Exploring the impact of telehealth videoconferencing services on work systems for key stakeholders in New Zealand: a sociotechnical systems approach

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ABSTRACT

This thesis explores how the impacts of telehealth videoconferencing services (THVCS) on work systems are perceived by key stakeholders in New Zealand. Telehealth- the use of information and communications technologies to deliver healthcare when patients and providers are not in the same physical location- exemplifies how technological developments are changing the ways in which healthcare is provided and experienced. With the objectives of improving access, quality, and efficiencies of financial and human resources, THVCS use real time videoconferencing to provide healthcare services to replace travel to a common location. Despite the benefits of telehealth reported in the extant literature, there continues to be difficulties with developing and sustaining services.

The aim of this inquiry is to understand how THVCS impact key stakeholders in the work system. Specifically, it seeks to examine the characteristics of THVCS in the New Zealand context, identify the facilitators and barriers to THVCS, and understand how the work system can adapt for THVCS to be sustained practice.

The research design is framed by a post-positivist approach and underpinned by sociotechnical systems (STS) theory. STS theory and a human factors/ergonomics design approach inform the methodology, including the use of the SEIPS 2.0 model. Forty semi-structured qualitative interviews and contextual observations in a two-phase methodology explore the perceptions of an expert telehealth group, and providers, receivers, and decliners of THVCS. These data are analysed using the framework method of thematic analysis.

The key findings suggest that to enable sustained THVCS in New Zealand, factors such as new ways of working; change; human connection; what is best for patient; and equity need to be recognised and managed in a way that balances costs and consequence and ensures fit across the work system.

Theoretical contributions to knowledge are made through the development of a conceptual model from the literature, exploring THVCS with an STS theory lens and developing SEIPS 2.0. Methodologically, this inquiry contributes a theory-based, qualitative approach to THVCS research and draws on the perceptions of unique groups of participants. Significantly, the findings make practical contributions to the design of the THVCS in the New Zealand context.

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PUBLICATIONS

Aspects of initial ideas and preliminary results of this inquiry have been presented at the following conferences and published in conference proceedings:

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Green, N., Tappin, D., Bentley, T. (2019) The impact of telehealth videoconferencing services on work systems in New Zealand: Perceptions of expert stakeholders. In S. Bagnara et al., (Eds) *Proceedings of the 20th Congress of the International Ergonomics Association (IEA 2018), Volume I: Healthcare Ergonomics* (pp. 192-197), Florence, Italy, August 26-30, 2018.

Green, N., Tappin, D., Bentley (2017) A review of theoretical frameworks for telehealth to support effective research. In *Proceedings of the 2017 Health Informatics New Zealand (HiNZ) Conference,* Rotorua, New Zealand on 1-3 November 2017 (Winner of the Best Student Paper award).

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LIST OF ABBREVIATIONS AND GLOSSARY

The following list explains the meaning of abbreviations and other terms which are used throughout this thesis.

Abbreviation	Meaning
ACC	Accident Compensation Corporation. State managed health insurance provider in New Zealand
CBA	Cost-benefit analysis
CEA	Cost-effectiveness analysis
CMA	Cost-minimisation analysis
COVID-19	Coronavirus that emerged as a pandemic in 2019
CUA	Cost-utility analysis
Decliners	Patients who were offered THVCS but prefer to continue to receive in-person healthcare
DHB	District Health Board
DI	Diffusion of Innovations
GP	General Medical Practitioner or family doctor
HFE	Human Factors and Ergonomics
HiNZ	Health Informatics New Zealand
HIT	Health Information Technology
Hub-and-spoke	THVCS used to connect a smaller 'spoke' hospital or medical centre with a larger 'hub' hospital or medical centre
IT	Information Technology
ICT	Information and Communication Technology
MOH	Ministry of Health
NASSS	Non-adoption, scale-up, spread and sustainability framework
NPT	Normalisation Process Theory
PHO	Primary Health Organisation
Primary care	Healthcare provided in the community with direct access
Providers	Healthcare professionals and others involved in the provision of healthcare to patients
Receivers	People who receive healthcare
Secondary care	Hospital-based specialised care
SEIPS	Systems Engineering Initiative for Patient Safety
STS	Sociotechnical systems
TAM	Technology Acceptance Model
THVCS	Telehealth videoconferencing services
UTAUT	Unified Theory of Acceptance and Use of Technology
VC	Videoconference or videoconferencing

CHAPTER 1 Introduction

1.1 Situating the research

Advances in information and communication technology (ICT) are increasingly being used to improve the delivery and experience of healthcare. These developments are changing the ways in which healthcare services are provided, the nature of the work that people do to provide and receive them, and their experiences. It is possible to collect, manage and monitor your health information through patient portals, wearable devices, and smart phones. Concurrently, healthcare systems around the world face increasing pressures from a growing and aging population, inequity of access, and finite financial and human resources. Telehealth is one potential solution to problems in health services delivery, such as accessibility, quality, professional resource scarcity, and increasing costs (Bradford, Caffery, & Smith, 2016; van Dyk, 2014). Telehealth is defined as the delivery of healthcare services at a distance using ICT (World Health Organization, 2010). The technologies available allow for synchronous (real time) services, for example, videoconferencing (VC) and asynchronous services (e.g. remote reading and reporting of X-ray images).

This thesis presents an inquiry that explores the impact of telehealth videoconferencing services (THVCS) on work systems for key stakeholders in New Zealand. Section 1.2 of this introduction will explain the definitions that will be used throughout this thesis. Section 1.3 will then situate THVCS in the global and New Zealand context of health technology and healthcare. The research will be located in the current literature in 1.4, outlining the extant research, knowledge gaps, and research aims. The inquiry will then be orientated philosophically, and the research approach explained in 1.5, before the findings are positioned as contributions to the knowledge base (1.6). The chapter will culminate with an outline of the structure of the thesis to navigate the subsequent narrative.

1.2 Definitions used in this research

The key terms and their variants that are used in this research are clarified before the inquiry context is described in more detail. These include the terms telehealth, THVCS, 'patient', 'providers', 'receivers', 'decliners' and 'in-person'.

While the terms in the ICT healthcare domain are often used interchangeably, telemedicine has been the most popular term used in the literature, followed by e-health and telehealth (Fatehi & Wootton, 2012). However, for the current inquiry the term telehealth is used to reflect both the broader activities implied by the term and also the delivery of health services over distance. In addition, telehealth is used commonly in the New Zealand context with a Telehealth Forum advising the Government and other stakeholders on telehealth (Ministry of Health, 2017a), a Telehealth Resource Centre providing information and networking services for stakeholders (New Zealand Telehealth Forum and Resource Centre, 2020c), and the Medical Council of New Zealand (MCNZ) has a Statement on Telehealth (Medical Council of New Zealand, 2016). Thus, this inquiry will use the term telehealth as defined by the New Zealand Telehealth Forum,

> "Telehealth is the use of information and communication technologies to deliver healthcare when patients and care providers are not in the same physical location" (Ministry of Health, 2017a).

In asynchronous, or store-and-forward, services there is a time separation between one phase of the process and another (Wilson & Maeder, 2015), whereas synchronous telehealth services are performed in real-time, most commonly through VC. This inquiry focusses on synchronous healthcare services provided to patients through real-time video connection. In this thesis, this form of telehealth, using VC to provide patient consultation, is referred to as telehealth videoconferencing services (THVCS).

Throughout this thesis, the term 'patient' is used to refer to people who are seeking or receiving healthcare. This is the term that is used predominantly in the field and by the participants in this inquiry and can include the caregivers or families of patients. At times, the term 'consumer' is used as an alternative to patient to reflect the language of participants, existing research, or to include a wider group of people who may be seeking healthcare in the future. The word 'receivers' also describes people who are receiving healthcare and is used particularly in the data collection phases of this inquiry to describe

patients who received THVCS. Conversely, the term 'decliner' denotes patients in the data collection of this research who were offered THVCS but preferred to continue with in-person healthcare.

Those that provide healthcare services, for example doctors and allied health therapists or those involved in the provision of care (e.g. nurse coordinators, booking clerks), are termed 'providers' in this thesis. The term 'clinician' refers to a health professional directly involved in patient care, and this is used sometimes interchangeably with provider.

