CAQDAS offers tools, such as memo-writing features, which enables the researcher to maintain closeness. Furthermore, it is possible for a researcher to use a combination of manual and computerised methods to analyse their data if they are concerned about becoming distant. This combination of methods was something discussed both by propagators and developers, as well as in the discussion list, Qual-software.

Coding

One of the most contested issues within the literature on CAQDAS was something that is central to analysis for many types of qualitative analysis; the coding process. Even before the development of CAQDAS, issues about what to code, how to code, how much coding, were pertinent. Therefore, it would be apparent that coding would also be important in CAQDAS and indeed is one of the main tools of the software, as one of the tasks that the computer can do is to aid the coding process. Coding for some is an 'attractive nuisance' (Miles 1983), something which can be alleviated by the computer, and was something that some developers sought to do with their products. This was a 'first level effect' (Sproull and Kiesler 1992); an intended process. However, what were unanticipated were the issues that would result because of coding and different groups' perception of it (a second level effect).

Coding using the computer was seen as a strength by some groups but others constructed it as something problematic. In the early days of development, there were technical problems. For example, one developer, Seidel (1991), in discussing his own package, the Ethnograph, argues that the early packages did suffer from a coding process that was very complex. This might have led users to be caught up with working how to code and so they may have lost sight of their data. This realisation of the problem was alleviated with subsequent upgrades of software.

However, as found out by one propagator whilst teaching a workshop, problems regarding coding are problems that remain, with or without the computer:

> *"An exercise I used was to give people a transcript and get them to work in a group to agree a coding scheme for the transcript and one of the things that was interesting about that, was that it was something that people couldn't agree about, what a code was, how to code it, whether you should or should not have any assumptions beforehand."* (P1)

Nonetheless, those critical of the software argue using a 'code-and-retrieve' program may result in too fine analyses and gets the researcher bogged down in coding (Denzin and Lincoln 1994).

Furthermore, the issue about coding led to a particularly intense debate suggesting that qualitative computing might blur the boundaries between qualitative and quantitative research (Ragin and Becker 1989). For example, some software packages such as MAXQda, allow for data in mixed qualitative-quantitative studies to be imported from and exported to SPSS, as well as providing statistics about the proportion of text that is coded against a particular code, and the number of times a particular code has been applied (Mason 1996). However, it can be argued that this was the intention of the developer, whose objective was to incorporate a mixed methods approach based on the methodology of Max Weber. The developer explained:

> *"Before WinMAX, the program was called MAX, after Max Weber in relation to his work, because his methodology brought together qualitative and quantitative thinking."*

Therefore, one might argue that the blurring of boundaries is not an issue but something that a user might want.

Furthermore, computer based methods have potentially allowed new techniques such as hypothesis testing and the building of formal and semi-formal models not traditionally found in interpretative methodologies (Mangabeira 1995). As a result, this has led to a concern amongst those critical of CAQDAS that this would lead to 'analysing qualitative research quantitatively ' and as such would produce a new orthodoxy of qualitative analysis (Coffey *et al.* 1996). This assertion was challenged by Fielding and Lee (1996: 22) who argued that "the software represents not a developing orthodoxy but rather the ability effectively to manage data which may be a considerable improvement over the ad hoc procedures frequently underpinned in manual analysis", referring to the traditional individual researcher's methods of analysing their field notes using coloured pens and paper. Instead, computer software provides multi-tooling to qualitative researchers, making available a wide range of analytic techniques (Fielding and Lee 1996). As pointed out by one developer, this assertion may be the result of a misunderstanding of what the software is about and what it can do for the researcher:

> *"They are treating qualitative data like quantitative and that's not what it's meant for, it's to get a process, to get an understanding and not to get a generalisation. Among other things, that to me is a big mistake."* (D5)

One of the easiest tools for computerisation was the coding process and coding is an essential component of grounded theory. As a result this would develop into a long-standing debate between coding and grounded theory, with those critical of CAQDAS arguing that the use of software would lead researchers to use grounded theory over other approaches. Controversies surrounding grounded theory itself, a debate initialised since its conception in the 1960s, are one which has continued and has re-emerged in the literature on software. This debate is examined next.

The Grounded Theory Debate

Critics have argued that some of the programs were explicitly aimed at assisting in grounded theory analysis. Richards and Richards (1993: 47) suggest that this may be because grounded theory produces, as theory emerges, an imploding collection of codes and an expanding system of cumulative memos about the data, something which CAQDAS can assist with.

There have been two basic positions within this debate. Those sceptical of CAQDAS argued that this would lead researchers to adopt a new orthodoxy of qualitative analysis, resulting in a homogenisation of methods, where the programs combined computing techniques with methodological perspectives associated with 'grounded theory' (Coffey *et al.* 1996). This assumption was based on the fact that the software provided 'code-and-retrieve' features which indeed can be seen as part of grounded theory methods. Lonkila (1995) argued that aspects of grounded theory have been overemphasised in the development and use of qualitative data analysis software, whilst other approaches have been neglected in comparison. As a result, there is a danger that researchers may be led towards an uncritical adoption of a particular set of strategies as a consequence of adopting computer-aided analysis.

Coffey, Holbrook and Atkinson (1996) argue that the widespread use of software that had developed around grounded theory would result in a homogenisation of all the qualitative analysis processes; i.e. we would all become grounded theorists. Lonkila (1995) argues that some aspects of grounded theory have become overemphasised, especially the process of coding, or that some of the qualitative researchers choose to use grounded theory because they believe the software is based on this methodology.

This issue was expressed by a number of propagators, one of whom criticised Lonkila arguing that:

> *"What he did was to simply look for examples where developers had been influenced by grounded theory and ignored instances where they hadn't and I think there is also a fundamental misunderstanding about what grounded theory is. What people latched onto was the idea of coding, that coding is fundamental to CAQDAS."* (P1)

However, as discussed by Fielding and Lee (1991: 2), the software emerged "out of qualitative research itself, the developments were driven by the needs of the research community, rather than being the products of a competitive-driven situation." Tesch (1990) argues that each programmer developed their software according to their own perception of how a qualitative researcher would approach the task; each had their own working style and certain terminology. She argues further that the developers were mimicking what qualitative researchers have done for decades as part of their work and are still doing.

In response to Coffey *et al.* Lee and Fielding (1996: 2) argued that the software was not a developing orthodoxy but a "multi-tooling of qualitative researchers, making available to them more or less at will, a wide range of analytical strategies." The researcher has a choice of whether to use computerised methods or manual methods and, if so, which software. According to Fielding and Lee (1996:3), the use of software has an advantage as the "ability effectively to manage data may be a considerable improvement over the ad hoc procedures frequently underpinned in manual analysis", alluding to the traditional individual researcher's ad hoc methods of analysing their field notes using coloured pens and paper. Tesch (1990) argued that individual scholars have conducted inventive qualitative studies without labelling their method, each one made up his or her own way of analysing data, as such no one has 'codified' the procedures for qualitative analysis and it is not likely that anyone ever will'. Furthermore, Fielding and Lee (1996) endorse the view previously mentioned that Lonkila only looked at examples that confirmed his view and ignored other examples less favourable to his position.

This debate about grounded theory can be addressed here since the interviews with the developers provide an understanding into how and why they developed their software.

As discussed elsewhere, the most common reason was to meet their own research needs and practice.

