Investigating Factors and Characteristics of the use of e-Collaboration Tools in Research Collaboration

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A Thesis submitted for the partial fulfilment of the requirements for the degree of Master of Science at the University of Otago, Dunedin, New Zealand

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Abstract

Research collaboration, which is the working together of researchers to achieve a common goal of producing new knowledge, is worthy of investigation. Mattessich et al. (2001) identified twenty factors that influence the success of research collaboration. This exploratory investigation used Mattessich et al's (2001) model to measure the perception and degree of collaboration amongst researchers from the Otago region of New Zealand. A mixed-method research design, using both quantitative and qualitative methodologies, was employed to assess a number of collaborations in the Otago region.

This study employed an online survey instrument based on the Wilder Inventory (Mattessich et al., 2001). Forty-nine researchers from different disciplines in the Otago region completed a 42-item survey about their experience with research collaboration. Survey results were used to identify strengths and weaknesses in the Otago researchers' collaboration and to establish baseline data for future comparisons. Thirteen in-depth interviews were conducted with researchers who had been involved in collaborative research. Researchers from different sectors were interviewed individually. During these interviews, the preliminary outcomes from the online survey data were used to encourage the researchers to recall particular events about their collaboration, how they felt at the time and to reflect on these experiences. Qualitative data were analysed for emergent categories and themes, and were used to explore the status of collaboration amongst Otago researchers.

The twenty factors mentioned in Mattessich et al. (2001) can be useful in evaluating the success of research collaboration. According to the Wilder Inventory guidelines (Mattessich et al., 2001), nine factors scored high (4 – 4.3) indicating strengths in the Otago researchers' collaboration, eleven factors fell within the borderline area (3 – 3.9) and no factors scored lower than 2.9 indicating no weaknesses in their collaboration. However, interview findings showed that new technologies are still not utilised as they could be in the area of research collaboration. The findings of this study may help Otago researchers to enhance the strengths and work on weaknesses in their collaboration.

Acknowledgements

I would like to thank my supervisors Mr. Russell Butson and Dr. Maryam Purvis for their support and patience throughout this study.

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Chapter 1

Overview of the Study

Research collaboration may be defined as two or more researchers working together in order to achieve the common goal of producing new knowledge. It occurs when researchers determine the need to collaborate and identify possible gains. Access to information, the availability of technical facilities or personnel, and professional interaction are some of these needs, and increased prominence in the field, new knowledge and the establishment of networks are some of its possible benefits.

In research contexts, collaboration has been noted as generally "good for science" (Wray, 2006, p. 507), not only because collaborative research teams are more productive (Adams, Black, Clemmons, & Stephan, 2005), but also because multi-authored papers are usually higher in quality than single-authored ones (Rigby & Edler, 2005). In addition, collaborative research is an essential means of training new scientists, as some areas can only be studied collaboratively.

When teams of researchers collaborate, the results are more likely to be remembered and followed up because there are "more minds consciously aware of what has been discovered and where desired information can be found" (Wray, 2006, p. 508). With the possible exception of economics research (Medhoff, 2003), the ongoing process of peer review during collaborative projects may account for the high quality of multi-authored papers in many fields (Rigby & Edler, 2005).

The first step in organising a collaboration is for those involved to define their understanding of the research task (Hmelo-Silver, 2003). Good communication and commitment to the relationship are essential (Davenport, Davies,& Grimes, 1999). Both quality and quantity of communication are vital because the social interaction that occurs during collaborative work "affects both cognitive and socio-emotional processes" (Vinagre, 2008, p. 1022). In a study of students' email exchanges in a collaborative learning environment, Vinagre (2008, p. 1022) found that "fostering

closeness, solidarity and cohesion becomes the priority to be achieved between the partners instead of the expected … formality and impersonality".

Collaboration can be maintained when team members employ questioning as a means of seeking understanding of data, contexts, methods and other research constructs (Hmelo-Silver, 2003). Questioning and other forms of sharing rely on "positive interdependence and joint responsibility" (Vinagre, 2008) for their success:

> Positive interdependence refers to the idea of exchange and, if this exchange is to be successful, there has to be a balanced partnership in which both participants work together for mutual benefit. Thus, they have to exchange information, negotiate meaning, discuss topics or carry out tasks with other speakers. (p. 1024)

Socially, collaboration involves the development that individuals make of their own ideas, knowledge and beliefs towards shared processes of exploring and expressing new knowledge and ideas, and even new beliefs about this knowledge (Puntambekar, 2006). Social practices in collaborations, as well as the research activity itself, should be clarified and supported by those involved (Melin, 2000).

Mattessich et al. (2001) identified twenty factors that influence the success of research collaboration (see Chapter 2 for detailed discussion). The main aim in conducting this study is to use Mattessich et al's (2001) model to measure the perception degree of collaboration amongst researchers in the Otago region, and to illustrate what collaborative work means in terms of understanding the actual concept. Groups of researchers from the Otago region, whose collaboration was assessed, were part of this testing.

Mattessich et al's (2001) survey based on the twenty factors was used to understand and evaluate collaboration amongst researchers. This survey was used in this study as an assessment approach to identifying strengths and weaknesses with respect to the factors that influence collaboration success. This type of information is more useful as feedback than as an overall score of collaborative success or potential for success.

After the collection of data from the online survey, researchers from different sectors were interviewed individually. During these interviews, the preliminary outcomes of the online survey data were used as a way to probe the researchers to recall particular events in their collaboration, how they felt at the time and to reflect on these

experiences. The interviews were semi-structured in that the researchers had a predetermined set of questions. However, the style of the questions was open-ended allowing for responsiveness to the lead of the interviewee and for some latitude in terms of relevance.

The remainder of this thesis is structured as follows. Chapter 2 provides an overview of research collaboration. It consists of a background, definitions of research collaboration, levels and forms of collaboration, benefits of collaboration, factors influencing the success of collaboration and barriers to collaboration. Chapter 3 provides an overview of e-collaboration. It includes a definition of e-collaboration, criteria of e-collaboration tools and examples of online virtual office environments. Chapter 4 describes the methodology used in this study. It consists of the rationale underpinning the research methodology, study instruments, study participants, and procedures followed for data collection and analysis. Chapter 5 sets out the findings of the study. It presents the results of both the online survey and the interviews. Chapter 6 provides a detailed discussion of the findings and a conclusion.

1. 1 Definition of Terms

Collaboration: The action of working with other people to produce or create something.

Research collaboration: The working together of researchers to achieve the common goal of producing new knowledge.

E-collaboration: Collaboration using electronic technologies among different individuals to accomplish a common task.

Collaborators: Those who work together on the research project throughout its duration or for a large part of it.

Characteristic: An individualistic feature or attribute that serves to identify and characterise research collaboration.

Factor: Anything that contributes causally to the result of research collaboration.

E-collaboration tools: Virtual office environments, which allow collaborators to share files, events, tasks and manage projects online, no matter where they are physically located.

Chapter 2

Review of Research Collaboration

2. 1 Introduction

Collaboration is an age-old practice. In the past, humans used to collaborate with their neighbors and the people in their village to build houses or for other matters. At present, collaboration still exists in most of the things we do. However, the focus in this study is on research collaboration within the academic environment.

The following section begins with a background to research collaboration, followed by a definition of research collaboration and its levels and forms. This section also defines successful collaboration and gives an overview of benefits of, and barriers to, collaboration.

2. 2 Background to Research Collaboration

The term ‘collaboration’ originally meant working with the enemy during and after the Second World War. Since then it has been used in a more positive sense referring to “working in association with others for some form of mutual benefit” (Huxham, 1996, p. 1). Nowadays, it is widely believed that collaboration in research is 'a good thing’ because it helps researchers to produce high-quality outcomes (Katz & Martin, 1997; Wray, 2006). In addition, it helps to increase the productivity of research (Adams et al., 2005; Lee & Bozeman, 2005). Researchers have an increasing interest in the idea of research collaboration as the number of studies done by multiple researchers indicates (Katz & Martin, 1997; Wray, 2006).

Katz and Martin (1997) believe that collaboration should be encouraged. However, it is assumed that when researchers are attempting to collaborate on specific projects, they might misunderstand the precise nature of collaboration. In other words, they do not collaborate as they should; they think that they are collaborating but they are not. For example, each researcher in a collaborative group writes a part of the research without involving the others. This is not true collaboration. Rather the researchers should all

collaborate in each part of the research. This study attempted to clarify the nature of research collaboration and to make it more understandable.

2. 3 Definition of Research Collaboration

Samaddar and Kadiyala (2006, p. 193) define collaborative relationships as those where:

> An organisation initiates and implements a knowledge creation endeavour, and a collaborating organisation shares the expense and benefits of newly created knowledge, including its joint ownership through patents and licenses. Any economic rent or financial gain obtained is shared by a mutually agreed gain sharing rule. Depending on an individual organisation's prior efforts in knowledge creation, an organisation may or may not bring prior knowledge relevant to the collaboration at hand.

However, Katz and Martin (1997) believe that to define research collaboration, it is necessary to distinguish between true collaborators and others who were not directly involved in the research. According to them, collaborators include firstly, those responsible for one or more of the main elements of the research - for example, the experimental design, construction of research equipment, execution of the experiment, analysis and interpretation of the data and writing up the results in a paper. Secondly, collaborators include those who work together on the research project throughout its duration or for a large part of it, or who make frequent or substantial contributions and also those whose names or posts appear in the original research proposal.

They also mention that in some cases collaborators can also be the original project proposer and/or fund raiser, even if his or her main contribution subsequently is limited to the management of the research; for example a team leader and those responsible for a key step (the original idea or hypothesis, the theoretical interpretation). They suggest that collaborators will generally exclude those not seen as, or treated as, 'true' researchers; for example technicians, research assistants, and also those who make only an occasional or relatively minor contribution to a piece of research. While the above criteria for distinguishing between collaborators and those indirectly involved may apply in many research circumstances, Katz and Martin (1997) believe that there are

many exceptions to virtually all the above criteria in particular fields, institutions or countries. The literature mentioned above suggests that each researcher defines collaborative research in different ways. However, the majority of them agree that research collaboration could be defined as a group of researchers working together in order to achieve the common goal of producing new knowledge. Collaboration can be more easily understood if different forms and levels of this concept are discussed.

2. 4 Levels and Forms of Collaboration

There are different levels and forms of collaboration evident in different styles of research. Distinguishing between these forms and levels is necessary to understand the concept of collaboration. Collaboration can occur at different levels, that is, between individuals, groups, departments, institutions, sectors and nations. There are two forms of collaboration, the *inter-* and the *intra-* forms. *Inter-* refers to collaboration between levels whereas *intra-* describes collaboration within levels. However, collaboration may not belong solely to one of these forms. It may be either *homogeneous*, which refers to either the *inter-* or the *intra-*form, or *heterogeneous*, which describes a mixture of these forms (Katz & Martin, 1997; Melin, 2000). These levels and forms of collaboration are summarised in Table 2.1. The levels and forms of collaboration outlined above help to distinguish between the different types of research collaboration.

Table 2.1: Different levels of collaboration and distinction between *inter-* and *intra-* forms. (Katz & Martin, 1997, p. 10)

Levels	Forms	
	Intra	Inter
Individual	-	Between individuals
Group	Between individuals in the same research group	Between groups (e.g., in the same department)
Department	Between individuals or groups in the same department	Between departments (in the same institution)
Institution	Between individuals or departments in the same institution	Between institutions
Sector	Between institutions in the same sector	Between institutions in different sectors
Nation	Between institutions in the same country	Between institutions in different countries

In addition, levels and forms of collaboration vary depending on the need. Collaboration occurs when researchers identify that there is a need to collaborate and that there is something to gain from it. Needs might include access to information, technical facilities or personnel, or social engagement that stimulates and motivates people. Benefits might include increased visibility in the field of research, new knowledge or wider networks (Lynch, 2008).

2. 5 Successful collaboration

Collaborators can collaborate regardless of time and place. However, for a successful collaboration, collaborators need to understand underlying principles. Weckstrom (2009) believes that there are four key principles at the heart of successful collaboration. These principles are:

- *Appreciation* of each other's abilities, skills, knowledge and ideas.
- *Trust* between collaborators and their leaders will encourage collaborators not only to do what is asked of them, but also to challenge their thinking and incorporate new ideas into their learning. In addition, trust between collaborators ensures greater efficiency.
- *Commitment* among two or more individuals refers to the equality of participation by each one.
- *Recognition* means identifying a need in the collaborative work independently and taking appropriate action.

These four principles provide a general schema for the success of collaboration. Mattessich et al. (2001) identified twenty factors (including these principles) that influence the success of collaboration. The factors are grouped into six categories: (1) Environment, (2) Membership Characteristics, (3) Process and Structure, (4) Communication, (5) Purpose, and (6) Resources. The factors influencing the success of collaboration are:

1. Factors related to the Environment
    a. History of collaboration or cooperation in the community.
    b. Collaborative group seen as a legitimate leader in the community.
    c. Favorable political and social climate.

2. Factors related to Membership Characteristics
    a. Mutual respect, understanding, and trust
    b. Appropriate cross section of members
    c. Members see collaboration as in their self-interest
    d. Ability to compromise
3. Factors related to Process and Structure
    a. Members share a stake in both process and outcome
    b. Multiple layers of participation
    c. Flexibility
    d. Development of clear roles and policy guidelines
    e. Adaptability
    f. Appropriate pace of development
4. Factors related to Communication
    a. Open and frequent communication
    b. Established informal relationships and communication links
5. Factors related to Purpose
    a. Concrete, attainable goals and objectives
    b. Shared vision
    c. Unique purpose
6. Factors related to Resources
    a. Sufficient funds, staff, materials, and time
    b. Skilled leadership

These twenty factors provide a framework for any successful collaboration. They are not considered to be fixed factors that every collaboration should follow. The twenty factors are mentioned in this study because the Wilder Inventory (Mattessich et al., 2001) is based on them. The intention is to find out which factors are the most important.

2. 6 Benefits of Collaboration

There are several benefits of collaboration. The first is the transfer of knowledge or skills. It can be time-consuming for an individual to update their knowledge or to retrain (Katz & Martin, 1997; Somerville & Rapport, 2000).

A second benefit is the sharing of knowledge, skills and techniques through a division of labour. For example, one person may be good at constructing, operating and maintaining scientific instrumentation and another at analysing the data produced (Katz & Martin, 1997; Sage, 2000).

Thirdly, collaboration provides intellectual companionship. Research can be a lonely occupation. An individual can partly overcome that intellectual isolation through collaborating with others, or forming working and perhaps also personal relationships with them (Katz & Martin, 1997).

A fourth benefit is that collaboration may bring about a cross-fertilisation of ideas, which may in turn generate new insights that individuals working on their own would not have grasped. Thus, collaboration may be a source of stimulation and creativity. Such benefits are likely to be greatest when the collaboration involves partners from different backgrounds.

Moreover, collaboration has the effect of widening the network of contacts in an academic community. An individual researcher may have good contacts with a number of other researchers in his or her field around the world whom he or she can contact for information or advice. By collaborating with others in another institution or country, the individual can greatly extend that network.