On occasions, the literature and participants in this inquiry use the term 'face-to-face' to refer to care where the patient and the provider are physically present in the same room or physical space. This term can be ambiguous and is outdated since a THVCS interaction between patients and providers is face-to-face, that is, they can view each other's faces (Cason, 2017; New Zealand Telehealth Forum and Resource Centre, 2020b). In this thesis, the term 'in-person' is used to clarify when the people in a consultation are in the same physical space.

These definitions begin to set the parameters of this inquiry, while the broader healthcare context and New Zealand's position in this is detailed in the next section.

1.3 Context of this inquiry

New Zealand has a population of just over 5 million people (Statistics New Zealand, 2020) and has approximately 16,000 practising doctors (Medical Council of New Zealand, 2018) and 58,000 nurses (Ministry of Health, 2019). The New Zealand public health system is organised around twenty District Health Boards (DHB) and thirty primary healthcare organisations (PHO). The Ministry of Health (MOH) provides the funding for DHBs, sets policy, regulates, monitors, and provides leadership for the health and disability sector. PHOs provide primary healthcare either directly or through member general practices, and DHBs operate secondary care hospital services in their geographical area. Additionally, DHBs provide some funding and monitoring for PHOs and other health providers in their district (Parry et al., 2013). Specialist or secondary level care is also available in New Zealand through private (user-pays) services.

While most healthcare in New Zealand continues to be provided through traditional 'bricks and mortar' models of care where the patient attends the physical location of the health provider, alternative models of care are being designed to improve efficiencies of resources and efficacy of outcomes (Ministry of Health, 2016). Health care systems and the paradigms of healthcare are changing as efforts are made to engage patients more actively in partnerships with health providers (Holden et al., 2013) and people are placed centrally in models of integrated health and social services (Canterbury District Health Board, 2013). While in the past patients were passive, they are now becoming increasingly active as the medical information accessible on the internet is increasing knowledge and involvement in their own care (Carayon et al., 2011). In addition, there is growth of consumer facing ICT health services available including direct to consumer THVCS in primary care in an increasing number of jurisdictions (Oliver, 2019; Raven, Butler, & Bywood, 2013; Schoenberg, 2015; Uscher-Pines & Mehrotra, 2014), including New Zealand (Meier, 2018). Globally, ICT is increasingly used as a tool for healthcare systems and services to achieve goals of universal health coverage and better use of scarce resources. Some 57% of WHO Member States in 2015 reported that they had a national telehealth policy or that they reference telehealth in their eHealth policy (World Health Organization, 2010, 2016). In New Zealand, the health system is facing an aging population with increasing health demands (Ministry of Health, 2017b). There are extra challenges in providing medical services to rural communities due to staff recruitment, retention, and isolation issues (Crampton & Baxter, 2018). In addition, patients and families living away from main centres who seek specialist health services often face both time consuming and costly travel. Efforts have been made to improve efficiencies, quality, access, and sustainability of healthcare services, for example, with the business models of Better, Sooner, More Convenient (Lovelock, Martin, Cumming, & Gauld, 2014). ICT features in these models as a medium to help achieve these goals and telehealth is often included as a potentially useful tool.

THVCS is a subset of telehealth. THVCS is a model of care in which a healthcare provider delivers healthcare to a patient using the medium of video to replace being in the same physical location. The service is direct-to-patient and synchronous in time (Schoenberg, 2015). The service provided by THVCS aims to be equivalent to an in-person service. Therefore, THVCS do not include any physical examination of the patient

that requires tactile or olfactory senses unless these assessments can be performed by another health provider who is co-located with the patient. Within these limits of clinical practice, THVCS can be delivered by many providers of healthcare including doctors, nurses, and allied health professionals (e.g. speech language therapists, dieticians, physiotherapists). THVCS in New Zealand may be provided in the primary or secondary healthcare sectors and by a variety of healthcare specialists. Primary care refers to the professional healthcare provided in the community, usually from general medical practitioners (GPs), nurses or allied health professionals that people can access directly (Ministry of Health, 2020b). Secondary care refers to more specialised care that is usually hospital-based and a patient is referred from the primary sector to receive care in the secondary sector (Southern Health, 2020). In this inquiry, THVCS in both primary and secondary care is explored.

The 2014 New Zealand telehealth stocktake reports sixteen DHBs and two PHOs were using THVCS (New Zealand Telehealth Forum, 2014, 2015). The anticipated trend was for growth in the field and the 2019 update of this survey confirmed THVCS use in DHBs had increased to nineteen (New Zealand Telehealth Forum, 2019). In addition, the refreshed survey notes a significant increase between 2014 and 2019 in frequency of use, number of disciplines, and types of interactions with THVCS. The extent of use in the primary health sector was not considered in the survey update though it notes that in 2019 the MOH identified that 30 primary care practices had introduced THVCS. This reflects a global increase in interest in telehealth with more countries implementing more kinds of telehealth programmes in 2016 than in 2009 (World Health Organization, 2010, 2016).

1.4 Research aims

International findings suggest that telehealth can be as effective for health outcomes as usual service provision (Assimacopoulos et al., 2008; McLean et al., 2013); beneficial in reducing travel and associated costs (Müller, Alstadhaug, & Bekkelund, 2016; Wootton, Bahaadinbeigy, & Hailey, 2011); increases access to healthcare for isolated communities (Moffatt & Eley, 2010; Sevean, Dampier, Spadoni, Strickland, & Pilatzke, 2009); and increases access to scarce specialist care (Birns, Roots, & Bhalla, 2013; Kazley, Wilkerson, Jauch, & Adams, 2012). Telehealth can also be cost-effective (Akiyama & Yoo, 2016; Wade, Karnon, Elshaug, & Hiller, 2010). However, research indicates that

the diffusion of telehealth into ongoing and routine care remains problematic (Zanaboni & Wootton, 2012) and there are many examples of telehealth programs that are not successful past the pilot stage (Broens et al., 2007; Eason, Waterson, & Davda, 2014; Hendy et al., 2012; Wade, Eliott, Karnon, & Elshaug, 2010) . The literature suggests that the barriers to success include societal factors (e.g. policy, law); organisational factors (e.g. cost, reimbursement, change management), consumer factors (e.g. age, computer literacy, acceptance), provider factors (e.g. resistance to change), and technological factors (e.g. bandwidth, security, usability) (Brewster, Mountain, Wessels, Kelly, & Hawley, 2014; Kruse et al., 2018; LeRouge & Garfield, 2013).

The review of the literature in Chapter 2 shows that diverse disciplines have an interest in telehealth research. In many cases their research lens examines one aspect of telehealth but does not clearly consider all the aspects of the system. It has been noted that healthcare is a complex, adaptive system (Berg, 1999; Carayon et al., 2011), and several reviews have recommended that telehealth would be better examined from a sociotechnical systems (STS) perspective (Eason et al., 2014; McLean et al., 2013; van Dyk, 2014), although few studies have done this. Furthermore, telehealth is disruptive, and changing business models and the way work is done is required for the introduction of technology into the healthcare system (Bagot, Cadilhac, Vu, Moss, & Bladin, 2015). Researchers have suggested that in order for telehealth to be implemented effectively and be sustained, it must be an integral part of the healthcare service (LeRouge & Garfield, 2013). In addition, the lack of theoretical underpinning in telehealth research has been criticised (Gammon, Johannessen, Sorensen, Wynn, & Whitten, 2008; Wade, Gray, & Carati, 2017), and when theories have been used to inform telehealth research they have not fully considered the context of health when presenting frameworks from other fields and applying them to a healthcare context (Gammon et al., 2008; Holden & Karsh, 2009; Holden & Karsh, 2010). Finally, published THVCS research in the New Zealand context is limited and has not been conducted in recent times.

In summary, much literature notes the difficulties of implementing, adopting, and embedding telehealth into the healthcare system, despite its reported benefits at all levels of the work system. Technology introduction is disruptive and changes the nature of work for key stakeholders.