It is apparent when examining the history and development of CAQDAS, that some of the developers may have been influenced by coding in the beginning or specified that it can assist with grounded theory because of the coding tools. Certainly the software does not only assist with grounded theory analysis but can be applied to a variety of methods. Fielding and Lee (1993: 8) metaphorically refer to this as ‘Frankenstein’s monster’, in that like the monster, the programs are misunderstood, that what you have created comes back to haunt you. These misconstructions were something which occurred early on and as a result were misrepresented in certain literatures, a matter discussed by a number of propagators:

> *“The authors didn’t really understand what qualitative software was and they presented it as a kind of analysis like analytic induction or grounded theory. It’s just the way they worded the references to it and was presented as a style of analysis. Although the developers emphasised that the software was supportive to grounded theory procedures and approaches, what they really meant was that it used codes, and as codes are discussed in the original Glaser and Strauss’s terminology, it made people think OK, this is grounded theory software. Whereas you know that’s quite wrong, it can be used for other schools, for example, it can be used for micro-analysis or for analytic induction.”* (P2)

Another propagator provided a similar argument, suggesting that the programs were misunderstood:

> *“I don’t think they’re all grounded theory orientated, I don’t think that’s true at all. I think some of the concerns have to do with not understanding the range of programs that are around. So, I think the programs will tend to push you in certain directions based on their conceptual orientation of the developers, but I also think you don’t have to be trapped by them.”* (P9)

However, despite much discussion about this and an attempt to rectify the situation, it is a belief that some still hold and as such a debate that will not be resolved in the immediate future.

Interviews with developers provide an opportunity to assess the extent of the link, if any, between grounded theory and software development. It is clear that the early software was developed by each researcher for their own needs and that what they were doing was 'computerising the research processes' and thus their own research practice. As discussed in an earlier chapter, the developers were able to bring previous knowledge and skills to product development and wherever necessary the acquisition of new skills. They saw what was happening in other disciplines and with quantitative methods and content analysis and thought the same could be applied to qualitative methods.

What has led critics to make a link between the software and grounded theory is the coding process. As coding was an easy tool to computerise, it was evident that a coding tool would feature in the software. However, the coding procedure would be different for each developer because of their own unique research style. Furthermore, as development took place in a number of different countries for developers' own research needs, is it then possible that they all developed the software with grounded theory in mind? Tesch (1990) wrote that 'qualitative research means different things to different people and also differs amongst disciplines, as each one seems to have its favourite type of qualitative researchers, where researchers in one are often not even aware of what 'qualitative' means in the others'. Therefore, some researchers may not even have heard of grounded theory. What is more plausible is to take each individual developer and look at their backgrounds and influences at the time of development.

It was found that developers were actually computerising their own research practice, whether that was grounded theory or not. For example, one developer originally based his products on, and was influenced by, a similar already existing content analysis program, TextPack, which he thought was a good system but too crude for his needs and as such decided he would develop his own. He explains:

> *"I started to study mass communication in 1978 and at that time I got into contact with mainframe computers. In 1979 I was involved with a research project on the content analysis on mass media and this was where I did the first course on computer aided content analysis with the program TextPack. Therefore, I had my experiences with TextPack, but found it rather crude, and so thought about writing another one."* (D1)

Another developer said that he had based the program on his earlier research:

> *"I was just writing this program, which was really about taking the transcripts and coding them according to this categorisation system that I had developed."* (D3)

A couple of developers had been inspired by particular social theorists such as the mixed methodology of Max Weber and Harvey Sacks and Ethnomethodology, for example:

> *"I was introduced to ethnomethodology by one of the faculty members and discovered the works of Harvey Sacks."* (D4)

For a number of developers, the software was initially developed specifically for the research projects they were working on at the time. They found that no software existed that matched their needs. For example, as one developer explains:

> *"I had done a lot of research using manual methods and didn't see the need of moving past manual methods until I was working on a complex project. I didn't know of any programs for helping with qualitative research and so thought one could be developed."* (D8)

Similarly, another developer explained:

> *"One of the goals of the project was to create a tool that handled unstructured data, a tool which could also be used to enforce or amplify certain modes of painting and reasoning, without taking any reasoning responsibility from human beings. Two surveys had been conducted, one asking people what they need for their work and another asking what kinds of tools were available in the area. It was found that there was nothing based on hermeneutical phenomenological approach to the data."* (D2)

It is without question that CAQDAS does offer the tools for carrying out grounded theory, i.e. it provides code and retrieve and memoing functions, but these tools can be used for other methods and the proposition that the developers were influenced by grounded theory is, as Fielding and Lee (1996) suggest, a red herring. Although early development was based on the researcher's own methodology, in time as the products have grown and become more sophisticated, the tools offered can be applied to different methodologies.

What is interesting is that some of these debates, as well as others, have re-emerged online in the discussion list qual-software (which was examined in detail in the previous chapter) and therefore are not approaching resolution.

Discussion Lists

The discussion list provides an arena that enables controversies to be discussed in an open forum from scholars of different disciplines and backgrounds. Despite the fact that software for analysing qualitative data has been around for some time now, as Gibbs, Friese and Mangabeira (2002) argue, the use of new technology still raises issues, such as what should be analysed and how it should be analysed and in what ways are these different to those done in more traditional ways. These particular issues and debates were clearly evident on the discussion list. Often discussions on the list reflected discussions elsewhere, for example, some were based around a particular paper or book at the time.

It has been argued that electronic conferences could help to solve or develop theoretical, methodological and ethical controversies in a research field and that, as a result, might speed up the development of whole research fields (Matzat 2004). However, this is debateable, as some scholars (for example Hiltz 1984, Harasim & Winkelmans 1990, Lewenstein 1995, Tombaugh 1984) have argued that these types of computer-mediated-discussions are not well suited for the discussion or solution of intellectual controversies among researchers. This view was also expressed by a developer who argued:

> *"I think the original idea that types of heavy discussions and idea sharing that was the hope of all the newsgroups, was a misunderstanding of the nature of the medium of those lists, they're not good for heavy discussions. If you write more than a screenful of information, it's too much and people don't have time, it's a medium that works for short off the hand comments that are poorly formulated and frequently misunderstood, and in the early years led to*

these ridiculous 'flame wars', because when you wrote something, you couldn't do all the explanations of your thinking behind it." (D4)

A frequent discussion on the list that tests this theory is the relationship between grounded theory and software: the 'grounded theory debate'. It can be argued that the controversies surrounding grounded theory have not found a resolution or closure and instead, as can be seen on the discussion lists, re-emerge. As Hiltz and Murray (1993: 222) suggest, controversies are a perpetually recurring, if not a permanent feature of science, in fact a vital feature of science in the sense that science is fundamentally dependent on them for the interjection of fresh points of view and the challenging of old established beliefs. This is because and is expected, in the natural course of the development of science, those scientists of different schools of thought, theoretical persuasions, points of view and disciplines will develop different hypotheses with regard to the same phenomena. These hypotheses will clash sharply, since they are frequently based on different ideologies (Hiltz and Murray 1993).

Conclusion

This chapter looked at the debates and contestations that occurred as a result of using computers for the analysis of qualitative data. Issues included closeness to data, coding and the grounded theory debate. What is interesting is these are discussions that emerged from the beginnings of the CAQDAS world and still continue to the present day and have even been extended to the discussion lists. What this suggests is that these issues that occur are not approaching resolution and closure and that perhaps they never will. In accordance with social worlds theory, it can be argued that as social worlds become more complex and segment with other worlds, this results in the increased number of different groups from diversified backgrounds. Therefore, as a result, these groups bring with them differing views and opinions and as such it can be argued these groups cannot reach agreement and therefore these disputes will not approach resolution.

Chapter 10 Conclusion

Introduction

The social construction of a scientific community, the CAQDAS (Computer Assisted Qualitative Data Analysis Software) community was examined in the thesis. The overall aim of the thesis was to identify how a scientific community like CAQDAS is socially constructed and to understand its origins, the processes that led to its development and propagation and its reception in the wider scientific community.

The broader aims of the thesis were: to examine the roles of social networks, both formal and informal in diffusing knowledge within the scientific community, to identify how a scientific community is transformed by technological innovation and to assess its impacts and responses within the research community.

This chapter starts by discussing why social worlds theory was chosen as the theoretical framework. Then it will identify and discuss the key findings relating to the processes that led to the development of the CAQDAS world. Finally, the chapter will discuss the possibility of further research and future directions.