In addition, collaboration can enhance the potential visibility of the work. Using their network of contacts, one's collaborators can disseminate the findings, either formally (for example through conference presentations), or through informal discussions. Together, collaborators are likely to arrive at a more informed decision as to the best journal in which to publish the results (or the one most likely to accept the paper). Once published, the paper may be accessed in library searches by scanning for work produced by any of the collaborating authors, multiplying the chance that it will be located and used by others. On average, it is therefore likely to be cited more frequently and to have greater impact.

There are several other benefits associated with collaboration across sectors. These benefits include: delivering commercial outcomes (Australian Centre for Innovation et al., 2002; Gorman & Mehalik, 2002; Prime Minister’s Science, Engineering and Innovation Council, 2005), solving problems (Reback et al., 2002), providing services to the community (Reback et al., 2002), engaging the public or industry in debate,

activities or projects (SCST, 2002) and encouraging creativity and innovation for research, community and commercial outcomes(Prime Minister's Science, Engineering and Innovation Council, 2005).

These benefits are mentioned here in order to compare them with the benefits mentioned by the participants in this study, and to explore whether there were any additional benefits that e-collaboration might provide.

2. 7 Collaboration Barriers

There are many barriers and challenges to collaborating across the sectors, including the cultural and disciplinary diversity of members, the need to generate commitment, geographical dispersion, communication constraints, status differences, the need to build creativity and innovation, and lack of support.(Andersen, 2003; Chatman et al, 1998; Duncker, 2001; Garza & Santos, 1991; Johnson & Chang, 2000; Kramer, 2002; Lamb et al, 1998; Leonard & Straus, 1997; Oetzel, 2002; Prime Minister's Science, Engineering and Innovation Council, 2005; Scott, 1997; Suzuki, 1998; Tsui et al., 1992)

In addition, Cunningham (2006) also identified four broad areas where researchers face problems when they engage in cross-sectoral collaborations. These areas are cultural, resourcing, structural rigidity, and recognition and status.

The first problem comes down to cultural differences between disciplines. Pecking orders amongst disciplines make collaborations difficult, especially when mutual respect is considered as a factor in successful projects. This issue can be overcome by allowing time for a relationship to develop.

The second problem is resourcing. Participants in Cunningham's study were not positive about the structures, and saw potential threats in the Research Quality Framework. This particularly applied when it came to evaluation, and proposals for cross-sectoral collaborations were seen as being a disadvantage in having to compete against proposals based on a single discipline.

The third problem is the rigidity of structures in universities and research organisations. The physical environment, the funding arrangements and the prevailing culture discourage engagement across the sectors.

The fourth impediment is a lack of a clear reward structure. The conventional reward systems in research are constructed along the lines of a single discipline: promotion

within the department or faculty, articles in discipline-based journals or funding provided by panels focused on a narrow range of disciplines.

These barriers are mentioned as a starting point to find out if they are experienced by the current study participants and if there are other barriers.

Chapter 3

Review of E-collaboration

3. 1 Introduction

E-collaboration is a new concept which emerged as the use of the Internet and the new electronic technologies became popular. These technologies are experiencing a wide diffusion among people. This section begins with a definition of e-collaboration, followed by examples of online virtual office environments and outlines the criteria of good e-collaboration tools.

3. 2 Definition of E-collaboration

Electronic collaboration (e-collaboration) is operationally defined here as collaboration using electronic technologies among different individuals to accomplish a common task (Kock & D'Arcy, 2002). This broad definition includes computer-mediated collaborative work as well as collaborative work supported by other types of technologies, such as web-based video and audio conferencing, and teleconferencing, whose main components are cameras, monitors and telecommunication devices. In this study, the focus will be on online virtual office environments, which allow collaborators to share files, events, tasks, manage projects and complete their tasks as if they were all located in the same place, no matter where they are physically located.

According to Kock (2005), there are six key conceptual elements for e-collaboration. These elements define e-collaboration in the sense that changes in those elements can significantly alter the nature of an e-collaboration episode. These elements are (1) individuals involved in the collaborative task, (2) the social environment surrounding the individuals, (3) the collaborative task, (4) mental schemas possessed by the individuals, (5) e-collaboration technology, and (6) the physical environment surrounding the individuals.

Collaborators' skills or knowledge play an important role in any e-collaboration. In addition, the relationships amongst collaborators are an essential element for e-

collaboration. The e-collaboration tools also affect the nature of e-collaboration because each tool offers different features. Different tasks need different features. Therefore, the choice of e-collaboration tools plays an essential role.

3. 3 Criteria of E-collaboration Tools

A set of criteria is needed to identify the quality of e-collaboration tools. Lomas, Burke, and Page (2008) state that good e-collaboration tools should provide:

- *Strong communication capability:* use of multiple video and audio, or even a simple text.
- *Easy-to-understand interface:* an easy interface for the users to navigate and use.
- *Ambient communications:* the ability to ask a question from experts, friends, or acquaintances at any time, regardless of location.
- *Document construction:* allowing collaborators to work in a synchronous environment on a single document.
- *Sharing documents and files:* the ability to share files and documents between collaborators.

The aim of Lomas, Burke and Page's (2008) study is to enable new forms of communication and engagement in the classroom, permitting extensions of and variations on the informal interactions already occurring in classrooms and hallways, and creating new frontiers for collaboration across geographic boundaries. They tried to do so by relying on the familiar ways students use collaboration tools, using technologies to do what they want such as communicating with each other. These criteria were used as a checklist to evaluate the e-collaboration tools chosen in this study.

3. 4 Example of Online Virtual Office Environments

There are many examples on the market of online virtual office environments which enable collaborators to work together. Different vendors use different names for their products. The tools mentioned below were chosen as examples of these kinds of tools.

They were found by searching Google using terms such as ‘e-collaboration’, ‘tools’, and ‘collaboration’. No meta-reviews or databases were found to help locate the tools.

3.4.1 Collaber

Collaber is a collaboration software program that works as a “Virtual Office Environment”. It helps collaborators work together, even if they work for different organisations, work remotely, or work offline.

Collaber offers more than 14 tools in a single workspace. Members of a workspace can communicate with each other by using the chat tool provided by Collaber, share and store synchronised files, discuss ideas, hold meetings, plan schedules, and manage projects. The same account can be used in more than one computer. Collaber also offers a web-based application.

Collaber offers 4 different packages for client download:

- Free: Users who opt for the free plan get 2 workspaces with unlimited members, 500MB of data storage space and 1GB data transfer per month. Forum and community is within accessible reach. Exceeding storage space or the data transfer will redirect the user to upgrade his/her package.
- Basic: This plan is for users who are in need of Collaber with more requirements. This provides unlimited workspaces and unlimited members, 4GB of Data storage space and 8GB data transfer per month. Added to the forums and community it gives email support for interaction. It is possible to upgrade the account.
- Premium: For people who require more space and data transfer. It gives 8 GB of data storage space and 16 GB data transfer per month. It gives full support in the form of telephone, email, forums and community. It is possible for the collaborators/users to get in touch with each other. All the data which is uploaded and downloaded falls under data transfer and storing any data in Collaber adds to storage space.
- Enterprise: This is for enterprise people who may use Collaber to have unlimited workspaces and unlimited members. The data storage is unlimited. Along with this the package provides telephonic support, email support, forums and community.

Collaber has met all the criteria that Lomas and his colleague identified (2008). It allows collaborators to communicate using chat box and Instant Messaging. It also allows them to share and construct files. Therefore, it can be said that Collaber can be a good collaboration tool. Collaber works with both Windows and Mac operating systems.

Figure 3.1: Screenshot of Collaber's Launchpad.

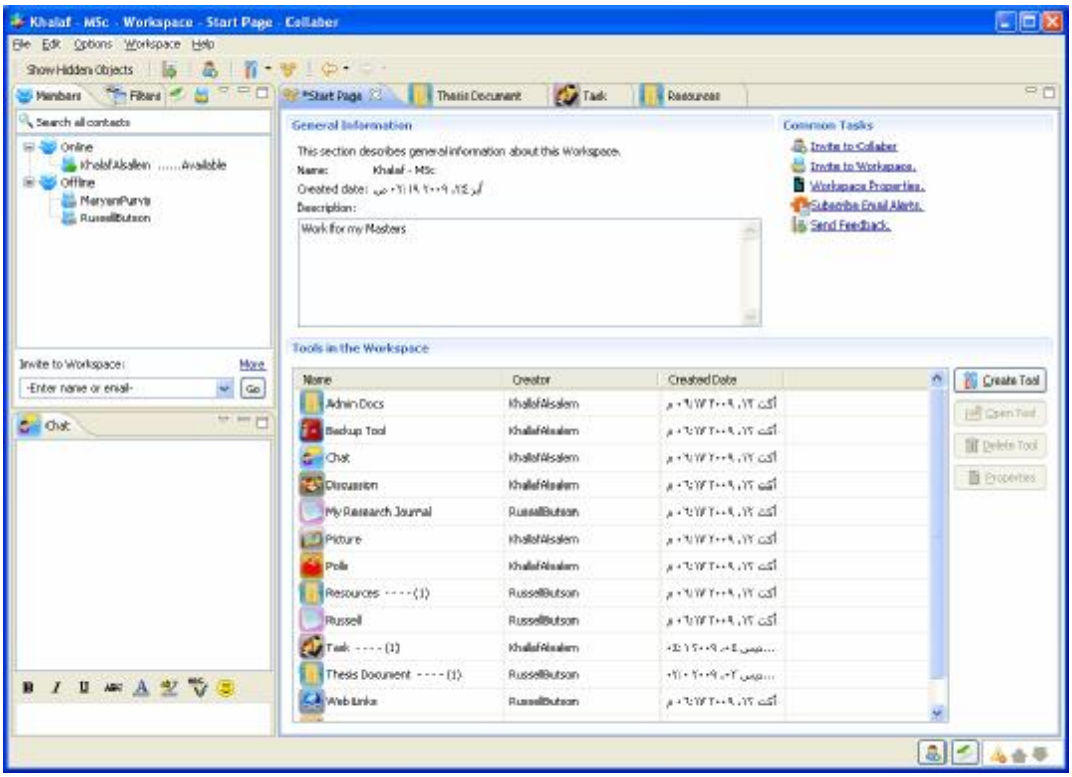


Figure 3.2: Screenshot of Collaber's Workspace.

3.4.2 ContactOffice

ContactOffice is a virtual office. It manages data (emails, contacts, meetings, documents, tasks...) in a virtual office from any computer with a Web browser and an Internet connection. It provides data sharing and access to shared data in the context of work or leisure groups. Data is available anytime on the Web, on a Personal Digital Assistant (PDA) (online or offline) or on a Wireless Application Protocol (WAP) capable cell phone. ContactOffice has four different versions: individual, group, customized and education version. Each version has different features according to need. The web interface is the most complete. It provides features such as Messages, Calendar, Contacts, Documents, Tasks, Forum, Chat, Notes, Bookmarks, SMS, Fax and Phone Calls.

ContactOffice has similar features to Collaber. On the other hand, it has a feature which Collaber lacks. This feature is email and SMS notification. Members in ContactOffice receive a standard notification by email or SMS when documents have been added or edited. ContactOffice is a web-based application only.

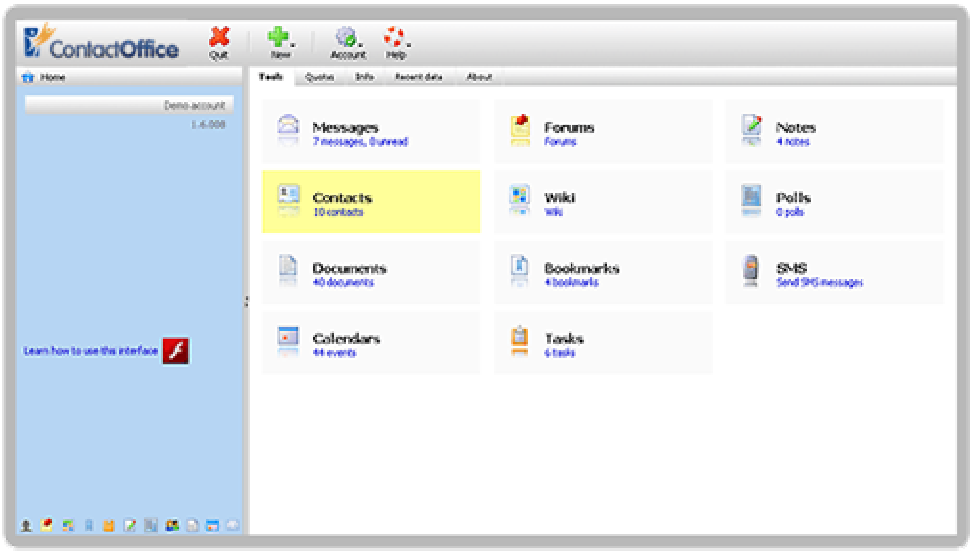


Figure 3.3: Screenshot of ContactOffice's Home.

3.4.3 WebEx WebOffice

WebEx WebOffice provides collaboration services, featuring an integrated suite of business applications, including document sharing, online calendar, group scheduling, online database, online meetings, web conferencing services and more. It is designed for

business. WebEx WebOffice is a solution for organisations, departments, teams – even individuals– and is a web-based solution.

WebEx WebOffice has a feature which the tools mentioned above do not provide. WebEx's original WebMeeting service allows for live conferencing on the Web, by phone, or both simultaneously. Adding a new or existing WebMeeting subscription to WebOffice can be arranged.

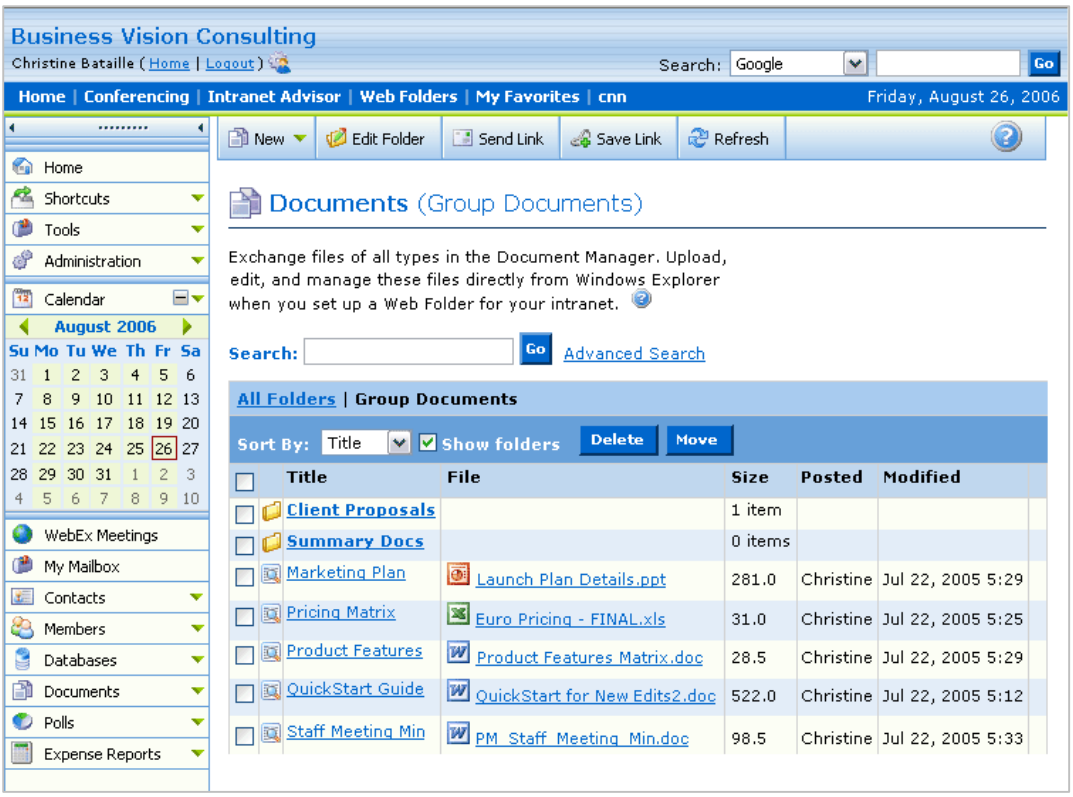


Figure 3.4: Screenshot of WebOffice.