The work system as defined in this thesis consists of people, technology, tasks, organisation, the internal environment, and the wider external environment and THVCS interactions with all these elements, and is consistent with an STS approach. The nature of the work system interactions, how the system adapts, and how these impact on key stakeholders and the wider work system is not clear. Exploring these elements will aid in understanding the resultant outcomes. Given this research background and the global and local backdrop, this inquiry aimed to explore how the impacts of THVCS on work systems are perceived by key stakeholders in New Zealand using the theoretical base of sociotechnical systems theory. To address this, four research questions established from the literature review were posed:

1. What are the current characteristics of THVCS in use in New Zealand?
2. How do THVCS impact key stakeholders in the work system?
3. What are the facilitators and barriers to THVCS for key stakeholders in New Zealand?
4. How can the work system adapt for THVCS to be sustained practice in healthcare in New Zealand?

1.5 Research approach

Much of the previous telehealth research has been positivist in nature, following quantitative research designs. The present inquiry adopts a qualitative strategy to explore the perspectives of key stakeholders. The research design is located with a critical realism ontology and a constructivist epistemology, with a recognition of the human factors and ergonomics (HFE) and health perspective and experience of the researcher. The inquiry lens draws on post-positivism and an STS theoretical base. STS theory recognises that the work system is open and subject to a wide range of environmental factors, while being made up of social networks (Eason, 2014). STS theory assists with analysing the effectiveness of work systems in achieving their objectives and evaluating the outcomes of a technical change. Utilising an STS approach as a research lens for this inquiry is proposed as a way to more comprehensively understand the impact and outcome of change for key stakeholders with the introduction of THVCS.

The HFE discipline builds on STS theory to view complex systems (Waterson, 2015). This is reflected in various work systems models presented over the years, for example

Smith and Sainfort (1989); Rasmussen (1997); Moray (2000); Kleiner (2004); Leveson (2004); Wilson and Corlett (2005). These work systems models have been used in a wide range of industries to understand and explain the interactions of the system components, investigate accidents and design safe and efficient workplaces for all levels of the system (Carayon, Hancock, Leveson, Noy, Sznelwar, & van Hootegem, 2015). A work systems approach has been chosen for this inquiry to account for the complexity of the healthcare system and THVCS within this and to explore the interactions between people and the tasks, technology, organisation and environments.

Developed for healthcare, the Systems Engineering Initiative for Patient Safety (SEIPS) and SEIPS 2.0 models of work systems are STS and HFE framework (Carayon et al., 2016; Holden et al., 2013). The SEIPS 2.0 model was chosen as the theoretical touchstone for this inquiry as it adopts an STS and human-centred approach to identify all the elements in the complex work system, their interactions within the physical and organisational environment, and their impact on patient, family, provider and organisational outcomes (Carayon et al., 2011). Although the first iteration of the SEIPS model has been used in many aspects of healthcare, it has not, to the researcher's knowledge, been used to examine THVCS.

The research process is illustrated in Figure 1.1. Following a comprehensive review to map the extant literature, identify gaps in knowledge, and develop the research questions, the research methodology was designed to address the research questions. The data collection took a two-phased approach: Phase I used semi-structured interviews with an expert THVCS group and Phase II collected data through semi-structured interviews and contextual observations with providers, receivers, and decliners of THVCS. Data collection was completed in December 2019, prior to the COVID-19 global pandemic. Each phase of the data was analysed using a robust process of thematic analysis, and the findings of both phases were synthesised to form the discussion, culminating in the contributions of this inquiry to knowledge.

1.6 Research contributions

This thesis makes theoretical, methodological, and practical contributions to existing knowledge of THVCS, and telehealth more broadly, by examining through the lens of STS how the impacts of THVCS on work systems are perceived by key stakeholders in New Zealand.

Theoretical contributions are made through the development of a conceptual model from the extant literature following a robust literature search process. In addition, this inquiry enhances the theoretical base of telehealth, by drawing on STS and the SEIPS 2.0 framework to conduct a multi-level systems analysis of THVCS. Concurrently, the empirical base of SEIPS 2.0 is strengthened by using it in a THVCS context. Exploring THVCS in the New Zealand healthcare system contributes to the knowledge base in this specific context.

This inquiry contributes methodologically through its qualitative approach and the use of a theoretical framework to inform methods. In addition, engaging an expert group of participants, and patient participants who prefer not to use THVCS is unique.

The multi-level system analysis of this inquiry adds to the broader understanding of THVCS and contributes a practical roadmap for designing THVCS. This thesis argues that the impacts of THVCS on key stakeholders in the work system need to be recognised, considered, and managed to promote sustained practice in New Zealand.

1.7 Thesis structure

The remaining chapters report the conceptualisation, considerations, justifications, journey, and outcomes of the inquiry. The thesis is structured around the research process described in section 1.5. The chapter number and titles are in bold text in Figure 1.1 while the text below states the stage of the research process, contents of the chapter, and the research questions the chapter addresses (where relevant).

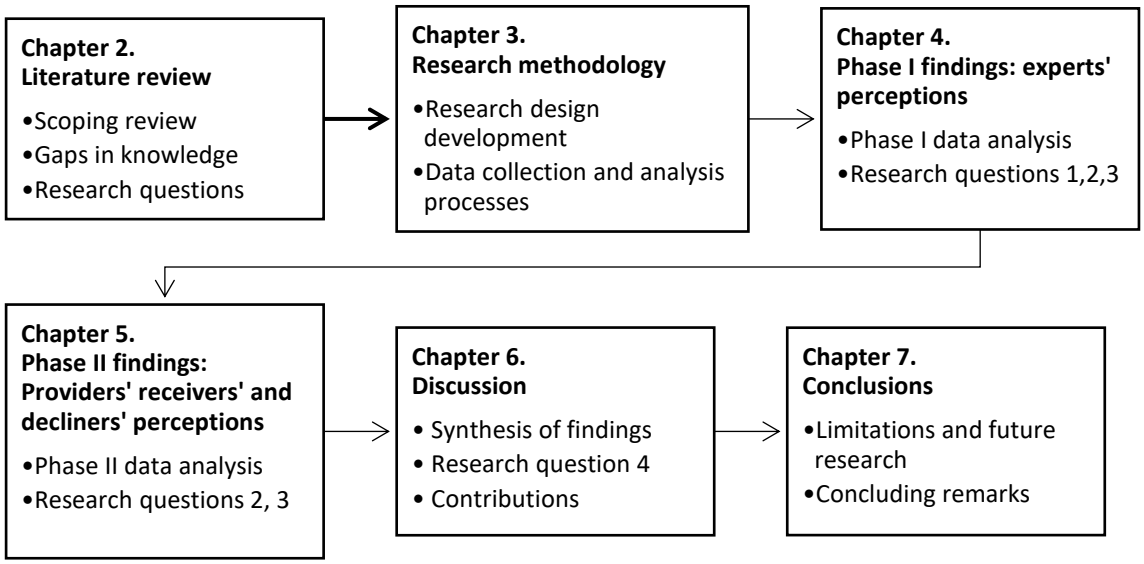


Figure 1.1 The research process and structure of this thesis

Chapter 2 begins with describing the process of the scoping review of the literature before the literature is mapped, gaps in knowledge are identified and the research questions are presented. Chapter 3 explains the research methodology that informs both the Phase I and Phase II data collection, the findings of which are summarised in Chapter 4 and Chapter 5, respectively. The findings of both phases are combined in Chapter 6 where the contributions the inquiry makes to knowledge are also demonstrated. The thesis concludes with Chapter 7 and a discussion of limitations, future research, and a post-script concerning the impact COVID-19 has had on THVCS.

CHAPTER 2 Literature review

2.1 Introduction

A scoping review was chosen to review the literature to explore and provide a summarisation of prior knowledge in the THVCS field (Paré, Trudel, Jaana, & Kitsiou, 2015) while developing a robust process for comprehensiveness. The aims of the literature review were to gain understanding of the broad telehealth literature, to ascertain conceptual content, and to identify any gaps or weaknesses in the existing research to provide a background to position this inquiry appropriately. First, in section 2.2 the initial literature search process and outcomes are detailed, and it is explained how this process provided a foundation to continue to broaden the literature base as the inquiry progressed over time. The review then identifies a large and growing body of telehealth literature which emanates across a range of disciplines and subject matter areas (Armfield et al., 2014; Wade et al., 2017). Next, terminology used in telehealth is explained in section 2.3. Following this, the key theoretical frameworks that have been used to investigate telehealth are presented and critiqued (2.4). A discussion summarising the main themes, structured around questions that are frequently posed in the literature makes up section 2.5. Section 2.6 concludes the chapter by clearly identifying the gaps in knowledge and presenting the research questions for this inquiry.