Theoretical framework

There are a number of different schools of thought within the Sociology of Science that attempt to explain the nature of scientific communities. However, it was determined that the most appropriate method for studying the CAQDAS community was social worlds theory. This theoretical framework was seen as appropriate because, in order to understand the construction of a community such as CAQDAS, both macro-level phenomena (such as the development of computer technologies) and micro-level phenomena (such as the individual history and development of individual CAQDAS packages) needed to be examined. Thus it was essential to examine both technical and social factors and as a result open the ‘black box’ and examine the contents inside.

The thesis adopts a pluralistic approach which draws on other theories and concepts found in the sociology of science, such as those of Merton (1961, 1973) (‘norms of science’) and Kuhn (1962). As suggested by Lofland and Lofland (1995: 195), “there is no single way to interpret social worlds.” Data collection and analysis were carried out using a grounded theory approach as outlined by Strauss and Corbin (1998), an approach which is associated with the social worlds framework. Grounded theory provides more than a micro approach as, combined with the social worlds perspective, it also provides a ‘meso’ level (Urquhart 2007:341).

It was found in the thesis that the development of the CAQDAS world emerged out of three main interrelated processes; initial conception, propagation and reception. These processes are discussed next.

Initial development of CAQDAS

The first stage of development was the conception and early development of the software. The thesis identified a number of sub-processes that led to the initial development and social construction of CAQDAS.

Firstly, initial development of CAQDAS was made possible by the development of computer technologies and as such was the result of the intersection of two distinct social worlds: qualitative research and computing. But why develop software? In the early development of CAQDAS, many scholars were sceptical as they thought that qualitative research and computing were seen as an incompatible partnership, that computers belonged within a positivistic paradigm. However, CAQDAS emerged because developers wanted to find new and improved ways to carry out their research, so it was something that was developed for their own research needs. Many of those interviewed said that they thought there had to be a better way of analysing data rather than using manual methods and as they saw what was happening with computer technologies, thought these could be applied to qualitative research. As this happened at the same time as the developments occurring with computer technologies, the result was a mixture of serendipitous discovery (Foster and Ford 2003), as well as intended discovery activated by what Pasteur called the ‘prepared mind’ (Barber and Fox 1958). It was found that development occurred simultaneously in a number of different countries and was thus a process of ‘multiple discovery’, a feature not uncommon in science (Merton 1961).

Secondly, the next process for developers was to solve the puzzle of how to computerise manual methods of qualitative data analysis. Puzzle-solving can be seen as another feature common to academic life (Kuhn 1962). As computer technologies were advancing and becoming more affordable, qualitative researchers were able to experiment with them by crafting do-it-yourself approaches using word processors and text retrievers. Over time, computers and associated products became more affordable and more user-friendly, resulting in wide-spread diffusion. The first CAQDAS programs were developed in mainframe computers and then later, as computer technologies developed and changed, for the PC, at first in DOS, then later in Windows. Each transition meant that the developer had to evolve their own products. For those that did not, for example, make the transition from DOS to Windows, the programs became obsolete. Therefore, through a mixture of existing knowledge (knowledge about qualitative research), acquired knowledge (learning about computer technologies) and previous experience (in either or both qualitative research and computing), these puzzles were resolved. Knowledge of qualitative research, computers and programming, whether through past experience or specifically learning the technology, provided the formula for the creation of computer programs for qualitative data analysis, whether this was done by one developer or in some cases, in collaboration with a computer scientist.

Serendipitous discovery can also be social, for example through attendance at conferences and seminars, or simply by being in the right place at the right time. It is through the formation of social networks, both formal and informal, that led to further development of the scientific community as it enabled further propagation of the software and was the next process in the development of the CAQDAS world.

Propagation of CAQDAS

After initial development, the next stage in the development of CAQDAS was the diffusion process, which occurred via both informal and formal social networks, something which was amplified with the advent of interactive technologies.

Informal social networks, referred to as 'invisible colleges' (Crane 1972), were important in the early propagation of CAQDAS. Initial diffusion of CAQDAS was largely word-of-mouth, developers informing colleagues in their own local networks of what they were doing. Early adopters would inform others within their own networks, who would then inform others and so on. These early adopters would be influential and became the core of the CAQDAS world, diffusing knowledge of CAQDAS further, not only through word-of-mouth, but also through more formal means such as publications about the software and conferences dedicated to CAQDAS. Propagation of knowledge, sharing findings and informing others, can be seen as a norm in science (Merton 1973).

Another normative activity of science is attending meetings such as seminars and conferences. Kuhn (1962) stated that science is a communal activity and social networks are created and developed as a result of these activities. With regard to CAQDAS, an early series of conferences organised by the early adopters was quite significant. They were significant because they brought the community together. The conferences provided a dual process of diffusion; they enabled the community to meet and the developers to introduce and share their products. They also diffused knowledge to a wider audience and in doing so enabled intellectual discussions to emerge concerning epistemological and methodological issues surrounding the software.

Competition is also part of scientific development (Callon 1995) and is the desire of scientists to receive credit for successful work (Restivo 1995). Therefore, it is the consequence of the 'institutional norms of science', where the scientist is reminded that it is their role to advance knowledge and in doing so receive recognition (Merton 1973). As a result, scientists will be under pressure to make their contributions to knowledge known to other scientists (Merton 1973) and thus open to scrutiny. By the time of the third conference, the software had become commercial as developers were selling their products. Consequently the competition between developers increased and, for some, intensified. Nonetheless, some developers have maintained a competitive, but friendly relationship, referred to by Tunstall (1971) as 'competitor-colleague' relations.

For CAQDAS, commercialisation and competition were important as they ensured the product's survival and continued development. Whilst competition is normal in science, commercialisation, at least in the social sciences, is not. Commercialisation occurred in CAQDAS once developers decided they were going to sell the software and took place for a number of reasons. Developing software was time consuming and so there was a necessity for some kind of financial reward. Some found that developing software conflicted with their academic roles and so made the decision to leave their posts and concentrate on developing their packages. However, in order to make a living, the developers had no choice but to sell their products commercially. For some it was a progressive direction and expansion of their product and the distribution of the software by Sage Scolari assisted with this. However, there were a few developers who thought that the intervention of Sage Scolari had not been beneficial to them and their software.

Despite widespread diffusion, propagation of CAQDAS was only confined to these networks and not diffused to all potential adopters. This is seen as a consequence associated with informal networks, referred to by Crane (1972) as 'invisible colleges'. However, this was to change with the development of interactive technologies, which transformed the CAQDAS community in three main ways; facilitating development, facilitating diffusion, and expanding the boundaries of invisible colleges. Scholarly communication and social networks have moved online (Koku *et al.* 2001), resulting in the development of online social worlds. Looked at from the perspective of social worlds theory, online worlds can be seen as 'social world systems', which are the largest of worlds and consist of numerous segmentation and intersections of various social worlds (Unruh 1980).

Interactive technologies facilitated further development of CAQDAS as they encouraged the development of new features in the software, as well as the transformation of existing methods and the creation of new ones. They enabled further propagation of CAQDAS by aiding the testing and distributing of software, as well as providing online support via emails and the discussion list, qual-software. Online journals, such as *Forum: Qualitative Social Research* have meant that the propagation of CAQDAS could occur much more speedily than traditional print and to a much wider audience. Therefore, the internet provides greater visibility in that people can search the internet and find information on CAQDAS with relative ease and speed. As a result of its diffusion, the internet expands the boundaries of invisible colleges, enabling anyone with an internet connection and interest to participate in discussions that were once confined to seminars and conferences. This was seen in the setting up of dissemination networks such as the CAQDAS Networking Project. The project was set up in order to provide assistance and advice to users through workshops and seminars, as well as providing the means, a discussion list 'qual-software' for the community to interact and discuss the methodological, epistemological and theoretical issues surrounding CAQDAS.