3.4.4 Office Groove 2007

Office Groove 2007 is a peer-to-peer tool, which is distributed network architecture composed of participants that make a portion of their resources directly available to other network participants, without the need for central coordination instances. It is a collaboration software program that helps teams work together even if team members work for different organisations, work remotely or work offline. Office Groove 2007 is an example of how the 2007 Microsoft Office system helps teams and organisations collaborate.

The Groove launchpad looks like an instant messenger, but lists workspaces as well as contacts. The shared files and the discussion about the workspace can be seen in separate windows.

The difference between Collaber and Groove is that Groove works with one operating system (Windows) whereas Collaber works with both Windows and Mac as mentioned earlier. In addition, Collaber offers a web-based application unlike Groove.

Figure 3.5: Screenshot of Groove's Launchpad.

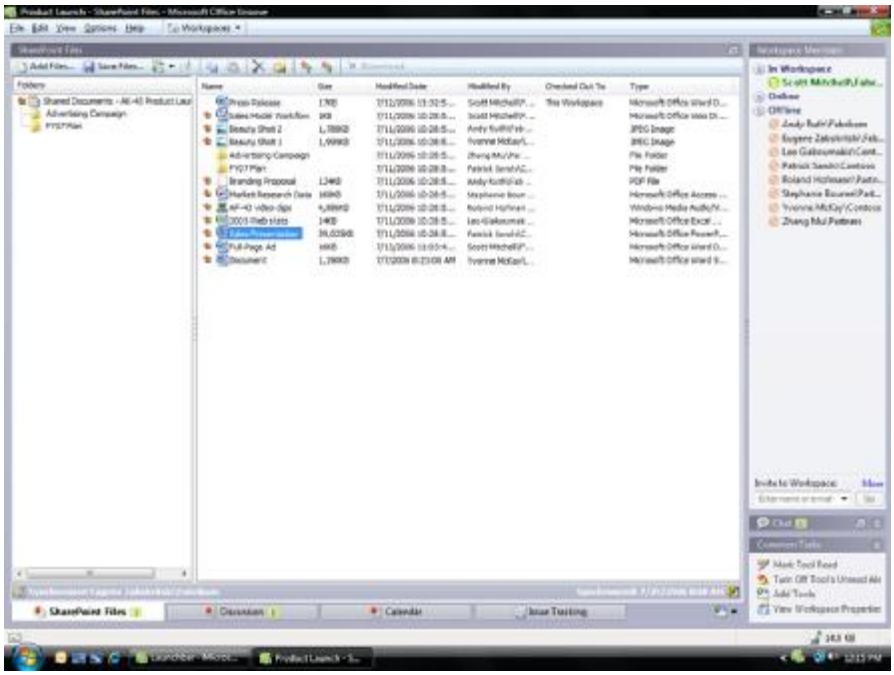


Figure 3.6: Screenshot of Groove's Workspace.

3. 5 Example of E-collaboration Tool for Research Use

E-collaboration tools for research are a subset of the wider e-collaboration tools. For this research, the primary researcher used Collaber. Some of the examples mentioned here were drawn from that experience. File sharing was used for sharing the Word documents of the research and also to share and store the resources used, such as online articles. These were shared with the supervisors.

The other tool was Notepad. It is similar to MS Windows Notepad but is built in Collaber. This tool helped to write or edit text in rich-text editor and was used to write the research journal. Writing and sharing the journal with the supervisors was helpful in keeping track of the research.

Collaber also offers the task tool. This tool was used to create and maintain the research task and enabled tasks to be assigned to each researcher. This helped the primary researcher and the supervisors to know which tasks they should accomplish and when they need to be accomplished by.

The Instant Message provided in Collaber was also a very useful tool which enabled the primary researcher to chat with the supervisors.

Most online virtual office environments offer these tools for research use, however, the interface does differ from one to another. The researchers have to find the tool that they feel comfortable with.

There is another matter that the primary researcher noticed about the communication means offered by Collaber. Instant message as the only means of communication is not sufficient. Chat-only can lead to misunderstanding. It would be beneficial to have the choice of chat, audio or videoconferencing instead of being limited to just one.

Chapter 4

Research Methodology

4. 1 Introduction

This study is primarily an exploratory investigation designed to gather information from a multidisciplinary group of researchers about research collaboration. A mixed-method research design, which used a quantitative methodology (online survey) in conjunction with qualitative methodology (semi-structured interviews), was employed for the purpose of measuring the perception degree of collaboration amongst researchers in the Otago region. The methodology used in Jacobsen's (1998) study - adoption patterns and characteristics of faculty who integrate computer technology for teaching and learning in higher education - was adopted here since it had the same method design. Derose, Beatty and Jackson (2004) used the Wilder Inventory (Mattessich et al., 2001), which is used also in this study, to explore issues of collaboration in Community Voices Miami. This helped in describing the online survey in this study. Researchers from the Otago region, who were involved in collaborative research, were part of this testing through an assessment of their collaboration.

4. 2 Rationale for Research Methodology

The strength of a mixed-method lies in its multiple sources of data. Applying different methodologies has several advantages. First, the use of both quantitative and qualitative research methods enhances the value of the investigation as each can extend the usefulness to both practice and theory. For example, qualitative research is often concerned with process as well as with outcomes; descriptive accounts provide a means of drawing parallels and contrasts between the phenomena being investigated and the practice. Quantitative research seeks to measure and evaluate the phenomena or construct of interest, and provides a means for generalisation and reproduction by other researchers. Secondly, qualitative and quantitative methods can provide distinct but

complementary information about the phenomena of interest. Finally, each method can build upon the strength of the other. For example, quantitative research, with its emphasis on large samples, can provide an overview of an area that can reveal relationships, patterns, inconsistencies and so forth, which can then be further investigated qualitatively.

4. 3 Study Instruments

4.3.1 Online Survey

The Wilder Inventory (Mattessich et al., 2001) was used to understand and evaluate collaboration amongst researchers. The primary researcher wanted to find out the strengths and weaknesses in researchers' collaboration which would then be explored further in the interview phase.

The twenty factors that had been identified in Mattessich et al's (2001) study were developed through a systematic review of empirical studies of collaboration. The authors used a typical meta-analysis which blended the findings of forty studies from the first edition in 1992 and second edition in 2000, in order to establish factors influencing the success of collaboration.

To ensure validation of the factors, a second Wilder Research Center researcher independently reviewed each of the case studies in 1992 and critically examined the evidence related to each factor identified by the first researcher. In 2000, the researchers jointly discussed each factor identified by the first researcher.

The original inventory was designed to be a diagnostic tool for collaborative groups, to be used throughout a project's lifespan. It was selected for this study because it has a clear evidentiary base - that is its development was rooted in the research literature. The online survey of this study was used as an assessment approach to identify strengths and weaknesses with respect to the factors that influence collaborative success, since this type of information is more useful as feedback than is an overall score of collaborative success or potential for success.

As mentioned earlier in chapter 2, the twenty factors were grouped into six categories: environment, membership characteristics, process and structure, communication, purpose, and resources. Three questions were added to the beginning of

the original Wilder Inventory to gather some information about respondents. These questions determined the respondents' experience of research collaboration, the communication means they used and how far they were from their collaborative team members in terms of geographic location.

The online survey had a total of 42 questions divided into seven parts, one part for each of the six categories, in addition to the first part about respondents. Each part consisted of from three to thirteen survey items/questions. Each item in the survey was given as a statement and respondents were asked to respond using a five-point scale: strongly disagree (1), disagree (2), are neutral or have no opinion (3), agree (4), or strongly agree (5) (Appendix A).

The reasons for using an online survey instead of paper-based survey were firstly, web-based surveys can access a large cross-cultural sample. Secondly, because the Internet is available to anyone with a computer and a connection, at any time and from anywhere, data can be collected 24 hours per day without the researcher having to be physically or temporally present and without having to procure physical space. Finally, instead of using manual methods for data entry, the data collected using a web-based interface are entered by participants and are stored in a cumulative data file that is ready for analysis with any statistical software.

4.3.2 Participant Interviews

After the collection of data from the online survey, researchers from different research centers were interviewed individually. During these interviews, the preliminary outcomes of the online survey data were used as a way to encourage the researchers to recall particular events about their collaboration, how they felt at the time and to reflect on these experiences. The interviews were semi-structured in that the researchers had a predetermined set of questions (Appendix B). However, the style of the questions was open-ended in nature in order to be responsive to emergent topics and themes.

4. 4 Study Participants

4.4.1 Online Survey Sample

The present investigation surveyed researchers from different disciplines in the Otago region (n = 88). A 42-item survey instrument was administered to participants using an online survey. Advertising for the online survey was accomplished by sending emails to an extensive network of researchers. A letter was sent by email to two research institutions (Appendix A) requesting distribution of the online survey to their entire email list. The email list for Otago University staff was also used to distribute the online survey to all the researchers at the University of Otago through the receptionist at the Information Science Department.

4.4.2 Interview Sample

A booklet called *Research Excellence Dunedin* was consulted to make use of the research teams listed in it. Groups of researchers were chosen from the research teams randomly. In addition, researchers from the University of Otago were chosen. A letter was sent by email to each of the selected researchers (Appendix B). The emails invited the researchers who had been involved in research collaboration to participate in the study and to arrange a time if they were interested in being interviewed. An email letter was then sent to participants after their agreement to participate to thank them and send the interview questions (Appendix B).

Because of the time commitment necessary for the interviews, data transcription and the potentially rich data acquired, a small number of researchers were invited to participate in this part of the study. A total of 13 researchers participated in a semi-structured, face-to-face interview.

4. 5 Data Collection Procedures

4.5.1 Online Procedure

The online survey was tested using multiple platforms (i.e., Windows and Macintosh) and a variety of browsers to ensure that the online surveying tool would display effectively using Firefox, Safari or Microsoft Internet Explorer. The online survey

instrument was subjected to a number of revisions and tests to improve its design. The web-based interface was reviewed by six researchers, four from the Information Science Department at the University of Otago and two from different research centers. Reviewers were regarded as representative of those for whom the survey was designed. Reviewers were asked to provide feedback about the content validity of the instrument, as well as to make suggestions about how to improve the design of the online web interface. As a result of this feedback revisions were made to the design and format of the online instrument.

The first web page of the survey contained information about the study and an accompanying consent form. With a web-based survey, it is currently not feasible to get an actual signature, so the participants were instead presented with an on-screen link that said "click this link to proceed", and by doing so, the participants implied acceptance of the terms of the consent form and proceeded to the first section of the survey. In fact, this method is considered legally binding by owners of current software install programs. In order to provide a convenient means of pre-survey communication, contact information was provided for the primary researcher and the thesis supervisors (i.e., name, email link and phone number) on this first web page.

Voluntary participation was assured because participants had to consciously decide to link to the web-based survey site, then read and click on the "click this link to proceed" on the information and consent form before they reached the actual survey. Participants were free to quit the survey at any time, however, they could not move to the next section unless they had answered all the questions in the previous one.

Study participants were guaranteed anonymous participation. Participants were not required to provide any identifying information as a part of the survey proper. However, for those study participants who wanted to receive a report on the outcomes of the investigation, a separate "Thank you" web page was presented at the conclusion of the survey, which had the primary researcher's email as a point of contact.

4.5.2 Interview Procedure

Interviews were conducted with researchers to gain an in-depth understanding of unique and common issues and concerns related to research collaboration. The investigator conducted 13 semi-structured, face-to-face interviews with researchers who had been

involved in collaborative research, from August 19, 2009 to October 14, 2009. Interviews took from 30 minutes to one hour each. Participants represented a range of disciplines (i.e., design, physics, biochemistry, research centers of different areas and developing centers).

On the day of the interview, each participant was given an *Information Sheet for Participants* (Appendix B) on the aims and purpose of the study. In addition, a *Consent Form* was given to the participants to sign (Appendix B). The interviews were audio recorded and transcribed verbatim by the primary investigator. The anonymity of interview participants was protected using codes instead of their actual name. Audio recordings were then erased.

4. 6 Data Analysis

4.6.1 Online Survey Analysis

Survey data was converted to an Excel spreadsheet. The factors were measured according to the Wilder Inventory guidelines (Mattessich et al., 2001).These recommended averaging across all ratings for items within a given factor. Factors scores were interpreted as suggested by the authors of the inventory: scores of 4.0 or higher show strength and probably do not need special attention; scores between 3.0 and 3.9 are borderline and may require attention; and scores of 2.9 or lower indicate concern and should be addressed.

The procedure to find the score for each factor was to follow two steps (1) adding together all the ratings for the items related to each factor, (2) dividing first-step outcome by the total number of ratings for those items. This number is equal to the number of respondents multiplied by the number of items for each factor. These two steps yield an average score for each factor. A graph was produced to show the scores of the factors ordered from the highest to the lowest score.

4.6.2 Interview Analysis

The qualitative data was analysed using a framework analysis approach, which is often called thematic analysis (Lacey & Luff, 2007). In addition, a case was created for each transcript to preserve the participants' 'voice'. The transcripts and the interview cases

were analysed for common and emergent themes. These stages were followed to analyse interview data: (1) a whole reading and transcription of each interview, (2) identifying themes using a constant comparison method, (3) applying the thematic framework to the data, using textual codes to identify specific pieces of data, which corresponded to differing themes, (4) searching for patterns, associations, concepts, and explanations in the data.

Chapter 5

Results and Analysis

5. 1 Introduction

This chapter presents the findings obtained from the online survey and the interviews regarding the measurement of the perception degree of collaboration amongst researchers in the Otago region. The results were analysed using the methods outlined in Chapter 4. These results are then discussed in the following chapter.

5. 2 Online Survey Results

5.2.1. Participants' Characteristics

Two different organisations distributed the survey to their email list. A total of 88 responses were received from the online survey. Forty nine respondents completed the online survey; eighteen respondents completed just parts of the online survey, six filled the first two parts, ten filled the first three parts and the remaining two, one filled the first four parts and the other filled the first five parts. These responses were included in the analysis. Twenty one survey responses were discarded, eleven because they completed only the first part of the survey, which is irrelevant to the study by itself, and ten because they had never been involved in collaborative research. Refer to Table 5.1 for a quick review.