2.2 Literature search process and outcomes

2.2.1 *Initial search*

The first stage of the search was exploratory to establish the scope of the telehealth literature and to identify the keywords used in this area. A list of keywords reflecting the telehealth concept was developed from this exploration (Table 2.1). Four databases: Scopus, Business Source Complete, Web of Science and PubMed were chosen as being the most suitable for retrieving telehealth information (Ahmadi, Ershad-Sarabi, Jamshidiorak, & Bahaodini, 2014) and were used to search the literature using these keywords in the source title. The search was restricted to English language, published as an article, a review, an article in press, a book chapter, or book after 2006. The first search was performed in 2016 and searching for only publications after the year 2006 was

selected as part of the strategy since it was a decade preceding the search (Paré et al., 2015) and to reflect the recency of technological advancements. The search strategy for this first stage is outlined in Table 2.1 and the search process illustrated in Figure 2.1.

Table 2.1 Exploratory search strategy

Field code	Keywords	Operator	Limits	Database
TITLE	Telehealth Telecare Mhealth "Mobile health" Telemedicine Ehealth "Virtual health*" Telemonitoring Telehealthcare	OR	English language After 2006 Article, review, article in press, book chapter, book Exclude: trade publication, conference proceeding, undefined	Scopus Business Source Complete Web of science PubMed

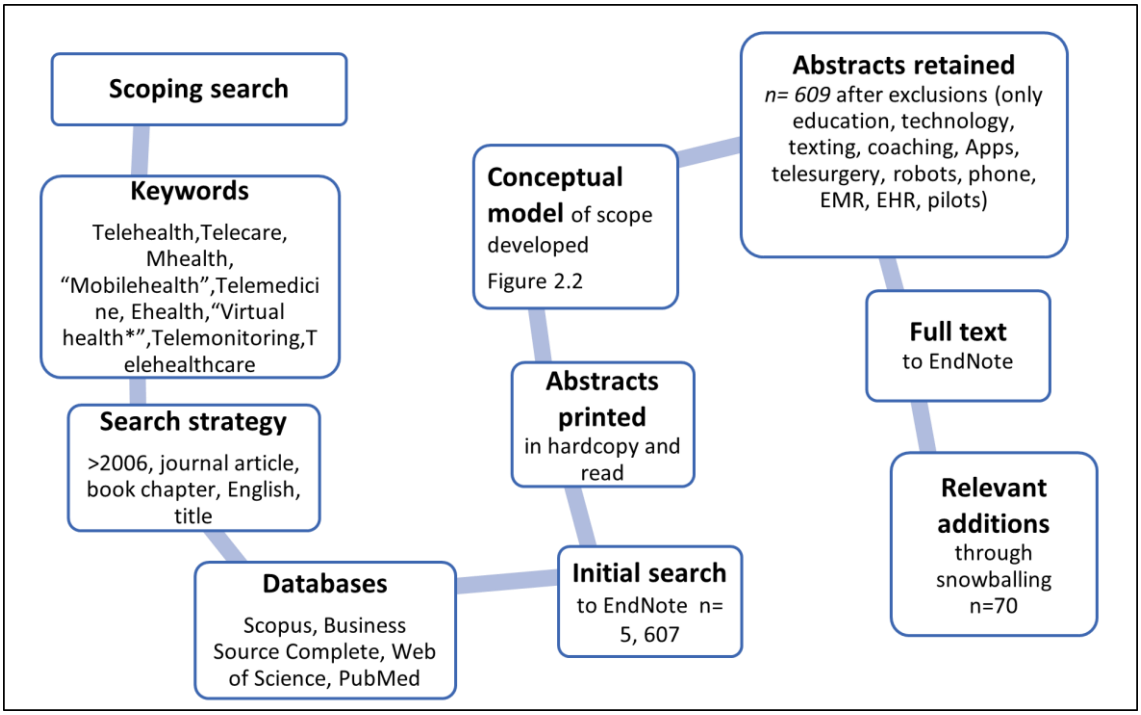


Figure 2.1 Literature search process

After the removal of duplicates, there were 5,607 potentially relevant articles. The citation and abstracts of these articles were then imported into a bibliographical software database (EndNote x9, PDFTron Systems Inc), printed in hard copy, and read. The telehealth literature that emerged from the literature sweep covered a broad range of

topics and contexts. To help with understanding this scope and to aid conceptual thinking, the key subject matter of each article was noted. This included setting, technology, application, and participants. The general areas were grouped iteratively into a work system-based model, drawing on existing systems models of Smith and Sainfort (1989); Moray (2000) and Wilson and Corlett (2005) and illustrated in Figure 2.2. The developed model has examples of telehealth in the centre along with the people for whom the services are designed. Spreading out from this centre are the varying technologies, environments, organisations, and societal aspects that were discussed in the identified literature. This conceptualisation aided the comprehensive understanding of the extant telehealth literature and how the current inquiry can be located. Concurrent to the development of the model, the abstracts were screened to identify those that were potentially relevant to the current inquiry.

Abstracts that suggested consideration of the broader system, terminology definitions, research framework, and reviews were retained. Literature was excluded if the abstracts reported research concerned *only* with tele-education, technology, text messaging, coaching, health Apps, telesurgery, robots, telephone, electronic medical records (EMR) or electronic health records (EHR) and small-scale pilot studies reporting just clinical outcomes. The excluded citations were deleted from Endnote and the full texts of the remaining references (n=609) found. Other relevant references were included (n=70) as they arose through 'snowballing' by reading the full text articles, examining their reference lists, and identifying any potentially relevant literature including those outside the initial date range. This was in an effort to capture 'classic' work which may be important in understanding the field and its theoretical development. Most (92%) of the references in the review were journal articles with 6% sections of books and the remaining 2% were books or serials. Additionally, during this process, attention was given to the general types of research design including theoretical perspectives, design framework, methods of data collection, the interactions that the research examined and the stated outcomes. This aided in the distillation of the predominant themes of the literature which are presented in section 2.5.