The content of the discussion list was analysed from 1994, when the list began, to December 2005[35] in order to examine the discussions around CAQDAS from a users' perspective. It was found that the majority of respondents were from academic or academic-related disciplines and that only a small percentage were non-academic. However, over time the number of non-academic subscribers had increased marginally. Four main usages of the list were identified and can be categorised as follows: firstly, the list acted as a means of disseminating knowledge about CAQDAS and CAQDAS-related issues, such as information about forthcoming seminars and conferences. The number of this type of 'advertising' post increased steadily over time.

Secondly, the list functioned as a support network, or as one developer called it a 'virtual classroom', as users, particularly novices, would seek the help and advice of more experienced users. Enquiries were usually about which software to use and the suitability of software for particular methods, software evaluation and comparisons (for example, user-friendliness) and software-specific discussions where users may be experiencing problems with the software (in the early development of CAQDAS these were largely technical problems). Over time, support increasingly became a regular theme. However, problems using specific software moved to the associated discussion lists, when developers created their own lists.

Thirdly, the list functioned as a 'counselling service' where users shared their frustrations, dilemmas and experiences about their work. Such posts tended to come from novice or less experienced researchers seeking advice from those more familiar with the field and as such were advantageous to novice users. What was interesting in the discussion lists was the willingness of people to share and exchange information, something which Sproull and Kiesler (1991) call 'electronic altruism'. In this way, the

[35] It was viewed that twelve years of data from the discussion list was sufficient for analysis.

discussion list enabled those that may have found it difficult to break into a traditional invisible college to gain easier access to a variety of scholarly experts in their field of study and as a result increased the probability of finding someone that could help to solve problems (Kraut and Attewall 1993). With Qual-software a small minority of experts, and not just consultants, would be identified; there were regular contributors to the list offering help and support in the altruistic style that Sproull and Kiesler discuss.

Finally, the Qual-software discussion list provided the opportunity for members to participate in debates about the use of CAQDAS. These debates were predominantly an extension of existing debates found in the literature on CAQDAS and will be discussed in the next section.

What is interesting to note is that throughout the first twelve years of its existence the same questions reappeared in the list at regular intervals. It is also important to highlight the fact that this analysis of qual-software only provides a partial explanation for the wider changes in the CAQDAS community and can only be fully understood with further investigation. As knowledge of CAQDAS diffused and continues to do so, it was possible to examine the impact and reception of CAQDAS, the third stage of development.

Reception of CAQDAS

Early reception of CAQDAS was subject to dual scepticism: computer technologies were treated with caution by academics and computers for qualitative data analysis were met with some cynicism, as they were seen as something that belonged to the quantitative paradigm. The reception of CAQDAS was, and remains, mixed. Some researchers welcomed the use of the tools to assist with data analysis, whilst others were more dubious.

As social worlds expand and segment with other worlds, different groups with differing opinions will emerge. Reception of new technologies is often not without controversy but is seen as an essential part of a social world, one that is necessary for the world to evolve. As CAQDAS has been around for some time, it is possible to identify different categories of user. Each group will have a different problem in relation to the product.

The thesis developed and elaborated the typology originally formulated by Mangebeira *et al.* (2004); these are 'program loyalists', 'critical appropriators' and 'experienced hands'. 'Program loyalists' accepted the programs and tended to lack a critical stance towards the strengths and weaknesses of the package. This group was the most likely group to adopt a package without questioning its suitability. A critical approach was something that 'critical appropriators' did acknowledge as they adopted an analytical stance towards developers' claims about program capabilities and interacted with programs from within a comparative framework. Critical appropriators were able to find creative and innovative ways of using the software. 'Experienced hands' were older researchers, who had experience in the manual analysis of qualitative data but who had acquired their computer skills later in life. They were more hesitant than younger users in their interaction with the hardware and software but exhibited a greater critical and reflexive awareness about package use. It was anticipated that this group will diminish as the older generation retires. Whereas 'critical appropriators' and 'experienced hands' are more likely to assume a more critical stance, this does not necessarily result in non-adoption of a package. 'Critical appropriators' and 'experienced hands' were the most likely groups to raise issues about using CAQDAS for qualitative research, whereas 'program loyalists' were most likely to experience problems with the technicality of using the software in carrying out their research projects. Those sceptical of CAQDAS were most likely to hold the most reservations.

To this typology formulated by Mangabeira *et al.* (2004), three more groups were identified, 'pioneers', 'non-users - laggards' and 'sceptics – late majority'**.** The pioneers were the innovators: the core group of developers and propagators that initiated the development of CAQDAS. 'Non-users - laggards' were those that did not use the software. This group did not necessarily have any reservations about using the software but rather saw manual methods as more appropriate, whether it was because manual methods may be a personal preferred style of working or seen as more suited for certain type of methodologies. However, it may also be the case that researchers, despite widespread diffusion, have not heard of CAQDAS. Although in time this is likely to change, particularly with the influence of the internet –this still does not necessarily guarantee adoption. The ‘sceptics – late majority’ are those that directly oppose the use of computerised methods. It is this group that holds the most reservations and is highly critical of CAQDAS. These categories drew on the work of Rogers’ and his adopter categories of ‘innovators’, ‘laggards’ and ‘late majority’. Aside from Rogers, there has been little investigation into adopter categories, and with further research, these six categories identified in the thesis can be further refined.

Sproull and Kiesler (1992) identify a two-level perspective on technology. The first level effects are the anticipated ones, such as the planned efficiency gains and productivity gains. The second level effects are the unintended consequences of the first level effects. With regards to CAQDAS, first level effects included speedier retrieval and analysis of data, data management and the ability to work with more data. Previous research (Lee and Fielding 1998, Tesch 1989, Barry 1998), as well as findings from the thesis, highlighted that use of the software resulted in a less tedious analytic process and offered the possibility of a more refined and replicable analysis, as well as automating and speeding up the coding process. Furthermore, the software was able to provide a formal structure for writing and storing memos to develop the analysis and aid more conceptual and theoretical thinking about the data. However, it was found that not all problems have been eradicated and new ones have presented themselves. For example, the initial organisation of data remains time-consuming, it is only once the data has been organised and retrieval and analysis has begun, that the computer can save time.

The second level effects were technological problems, methodological and theoretical issues. In the early history of CAQDAS, the first packages were prone to bugs and program crashes. It can be argued that this is an anticipated part of the process of software development. Initially, the developers had created the products for their own needs and so any issues such as bugs were not seen as important. However, as others began to adopt it, bugs were something that the developers had to take on board and make the necessary improvements, eventually leading to product stability.

Even in current times, with greater sophistication, it is not unheard of that a software program may experience unforeseen technical glitches due to incompatibilities with other products. For example, some anti-virus software programs may prevent other programs from working effectively. Therefore the end result is greater stability but not necessarily resolution and closure, as new problems may be presented. For example, compatibility issues may arise with the emergence of a new technology, such as a new operating system. By way of illustration, when Windows Vista emerged in 2007, there were some known problems which were resolved in the next upgrade.

Methodological issues, particularly those faced by a novice user, can also be seen as a second level effect. The thesis highlights the kinds of problems users experienced and explored the value of training. The most common problem was choosing which package to use and determining which was 'best' for certain methods. Whilst the software has alleviated some of the problems relating to data management (a first level effect) what was not anticipated was that researchers would take on more data (a second level effect).

Another issue was the different terminology used with each package. As each developer initially developed the software for their own use and in accordance with their own methodologies, each package has its own terminology. For example, a 'hermeneutic unit' in Atlas.ti or 'nvivo' in N9 may result in confusion for the novice.

Those critical of CAQDAS, the 'sceptics – late majority,' argue that users could get an impression that analysis is actually done by the software, referred to by MacMillan and Koenig (2004) as the 'wow' factor. Some propagators and developers did experience this misconception. However, this may indicate a lack of training in social research methods. Training is available on an increasing scale. In the early days of CAQDAS, users were predominantly self-taught and workshops were minimal. However, due to demand diffusion and an increasing rate of adoption leading to an increased demand for workshops, the result was the development of initiatives such as the CAQDAS Networking Project (CNP). Demand diffusion also led to a gradual emergence of a number of consultancies, some of which were set up by the early 'experts', such as QUARC, SdG Associates and ResearchTalk[36].