Table 5.1: Online survey number of responses.

Full Responses	49
Partial Responses	18
Discarded	21
Total	88

The majority of participants had been involved in collaborative research for more than six years (62.7 percent). The most popular communication means were emails (100 percent) and face-to-face meetings (94 percent). Phones and mobiles come second (62.7 percent). A minority of participants used videoconferencing (16.42 percent), messenger (14.93 percent) and wikis/blogs (13.43 percent). Four percent reported that they used tools such as Google Docs and social networks. More than 63 percent used more than three communication means.

5.2.2. Collaboration Factors Scores

Factors' scores were measured according to the Wilder Inventory guidelines (Mattessich et al., 2001), which recommend the averaging across all ratings for items within a given factor, as mentioned in Section 4.6.1. The authors of the inventory suggested the following interpretation of the scores: scores of 4.0 or higher show strength and probably do not need special attention; scores between 3.0 and 3.9 are borderline and may require attention; and scores of 2.9 or lower indicate concern and should be addressed.

Table 5.2 presents the scores for each factor examined including standard deviation (SD) and the percentage of responses in each factor. More than half of the factors (11) fell within the 3.0 – 3.9, or borderline range, nine fell in the strength range, and none fell in the concern range. According to Wilder guidelines (Mattessich et al., 2001), this indicates that more than half of the factors show that the collaboration may need to be re-evaluated, nearly half of the factors do not need attention or are perceived as having a lot of potential, and no factor on which the collaboration should be focused heavily.

The results as categorised by the Wilder Inventory are described and analysed below. The way these results are written is influenced by the way Derose and his colleagues (2004) wrote their survey results. A summary of the online survey results is shown in Figure 5.1 below.

Table 5.2: Factors' scores for collaboration survey of Otago researchers.

Factor Category	Factors (number of questions or items)	Score	SD	% (N= 67)
Environment	History of collaboration or cooperation in the community (2)	3.9	0.853	100
	Collaborative group seen as a legitimate leader in the community (2)	3.5	0.773	
	Favourable political and social climate (1)	3.7	0.859	
Membership characteristics	Mutual respect, understanding, and trust (2)	4.3	0.687	91.04
	Appropriate cross-section of members (2)	3.5	0.883	
	Members see collaboration as in their self-interest (1)	4.2	0.563	
	Ability to compromise (1)	3.7	0.874	
Process and Structure	Members share a stake in both process and outcome (3)	3.9	0.838	76.12
	Multiple layers of participation (2)	3.2	0.784	
	Flexibility (2)	4.0	0.711	
	Development of clear roles and policy guidelines (2)	3.6	0.771	
	Adaptability (2)	3.6	0.672	
	Appropriate pace of development (2)	3.4	0.813	
Communication	Open and frequent communication (3)	4.0	0.690	74.63
	Established informal relationships and communication links (2)	4.2	0.711	
Purpose	Concrete, attainable objectives (3)	4.2	0.616	73.13
	Shared vision (2)	4.0	0.600	
	Unique purpose (2)	4.0	0.947	
Resources	Sufficient funds, staff, materials, and time (2)	3.0	1.098	73.13
	Skilled leadership (1)	4.0	0.659	

5.2.2.1. Environment

Environmental characteristics describe how effectively groups have worked together in the past, the current political and social climate in which groups work, and the community's perception of the legitimacy of the collaboration's leadership (Mattessich et al., 2001, p. 14).According to participants, the three factors related to environment were rated borderline (3.5 - 3.9). This means that these factors need to be re-evaluated and to be noted.

5.2.2.2. Membership Characteristics

Membership characteristics relate to perceptions and attributes of collaborative group members, their ability to compromise and their level of self-interest and investment in the group.

The factor mutual trust and understanding is a key component of collaboration. A sense of others' willingness to compromise and an acceptance of others' efforts as genuine promotes stronger commitment in participants to the goals of the collaboration and aids their implementation. This was a strength in the Otago researchers' collaboration with a score of 4.3, according to the survey respondents.

Respondents demonstrated a high level of self-interest in the collaboration (with a score of 4.2). Self-interest is important: if individuals and organisations have a vested interest in the collaborative process their involvement is likely to remain constant and their willingness to compromise in decision making will be enhanced.

Collaboration can be aided by the makeup of the collaborative group which should include people who have a stake in the outcomes (stakeholders). An appropriate cross-section of members will help to ensure a range of skills, knowledge and experience. With a score of 3.5, Otago researchers should give more attention to this factor when they are collaborating.

In rating others' willingness to compromise on important aspects of the project, respondents provided slightly less favourable ratings (a score of 3.7).

5.2.2.3. Process and Structure

Factors related to process and structure include layers of participation and decision-making, tools for developing consensus, adaptability, and pace. All of these factors were rated borderline (3.2 – 3.9) except flexibility with a score of 4.0. Flexibility is important in the collaborative process not only because it provides members with an incentive to join and remain committed to the group, but also because codified structures and behaviours can stifle new attempts at problem solving and outreach to new members (Mattessich et al., 2001, pp. 20 – 21).

Participants also provided positive ratings (a score of 3.9) of members' time commitment and commitment to project success. Participants' responses indicated that the collaboration assumed the right amount of work at the right pace and that the project team was able to keep up with all coordinating aspects of the project (a score of 3.4).

The process and structure factor receiving the least favorable score (3.2) was participation, that is, sufficient time allotted for participants to confer with colleagues about decisions related to collaboration and participants being able to speak for their entire organisation. Allowing enough time for participants to consult members of their organisations encourages broader engagement in the collaborative process (Mattessich et al., 2001, pp. 19 – 20). Individuals not attending meetings may have information pertinent to the efforts of the collaboration. The efficacy of the process can be undermined by insufficient time for individual members to reflect and engage with others.

Also critical to decision-making is members' understanding of their roles and responsibilities and the collaboration's decision-making procedures. Members who are not familiar with their roles, rights, and responsibilities may be less likely to engage in important decisions. Participants scored in the middle range of borderline (3.6) on this factor. Mattessich et al. suggest making member responsibilities explicit, e.g., by asking participants to sign letters of agreement (Mattessich et al., 2001, p. 20).

Adaptability, defined as the collaboration's capacity for maintaining focus and momentum in the face of major changes (Mattessich et al., 2001, p. 21), received a score of 3.6. In theory, the collaboration should be sustained as community needs, trends, and environment shift. One element critical to sustainability is periodic re-

evaluation of the collaboration's mission, goals, and objectives. If appropriate, the collaboration may need to redefine its agenda.

5.2.2.4. Communication

Communication is essential to effective collaboration; group efforts require an open exchange of ideas between leadership and members and among members. Mattessich et al. (2001) recommend establishing open communication, with clearly defined member responsibilities, and they caution against selected distribution of project ideas and documents, which can fragment the group (Mattessich et al., 2001, p. 23). The focus of the communication factors is on inter-participant communication, information dissemination by leadership, and leadership-participant communication. Here, participants received a factor score of 4.0, strength.

To achieve effective collaboration, leaders must consistently inform participants about project developments and meetings and must encourage participants to work together, inside and outside the structured framework of scheduled meetings. Informal communication leads to increased trust, greater commitment to the collaboration, and greater potential for future collaboration. In the areas of within-group and informal communication, participants received a score of 4.2, strength.

5.2.2.5. Purpose

With regard to the purpose of any collaborative project, it is important to ensure that members are involved in establishing specific goals which must be clearly set out and understood by all participants.

Commitment to the collaboration by all members is also essential for a successful outcome. This commitment can be generated by a sense of ownership in establishing the collaboration, establishing its goals, and an awareness that the group can achieve a better outcome than the organisation by means of this collaboration. Members' involvement is dependent upon their belief or conviction that they are striving for achievable, realistic goals which are common to all members. A vision for the collaboration that is shared by its members, whether it is developed inside or outside the

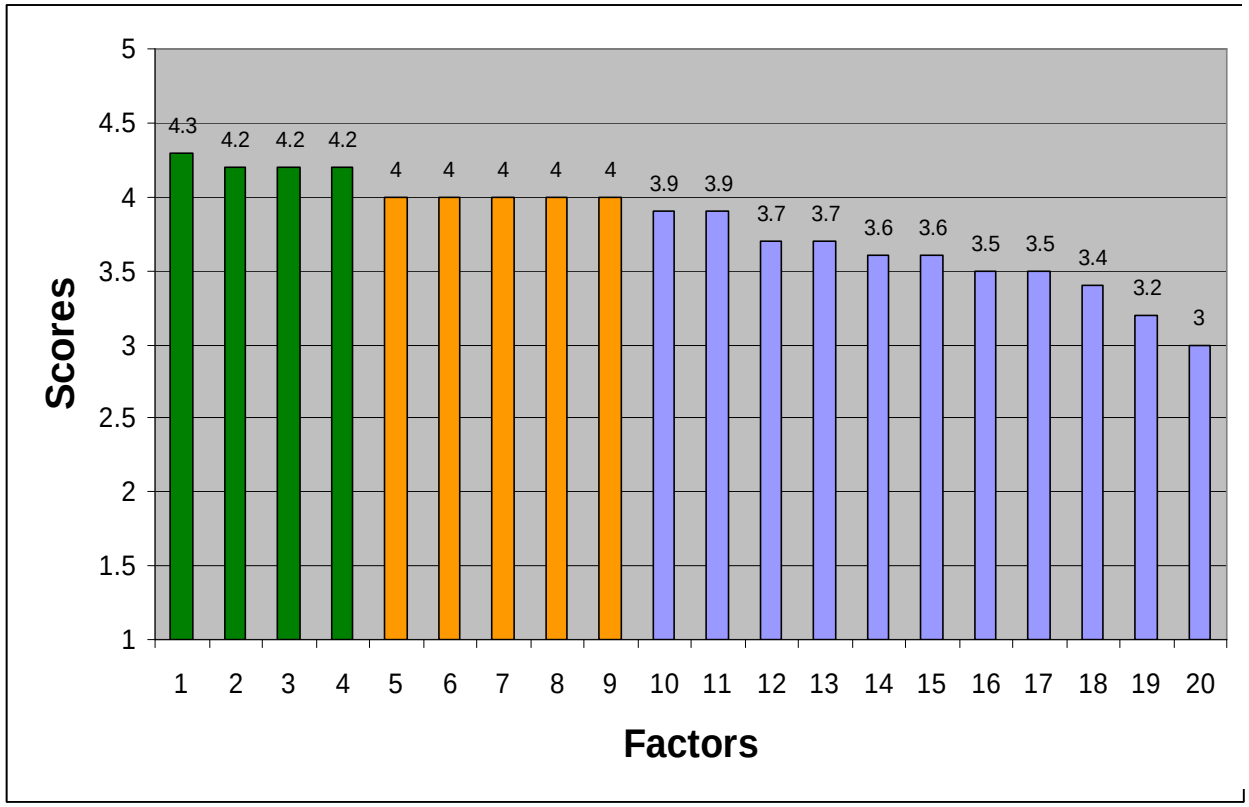
collaboration, will motivate participants to realise that vision (Mattessich et al., 2001, p. 26).

Having a mission, vision, and goals that are unique to the collaboration also supports the collaboration's purpose. A participant who feels that the collaboration's goals are identical to those of his or her own organisation may be less likely to collaborate, questioning the collaboration's purpose and perhaps sensing that the collaboration is redundant (Mattessich et al., 2001, p. 26). Participants received factor scores of 4.2 (strength) for goals. The factor scores for shared vision and unique purpose were 4.0, which were perceived as having a lot of potential.

5.2.2.6. Resources

While 'resources' refers to material aspects such as sources of funding and physical capital, the term also includes human resources: the knowledge base, skills, experience and communication skills that participants contribute. Participants' scores for funds and staffing fell within the area of borderline (3). Their responses were based on their actual situation.

Participants received higher score when they were asked to evaluate whether their leaders were skilled at working with people and organisations, that is, whether they had experience in the subject area, were able to minimise power struggles and turf issues, and were able to create a balance between group process and task activities (Mattessich et al., 2001, p. 28). For this factor, participants received a score of 4.0 (strength).



1) Mutual respect, understanding, and trust
2) Members see collaboration as in their self-interest.
3) Established informal relationships and communication links.
4) Concrete, attainable objectives.
5) Flexibility.
6) Open and frequent communication.
7) Shared vision.
8) Unique purpose.
9) Skilled leadership.
10) Members share a stake in both process and outcome.
11) History of collaboration or cooperation in the community.
12) Ability to compromise.
13) Favourable political and social climate.
14) Development of clear roles and policy guidelines.
15) Adaptability.
16) Collaborative group seen as a legitimate leader in the community.
17) Appropriate cross-section of members.
18) Appropriate pace of development.
19) Multiple layers of participation.
20) Sufficient funds, staff, materials and time

Figure 5.1: Factors' scores form the highest to the lowest score.

Figure 5.1 shows the factors' scores sorted from the highest score to the lowest score. The findings show that Otago researchers define the first four factors as the key components of successful collaboration. According to the Wilder Inventory guidelines (Mattessich et al., 2001), factors 1, 2, 3, 4, 5, 6, 7, 8 and 9 are considered strengths in Otago researchers' collaboration and the remaining factors (10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20) fell within the area of borderline. There is no factor considered as a weakness in Otago researchers' collaboration.

5. 3 Interview Results

5.3.1. Participants' Characteristics

Thirteen researchers were interviewed. They were from different sectors, to gain a variety of opinions in relation to their experience with collaborative research. Each interview lasted between 30 minutes and one hour. The majority of the participants collaborated with a group of researchers and a few of them mentioned that they collaborated just with one other researcher. In addition, national collaboration was the most popular form of collaboration, international collaboration came second and local collaboration third. The most popular communication means that the participants used, was email. A few of the participants preferred face-to-face meetings to email because they believed that emails can create misunderstanding. A minority of the interviewees used videoconferencing and teleconferencing.

5.3.2. Interview Cases

Cases were created to enable participants' ideas and thoughts (participant 'voice') to be expressed. Participant voice is important to ensure the credibility of the investigation and the analysis. The cases provide a summary of important topics mentioned in each interview. They were coded to identify each participant's summary and to ensure anonymity.

Each case represents the opinions and the views of the participant regarding research collaboration and the issues that were faced. These cases were created using the answers to the interview questions given by each participant in the transcripts. These cases were written in a narrative style to give the reader a sense of participation.

5.3.2.1. Case I1

I see research collaboration as people or institutions engage in research together where they are sharing the investigations, co-writing up the results and publishing them in a collaborative way. My area of research is community work and looking at organisations in the non-profit sector. Therefore, collaboration can be important for our research, because the topic itself is inherently collaborative. However, collaboration can be quite

difficult especially when there is a group dynamic and you are just getting to know each other.

All of my collaborations are local. When I decided to collaborate, I was working in the community and voluntary sector at the time. I made an approach to this person about getting involved with working with Otago University, and how it would be good to have an academic input to a community project.

I use emails and face-to-face meetings to get in touch with my other colleague. I think this is because there are just the two of us collaborating. If there were more people, e-collaboration would be more useful. Also I think, probably, even if there were more people involved, we would like to meet face to face. It is quite easy to misunderstand from written communication; you can clarify yourself a lot easier when you are face to face with your collaborators. We like to discuss key points face to face.