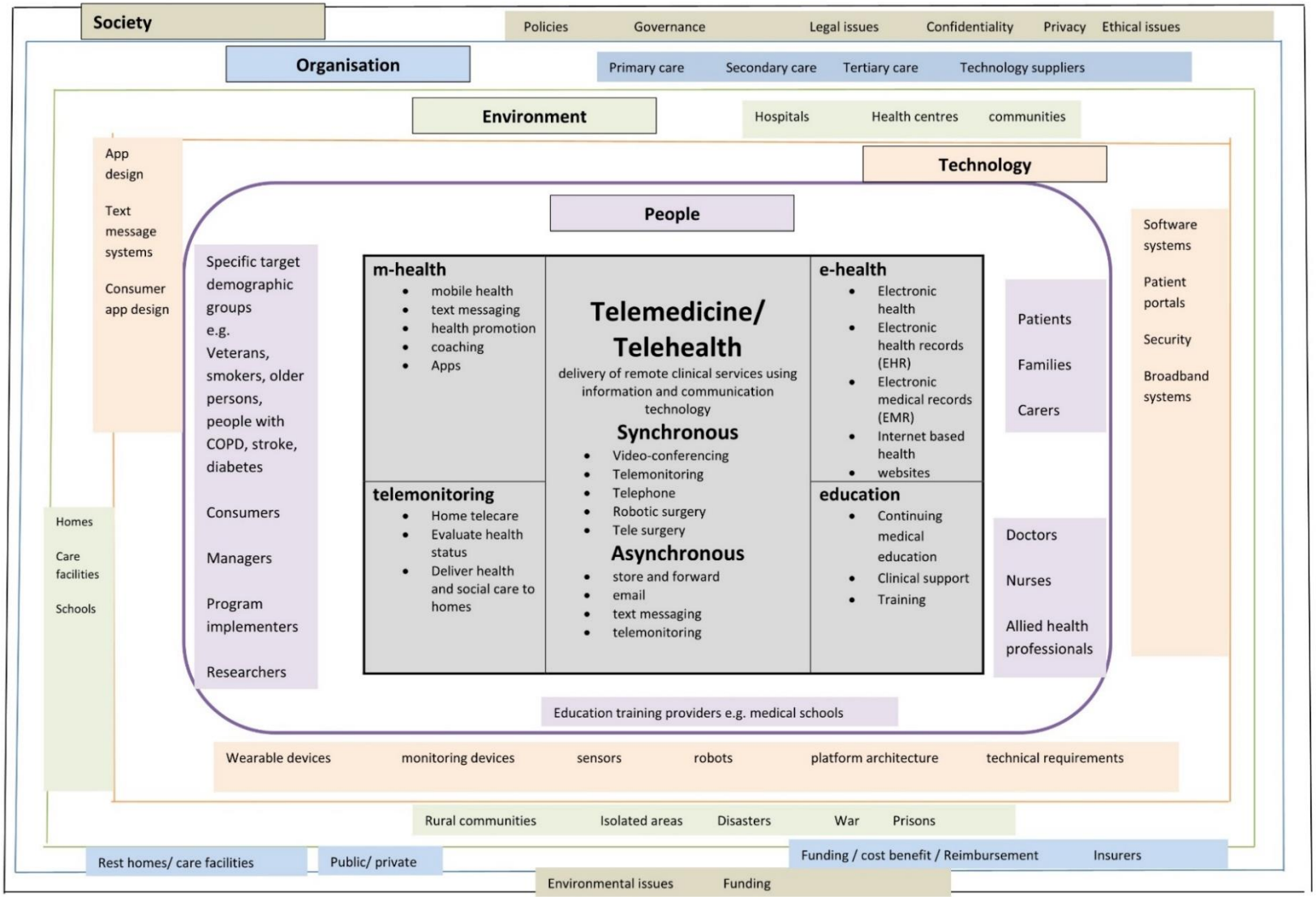


Figure 2.2 Model of scope of telehealth literature resulting from initial search of 5,607 search results

2.2.2 *Subsequent searches*

The structured process described in the preceding section not only provided confidence that all aspects of the literature were being considered but was a repeatable method to stay abreast of the literature as the project continued. To do this, search strings based on the strategy were setup in each database to alert to the publishing of any literature meeting these criteria. When the alerts were received, they were examined, any relevant citations found, and entered into EndNote. This provided confidence that important literature would not be overlooked. As an additional measure, the initial search strategy was reapplied in October 2020, modified to examine only telehealth relating to VC with narrowed search terms. The search was modified to exclude any literature relating to the COVID-19 pandemic. The pandemic has resulted in numerous changes to THVCS and the wider healthcare environment but as the data collection for this inquiry was completed before the onset of COVID-19 this literature was not considered relevant to the review for this thesis. The modified search strategy is shown in Table 2.2 below.

Table 2.2 Search strategy for 2020 update

Field code	Keywords	Operator	Limits	Database
TITLE	Telehealth Telecare Telehealthcare	OR	English language Between 2017 and 2020 Article, review, article in press	Scopus Business Source Complete Web of science PubMed
	video*	AND		
	covid*	AND NOT		

After the removal of duplicates and abstracts that did not relate to patient care or were research protocols or small-scale pilot studies, the 2020 search resulted in 168 papers. Twenty-nine of these were potentially additive to the existing literature and were included in the review where relevant. It was interesting to note some general trends emerging over the period of the project. There has been an increase in: THVCS-specific research; THVCS in allied health; THVCS in a wider variety of settings (e.g. schools, ships, prisons); direct-to-patient models and in primary care. Additionally, there is a tendency towards more consideration of the perceptions of patients compared to the earlier literature which focussed on technology use by providers.

The resultant literature provided the basis for the conceptual (Figure 2.2), and empirical review of the extant telehealth literature which is summarised in the remainder of this chapter. Many disciplines have shown an interest in telehealth and the literature search process identified six general areas of health informatics, technology, management, implementation science, economics and business, medicine, and health clinical practice. These are depicted in Figure 2.3, with telehealth as the overarching topic encircling the various disciplines that consider it. The centre is medicine and health clinical practice as the predominant field with the other areas intersecting this from their particular perspectives and overlapping each other. This was evidenced by journal titles, with around 40% of the literature coming from journals with 'health' or 'medicine' in their titles.

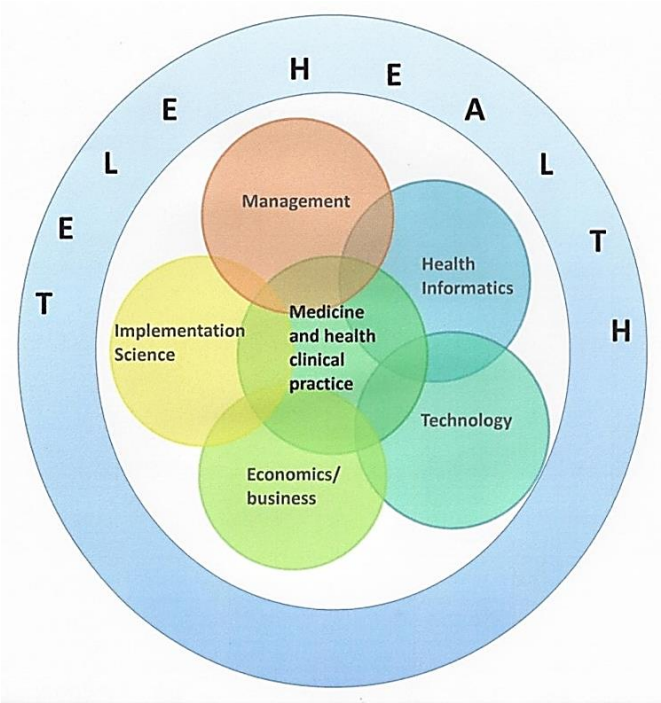


Figure 2.3 Key disciplines from which telehealth research has been approached

As Figure 2.2 showed, the literature considers features that span the work system. In the first stages of examining the literature, it became clear that the various terms used to describe the provision of health services using technology can be problematic in defining telehealth concepts and attention is turned to this now before the key theoretical frameworks in telehealth research are considered in section 2.4.

2.3 Terminology in telehealth

Throughout the literature, various terms are used (in italics below in the first instance), both historical and emerging, to refer to the phenomenon of providing health services from a distance. The umbrella domain for the field may be seen as ICT healthcare (Bashshur, Shannon, Krupinski, & Grigsby, 2011). The term *telemedicine* was the first used in the 1960's to denote medical care when the doctor and patient were not in the same location. *Telehealth* was used in 1978 with the intention of being more inclusive of the wider activities of health beyond the practices of doctors (van Dyk, 2014). Extending this further, *telecare* usually refers to ICT and monitoring technologies used to facilitate health and social care to individuals in their own homes (Solli, Bjørk, Hvalvik, & Hellesø, 2012). *E-health* was coined in the late 1990's amongst the explosion of other 'e-terms' (e.g. e-commerce, email) associated with the beginning of public access to the internet (Oh, Rizo, Enkin, & Jadad, 2005) and is generally understood to be health and/or information services delivered or enhanced through the internet and related technologies. The most recent terminology addition to the domain is *m-health* or *mobile health* which emerged around 2003 and refers more to e-health applications (Apps) that are executed with mobile technologies, for example mobile phones and tablets. Often the various terms are used interchangeably (Bashshur & Shannon, 2012; Fatehi & Wootton, 2012) and the boundaries between them are fuzzy. Figure 2.4 shows one conceptualisation of the relationship and boundaries (van Dyk, 2014) whereby telemedicine is a subset of telehealth differentiated by more specific medical activities than telehealth. Telecare may be seen as a subset of all the domains, with e-health being the over-arching concept not limited by provision over distance and m-health spans the areas, depending on the technologies employed.