Another methodological issue considered by some was that as adoption of CAQDAS was increasingly spreading outside the social sciences; a consequence of this may be

[36] For details see appendix

the lack of training in research methods. The response to this was mixed. From their empirical investigations, Mangabeira *et al.* (2004) identified two new categories of user: those engaged in applied research and those involved in research that is not based in social science. This was also evident from my own investigations (from the interviews and analysis of the discussion list) where it was found that users came from different businesses, medicine (including specialties like epidemiology, general practice and psychiatry), government agencies, marketing and evaluation research. Therefore, these researchers would bring their own methodologies and ways of using the software. For some, this was seen as an issue as it was not regarded as using the software appropriately. However, researchers contended that this did not matter as long at the tool worked for their own research practice. After all, it can be argued that the software is a tool and if it helps you to do your work better, then it is doing what it was intended for, no matter what the type of research.

Therefore, whether CAQDAS is being used 'appropriately' or not, in terms of academic research, is perhaps of irrelevance and not a concern for those outside the academic world. If, after all, the software is only a tool, then surely it can be used effectively by researchers that match their theoretical framework, regardless of academic background. Furthermore, research is increasingly becoming more multidisciplinary. Increased usage outside the social sciences can be seen as the next stage in the process of evolution in the development of CAQDAS. Was this inevitable? It would be interesting to see where the future developments in this respect will be.

Whilst a useful perspective, this two level approach by Sproull and Kiesler (1992) is somewhat dated as the authors were studying business organisations at a time when interactive technologies were only just beginning to be widely adopted and, as a result, some of the second level effects they identify may have changed and new ones emerged. In this respect, the thesis also identified third level effects, which arose as a consequence of the first and second level effects. The third level effects are the debates and contestations that arose in relation to using the software.

Debates included whether use of the computer and the software had come between the researcher and their data, and whether using software would result in the blurring of boundaries between qualitative and quantitative methods, particularly as some programs permit a mixed methods approach. However, for some researchers this was not seen as a problem but a methodological approach and certainly in the case of some software, this was intentional.

Other debates concerned issues surrounding coding, most commonly discussions on how to code. However, one particularly major debate was that the software would lead researchers to adopt a grounded theory approach over other methods. The thesis examined this debate in detail and provided an explanation as to why the association between grounded theory and qualitative software was made but also why this was not actually the case.

Coding was one of the most obvious tools to computerise and, with regard to programming, one of the easiest. As suggested by Holton (2007: 287), 'given the pervasive nature of technology, it is not surprising to see it surface as a tool for research'. So this was something the developers sought to do with the products – a first level effect. However, as coding is a key feature of grounded theory, those who tried to make sense of the software and the impact on methods made this link and wrote about it in publications (for example, see Lonkila 1995). As a result of this, there is a misconception that using a software tool will guide you towards doing grounded theory. Unfortunately, the emphasis on the coding process meant that CAQDAS was misunderstood and criticised for adopting a particular approach – grounded theory. Consequently what has occurred is a continuous debate amongst those advocating the use of software and those opposed to it. Those critical of CAQDAS argued that the use of software would lead researchers to use grounded theory over other approaches (for example, Coffey *et al.* 1996). Previous literature (Lee and Fielding 1996; Tesch 1990) suggested that this is not the case. My own empirical findings support this in that each developer had a different background and influences at the time of development.

CAQDAS does offer the tools for carrying out grounded theory but the tools can be used for other methods. Although early development was based on the researcher's own methodology, in time, as the products have grown and become more sophisticated, the tools offered can be applied to different methodologies. Having interviewed the developers about their backgrounds and how they first set about developing their tools, it shows that the link between the software and grounded theory is a myth.

Empirical evidence gathered in the thesis shows that because of the relative ease of creating coding tools in the software, some of the developers may have been initially influenced by coding or had specified that it can assist with grounded theory. But the software does not only assist with grounded theory but can be applied to a variety of methods. The early software was developed by each researcher for their own needs and essentially what they were doing was ‘computerising’ their own research practice.

What is interesting about the debate regarding CAQDAS and grounded theory is that, in accordance with recent literature, this debate is not approaching resolution, particularly as the social world of grounded theory itself has increasingly become fragmented. Originally those adopting a grounded theory approach would have been trained by its inventors Anselm Strauss and Barney Glaser (Timmermans and Tavory 2007: 494) when they developed the method in the 1960s. However, grounded theory methods became popular in the late 1980s as the result of two books published by Strauss (1987) and Strauss and Corbin (1990): *Qualitative Analysis for Social Scientists* and *Basics of Qualitative Research* (Timmermans and Tavory 2007). Both books offered a user-friendly guide to understanding the grounded theory approach. As a result, researchers were able to train themselves using these books as guidelines (Timmermans and Tavory 2007). What have been the implications of this? Grounded theory has become more fragmented. According to Charmaz (2006) and Clarke (2005), there are multiple versions: positivist, postpositivist, constructivist, objectivist, postmodern, situational and computer-assisted (Denzin 2007).

There are also those who believe that CAQDAS and grounded theory are not a compatible match. For example, Holton (2007: 287) argues that CAQDAS ‘does not lend itself to the coding and analysis of data in classic grounded theory methodology’. This is because ‘the coding process is not a discrete phase, but rather an intricate and integral activity woven into and throughout the research process. The mechanistic mind-set that results from their application is time-consuming and counter-creative to the conceptual ideation imperative for generating good grounded theory’. According to Morison and Moir (1998), the use of CAQDAS may actually create a barrier in a student’s understanding of what it means to analyse qualitative data, that computer software will dehumanise the research process and eliminate the personal aspects of data collection.

Summary

In summary, the thesis has shown how a particular scientific community is socially constructed. It examined the processes that led to the development and transformation of the CAQDAS world, processes which can be seen as 'normal' in the construction of that world. In order to understand the development of the CAQDAS community, the thesis examined both macro and micro phenomena, thus ensuring that the contents of the 'black box' were fully examined. Failing to open and examine the contents of the 'black box' is often a criticism of SSK (Winner 1993). Using and adapting the social worlds theory perspective and drawing on concepts from within the sociology of science, the thesis has provided a detailed analysis and explanation of how a scientific community is socially constructed. It has identified the various stages of development in the construction of the CAQDAS world.

The development of the CAQDAS community occurred in the following way: CAQDAS developed simultaneously in different locations across the world, initial diffusion was more localised but then spread outwards from these different locations through social networks, gradually becoming more regional and national, eventually international and global. There was a transition from a 'local social world', with people doing things in their own country, to a more 'dispersed social world' (Unruh 1980). As a result of interactive technologies, an online CAQDAS world also emerged. Currently, CAQDAS can be seen as a 'Social Worlds System', the largest of worlds consisting of numerous sub-worlds.

Thus, the stages of development of the CAQDAS world were as follows:

First, the innovation occurred, which was a process of simultaneous, partly serendipitous, multiple discovery. The CAQDAS world was the merging of two social worlds, qualitative research and computing. Second, the innovation was developed. This process involved a mix of previous experience, previous knowledge and acquired knowledge in order to solve the puzzle (Kuhn 1962) of how to computerise manual methods. Third, propagation of the innovation, where diffusion occurred alongside continued development and sophistication of the software. Scientists shared knowledge through both informal (‘invisible colleges’ (Crane (1972)) and formal networks. The processes involved in these three stages all constituted activities that can be seen as ‘normal’ in science, as suggested by Merton (1973). These normal activities included multiple discovery, communism, competition and scepticism. Propagation occurred informally via word-of-mouth and formally through normal activities – publications, seminars and conferences. With the arrival of the internet, the CAQDAS world became an online world, which resulted in rapid diffusion and further developments – in essence, the arrival of a new technology, the internet, transformed the CAQDAS world. Therefore, what was initially a local social world has now become a ‘social world system’, a multitude of subworlds. What evolves next for the CAQDAS world, remains to be seen.