5.3.2.2. Case I2

For me, there are different models of research collaboration. One I am familiar with"action research" where your role as the researcher is to help others in the group achieve their goals. That is one model. The other is, where I may be one researcher in a larger research team. For example, one of my recent projects involved working with community groups. At other times I have my own research questions or I provide research expertise to help facilitate their research. I am currently working on two other researches with community groups. We have a steering group of 5-6 people who then work with other groups. Collaboration can be complex. For 18 month to 2 year long projects, the goal is to develop relationships with those people. The idea is to find ways to work together effectively. Working with people is more complex, some people have certain ways of doing things. The more familiar you are with those ways, the more able you are to help them.

There is a lot of trust required on the part of everybody. If there is a high stakes evaluation, there are lots of implications for your report. If it is not done right you might not be asked back. It has to suit the organisation. I have gone into organisations we didn't know well. People at the top of the organisation went onto new jobs, so we had to re-evaluate our research proposal. The difficulty was, we were now the outsiders telling the insiders how to do things. That was counter to what I was saying before, about

supporting the organisation in how to do things.One time I had an advisory group. The key around advisory groups is that it is important to have a mix of people, people who understand the people you are researching. So you can go to them to take their advice on the area that they are familiar with. I think each collaborative group should have an advisory group.

I faced some barriers in my collaboration. There are barriers to participation when recruiting participants. For example, in one of my projects teachers were asked from their manager to get involved in the research. I think teachers should participate voluntarily.Sometimes there is not enough enthusiasm in an organisation for the research.

The majority of my collaboration have been local, some have been national and very few have been international. Most of my work is done collaboratively with other researchers and these collaborations emerged out of conversations.

In collaboration, I think the email is key to making things work. It takes a long time to organise meetings by phone. I have been using email for quite a long time, as I had an interest in IT before taking this job.Email is good at presenting information. In terms of ongoing discussion where you're not sure of the answer, it's usually quicker to get together, or call each other on the phone. It's more efficient at arriving at an answer. At times I find myself writing emails, but I think I should use the phone to make it clearer and more synchronous. Often there are different ways of facilitating a collaboration. The face to face contact is important. On the phone you can't quite get the same facial expressions.At times we use video conferencing, but that's not as common place yet, but it's easy to set up.

I have tried setting up a Wiki for a group of researchers, but it didn't take off. Only two or three were familiar with it. It wasn't a good tool for bringing people together as a group. We have a national conference once a year. People were keen to meet face to face at the national conference.

5.3.2.3. Case I3

I have done collaborations in history, lycanology and biochemistry over the years. I always think that people working together, two or three brains are much better than a person working on their own. That said, there are many areas which you must tackle on

your own. But it is much nicer to use another person as a sounding board for your own ideas. In 1963 I started a collaboration with a Lycanologist in Australia. I would write to people in Scandinavia and they would send out literature.It was important to find someone else to talk to.

When you do individual research, it is important to discuss your research. It is helpful therefore to collaborate with others. However, there is one great difficulty in research collaboration, the personality difficulty. The difficulty is that often you run up against personal interests and personal differences.

Most of my collaborations are with at least three people. 50% is national, 40% is international and the rest is local. All of my collaboration started with colleagues that I already knew. I mainly use emails with my collaborators and sometimes I phone locally or physically see a person.

5.3.2.4. Case I4

From my point of view research collaboration is about two different groups of people who have different skills working together to solve a research problem. Research collaboration is very important in my area of research. I'm a geneticist; I have to collaborate with clinical people who have access to patients to recruit. Collaboration comes down to personality and interacting with people on a one to one basis. You know your instinct is right when you get to know someone over a long period of time who you can trust. My collaboration is roughly 50% national, 25% local, 25% international. I tend to work directly with colleagues and most of the work I do is one to one.

Collaboration is difficult on a long-term basis. I found that the cultural challenges are difficult, but I think the biggest barrier is trust. I have to trust people when I collaborate. Mutual respect is important. If trust isnot there, it is very hard to work with someone. With people you don't know, you have to take a gamble on trust. If trust is not there, I will disengage from the collaboration. Trust is instinctive. I like to assume people are trustworthy. It's not very often at all that people are not trustworthy.

When it comes to group formation, we exploit the contacts we have with people. It is based on shared interest, and then shared skills which let us work together. My main communication means that I use with my collaborators are telephone and email.I also use Skype for just one or two people.I've heard about Google Docs, but I haven't used

it yet. We write a document and make track changes, and then it gets sent to the collaborators. We would use e-collaboration tools, but it is just a matter of trying it out at some stage.

5.3.2.5. Case I5

I see research collaboration as a process that people use to work with a group when they are doing some sort of research process. It is as a consensual process, you might have a lead researcher, but you don't have a dictator, you share ideas and agree on the process. It is very important in learning. In 2004 I got into it because the Ministry of Education and Tertiary Educatione commission were putting up a lot of projects, they wanted to encourage collaboration. Looking back I think it has helped educators involved in tertiary sector to make new connections. It's a very supportive process and very important in education.

I found collaboration challenging because it takes longer than doing research yourself, if you do the consensual model, you can only move forward until everybody is happy with it.I have worked with people across NZ and this is what makes it more challenging. It requires really good communication skills.

Most of my collaboration is done nationally and with groups. You have to be careful that you choose the right people, it wasn't a barrier because I had a good network of collaborators. One of the barriers is you don't know who to ask. Technology is also a barrier, for example, one company had to ask permission to use Skype because their firewall do not allow them to use Skype. In addition, some people do not respond properly, it is hard getting everyone to work on the document together.People are always busyand one person can lag behind and hold the whole project up. It's hard trying to keep everyone to the deadlines.

I prefer to work with people that I already had been working with and I trust. The last project I worked in was about information literacy. As well as telephone we used Skype, and Wiki as our communication means.We also set up a Google group, which is our main communication tool. Weekly meetings and email forums are most often used, for quick questions. We also use chat, sometimes a webcam and document sharing. I believe that working together on documents is a form of communication. Conferences are a way to keep in touch as well.

We do action research workshop.We use Google Docs all the time, it is really useful. We use it for file sharing and working on parts of a project. We do not tend to write on the Wiki. We did use it a little bit, but we tend to use Google Docs more for writing reports. It doesn't have all the same formatting of Word, but it is easy to export from Google Docs to Word. I always ask people to use a different colour when they contribute in Google Docs to know who wrote what. The most useful aspect of Google Docs is that everyone can access one central place and people can edit at the same time. That happens with Wikis as well. Some Wikis have Wiki text, but Google Docs is like Microsoft Word, and I really like that. Social networking tools are easily accessible and free to use. Some e-collaboration tools don't have the function that you want.

5.3.2.6. Case I6

I think research collaboration from my perspective is, any research undertaken in the institution or between the institution which engagesmore than one person.It is different from PhD or Masters, because you have to do that on your own. Often funding is contingent on collaboration.It is important for us to grow our research culture. If we collaborate with the university, it is better for us, our staff get experience, and we work with a bigger player. It also helps build our reputation.

Part of our strategy is to network collaboratively to build network groups. There are always financial difficulties. Where it becomes tricky is when it comes to the contract side of things. Negotioations can be difficult then.Sometimes the funding bodies don't see value in our research, which is often a barrier. There is another barrier here in New Zealand which is to understand the things which are leading things in the world.We do a lot of work to inform our political people of what the leading areas of research are.

Our collaborations are 80% national, 20% international and most of these collaborations are with groups. The formation of our collaboration group comes mainly from using our network of people who have similar interests. We mainly use telephone and email as our main communication means.We are now moving into using a lot of e-collaboration tools like Wikis. We write grant applications online on the Wiki. That has been very effective. It helps people see the grant application developing. We use that quite a lot now.I think they are very useful tools. They have made it easier for people to engage with each other, without having to have multiple documents. You lose track of

the changes when you send a document back and forth. We use open Wikis, such as Wiki educator, so anyone interested can add contributions. Working in an open environment is quite interesting, because you get people from all over the world contributing.

5.3.2.7. Case I7

Research collaboration is research that involves more than one team or group. Of course one always collaborates within a team, that is what it is about. I think it has got to involve cross-team and cross-discipline collaboration, but that is not always appropriate.We are mostly concerned with staff development. If we were solely concerned with our discipline we would waste a lot of time, and we wouldn't be as effective. No matter how good people are in the team, they would still be isolated. It is important to learn from other people.

I've found research collaboration quite easy.We don't encounter resistance or any problem with collaboration. Sometimes we have more difficulty collaborating within an institution who thinks that e-learning might be a threat to their job. When we collaborate in our own discipline and staff development people and internationally, there is no problem at all.

Our collaborations involve 10% local collaboration, 40% national collaboration and 50% international collaboration. Most of them are with groups. Usually they are formed from a pre-existing group,a group of people who are already together for some reason, to achieve a particular goal. It does happen that individuals come together but most of the collaboration comes from pre-existing groups, that I'm involved with.For many of us it is quite a risky thing for an individual to suddenly come into a new group.

We have used teleconferencing in our collaboration, but we mostly use computer conferencing, a program called Elluminate.We also use Skype, some people use video-conferencing andface to face meetings. Wikis are the main e-collaboration tool we use. We find Wiki Educator to be the best tool. It involves a bit of learning of Syntax, but not much. Mostly that is collaboration that you can certainly use, but quite often it produces new groups. When I went to overseas for a while because of our material on Wiki Educator, they knew my colleagues' names and they knew the courses we put on Wiki Educator. The value of that marketing is great, we don't need a Billboard. People

trust Wikis and they know what you put on the Wiki is not going to be rubbish. I believe that Wiki can pave the way towards face to face contact.

5.3.2.8. Case I8

I define research collaboration in two ways, formal and informal. Formal collaboration occurs between two institutions, for example, between Otago University and Otago Polytech. Informally, it is two people who have an interest in a topic and who come together to research. It could be from primary school kids, to researchers looking at how to cure a disease. In my area, research collaboration is very important. It is very spontaneous for relationship building through the technology.The formal collaboration is important, but the informal stuff is more important for me.

From my point of view, formal collaboration is difficult because there are no personal synergies, which is not factored into it. The informal collaboration is stronger, because you are building a relationship. I think there are some barriers facing our collaboration. Apart from personality barriers, which I say to come to grief with, there are overly tight restrictions on the scope of the project. Throughout the project we discover we need to research more, but it is not in the scope and guidelines of the project.Sometimes those discoveries are so important that we need to revisit the question.

Twenty percent of our collaboration is local and national. The remaining 80% is international. Most of these collaborations is with groups. Formal group collaboration is formed by contacting people with expertise. Informal group is formed by interacting online with others over a period of months or years. After a time a relationship is formed and collaboration occurs.

I use mostly emails, blogs and Skype to get in contact with my collaborators. We use Google Docs and Wikis. By the time we use those tools, we already know what we are going to be writing. The blogging and emailing already establishes our findings, and then we need to write it up. I find the Wiki useful. We use Wikiversity or Wiki Educator, which is like Wikipedia. They are useful because they are fast and widely known. Google Docs is useful as people are more familiar with it, but the formatting is a bit hard to control at times. The Wiki is also limited in formatting but I most definitely prefer Wikis.

5.3.2.9. Case I9

For me there are different types of research collaboration: Interdepartmental (non funded), external (funded), Internal (non funded), Administration (funded). Normally I would say it would be internally, doing research with other research departments. So looking at unfunded research. Things which may have good educational outcomes. The other type of collaboration is external to the university. So every year I have a few international clients, we look at theories and the students look at particluar ideas. It's mainly senior level students who are involved. The other type of collaboration is inter-departmental. In the past year I have worked with Forensic Science, Geology for a year and a half. Collaboration is important in my area of research. If I did not collaborate, there is no way I could keep abreast of current technologies. It is also important to keep my job.

I think collaboration is easy because our department is small and we run as a single unit. I think it would be difficult with a unit of over 50. However, there is one barrier, teaching commitments. I have a really high teaching load which affects my collaboration.

Most of our collaboration is with groups, 10% of it is local, 20-30% is national and the rest is international. All of these groups were formed by using our contacts. I use the telephone frequently with my collaborators but use emails reluctantly. Emails can be misinterpreted. Normally I phone them up and follow it up with minutes of the conversation. Sometimes I use Skype and video presentation. We don't use any Microsoft applications. If our clients have Apples they can log onto our server remotely. We have a Wiki site that our students and clients can access. I think the Wiki is useful. We use it as a backup of knowledge.

5.3.2.10. Case I10

To me, research collaboration would be when you are working with somebody else on a research project, and you each bring some expertise to the project. Collaboration is important in my area of research because it brings strengths of other people together, so you are not just relying on your own expertise, but you are bringing the strengths of

people from other disciplines or, not necessarily other disciplines, but maybe they have more experience even in the discipline in which you are working.

Seventy percent of my collaborations have been local, 15% national and 15% international. All of them are with groups and I have not had any difficulties. Most of these collaboration groups were formed by maintaining contacts that I already had. The most preferable way to communicate with my collaborators is face-to-face meetings if possible, emails come second and videoconferencing last.

My collaborators and I are currently not using any e-collaboration tools. Myself and the people I have worked with are still more comfortable with sending different drafts around for comments, but you are getting me thinking about using these tools, that would be more sensible, we just haven't made that move yet.

5.3.2.11. Case I11

Defining research collaboration is a bit more formal than I normally think it, so I don't approach it from a rigorous point of view. Situations arise where I believe that collaborations are useful and helpful and we pursue them but I don't actually think, ‘Oh, that's a collaboration, and this is a different category’, so I don't give much thought to it really. I guess I'm just not that structured in my thinking. However, I see it as working with other people positively. Research collaboration is important because it helps to know about part of the work you do not know about from others that do.

I have not found collaboration difficult because I choose collaborations when they are easy. If the collaboration is difficult, it is not going to work. Knowing if the collaboration is easy or not depends so much on the personality of the other person and their interest in it. I mean, if I am interested in collaborating with somebody and they're not, forget it.

Most of my collaborations are local, 50% are with one other researcher and 50% are with groups. Most of these groups were grown out of me working quite closely with people that share the same interest with me. I prefer face-to-face meetings to communicate with my collaborators. Nothing beats that.

I used Groove as an e-collaboration tool. It worked quite well, but I found it an absolute pain in the neck. Every time I started the computer, Groove came in and shouted at me, you have got work to do! No, I’ll make up my own mind when I have

got time. On the other hand, the one aspect of Groove that was helpful is being able to work on the same document, so that it was quite clear what you are working on, that was quite nice. So document control is pretty good with that, and I quite like that.

5.3.2.12. Case I12

To me, research collaboration involves working with other people but in ways whereby you're not just relying on your own knowledge or your own skills but you're actually actively combining those skills with other people's. It is very important in my area of research because it brings different points of view into a topic area. It is also particularly important in terms of the research I do in the Maori arena because there we are working with very different worldviews or different ideas of how the world exists. However, it is always challenging because I guess it takes work to do, time to create relationships, and to maintain those relationships.