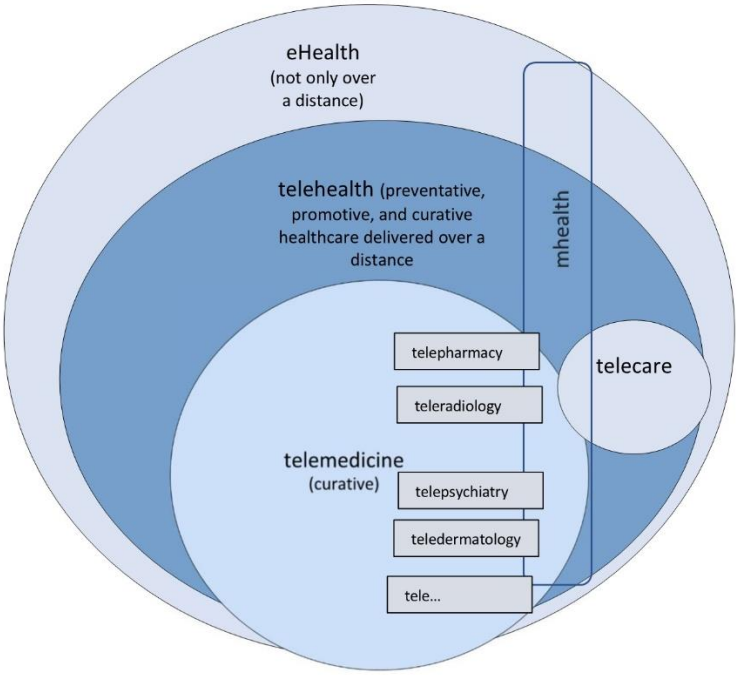


Figure 2.4 **A model of the terms used in ICT healthcare domain and their relationship to each other (redrawn from van Dyk, 2014, p. 1284)**

The other important delineation of health ICT is temporality, that is, if the healthcare is provided in real-time or if there is a time delay between the sending of information, receiving it, and responding to it. In asynchronous, or store-and-forward, services there is a time separation between one phase of the process and another (Wilson & Maeder, 2015). Examples of this type of telehealth is reading of X-rays by a distant provider or the subsequent interpretation of data that is provided through telemonitoring devices. Synchronous telehealth services, however, are performed in real-time, most commonly through VC.

As determined in the introductory chapter, this thesis uses the term telehealth to reflect broad healthcare activities performed by any healthcare provider and the delivery of health services where patients and providers are not in the same physical space. While this research is focussed on the synchronous telehealth of THVCS the literature review took a broad approach to telehealth so as to include research, particularly theory, that may be applicable to a THVCS context. This review now focusses on the predominant theoretical frameworks that have been used to examine telehealth. These are presented and critiqued in the next section before the main themes emerging from the literature are explained and discussed in section 2.5.

2.4 Theoretical frameworks

A recurring criticism of telehealth research is that it is mostly atheoretical (Wade et al., 2017). A low 5% of published research from 1990 to 2005 was found to refer to a theoretical concept (Gammon et al., 2008; Whitten, Johannessen, Soerensen, Gammon, & Mackert, 2007). Wade et al. (2017) suggests that this lack of attention to theory has not changed significantly since 2005 and this was corroborated by the exploration of literature conducted for this inquiry initially in 2016. Interestingly, this has not changed during the duration of this project; the 2020 refresh of the literature search (discussed in 2.2.2) identified only six papers (3.8%) that referred to a theory or framework. Previous reviews have identified that when theory has been considered, many different approaches have been used and often only in one isolated study (Gammon et al., 2008) and this was corroborated with the review for this inquiry. The range of approaches that appear in the literature is illustrated in Table 2.3, sorted by the six main disciplines identified in the review (Figure 2.3).

Telehealth research that focusses on medical outcomes is usually atheoretical and follows the scientific approach (Wade et al., 2017). These summative assessments typically propose hypotheses which are tested with the collection of quantitative data (Ekeland, Bowes, & Flottorp, 2012). In the telehealth field this includes randomised control trials where one group receives 'usual' healthcare, and another group receives services via telehealth. The research typically seeks to find evidence of causal relations and to estimate effects. This type of research dominates the literature and largely accounts for the atheoretical nature of the extant literature. However, it can be argued that telehealth is a complex interaction between providers and receivers with multiple possible antecedents and outcomes that are contextual (Holden, Valdez, Schubert, Thompson, & Hundt, 2017) and not captured by this approach alone (Ekeland et al., 2012; Greenhalgh & Papoutsi, 2018; Hendy et al., 2012).

Economic evaluation models, continuing the quantitative approach of the positivist medical research, are described first in section 2.4.1. The Technology Acceptance Model (TAM) and the Diffusion of Innovations theory (DI) are then discussed in section 2.4.2 and 2.4.3 as the most popular approaches in telehealth research. The non-adoption,

Table 2.3 General discipline, examples of subject matter and approaches used to research telehealth; dotted line indicates that the categories are not rigid. Approaches in bold italics are discussed in the sections 2.4.1 to 2.4.6

Discipline	Examples of subject matter areas	Examples of approaches used
Medicine and health clinical practice	Cardiology Dermatology Radiology Public Health Family practice Rural practice Psychology Nursing	Atheoretical
Economics and Business	Health economics Global business E-business research Health economics	***Economic evaluation models*** -cost-effectiveness analysis -cost utility -cost benefit analysis Markov Decision Models Transaction Cost Theory
Technology	Technology and innovation Technology and healthcare Health care Technology Engineering Information and communication technology	DeLone and McLean information systems success model ***Technology Acceptance Model (TAM)*** ***Modified Unified Theory of Acceptance and Use of Technology (UTAUT)*** Fit between Individuals, Task and Technology (FITT) framework Path Constitution Theory Technology-organisation-environment theory
Health Informatics	Health Information Technology (HIT) Information systems Behavioural and information technology Decision support	Analytic Hierarchy Process (AHP) ***Diffusion of innovations (DI)*** Health belief model Protection Motivation theory Social Cognitive Theory Social capital theory Theory of Planned Behaviour
Management	Organisational Change Health care Administration Governance Health Policy Health care management Business management Human factors / ergonomics	Change management theories Configuration Theory Institutional Theory Organisational change theories Sociotechnical systems theory -***Sitting and Singh*** -***Systems Engineering Initiative for Patient Safety (SEIPS)***
Implementation science	Program implementation Evaluation	Maturity models Technology implementation frameworks -***Non-adoption, abandonment, scale-up, spread, and sustainability (NASSS)*** ***Normalisation process theory (NPT)***

abandonment, scale-up, spread, and sustainability (NASSS) framework is introduced in 2.2.4, as a recent development of a technology implementation and evaluation framework with a theoretical foundation. The Normalisation Process Theory (NPT) is then considered, as it is grounded in sociotechnical change and was developed in the telehealth field. Finally, STS theory and two STS approaches are considered (2.4.6).

2.4.1 *Economic evaluation models*

There are several statistical or economic models that have been used to mathematically represent quantitative relationships between variables of costs and outcomes to determine economic effectiveness of telehealth programs (Gammon et al., 2008). These are typically cost-benefit analysis (CBA), cost-effectiveness analysis (CEA), cost-utility analysis (CUA) and cost minimisation analysis (CMA) (Angjellari-Dajci, Lawless, Stachura, Wood, & DiBattisto, 2013).

CBA values the health outcome and other non-resource benefits in monetary terms which makes its use in health challenging as it is difficult to assign a monetary value to health outcomes (Bergmo, 2015). In addition, it is more complicated and data intensive, though arguably more comprehensive than CEA and CUA (Angjellari-Dajci et al., 2013). CEA measures the benefits as health changes with the costs compared to a one-dimensional unit of effect, for example, wound size or symptom free days. Some limitations of CEA include the inability to compare findings across different health-care fields and its unidimensional outcome measure (Angjellari-Dajci et al., 2013).