Future directions

Even as I am finishing the thesis, the CAQDAS world continues to evolve and develop further and it would be intriguing to monitor its future directions, particularly as other new technologies may emerge. Social worlds theory suggests that worlds are constantly evolving, resulting in a never-ending segmentation with other worlds. The fate of a world is where it either becomes a whole new world, or continues to evolve with other worlds and develop further. It would be interesting to see whether for CAQDAS, the latter will be true.

The thesis addressed the debates that occurred amongst various groups about using the software, most notable of which was the grounded theory debate. This too would be fascinating, to see how these debates continue, as well as new ones, whether they re-emerge time and time again, or are approaching resolution. This thesis did show, from empirical evidence, that the developers had different reasons for developing the software the way they did, i.e. to computerise their research practice which was not only linked to grounded theory. Since its creation, there has been little empirical work carried out examining the effects of CAQDAS. These effects were examined in the thesis and a three stage model of effects was devised. As the CAQDAS world continues to evolve and the future is undetermined, and therefore unanticipated, more effects may materialise. Furthermore, the effects identified in the thesis, particularly the third level effects may become more apparent and some may even reach resolution. At some point in the future, it will be useful to revisit the three stage model of effects and look to other social worlds for comparison. The thesis also addressed the hypothesis that, due to interactive technologies, the boundaries of invisible colleges were expanding. This too, warrants further investigation as this was only based on one discussion list.

Therefore, further research might involve a comparison with other academic worlds and to test whether other scientific communities might develop in the same way. For example, the comparison with the development of CAQDAS within the discipline of Sociology compared to other academic disciplines, such as Health Studies and Medicine. As was previously discussed in the thesis, evidence has shown that the use of CAQDAS is extending to beyond the social sciences. Perhaps an investigation could build on previous research to find out to what extent this trend has continued.

Not only does the CAQDAS world continue to evolve, so do qualitative research methods. Some of what is currently happening and where the future is heading might have an impact on CAQDAS itself. This will be discussed next, in this final section. These are all areas to be observed as qualitative research methods and computing worlds continue to merge.

One particular area that might be examined is the archiving of qualitative data and the impact of this on the qualitative community as well as the CAQDAS community. A significant development on the archiving of qualitative data emerged as the result of the Qualitative Data Archival Resource Centre (Qualidata)[37] in 1994, funded by the Economic and Social Research Council (ESRC). As a result of this, the ESRC required from those applying for funding to check whether any data that could be used in the proposed project already existed and for those already in receipt of funding, that they agree to archive and make their data available to others (Geiger *et al.* 2010:6).

[37] Qualidata was the world's first initiative to pioneer preservation of qualitative social science data on a national scale. Since its inception, many have used Qualidata procedures as a starting point for developing their own archiving procedures (Corti 2000). The initial aim was to find out where, and to what extent, qualitative data were being kept, stored, preserved and shared in the UK. One of the key objectives was to identify both actual and potential sources of qualitative data across the UK and then publicise the sources.

Prior to this, sociology had received little attention in the literature on archiving but has now resulted in numerous debates about the reuse of qualitative data (Geiger *et al.* 2010).

What are the benefits for archiving qualitative social science data? Corti (2000) provides a detailed discussion on both the benefits and the limitations of archives but these are only discussed briefly here.[38] According to Corti (2000), many archives are approaching full capacity for paper documents and those with inadequate storage facilities are using inadequate basements for storage. Microfilming and digitising may save on storage space but it is not necessarily the cheapest option and filming and scanning are expensive operations. Furthermore, argues Corti (2000), the maintenance of electronic records in the long-term involves periodic transfers of data to new media and software. Technological changes and the ever-reducing cost of computer storage will undoubtedly mean that digitisation becomes a more attractive option over time because it allows the records themselves to be disseminated electronically. However, e-library (e.g. JISC E-Lib programme) and other electronic archiving initiatives in the archives world (H.E. Archives Hub) mean that it will not be long before traditional archives will be able to handle materials in any format.

Corti (2000) argues that researchers are able to re-use qualitative data in a number of ways. These include: creating new questions from existing data and thus approaching the data in ways that were not originally addressed, using the sampling and data collection techniques and tools to design a new study and in comparative research to compare new or other data sources across time or region or social group. CAQDAS can be used to aid the use of secondary analysis as data is already stored in electronic format. Furthermore, developers have added export and import facilities to their programmes in order to encourage sharing between packages.

However, archiving qualitative data has many implications for researchers, to the extent that some are wary of having their data archived. Firstly, ethical issues such as anonymisation, sensitivity and privacy of data. Whilst data can be omitted, any substantial changes in research material may diminish the material's applicability as a data source (Fink 2000).

[38] For further details see Corti (2000) http://www.qualitative-research.net/index.php/fqs/issue/view/27

Secondly, researchers are wary of criticism and so may be unwilling to hand over their data, coding and notes. Qualitative social scientists are not used to making their findings publically accessible and may be worried about others seeing their data and possibly picking holes in it (Corti 2000). It is not the archive that will be destabilised but an academic career, years in the making that might be hastily undone (Geiger *et al.* 2010).

Thirdly, some researchers may argue that the context of coding and comments and 'being in the field' are lost. For example, when analysing an interview transcript the researcher might feel that they are the only one who is able to use the data, that the result of both coding and analysis depends exclusively upon the researcher's interpretation of meanings hidden in data (Fink 2000). Gieger *et al.* (2010) suggest that sociological anxieties around the archive are often more about the possibility that reuse will undo the authority and validity of the 'original' research – and the original researcher. It is only the 'original' researcher who carried out the interview who has access to the true meaning of the encounter and even its traces in the transcript.

Fourthly, some researchers argue that certain approaches used in qualitative research, for example, grounded theory (Glaser and Strauss 1967), which opposes the scientific paradigm of testing hypotheses, does not lend itself to verification and is thus seen as unsuitable for archiving and secondary use (Corti 2000).

Fifth, there are practical problems, such as data stored in certain electronic formats where, over time, the medium on which these are stored can become obsolete, particularly as archive material may be used long after the original study was carried out (Fielding 2000). Furthermore, as Geiger *et al.* (2010) argue that, while often seen as an extremely versatile depository of documents, facts and information, the internet constantly changes and transforms the information posted.

As outlined above, there are many benefits as well as implications regarding the archiving of qualitative social science data. Nevertheless, as suggested by Gieger *et al.* (2010), the future uses of the archive cannot be determined or known how it will be used or if indeed it will ever be used.

What is interesting about these reactions to archiving is what Fielding (2000) calls 'echoes of the resistance to qualitative software'. The discussion surrounding the archiving of qualitative data is something that could be examined in detail in future research, particularly its association with CAQDAS programs, as well as programs that have been developed specifically for archiving, an example of which is QBiQ (Kluge and Opitz 2000). 'QBiQ' (pronounced as 'cubic') provides archiving for both qualitative and quantitative methods as well as providing other functions such as coding and text retrieval.

Another area to be examined is the increase in data available due to digitisation. According to Thrift (2005), social research methods are proliferating. This has to do with the digitisation of everyday life and the growth of digital transactional data (Savage, Ruppert and Law 2010). According to Law *et al.* (2011), there is a whole range of new methods out there and unless social science keeps in touch with these changes, it will no longer be competent to contribute to new modes of social research. Savage and Burrows (2007) refer to this as the 'reconfiguration of social research in the digital age' (Gieger *et al.* 2010: 23).

As a result, a number of sociologists have argued that the future of sociology is in crisis. Savage and Burrows (2007) examine the changing significance of empirical research, where between 1950 and 1990 sociologists could claim a series of distinctive methodological tools that allowed them to state clear points of access to social relations. However in the early 21st century, social data is now so routinely gathered and disseminated that the role of sociologists in generating data in now unclear. According to Mair *et al.* (2013), in a recent National Centre for Research Methods (NCRM) Working Paper, social science methods are increasingly being treated as part-and-parcel of those societies and cultures and constitutive elements of the knowledge-making practices that operate at their very centre.