Thirty percent of my collaborations were local, 50% national and the remaining international. Most of these collaborations were with groups. These groups were formed through networking organisations that put together different people involved in the same area.

I use email and telephone to contact my collaborators. Sometimes we use teleconferencing. I have used e-collaboration tool called Collaber. It has been useful really as a common data store, and to some extent as a way of transferring audio files from the people who do the interviews back to us here so that they can be transcribed. So when that audio file thing works, it's been good. I anticipated we would use it more for other things and in fact I was quite keen to use it as a planning tool and for direct exchange and also for working on common documents, but in reality we've tended to work on a document and once it's completed we'll put it up on this one or this one. So we are not working on it on the site, we are actually working on it on our home computers and then putting it up. I think partly because we are not used to it, it is a new way of working. Also when I first got Collaber I thought, ‘Great, here's a wonderful opportunity to work in a new way, work collaboratively, have an interactive space’. But I realised, in fact, it just looks like another file store, it just looks like part of your computer where you download files and pick them up again, so it doesn't look any

different from anything else. It doesn't actually look like a collaborative space. I don't know whether it is difficult for people to change the way they work anyway.

5.3.2.13. CaseI13

For me, research collaboration is working together on any aspect of research, so it covers a broad range of different relationships among researchers. I believe it is important because it helps to learn from other people who are knowledgeable about a certain area.

I have never personally found collaboration particularly difficult, except perhaps in some stages of research. For example, I do a lot of co-authored papers and I find that some people are very good at contributing in a timely way and others aren't. I don't want to publish something without their name on it, so I have to wait until they are ready or get around to doing what they need to do and sometimes that takes a lot of patience. People often procrastinate, not that they are not interested but they have other priorities.

Most of my collaboration is locally and internationally. All of these collaborations are with groups. These groups were formed by using our network of people, who are interested in the same kind of work. I mostly use emails and face-to-face meetings when I want to communicate with my collaborators. Sometimes we use teleconferencing. I have not used any e-collaboration tools maybe because it is too late for me to try using new technologies.

5.3.3. Themes of Interview

After the full transcription of the interviews and the creation of the cases, data were analysed for common and emergent themes. Five themes were formulated from the interview questions: these were the most common topics raised by participants. The themes are Research Collaboration Definition (question 1), Collaboration Importance (question2), Barriers and Difficulties of Research Collaboration (question 3 & 7), Group Formation (question 9), and Web-based Technologies (questions 12 & 13).

The data was analysed by applying the thematic framework to the interview data, using textual codes to identify specific pieces of data, which corresponded to differing themes. The findings drawn from the five themes are described below in more detail.

5.3.3.1. Research Collaboration Definition

Table 5.3 presents all the statements of the interviewees. These statements are responses to interview question 1. They are ordered by type: 1 is when the types of collaboration are not identified, and 2 is when the types are identified. The "Code" column identifies interviewees throughout the research.

Table 5.3: Interviewees' statements regarding research collaboration definition.

Code	Statements	Type
I1	People or institutions engage in research together where they are sharing the investigation, co-writing up the results and publishing them in a collaborative way.	1
I3	People working together.	1
I4	It is two different groups of people who have different skills working together to solve a research problem.	1
I5	A process that people use to work with a group when they are doing some sort of research process. I see it as a consensual process. You might have a leader researcher, but you do not have a dictator. You share ideas and agree on the process.	1
I6	Any research undertaken in the institution or between the institutions which engages more than one person.	1
I7	It is research that involves more than one team or group.	1
I10	Working with somebody else on research project and each bring some expertise to the project.	1
I11	Working with other people positively.	1
I12	Research collaboration involves working with other people, but in ways whereby you are not just relying on your own knowledge or your own skills, but you are actually actively combining those skills with other people's.	1
I13	Research collaboration is working together on any aspect of research, so it covers a broad range of different relationships among researchers.	1
I2	There are different models of research. One I am familiar with is "action research" where your role as the researcher is to help others in the group achieve their goals. The other is where I may be one researcher in a larger research team.	2
I8	In two ways. Formal and informal ways. Formally between two institutions. Informally, it is two people who have an interest in a topic and who come together to research.	2
I9	There are different types of collaboration, Interdepartmental (non-funded), External (Funded), Internal (non-funded) and Administration (funded).	2

Each interviewee gave a statement defining research collaboration. Some of them were aware of the types of research collaboration (I2, I8 and I9), while others gave

theoretical definition only. These individual statements helped to formulate a general statement regarding the definition of research collaboration.

Generalised Statement: research collaboration is the working together with other researchers to share skills and knowledge and it can occur in different forms.

5.3.3.2. Research Collaboration Importance

Table 5.4 presents the interviewees responses to question 2. They are ordered by the interviewees' code number. The "Code" column identifies interviewees throughout the research.

Table 5.4: Interviewees' statements regarding the importance of research collaboration.

Code	Statements
I1	It is important because I do community work and community work topics are inherently collaborative.
I2	Because it needs to make sense to the people who are making the changes.
I3	It is important to discuss your research with others to bring a particular set of skills together.
I4	I'm a geneticist, I have to collaborate with clinical people who have access to patients to recruit.
I5	It is very important in learning. It helps educators involved in tertiary sector to make new connections.
I6	If we collaborate with the university, it is better for us, our staff get experience, and we work with a bigger player. It helps build our reputation.
I7	It is important to learn from other people.
I8	It is very spontaneous for relationship building through the technology.
I9	If I do not collaborate there is no way I could keep abreast of current technologies. It is also important to keep my job.
I10	Because it brings strengths of other people together, so you are not just relying on your own expertise, but you are bringing the strengths of people from in the discipline or from other disciplines.
I11	Helps to know about part of the work you do not know about from others that do.
I12	It brings different points of view into a topic area. It is also particularly important in terms of the research I do in the Maori arena because there we are working with very different world views or different ideas of how the world exists.
I13	It is important because it helps to learn from other people who are knowledgeable about a certain area.

All the statements are regarding the importance of research collaboration. Each interviewee gave a statement about how important research collaboration is in their area

of research. The majority stated that research collaboration is important because it helps to learn from other people and to share skills that strengthen the research quality. Some of them (I5, I6 and I8) added that research collaboration helps to build reputation and new connections. These statements helped to formulate a general statement regarding the importance of research collaboration.

Generalised Statement: research collaboration is important because it helps researchers share skills and learn new knowledge.

5.3.3.3. Barriers and Difficulties of Research Collaboration

Table 5.5 presents the interviewees' responses to interview questions 3 and 7. They are ordered by existence of the difficulties, 1 if difficulties do exist, and 2 if they do not exist. The "Code" column identifies interviewees throughout the research.

Table 5.5: Interviewees' statements regarding the barriers and difficulties of research collaboration.

Code	Statements	Existence
I1	One of the difficulties is when there is a group dynamic and you are just getting to know each other.	1
I2	1- Working with people is complex, some people have certain ways of doing things. 2- There are barriers to participation when recruiting participants. Sometimes there is not enough enthusiasm in an organisation for the research.	1
I3	I had one great difficulty, a difficulty of personality. The difficulty is that often you run up against personal interests and personal differences.	1
I4	1- Collaboration is difficult on a long term basis. 2- There are cultural challenges, but I think the biggest barrier is trust.	1
I5	1- It is challenging because it takes longer than doing research yourself. 2- One of the barriers is you do not know who to ask. 3- Technology is a barrier, some systems have firewalls, one company had to ask permission to use Skype. 4- One person can lag behind and hold the whole project up. 5- People are always busy. 6- It is hard trying to keep everyone to the deadlines.	1
I6	1- There are always financial difficulties. 2- Negotiations can be difficult on sorting out the contracts. 3- Sometimes the funding bodies do not see value in our research, which is often a barrier. 4- There is a barrier here in New Zealand to understand things which are leading things in the world	1
I8	1- Formal collaboration is difficult because there are no personal synergies, which is not factored into it.	1

	2- apart from personality barriers there are overly tight restrictions on the scope of the project.	
I12	It is always challenging. I guess because it takes work to do, time to create relationships, and to maintain those relationships.	1
I13	1- Some people are very good at contributing in a timely way, and others are not.	1
I7	Collaboration is not difficult. I have found it quite easy.	2
I9	1- Collaboration is easy. I think it would be difficult with a unit over 50. 2- Teaching commitments is a barrier. I have a really high teaching load. It affects my collaboration.	2
I10	I have not had difficulties in collaboration.	2
I11	Collaboration is not difficult, if the collaboration is difficult it is not going to work	2

All the statements relate to the barriers and difficulties of research collaboration. The majority stated that the greatest difficulty they have faced in research collaboration is with regard to personality. A few mentioned that trust and technical difficulties are barriers. A minority (I7, I9, I10 and I11) stated that they have not faced any difficulties. These statements helped to formulate a general statement regarding the barriers and difficulties of research collaboration.

Generalised Statement: difference in personality is the biggest difficulty that researchers face.

5.3.3.4. Group Formation

Table 5.6 presents the interviewees responses to interview question 9. They are ordered by the interviewees' code number. The "Code" column identifies interviewees throughout the research.

Table 5.6: Interviewees' statements regarding their group formation.

Code	Statements
I1	I made an approach to this person about getting involved with working with Otago University.
I2	Things emerged out of conversations.
I3	A colleague asked me to do a lycan project in South-East Asia.
I4	We exploit the contacts we have with people, especially with Counties Manukau. It based on shared interest, and then shared skills which let us work together.
I5	Contact people I already had been working with and trust.
I6	One of our staff is leading in that area, and has networked with people who have similar interests.
I7	Usually it is a pre-existing group. A group of people who are already together for some reason to achieve a particular goal.
I8	1- Formal collaboration they contact people with expertise. 2- Informal collaboration you interact online over a period of months or years. After a time a relationship is formed.
I9	Formed through contacts.
I10	It is just a network-building thing.
I11	Collaboration grew out of me working quite closely with other people that share the same interest with me.
I12	Through networking organisations which put together different people involved in the same area.
I13	Network of people, who are interested in the same kind of work.

All the statements focus on group formation. Each interviewee gave a statement on how their group was formed. The majority stated that most of the groups were formed through contacting researchers that they already knew. These statements helped to formulate a general statement regarding the group formation.

Generalised Statement: groups are usually formed where group members share the same interest.

5.3.3.5. Web-based Technologies

Table 5.7 presents responses of the interviewees' to interview questions 12 and 13. They are ordered by the use of e-collaboration tools; 1 if the interviewee uses any e-collaboration tool and 2 if he/she does not use any e-collaboration tool. The "Code" column identifies interviewees throughout the research.

Table 5.7: Interviewees' statements regarding the use of web-based technologies.

Code	Statements	Use
I5	Google Docs is really useful, but it does not have all the formatting of Microsoft Word. Everyone can access one central place, people can edit at the same time.	1
I6	We are now moving into e-collaboration. We write grant applications online on the Wiki. That has been very effective. It helps people see the grant application developing. e-collaboration has made it easier for people to engage with each other, without having to have multiple documents. You lose track of the changes when you send a document back and forth. We use open Wikis, such as Wiki educator, so anyone interested can add contributions. Working in an open environment is quite interesting, because you get people from all over the world contributing.	1
I7	Wikis are the main tool we use. We find Wiki Educator to be the best tool. It involves a bit of learning of Syntax, but not much. Mostly that's collaboration that you can certainly use, but quite often it produces new groups. Often out of the blue an email will come from an African country. When I went to Ghana a while ago, I went to a town called Winnabar, I went to the staff development centre. Because of our material on Wiki Educator, they knew my colleagues' names, they knew the courses we put on Wiki Educator. The value of that marketing is great, we don't need a Billboard in Ghana! People trust Wikis. People know what you put on the Wiki is not going to be rubbish. The Wiki can pave the way towards face to face contact.	1
I8	We use Google Docs and Wikis. By the time we use those tools, we already know what we are going to be writing. The blogging and emailing already establishes our findings, and then we need to write it up. I find the Wiki useful. We use Wikiversity or Wiki Educator, which is like Wikipedia. They are useful because they are fast and widely known. Google Docs is useful as people are more familiar with it, but the formatting is a bit hard to control at times. The Wiki is so limited in formatting it is hard to break. I most definitely prefer Wikis.	1
I9	We don't use any Microsoft applications. We have a Wiki site and it is useful. We use Wikis as a backup of knowledge.	1
I11	1- I used Groove. It worked quite well, but I found it an absolute pain in the neck. Every time I started the computer, Groove came in and shouted at me, You have got work to do! No, I'll make up my own mind when I have got time. 2- The one aspect of Groove that was helpful is being able to work on the same document, so that it was quite clear what you are working on, that was quite nice. So document control is pretty good with that, and I quite like that.	1
I12	1- Collaber has been useful really as a common data store and to some extent as a way of transferring audio files. 2- Working in one document is very useful.	1
I1	Email to a lesser extent. We like to discuss key points face to face. You can clarify yourself a lot easier when you are face to face with your collaborators.	2
I2	Just email. I have tried setting up a Wiki for a group of researchers, but it did not take off. Only two or three were familiar with it. It was not a good tool for bringing people together as a group. People were keen to meet face to face at the national conference.	2

I3	I do not use any e-collaboration tools.	2
I4	I have heard about Google Docs, but I have not used it yet. We would use Collaber, but it is just a matter of trying it out at some stage.	2
I10	1- Not to date in any e-collaboration tools. 2- Myself and the people I have worked with are still more comfortable with sending different drafts around for comments, but you are getting me thinking about using e-collaboration tools.	2
I13	It is too late for me to try using new technologies.	2

All the statements are regarding the use of e-collaboration tools. Each interviewee gave a statement stating whether he/she uses any e-collaboration tool or not. Fewer than half (46 %) stated that they do not use any e-collaboration tools. The rest mentioned that they used tools such as Google Docs, Groove and Wikis. Some found them useful especially because they offer working in one document and allowing everyone to access one central place. These statements helped to formulate a general statement regarding the definition of research collaboration.

Generalised Statement: new technologies are not utilised as they could be in the area of research collaboration.

Chapter 6

Discussion and Conclusion

6. 1 Major Findings of the Study

The findings showed that nine factors scored high (4 – 4.3) and can be considered as strengths in Otago researchers' collaboration, eleven factors fell within the area of borderline (3 – 3.9) and no factors scored lower than 2.9 which means that there were no weaknesses found in Otago researchers' collaboration. These scores were interpreted according to the Wilder Inventory guidelines (Mattessich et al., 2001). In addition, the findings of the interviews showed that the new technologies are still not utilised as they should be in the area of research collaboration.

6. 2 Explanation of the Meaning of the Findings

This investigation succeeded in identifying the strengths and weaknesses in Otago researchers' collaboration. Nine factors were perceived as a strength in Otago researchers' collaboration: **(1)** Mutual respect, understanding, and trust (scored 4.3), **(2)** Members see collaboration as in their self-interest (scored 4.2), **(3)** Established informal relationships and communication links (scored 4.2), **(4)** Concrete, attainable objectives (scored 4.2), **(5)** Flexibility (scored 4.0), **(6)** Open and frequent communication (scored 4.0), **(7)** Shared vision (scored 4.0), **(8)** Unique purpose (scored 4.0), and **(9)** Skilled leadership (scored 4.0).These factors do not require any further attention from Otago researchers since they scored high, however, they can be improved. The reasons behind the high scores in these factors could be because: (1) researchers tend to work with others whom they trust, (2) they tend to build relationships and communicate with other researchers, (3) they tend to work when they perceive the benefit of collaboration, (4) they tend to collaborate when the purpose of collaboration is clear, and (5) they tend to

collaborate specially when they feel confident that their leader is skilled enough to lead the whole group.