CUA is a special form of CEA where the outcome is measured as 'healthy years' and expressed as quality-adjusted life years (QALYs) or disability adjusted life years (DALYs) averted. QALYs are used to compare health gains and they are recognized as the primary metric for measuring health status in economic evaluations (Bergmo, 2015). One advantage of CUA is that the common units of measures (e.g. cost/QALY) allows cross program comparisons. Conversely, a criticism is that the benefits of a telehealth program may extend beyond health outcomes, for example improved access, skill transfer, less travel, and less waiting (Bergmo, 2015).

CMA compares the costs of alternative interventions that have equal effects. It seeks to answer the question "which is the least costly way of delivering a service that has the same health outcomes?" This method is limited by it being impossible to establish that

alternative options have no outcome differences in advance (Bergmo, 2015), it may overlook changes in benefits (Angjellari-Dajci et al., 2013) and may be organisation-centric, not considering the costs incurred by patients (Paré, Poba-Nzaou, & Sicotte, 2013).

These methods have all been used in telehealth contexts though it is reported that the number of economic evaluations is few, and the quality is poor (Akiyama & Yoo, 2016; Mistry, 2012; Wade, Karnon, et al., 2010). In addition, authors of economic analyses in telehealth accept that the models do not necessarily capture the benefits nor costs of users other than patients, for example carers and families (Henderson et al., 2014). Obviously, an economic focus does not consider the human elements of the interactions or the wider system in which they work, which the next theories attempt to address.

2.4.2 *Technology Acceptance Model*

The TAM is a commonly used theoretical framework in the telehealth field. It was developed initially to provide measures for predicting and explaining computer use to assist with users' willingness to use introduced computer systems (Davis, 1989). The TAM built on earlier psychological models of behaviour such as the Theory of Reasoned Action and the Theory of Planned Behaviour (Holden & Karsh, 2010). The theory asserts that uptake of information technologies is determined by 'attitude' towards using them and attitude is determined by 'perceived usefulness' and 'perceived ease of use'. The constructs of perceived usefulness and ease of use were found to be correlated with self-reported intentions to use the systems, or behavioural intention (BI). Perceived usefulness has an independent effect on BI or on 'acceptance' as it is commonly referred. Perceived ease of use has an effect on perceived usefulness. The TAM is depicted in Figure 2.5.

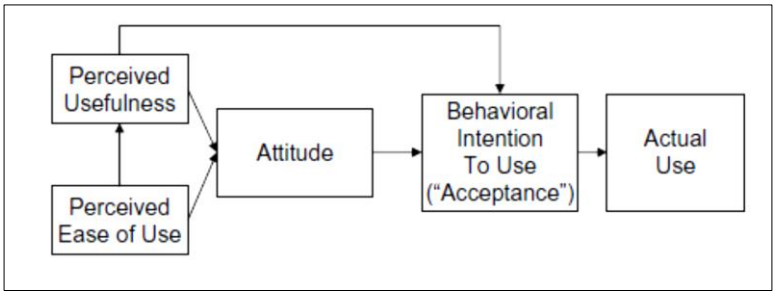


Figure 2.5 Technology Acceptance Model (TAM) (Holden & Karsh, 2010, p.161)

The TAM has been extended into TAM2 (Venkatesh & Davis, 2000) to include additional determinants of perceived usefulness and usage intentions with social influence and cognitive instrumental processes. These include subjective norms, voluntariness, image, job relevance, output quality and result demonstrability. The modified TAM is shown in Figure 2.6.

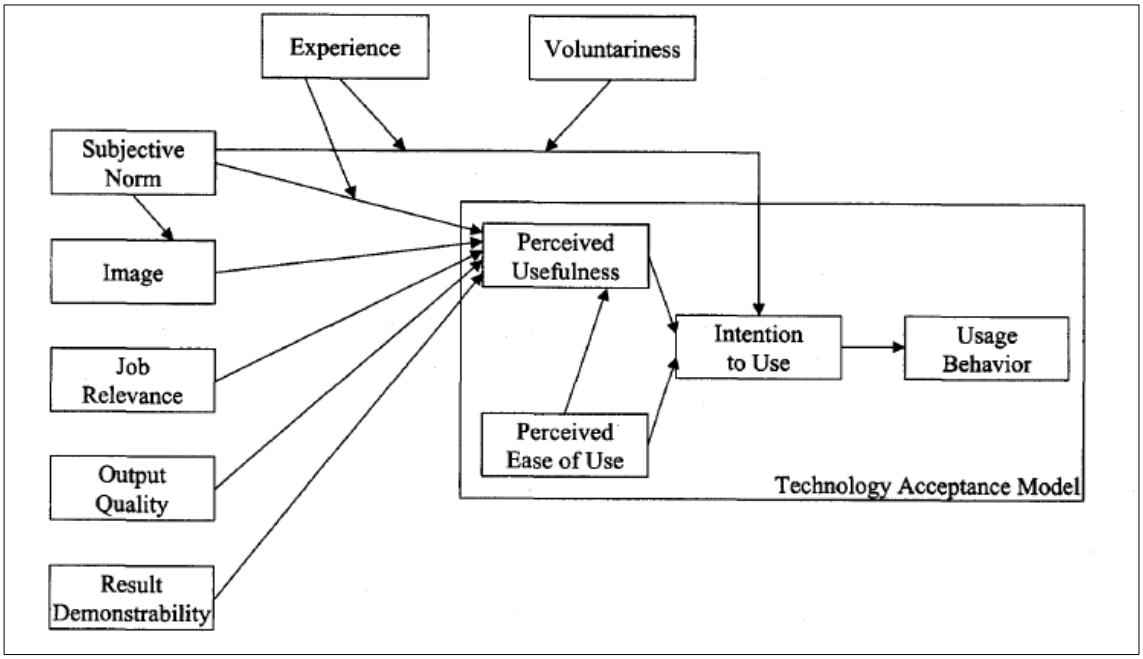


Figure 2.6 Technology Acceptance Model 2- TAM2 (Venkatesh & Davis, 2000)

In 2003 a further evolution of the TAM was proposed by testing and then combining eight models of information technology (IT) acceptance into the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003). The resultant model is shown in Figure 2.7.

Though the TAM and its iterations were developed for investigating general IT use adoption they have been used widely in the health information technology (HIT) field (Holden & Karsh, 2010) including some use in the telehealth field. TAM appears to be used more than TAM2 in health-related research (Yarbrough & Smith, 2007). While UTAUT has been used in more recent telehealth research (Adenuga, Iahad, & Miskon, 2015; Cimperman, Makovec Brenčič, & Trkman, 2016; Kohnke, Cole, & Bush, 2014) it seems that TAM remains the most popular among researchers (Harst, Lantzsch, & Scheibe, 2019).

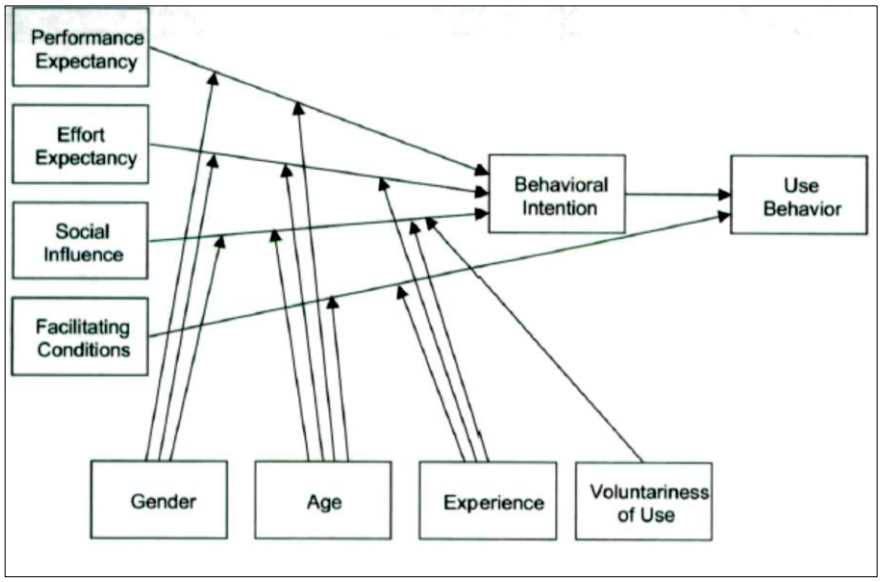


Figure 2.7 **Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003, p. 447)**

Hu, Chau, Liu Sheng & Tam (1999) found that the TAM may be too simplistic in the telehealth context and suggested it needs additional factors incorporated for this field. Reviews of TAM in healthcare found that most research added variables to TAM (Harst et al., 2019) and Holden & Karsh (2010) suggested this was an attempt to better understand the antecedents of acceptance of health IT. Gagnon, Orruno, Asua, Adbeljelil & Emparanza (2012) reported that the addition of a 'perception of facilitators' variable strengthened their modified TAM and Su, Tsai & Hsu (2013) found it useful to add social and institutional trust to the TAM in examining the intended use of telecare systems. However, Holden & Karsh (2010) criticised the adding of variables as potentially diluting the ability to combine or compare study results and perhaps indicating that the TAM is not fully suited to the healthcare context.