Savage and Burrows (2007) argue that social science research now occupies an increasingly marginal position in the huge research infrastructure that forms what Thrift (2005) calls 'Knowing Capitalism', where circuits of information proliferate and are embedded in numerous kinds of information technologies. Savage and Burrows (2007) argue that the repertoires of empirical sociology need to be rethought in an age of 'Knowing Capitalism'. Therefore, there needs to be a greater reflection on how sociologists can relate to the proliferation of social data gathered by others, a type of 'commercial sociology' which is currently ignored. This interest in the ‘politics of method’ involves sociologists reviewing their interests in methodological innovation and reporting critically on new digitalisations.

According to Uprichard (2013), the world of data has gone from being analogue and digital, qualitative and quantitative, transactional and a by-product, to simply BIG. She argues that more and more data will be automatically collected and generated through everyday interaction. So much more of everything will be simultaneously data-producing and data-driven. Social scientists need to fight back and need to be clear about the kind of social science we move forward to. However, as Uprichard (2013) argues, social scientists are used to dealing with big data. The concept of data being too big to handle is far from new for most social scientists, having too much data to handle is the norm. She argues that social scientists have a range of important tools and techniques, theories and sampling techniques for dealing with data that is too big and messy to handle. Indeed, such tools are the very tools discussed in this thesis. It can be argued that, as CAQDAS continues to evolve, it is being developed to deal with big data. Another area to be investigated in future research.

Another solution to the crisis of future sociology is put forward by Burawoy (2005) who believes that sociology needs to become more public. Public sociology can be seen as the autonomous and reflexive engagement with external audiences in which the preferences of the sociologist are made clear and those audiences are seen as equals (Scott 2005). According to Burawoy (2005), the sociologist is a public intellectual, communicating to educated people outside university contexts (Ericson 2005).

Burawoy’s (2005) view is that advocacy of a public sociology is a crucial means for redressing an imbalance in the development of sociology as a discipline and the growth of its professional ‘pathologies’ that overemphasise one or the other of the types of sociological knowledge. However, Scott (2005) argues that the promotion of public sociology is empty unless the public is willing to listen. If sociologists are to speak out, then there is also an obligation to ensure that the public listen to, and pay attention to, what is said. However, this is easier said than done.

Beck (2005) does not think that sociology can become an integral part of public discourse and practice and that mainstream sociology is not prepared for public discourse and practice. According to Beck (2005), all the different forms of public and non-public sociology are in danger of becoming museum pieces. He argues that sociology not only needs a public voice, it needs to be reinvented. Beck carried out research on the 'uses of sociology' in many fields in the late 1980s. The aim was to find out what happens to all the sociology being produced for public, practical or administrative purposes when it is used or not used. It was discovered that the non-sociological 'fellow sociologist' (Gouldner), the practitioners, decision-makers and journalists, had interpreted both the sociological content and the so-called 'results' within their own frame of reference and for their own practical purposes. As a result the process of intervention, the 'sociologiness' of a 'result' of sophisticated research gets lost. Beck (2005) argues that there is no direct correspondence between public sociology and the public uses of public sociology. If public sociology does not try to control the public users of public sociology, and if the public feels free to use sociology on its own terms and in its own interests, then there is no control and no expectation of control on either side.

In order to make sociology more 'public', what perhaps needs to be considered is for sociologists to increasingly examine their own practice. According to Leahey (2008) only a small (but growing) number of social scientists have done this. It is important to do this as technology continues to shape research practice, as has been outlined in this thesis. As Leahey (2008) points out, all sorts of technological advances are potentially relevant to social research, such as computers, programs such as Google Documents that make long-distance collaboration easier, open-source software and shareware, statistical packages and free web-based survey software. She asks: 'are such tools changing the way we collect and manage data, test theories, and report results and permitting the development of new methods?'

This thesis has addressed the questions asked by Leahey (2008). It has explored the impact of computer technologies on a scientific community, examined social research practices and how these were transformed by the development of CAQDAS and the internet. However, as Leahey (2008) suggests, more can be done to examine the effects of new emerging technologies not only on the qualitative community, as I have done, but on social research practice in general. One area that could be looked at is the implications of the study and the planning and provision of training. For example, my own role as 'participant researcher' and the effects of 'studying my own tribe', as well as having a supervisor as part of that tribe had various implications (which were detailed in the methodology chapter). This experience could be used as an example in the teaching of social research methods. Also as many fields are now being affected by technological change, CAQDAS could be used as a case-study for future endeavours. As discussed in the thesis, the role of propagators and support networks were most influential in the development of CAQDAS and provide a means from which others can learn, as the knowledge is already there. For example, nowadays, social media is so prolific and joining a mailing list or social network is considered the norm. In the pioneering days of CAQDAS, the internet had not widely diffused and the World Wide Web did not exist. It is only later in the history of CAQDAS that an online world emerged.

CAQDAS is able to assist the researcher in being reflexive. According to Dey (2007:186), CAQDAS "has encouraged a more diligent and disciplined approach to the auditing of the creative process. It is no longer enough to present a set of conclusions, supported and expanded by illustration from the evidential base. The reflexive practitioner at the very least has to monitor and present the critical steps in the development of the analysis, so that these can be followed and possibly disputed by the reader". Therefore, the researcher is able to document their research process and data analysis within a CAQDAS program, thus the research project is not only archivable, but also available for public scrutiny.

Another possibility for further research is looking at gender and its place in the development of CAQDAS. Women have tended to be invisible in science, and with regards to the computing world, this is no exception. According to Etzkowitz *et al.* (2008:405), "they were the 'invisible scientists', helpmates to fathers, brothers and husbands in the early stages of the scientific revolution in the 18th century." Even when "science was professionalised and industrialised, moving from home to laboratory, women became the personal support structure for male scientists in the home and then in the lab, a condition that persists to this day in attenuated form" Etzkowitz *et al.* 2008). According to Fox (1995: 206), in science, numbers of women may be present, but these are limited or constrained in their occupational locations, positions and rewards. Edwards (1995: 279) argues that "computer work is stratified in an almost linear way along an axis defined by gender ... where women are overwhelmingly dominant in the lowest skills, lowest status and lowest paid areas... For example, the percentage of computer science PhDs awarded to women has remained at 10-12% since 1978."

Further, argues Fox (1995:220), "women are outside of the social networks of science in which ideas are exchanged and evaluated and in which human and material resources circulate (Fox 1991)." With regards to technological innovation, women's contribution, such as Ada Lady Lovelace and Grace Hopper in the development of computer programming, has generally been left out of the history books, which still represent the inventor as male (Wajcman 1995: 200). Indeed with regards to CAQDAS, the developers were and are predominantly male and the social scientists female. Therefore, clearly there is a divide between gender and computers, something worthy of further investigation. Whilst some studies have been carried out on gender and computers, little has been done with regards to gender and CAQDAS.

A number of explanations have been put forward to explain the differences in gender and computing, most notably the fact that computers are seen as a masculine phenomenon embedded in history and culture. According to Wajcman (1995:201), "the enduring force of the identification between technology and manliness is not an inherent biological sex difference; rather it is the result of the historical and cultural constructions of gender. Wajcman (1995: 202) argues that, "engineering culture, with its fascination with computers and the most automated techniques, is archetypically masculine. Of all the major professions, engineering contains the smallest proportion of females and projects a heavily masculine image hostile to women." For as Fielding and Lee (1993: 78) suggest: "for women, the computing world can be foreign if not hostile" and according to Paczuska (1986, cited in Fielding and Lee 1993, p78), "girls become hostile to machinery from early childhood and from then on regard technology as a male preserve." This can in part be seen by the language of computing, which as Lyman (1984: 81) describes, "is an aggressively masculine technical language of control, filled with military/game slang and jargon, such as the machine 'crashes' " (Lyman 1984: 81). Such language may reinforce gender-shaped attitudes towards computing by providing a familiar ambience for men but contradictions for women (Fielding and Lee 1993: 78)

In order to understand the social construction of the CAQDAS world, the thesis identified its origins, development, propagation and reception. In doing so it identified how the scientific community was transformed by technological innovation and assessed the impacts and reception of CAQDAS within the wider scientific community. However, the CAQDAS world continues to evolve and so any future developments, for now, remain boxed.