On the other hand, the Otago researchers' need to reflect upon and re-evaluate eleven factors according to the Wilder Inventory guidelines (Mattessich et al., 2001). These factors are: **(10)** Members share a stake in both process and outcome (scored 3.9), **(11)** History of collaboration or cooperation in the community (scored 3.9), **(12)** Ability to compromise (scored 3.7), **(13)** Favourable political and social climate (scored 3.7), **(14)** Development of clear roles and policy guidelines (scored 3.6), **(15)** Adaptability (scored 3.6), **(16)** Collaborative group seen as a legitimate leader in the community (scored 3.5), **(17)** Appropriate cross-section of members (scored 3.5), **(18)** Appropriate pace of development (scored 3.4), **(19)** Multiple layers of participation (scored 3.2), and **(20)** Sufficient funds, staff, materials and time (scored 3.0). These factors need more attention from Otago researchers working in collaborative groups.

According to the Wilder Inventory guidelines (Mattessich et al., 2001), there are no weaknesses in the Otago researchers' collaboration since there were no factors scored lower than 2.9. This could be because Otago researchers have enough experience in research collaboration to make them aware of the things that might affect their collaboration and to avoid potential pitfalls. In general, it can be said that Otago researchers' collaboration is generally strong with some room for improvement.

The findings of this study seem promising compared to the collaboration in Community Voices Miami (CVM) (Derose et al., 2004). The authors used the Wilder Inventory for their evaluation of the collaboration in CVM. Their results show that one factor, *"Favourable political and social climate"*, fell within the strength range (4 or higher) compared to nine factors in Otago researchers' collaboration,; seventeen factors fell within the area of borderline (3 – 3.9) compared to eleven factors in Otago researchers' collaboration, and two factors, "*History of collaboration or cooperation in the community"* and "*sufficient funds, staff, materials and time"*, fell within the concern range (2.9 or lower) compared to none in Otago researchers' collaboration.

The interview participants emphasised the trust between collaborators. Trust and understanding are key components of collaboration (Mattessich et al., 2001). Trust in collaboration means a strong commitment on the part of participants to the goals of the collaboration. A sense of others' willingness to compromise and an acceptance of

others' efforts as genuine encourages a stronger commitment in participants to the goals of the collaboration and their implementation. Most of the interview participants also mentioned that sufficient funds and time are important for their collaboration and they define them as one of the key components of successful collaboration including the first four factors shown in Figure 5.1. However, Figure 5.1 shows that the factor *"sufficient funds, staff, materials and time"*, (the question asked participants if they were receiving sufficient funds, staff, materials and time) scored the lowest (3.0). According to the Wilder Inventory guidelines (Mattessich et al., 2001), this means that Otago researchers' collaboration lacks to some extent sufficient funds and time. In other words, collaborators are not convinced by the amount of funding or the period given for collaboration. This is an area that needs to be addressed in the collaboration of Otago researchers.

The first "generalised"[1] statement from the interview, that research collaboration is working together with other researchers to share skills and knowledge and can occur in different forms, presents research collaboration according to the definition given by the interview participants. Differences in defining research collaboration were observed. The levels and forms of collaboration mentioned in this study (Section 2.4) have an influence on the way researchers define research collaboration. Some of the participants were defining research collaboration by its levels and forms. However, they all agreed that research collaboration could be defined as a group of researchers working together in order to achieve the common goal of producing new scientific knowledge. This generalised statement supports the definitions mentioned in the literature of this study (Section 2.3).

The second "generalised" statement, that research collaboration is important because it helps researchers share skills and learn new knowledge, indicates that collaboration is important for a reason. Collaborators need to know the importance of research collaboration. The factor *"concrete and attainable objectives"* supports the importance of research collaboration. The generalised statement also indicates that there are benefits from collaborating, such as, sharing skills and learn new knowledge. However, participants were not fully aware of most of the benefits that research collaboration could provide (Section 2.6).

[1] The generalised statement formulated by the primary researcher for each of the themes of the interview.

The third "generalised" statement, that difference in personality is the biggest difficulty that researchers face, indicates that the factor, "*mutual respect, understanding, and trust"*, is very important for collaboration to succeed. This can be achieved focusing on the aim of the collaboration and leaving the personality issue aside because it is an issue that cannot be fixed.

The fourth "generalised" statement, that groups are usually formed through contacts where group members share the same interest, shows that it is important to involve collaborators who share similar interests. This supports the factor *"members see collaboration as in their self-interest"*.

The fifth "generalised" statement, that new technologies are not utilised as they could be in the area of research collaboration, with 46 percent of interview participants stating they were not familiar with e-collaboration tools. These tools could provide collaborators with all the features they need; for example, working collaboratively on one document instead of using a multi-version approach, improved communications and shared resources. They have the potential to advance collaboration beyond the current approach of email and phone.

According to interview participants, the reasons behind this include: (1) researchers are not used to these kinds of tools and they find it difficult to adapt to using such a tool, (2) they are afraid of using these tools because they are illiterate in using new technologies, or (3) they are ignorant about the existence of such tools. However, the move towards the use of e-collaboration tools should be encouraged. New technologies increase productivity and quality (Thatcher & Oliver, 2001); therefore, effort should be made to adapt to new technologies, at least to explore what they are offering. New technologies can also increase collaboration opportunities. This will help researchers to understand the benefits of these kinds of tools. Researchers might need to change their patterns of collaboration and devote their time and effort to do so.

6. 3 Recommendations

From the findings presented and discussed in this study, the following recommendations can be made. These recommendations could help Otago researchers to further improve their research collaborations:

1. Always focus on the aim behind collaborative research.

2. Consider and understand prior to collaboration the twenty factors influencing the success of research collaboration (Mattessich et al., 2001).
3. Evaluate research collaboration regularly, by using the Wilder Inventory (Mattessich et al., 2001) to identify collaborative strengths and weaknesses.
4. Make the effort to improve the level of collaboration by working on the weaknesses and maintaining the strengths.
5. Take advantage of the features provided by e-collaboration tools to enhance research collaboration.

6. 4 Importance of the Findings

The findings of this study help to turn the attention of collaborators to the factors that might influence the success of research collaboration. It is important to consider these factors before establishing any research partnership. They offer the chance to re-evaluate research collaboration and re-consider the important aspects of collaboration. In addition, the interview findings regarding the use of e-collaboration tools should encourage researchers to pay greater attention to new technologies.

6. 5 Suggestions for Further Research

The findings of this study can be used as a baseline for future studies. Otago researchers' collaboration could be re-evaluated in the future and the new results compared with the results of this study. This will show the improvement in research collaboration of Otago researchers. In addition, chapter 3 can be used as a starting point to discover more about e-collaboration tools.

Because of time constraints, the findings presented in this study are based only on the online survey and the interviews. Both are self-report methods for collecting data. Future research should use observations in addition to survey and interviews to obtain more effective and efficient results. Further areas that remain to be explored include the effectiveness of e-collaboration tools and an exploration of the factors that might influence e-collaboration research.

6. 6 Conclusion

In conclusion, the Wilder Research inventory based on the twenty factors (Mattessich et al., 2001) has the potential to identify strengths and weaknesses in research collaboration. The twenty factors influencing the success of collaboration can help managers, coordinators and research groups to increase researchers' awareness of the important areas that contribute to a successful collaboration.

E-collaboration tools could advance collaborative research beyond the traditional approach (phone and email) and raise it to higher levels. Therefore, researchers might need to change their patterns of collaboration and devote their time and effort to do so.

References

Adams, J., Black, G., Clemmons, J., & Stephan, P. (2005). Scientific teams and institutional collaborations: Evidence from US universities, 1981 – 1999. *Research Policy, 34*(3), 259-285.

Andersen, D. L. (2003). Communicating information across cultures: Understanding how others work [Electronic Version]. *Pantaneto Forum,* from http://www.pantaneto.co.uk/issue9/front9.htm

Australian Centre for Innovation, Partners, H., & Carisgold. (2002). *Best Practice Processes for University Research Commercialisation*. Canberra: Department of Education, Science and Trainingo.

Chatman, J. A., Polzer, J. T., Sigal, G. B., & Neale, A. (1998). Being different yet feeling similar: The influence of demographic composition and organizational culture on work processes and outcomes. *Administrative Science Quarterly, 43*, 749-775.

Cunningham, S. (2006). Four barriers to collaboration [Electronic Version], from http://www.chass.org.au/papers/PAP20061211SC.php

Davenport, S., Davies, J., & Grimes, C. (1999). Collaborative research programmes: Building trust from difference. *Technovation, 19*(1), 31-40.

Derose, K. P., Beatty, A., & Jackson, C. A. (2004). *Evaluation of Community Voices Miami: Affecting health policy for the uninsured.* from http://www.rand.org/pubs/technical_reports/2004/RAND_TR177.pdf

Duncker, E. (2001).Symbolic communication in multidisciplinary cooperations. *Science, Technology and Human Values, 26*(3), 349-386.

Garza, R. T., & Santos, S. J. (1991). Ingroup/outgroup balance and interdependent interethnic behavior. *Journal of Experimental Social Psychology, 27*(2), 124-137.

Gorman, M. E., & Mehalik, M. M. (2002). Turning good into gold: A comparative study of two environmental invention networks. *Science, Technology and Human Value, 27*(4), 499-529.

Hmelo-Silver, C. E. (2003). Analyzing cooperative knowledge construction: Multiple methods for integrated understanding. *Computers & Education, 41*(4), 397-420.

Huxham, C. (Ed.). (1996). *Creating collaborative advantage.* London: Sage.

Jacobsen, D. M. (1998).*Adoption patterns and characteristics of faculty who integrate computer technology for teaching and learning in higher education.* Unpublished Thesis Ph D -- University of Calgary 1998, University of Calgary Dept. of Educational Psychology, Calgary.

Johnson, J., D, & Chang, H. J. (2000). Internal and external communication, boundary spanning and innovation adoption: An over-time comparison of three explanations of internal and external innovation communication in a new organizational form. *Journal of Business Communication, 37*, 238- 257.

Katz, J. S., & Martin, B. R. (1997). What is research collaboration? *Research Policy, 26*(1), 1-18.

Kock, N. (2005). What is e-collaboration? *International Journal of E-collaboration, 1*(1), i-vii.

Kock, N., & D'Arcy, J. (2002). Resolving the e-collaboration paradox: The competing influences of media naturalness and compensatory adaptation. *Information Management and Consulting, 17*(4), 72-78.

Kramer, M. W. (2002). Communication in a community theatre group: Managing multiple group roles. *Communication Studies, 53*(2), 151-170.

Lacey, A., & Luff, D. (2007). Qualitative research analysis.[Electronic Version]. Retrieved24 March, 2009, from http://www.trentrdsu.org.uk/uploads/File/Qualitative_Data_Analysis_Revision_2007.pdf

Lamb, S., Greenlick, M. R., & McCarty, D. (Eds.). (1998). *Bridging the gap between practice and research: Forging partnerships with community-based drug and alcohol treatment*. Washington, DC: National Academy Press.

Lancor, L. (2008). Collaboration tools in a one-semester software engineering course: What worked? what didn't? *J. Comput. Small Coll., 23*(5), 160-168.

Lee, S., & Bozeman, B. (2005).The impact of research collaboration on scientific productivity. *Social Studies of Science, 35*(5), 673-702.

Leonard, D., & Straus, S. (1997). Putting your company's whole brain to work. *Harvard Business Review, 75*(4), 111-121.

Lomas, C., Burke, M., & Page, C. L. (2008).*Collaboration tools*. Retrieved 20 March, 2009, from http://net.educause.edu/ir/library/pdf/ELI3020.pdf

Lynch, P. (2008). *Collaboration and Interdisciplinary Research*: National Energy Research Institute for the Energy Efficiency and Conservation Authority.

Mattessich, P. W., Murray-Close, M., Monsey, B. R., & Wilder Research Center. (2001). *Collaboration: what makes it work* (2nd ed.). Saint Paul, Minn.: Amherst H. Wilder Foundation.

Medhoff, M. (2003). Collaboration and the quality of economics research. *Labour Economics, 10*(5), 597-608.

Melin, G. (2000). Pragmatism and self-organisation research collaboration on the individual level. *Research Policy, 29* (1), 31-40.

Metcalfe, J., Riedlinger, M., Pisarski, A., & Gardner, J. (2006). *CHASS Occasional Paper No. 3: Collaborating across the sectors: The relationships between the humanities, arts and social sciences (HASS) and science, technology, engineering and medicine (STEM) sectors*. Canberra, ACT: Council for Humanities, Arts and Social Scienceso.

Oetzel, J. G. (2002). The effects of culture and cultural diversity on communication work groups: Synthesizing vertical and cultural differences with a face-negotiation perspective. In L. R. Frey (Ed.), *New directions in group communication* (pp. 121-137). London: Sage.

Prime Minister's Science, Engineering and Innovation Council. (2005). *Imagine Australia: The role of creativity in the innovation economy*. Canberra: PMSEICo.

Puntambekar, S. (2006). Analyzing collaborative interactions: Divergence, shared understanding and construction of knowledge. *Computers & Education, 47*(3), 332 -351.

Reback, C. J., Cohen, A. J., Freese, T. E., & Shoptaw, S. (2002). Making collaboration work: Key components of practice/research partnerships. *Journal of Drug Issues, 32*(3), 837-849.

Rigby, J., & Edler, J. (2005). Peering inside research networks: Some observations on the effect of the intensity of collaboration on the variability of research quality. *Research Policy, 34*(6), 784-794.

Sage, A. (2000). Transdisciplinarity perspectives in systems engineering and management. In M. A. Somerville & D. J. Rapport (Eds.), *Transdisciplinarity: Recreating integrated knowledge*. Oxford, UK: OELSS Publishers Co Ltd.

Samaddar, S., & Kadiyala, S. S. (2006).An analysis of interorganisational resource sharing decisions in collaborative knowledge creation. *European Journal of Operational Research, 170*(1), 192-210.

Select Committee on Science and Technology. (2002). *Science and society: third report of the House of Lords Select Committee on Science and Technology*. London: House of Lords.

Somerville, M. A., & Rapport, D. J. (Eds.). (2000). *Transdisciplinarity: Recreating integrated knowledge*. Oxford, UK: OELSS Publishers Co Ltd.

Suzuki, S. (1998). In-group and out-group communication patterns in international organizations: Implications for SIT. *Communication Research, 25*, 154-183.

Thatcher, M., & Oliver, J. (2001).*The impact of information technology on quality improvement, productivity, and profits: An analytical model of a monopolist*. Paper presented at the Proceedings of the 34th annual Hawaii international conference on system sciences (HICSS) - Volume 8.

Tsui, A., Egan, T., & O'Reilly, C. (1992). Being different: Relational demography and organizational attachment. *Administrative Science Quarterly, 37*, 549-579.

Vinagre, M. (2008). Politeness strategies in collaborative e-mail exchanges. *Computers & Education, 50*(3), 1022-1036.

Ware, L. P. (1994).Contextual barriers to collaboration. *Journal of Educational & Psychological Consultation, 5*(4), 339.

Weckstrom, C. (2009). What makes collaboration work? Retrieved 18 April, 2009, from http://ceciliaweckstrom.com/2009/03/04/what-makes-collaboration-work/

Wray, K. B. (2006). Scientific authorship in the age of collaborative research. *Studies in the History and Philosophy of Science, 37*(3), 505-514.

Zhang, Y., & Candy, L. (2007). *An in-depth case study of art-technology collaboration.* Paper presented at the Proceedings of the 6th ACM SIGCHI conference on creativity & cognition, Washington, DC, USA.

Appendix A

Materials Used in On-line Survey

UNIVERSITY OF OTAGO
NEW ZEALAND

Collaboration Assessment Survey

Welcome, my name is Khalaf. I am a Master's student at Otago University in the Information Science Department. As part of my Masters thesis, I am conducting a study into characteristics of successful collaboration and effective e-collaboration tools.

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you of any kind and we thank you for considering our request.

The survey has a total of 42 questions, and it should take you about 15 minutes to complete. Select the response that best indicates how much you agree or disagree with each item. **If the question is not applicable or you have no opinion then select Neutral.** Your answers could be based on past or current collaboration. Be sure to answer all questions. You will receive a reminder if you have forgotten to select an answer.

The results of the project may be published and will be available in University of Otago library but every attempt will be made to preserve your anonymity.

You are most welcome to request a copy of the results of the project should you wish. The data collected will be securely stored in such a way that only certain people mentioned below will be able to gain access to it.

Thank you for your co-operation. If you have questions related to the study itself or the results obtained from your participation, please feel free to contact me or one of my supervisors:

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If you agree to participate in this survey, please click this link to proceed.

Figure A.1: Snapshots of the Start Page of On-line Survey.

Collaboration Assessment Survey

DEMOGRAPHICS

1. How long have you been involved in research collaborations?

- ○ Less than one year
- ○ 2 to 4 years
- ○ 4 to 6 years
- ○ More than 6 years
- ○ Never (please continue the survey by clicking the 'Continue' button at the bottom of the page)

If you you have ever collaborated, please answer Question 2 and Question 3 below.

2. What kinds of communication means are you using with your collaborative members?

- ☐ Face-to-Face meetings
- ☐ E-mail
- ☐ Video conferencing
- ☐ Wikis / Blogs
- ☐ Messengers (Yahoo, MSN, ...)
- ☐ Phones / Mobiles

Other (please specify)

3. How far are your collaborative team members from you?

- ☐ Same building
- ☐ Same city
- ☐ National
- ☐ International

Continue

Figure A.2: Snapshots of Part 1 of On-line Survey.

Collaboration Assessment Survey

Be sure to answer all questions. You will receive a reminder if you have forgotten to select an answer.

Factors related to the ENVIRONMENT surrounding your collaborative group

4. Researchers in our organisation have a history of working together.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

5. Trying to solve problems through collaboration is common in our organisation.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

6. Leaders in our organisation who are not part of our collaborative group seem helpful about what we can accomplish.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

7. Others in our organisation who are not part of our group would generally agree that the people and/or organisations involved in our collaborative projects are the "right" ones to make it work.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

8. The political and social climate is generally supportive of collaboration.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please use this area to add any thoughts or comments (optional):

Continue

Figure A.3: Snapshots of Part 2 of On-line Survey.

Collaboration Assessment Survey

Be sure to answer all questions. You will receive a reminder if you have forgotten to select an answer.

Factors related to MEMBERSHIP CHARACTERISTICS

9. People involved in our collaborative projects always trust one another.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

10. I have a lot of respect for the other people involved in our collaboration.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

11. Researchers involved in our collaboration represent a cross section of those who have a stake in what we are trying to accomplish.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

12. All the organisations that we might need to be members of our collaborative group have become members of the group.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

13. Researchers involved in our collaboration believe that they will benefit from their involvement in the collaboration.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

14. Researchers involved in our collaboration have the right to compromise on important decisions of our collaborative work.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please use this area to add any thoughts or comments (optional):

Continue

Figure A.4: Snapshots of Part 3 of On-line Survey.

Collaboration Assessment Survey

Be sure to answer all questions. You will receive a reminder if you have forgotten to select an answer.

Factors related to PROCESS AND STRUCTURE					
15.	The organisation / people that belong to our collaborative group invest the right amount of time in our collaborative effort.				
	○ Strongly Disagree	○ Disagree	○ Neutral	○ Agree	○ Strongly Agree
16.	Everyone who is a member of our collaborative group wants our collaborative work to succeed.				
	○ Strongly Disagree	○ Disagree	○ Neutral	○ Agree	○ Strongly Agree
17.	The level of commitment among the collaborative participants is high.				
	○ Strongly Disagree	○ Disagree	○ Neutral	○ Agree	○ Strongly Agree
18.	When the collaborative group makes major decisions, there is always enough time for members to take information back to their organisations to confer with colleagues about what the decision should be.				
	○ Strongly Disagree	○ Disagree	○ Neutral	○ Agree	○ Strongly Agree
19.	Each of the people who participate in decisions in our collaborative group can speak for the entire organisation / group they represent, not just a part.				
	○ Strongly Disagree	○ Disagree	○ Neutral	○ Agree	○ Strongly Agree
20.	There is a lot of flexibility when decisions are made; people in our group are open to discussing different options.				
	○ Strongly Disagree	○ Disagree	○ Neutral	○ Agree	○ Strongly Agree
21.	People in our collaborative group are open to different approaches to how we can do our work. They are willing to consider different ways of working.				
	○ Strongly Disagree	○ Disagree	○ Neutral	○ Agree	○ Strongly Agree
22.	People in our collaborative group have a clear sense of their roles and responsibilities.				

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
23.	There is a clear process for making decisions among the partners in our collaboration.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
24.	Our collaboration is able to adapt to changing conditions, such as fewer funds than expected, changing political climate, or change in leadership.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
25.	Our group has the ability to survive even if it had to make major changes in its plans or add some new members in order to reach its goals.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
26.	Our collaborative group has tried to take on the right amount of work at the right pace.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
27.	We are currently able to keep up with the work necessary to coordinate all the people, organisations, and activities related to our collaborative work.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please use this area to add any thoughts or comments (optional):

Continue

Figure A.5: Snapshots of Part 4 of On-line Survey.

Collaboration Assessment Survey

Be sure to answer all questions. You will receive a reminder if you have forgotten to select an answer.

Factors related to COMMUNICATION

28. People in our collaborative group communicate openly with one another.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

29. I am informed as often as I should be about what goes on in the collaboration.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

30. The people who lead this collaborative group communicate well with the members.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

31. Communication among the people in our collaborative group happens both at formal meetings and in informal ways.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

32. I personally have informal conversations about the project with others who are involved in our collaborative group.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please use this area to add any thoughts or comments (optional):

Continue

Figure A.6: Snapshots of Part 5 of On-line Survey.

Collaboration Assessment Survey

Be sure to answer all questions. You will receive a reminder if you have forgotten to select an answer.

Factors related to PURPOSE					
33.	I have a clear understanding of what our collaboration is trying to accomplish.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
34.	People in our collaborative group know and understand our goals.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
35.	People in our collaborative group have established reasonable goals.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
36.	The people in our collaborative group are dedicated to the idea that we can make our collaboration work.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
37.	My ideas about what we want to accomplish with our collaboration seem to be the same as the ideas of others.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
38.	What we are trying to accomplish with our collaborative work would be difficult for any single organisation / individual to accomplish by itself.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
39.	No other organisation / individual in our community is trying to do exactly what we are trying to do.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please use this area to add any thoughts or comments (optional):

Continue

Figure A.7: Snapshots of Part 6 of On-line Survey.

Collaboration Assessment Survey

Be sure to answer all questions. You will receive a reminder if you have forgotten to select an answer.

Factors related to RESOURCES

40. Our collaborative group has adequate funds to do what it wants to accomplish.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

41. Our collaborative group has adequate "people power" to do what it wants to accomplish.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

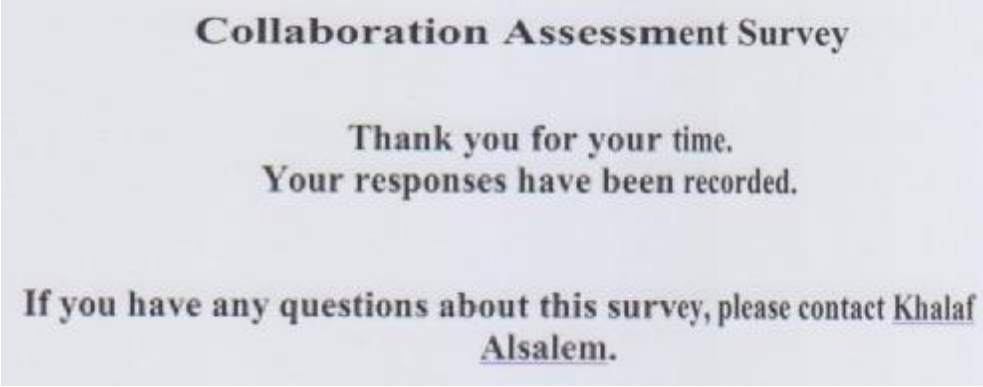
42. The people in leadership positions for our collaboration have good skills for working with other people and organisations.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please use this area to add any thoughts or comments (optional):

Continue

Figure A.8: Snapshots of Part 7 of On-line Survey.



Collaboration Assessment Survey

Thank you for your time.
Your responses have been recorded.

If you have any questions about this survey, please contact Khalaf Alsalem.

Figure A.9: Snapshots of Finish Page of On-line Survey.

Dear…….,

My name is Khalaf. I am a Master's student at Otago University in Information Science Department. I'm supervised by Russell Butson and Maryam Purvis. As part of my Masters thesis, I am conducting a study into characteristics of successful collaboration.

The survey has a total of 42 questions, and it should take you about 15 minutes to complete.

I would appreciate if you could distribute the on-line survey to your entire email list. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you of any kind and we thank you for considering our request.

Survey URL: http://www.business.otago.ac.nz/surveys/CollaborationAssessment/

Kind regards,
Khalaf Alsalem

Figure A.10: E-mail Letter to Research Institution.

Appendix B

Materials Used in Interviews

1. How do you define research collaboration?
2. Do you think collaboration is important in your area of research? If so, why?
3. Have you found collaboration difficult? If so, can you explain
4. What percentages of your collaborations have been... local - national - international?
5. What percentages of your collaborations are with... one other - with groups?
6. Have you faced any barriers in your collaborations?
7. From your experience, how these barriers can be overcame?
8. Do you think your current collaboration improves the relationship with the other organizations? If so, how?
9. Could you please describe how your group was formed in one of your collaboration groups?
10. Is it important for you and your collaborators to get support from your organization? If so, can you explain, and what kind of support do you get from them?
11. What are the main communication means you have used with your collaborators?
12. Do you use any e-collaboration tools in your collaborations? What are these tools?
13. How useful are these tools in your area of research? Which aspect of the tool is more useful for your collaborations?

Figure B.1: Interview Questions.

Dear …….,

This is Khalaf Alsalem from Information Science department at Otago University. I'm a master student. I'm doing my thesis on research collaboration and as part of my methodology I need to interview researchers who have been involved in collaboration groups. So if you have the time for me to interview you I'll be grateful. The interview will take approximately about 30 minutes to an hour and for your preparation the questions will be sent to you if you've decided to participate.

Please inform me with the day and time if you wish to be interviewed.

Kind regards,
Khalaf

Figure B.2: E-mail Letter Invitation to Researchers.

Dear …….,

Thanks for getting back to me. I appreciate your willingness in participating in the interview.

Please find an attachment of interview questions. These questions will give you an overview about what I would be interested on in your collaboration.

Best regards,
Khalaf

Figure B.3: E-mail Letter to Participants.

[*Date*]

Investigating Factors and Characteristics of the use of e- Collaboration Tools in Research Collaboration

INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you of any kind and we thank you for considering our request.

What is the Aim of the Project?

This project aims to define key indicators for successful collaboration.

This information sheet has been provided to you because you have expressed a willingness to provide us with further information about your collaboration with other colleagues.

What Type of Participants are being sought?

Researchers how have been involved in a collaborative research.

What will Participants be Asked to Do?

Should you agree to take part in this project, and to participate in individual interviews about your experience with research collaboration.

Please be aware that you may decide not to take part in the project without any disadvantage to yourself of any kind.

Can Participants Change their Mind and Withdraw from the Project?

You may withdraw from participation in the project at any time and without any disadvantage to yourself of any kind.

What Data or Information will be Collected and What Use will be Made of it?

The interview(s) will be transcribed verbatim. This project involves a semi-structured, open-questioning technique where the precise nature of all of the questions which will be asked have not been determined in advance, but will depend on the way in which the interview develops.

In the event that the line of questioning does develop in such a way that you feel hesitant or uncomfortable you are reminded of your right to decline to answer any particular question(s) and also that you may withdraw from the project at any stage without any disadvantage to yourself of any kind.

You will be invited to comment on the transcribed interview transcriptions. Data from all interviews will be analysed to set up key indicators of a successful collaboration.

Figure B.4: Participant Information Sheet.

Quotations from your interview may be used in reports or papers on the study but your name and identity will be kept confidential and anonymous. Only the researcher will have access to the data you provide and the data will not be used for any other purpose than this research.

The results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve your anonymity.

You are most welcome to request a copy of the results of the project should you wish.

The data collected will be securely stored in such a way that onlyme and those mentioned below will be able to gain access to it. At the end of the project any personal information will be destroyed immediately except that, as required by the University's research policy, any raw data on which the results of the project depend will be retained in secure storage for five years, after which it will be destroyed.

Reasonable precautions will be taken to protect and destroy data gathered by email. However, the security of electronically transmitted information cannot be guaranteed. Caution is advised in the electronic transmission of sensitive material.

What if Participants have any Questions?
If you have any questions about our project, either now or in the future, please feel free to contact either:-

Maryam Purvis Information Science Department University of Otago Tel: (03) 479 8423 tehrany@infoscience.otago.ac.nz	or	Russell Butson Higher Education Development Centre University of Otago Tel: (03) 479 5789 russell.butson@otago.ac.nz

This proposal has been reviewed and approved by the Head of Information Science Department, University of Otago.

Figure B.4: Participant Information Sheet (Cont.)

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CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I know that:-

1. My participation in the project is entirely voluntary;

2. I am free to withdraw from the project at any time without any disadvantage;

3. The data (video and audio) will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for five years, after which it will be destroyed;

4. Interviews in this project involve a semi-structured, open-questioning technique where the precise nature of all of the questions which will be asked have not been determined in advance, but will depend on the way in which the interview develops and that in the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind;

5. The results of the project may be published and available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve my anonymity.

I agree to take part in this project.

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(Signature of participant) (Date)

Figure B.5: Participant Consent Form.