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Appendices

Appendix 1: Who's Who

Appendix 2: Statement of Informed Consent and Permission to Use Information

Appendix 1: Who's Who

Developers

Ed Brent is Professor of Sociology and has taught at the University of Missouri since 1976. He developed the Methodologists' Tool Chest, a series of programs that advise people on conducting research projects. This was first marketed in 1987. With funding from the National Science Foundation he developed the program Qualrus over a five year period, which went on the market in 2002. He is owner and founder of his company Ideaworks – http://www.ideaworks.com/

Alan Cartwright is developer of Code-A-Text and CI-Said. He has now retired and is no longer developing, but still maintains the two programs.

Sharlene Hesse-Biber is Professor of Sociology at Boston College, Massachusetts, U.S.A. She is co-developer of HyperResearch, along with **T.Scott Kinder** and **Paul Dupuis** (later replaced by **Richard Gaskin** as Lead Programmer)**.** From 1989, HyperResearch started to be developed and by 1991 ResearchWare Inc. was formed, allowing the program to become commercially available. **Ann Dupuis** provides technical support for the company as well as updating manuals and tutorials. Scott Kinder is also a member of the Academic and Research support department at Boston College.

http://www.researchware.com/

Harald Klein is developer of Intext and TextQuest, software for aiding content analysis. He first started developing Intext ('Inhaltsanalyse von Texten' – 'Content analyses of texts' in 1980 and presented the software at the Softstat Conference in Heidelberg, Germany. Realising there was an interest in his software; Harald continued developing and developed a Windows version in 1989. However, by this time a Windows program already existed and so TextQuest was chosen and in 1999 the first version was released.

http://www.textquest.de/pages/en/general-information.php

Udo Kuckartz is Professor in Research Methodology at the University of Marburg. He is developer of MAXQda (formerly MAX and WinMax). In 1994 the first Windows version came out and to coincide MAX was changed to WinMAX. It was also the first English version, as previous versions had all been in German. In 2001 the name was changed to MAXQda.

http://www.maxqda.com/

Thomas Muhr is developer of Atlas.ti, which was originally a University project, but Thomas took over and developed the software further when the project came to an end. Project Atlas ran from 1989 until 1992 and was an interdisciplinary project initiated by psychologist Professor Heiner Legewie, German Aerospace, Damer Chrysler and the Technical University of Berlin. The first commercial release was in 1993.

http://www.atlasti.com/index.html

Tom and Lyn Richards are the developers of NUD*IST (Non-numerical Unstructured Data: Indexing, Structuring, Theorising) and Nvivo. The first commercial version of NUD*IST was created around 1982. In 1995, the Richards formed their company, QSR (Qualitative Solutions and Research) International. They are both now retired, but the company and development of the software continues.

http://www.qsrinternational.com/

John Seidel is developer of the Ethnograph, first developed around 1980 with the first commercial release in 1985. He also organised the second CAQDAS conference in 1991 at Breckenridge, Colorado.

http://www.qualisresearch.com/default.htm

Propagators

Nigel Fielding is Professor in the Department of Sociology, University of Surrey. Together with Raymond Lee, he is co-director and founder of the CAQDAS Networking Project and co-organiser of the first CAQDAS conference, held at the University of Surrey in 1989. He has written extensively on issues surrounding the software and in collaboration with Raymond Lee, has edited a book series, 'New Technologies for Social Research', published by Sage.

Susanne Friese is owner and founder of QuaRC – Qualitative Research and Consulting – a consultancy business she developed in 1996 after many years assisting users of CAQDAS programs such as the Ethnograph and Atlas.ti.

http://www.quarc.de

Silvana di'Giorgio developed her consultancy business, Sdg Associates in February 1997. The consultancy started off in the U.K. and was the first to provide training commercially other than the CAQDAS Networking Project, which at that time, was predominantly university based. Sdg Associates later expanded to Boston, Massachusetts, USA, in 1998, Silvana's hometown.

http://www.sdgassociates.com/mainframe.html

Udo Kelle is Professor of Methods of Empirical Social Research and Statistics at the Faculty of Humanities and Social Sciences, Helmut-Schmidt-University, Hamburg. He was organiser of the Bremen conference in 1993, the third and biggest in the series of early CAQDAS conferences. He has also written extensively on issues surrounding the software.

Raymond M Lee was Professor in the Department of Social and Political Science at Royal Holloway University of London, but is now retired. Along with Nigel Fielding, he is founder and co-director of the CAQDAS Networking Project and co-organiser of the Surrey CAQDAS conference. He has also written extensively on issues surrounding the software and in collaboration with Nigel Fielding, he has edited a book series, ‘New Technologies for Social Research’, published by Sage.

Ann Lewins was appointed as Resource Officer of the CAQDAS Networking Project in May 1994. She is now semi-retired, still running some of the day workshops. As part of her role Ann set up and maintained the Qual-software discussion list.

Ray Maietta set up his consultancy business ResearchTalk in 2000, although he had provided consultancy services prior to this for some time. The business is based in New York.

http://researchtalk.com/

Wilma Mangabeira wrote a paper on her use of a CAQDAS program in her PhD thesis which won a prize at the International Sociological Association. Since then she has written a number of articles relating to CAQDAS. Wilma left academia and now works as a Family and Systemic Psychotherapist.

Katja Mruck is founder and chief editor of FQS (Forum: Qualitative Social Research). FQS is an interdisciplinary, multi-lingual, free online journal and the first issue was published in January 2000. In 2001, it received funding from the Deutsche Forschungsgemeinschaft. Publications are available in English, German and Spanish. The journal has frequently contained articles on issues surrounding CAQDAS.

http://www.qualitative-research.net/index.php/fqs/index

Renate Tesch has been identified by many as a key person in the history and development of CAQDAS. She had written one of the first books on using computers in qualitative research. Renate had worked at the Fielding Graduate Institute, an independent semi-open university, founded in March 1974 in Santa Barbara, California, by herself, Frederic Hudson and her husband, Hallock Hoffman. She left that to start her own business, Qualitative Research Management. Renate died from liver cancer in 1994.

Eben Weitzman is Associate Professor and Chair in the Department of Conflict Resolution, Human Security, and Global Governance and Graduate Program Director of Conflict Resolution at the McCormack Graduate School of Policy and Global Studies, University of Massachusetts Boston. Along with Matthew Miles, he wrote the book ‘A Software Sourcebook: Computer Programs for Qualitative Data Analysis’ – which provided a detailed evaluation of the CAQDAS programs around at that time.

Sage representatives

Steve Barr is Managing Director of Sage UK, President of Sage International and Global Sales Director. He was involved in the initial stages of Sage’s role in distributing CAQDAS.

Simon Ross was a previous editor at Sage, and was involved in the selling and distribution of CAQDAS.

Appendix 2 – Statement of Informed Consent and Permission to Use Information

Name of Research Project: New Technologies and Qualitative Research

Research Institution: Royal Holloway University of London

Name of Researcher: Urszula Wolski

Contact Telephone No:

I have been given information about the research project and the way in which my contribution will be used. It has been explained to me how the transcript of the interview will be kept confidential unless I give permission for my name to be used.

My contribution will be kept safely and securely with access only to those with permission from the researcher.

I understand that I can withdraw my consent at any time by contacting the researcher.

I give my permission for the interview, which I am about to give/have given for the above project to be used for research purposes only, including research publications and reports, **with/without** strict preservation of anonymity.

Name of Participant…………………………..

Signature of Participant………………………….Date…………………

Signature of Researcher………………………….Date………………….