The TAM theories are subjected to further criticism in that they do not have the ability to consider external variables and barriers which influence technology acceptance (Yarbrough & Smith, 2007), and the interaction between the user and the task is not included (Ammenwerth, Iller, & Mahler, 2006). In addition, the focus is on the individual users without consideration of the context of the group or organisation in which it is being introduced and the model does not include any feedback or adaption capacities over time. Finally, as Jansen-Kosterink, Dekker-van Weering, and van Velsen (2019) suggest, since the TAM models were not developed in the healthcare context some unique

contextual features are not captured. This includes the social environment (Harst et al., 2019) which is considered more in the DI theory discussed next.

2.4.3 *Diffusion of Innovations*

The DI theory initially proposed by Rogers (2003) has been reported as the most commonly used theoretical framework in telehealth research (Gammon et al., 2008; Wade et al., 2017). Based in sociology, this theory posits that diffusion is the process by which an innovation is communicated through certain channels over time among members of a social system (Figure 2.8) (Rogers, 2003).

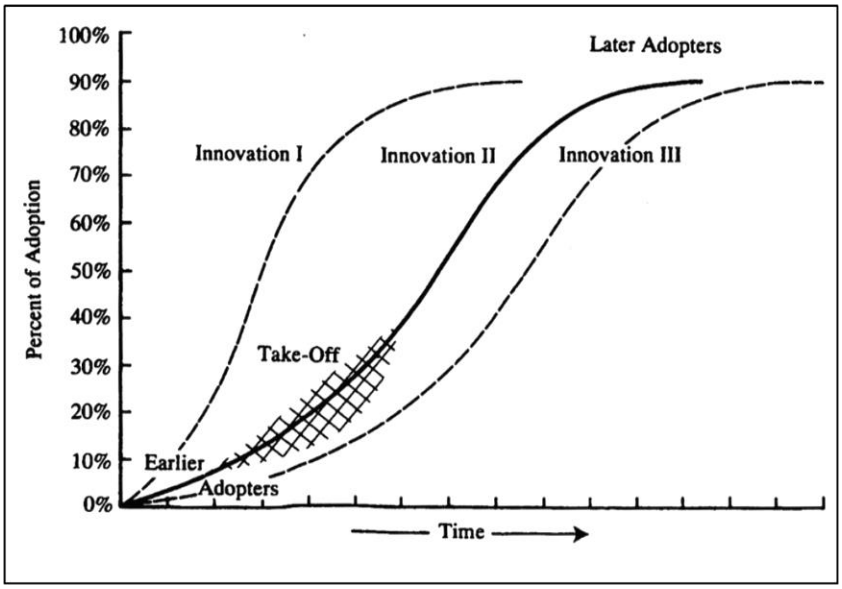


Figure 2.8 The Diffusion Process (Rogers, 2003, p.11)

According to the theory, innovations that are perceived by individuals as having greater relative advantage, compatibility, trialability, observability and less complexity (Table 2.4) will be adopted more rapidly than other innovations. Many adopters want to participate actively in customising an innovation to fit their situation. This is termed 'reinvention' and it is postulated that an innovation may diffuse more rapidly and be sustained if it can be reinvented (Rogers, 2003). Time is important in the innovation-diffusion process, in innovativeness (the degree to which an adopter is earlier in adopting new ideas than other members of a social system) and in an innovation's rate of adoption.

Table 2.4 Characteristics of DI framework (Rogers, 2003)

DI framework term	Definition
Relative advantage	The degree to which using the innovation is perceived as being better than that which it replaces
Complexity	The perception of how much effort will be required to use and understand the innovation
Compatibility	The degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters
Trialability	The degree to which an innovation may be experimented with on a limited basis before adoption
Observability	The degree to which the results of the use of innovations are readily seen

Rogers (2003) explains that the innovation-decision process is the way through which an individual or other adoption unit moves from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision. The DI theory was developed initially to consider uptake of technologies in agriculture but has been used to examine diffusion in a variety of industries including general healthcare (Cain & Mittman, 2002) and telehealth (Fraunholz & Unnithan, 2007).

In the telehealth field, DI theory has been used to predict and explain the rate of telehealth uptake. For example, Al-Qirim (2003) examined the adoption of VC for dermatology and mental health services in New Zealand; Helitzer, Heath, Maltrud, Sullivan, and Alverson (2003) evaluated a rural telehealth program in New Mexico; and Brooks, Manson, Bair, Dailey, and Shore (2012) analysed the factors affecting the diffusion of tele-mental health in Native American communities using DI framework. They all found that the theory was useful in identifying barriers to adoption and elucidating ways that this could be improved. Other scholars have used the theory to propose factors affecting the adoption of telehealth (Menachemi, Burke, & Ayers, 2004; Zanaboni & Wootton, 2012) and to examine service providers' experiences following introduction of a digital telehealth network (Newman, Bidargaddi, & Schrader, 2016). Similar to TAM, some researchers have combined models, adding items specific to their context (McIntosh, Alston, Booher, Sykes, & Segura, 2000; Turner, Thomas, & Reinsch Jr, 2004). An adaptation of Roger's theory specific to information systems was included in the UTAUT (Venkatesh et al., 2003).

While its popularity indicates its usefulness in examining telehealth adoption and diffusion, the DI framework does not consider other outcomes of telehealth such as

quality or effectiveness. The theory's focus is the innovation whereas in healthcare there is increasing demand for more patient or user-centred models. It is argued that the context in which new technologies are adopted is also important and not accounted for in the DI model (Turner et al., 2004). In addition, the DI framework does not consider the concept or nature of work which is significant in the healthcare environment (Holden et al., 2013) and focusses on relatively linear stages of integration of technology over time without explicit feedback loops to reflect change (Cresswell & Sheikh, 2013; Lanham et al., 2013). Beyond the social networks for communication, the framework does not account for the multiple interactions between the other parts of the complex system, for example between provider and patient, or between provider and the organisation (Lanham et al., 2013). Finally, the DI framework assumes that receiving information will influence behaviour in desirable ways that are anticipated, but complex human systems are characterised by uncertainty with multiple possible outcomes (Lanham et al., 2013). This complexity, and the difficulty seen with scaling up and sustaining health technology innovations, led to the development of the framework discussed in the next section.

2.4.4 *Non-adoption, abandonment, scale-up, spread and sustainability framework*

The NASSS framework (Greenhalgh et al., 2017) was developed in response to the difficulty with embedding and sustaining technology innovations in usual practice and to encourage complex system thinking (Greenhalgh & Papoutsi, 2018; Greenhalgh, Wherton, et al., 2018).

The developers of the NASSS framework drew on Gidden's structuration theory to support their work (Greenhalgh, Shaw, et al., 2018). Structuration is a process by which structures are constituted out of human agency, even as they provide the medium of that constitution (Peddle, 2007). In other words, structures and human agency are recursively linked and evolve together (Greenhalgh & Stones, 2010). Giddens (1984) explained that structuration involves the circumstances governing the stability or change of structures and the reproduction of social systems. Structuration theory argues that routines are important, and the process of changing routines is difficult. Peddle (2007) suggest that this is one reason that introducing telehealth is problematic, as it involves changing routines of clinical practice that have been part of social structures for a long time. Greenhalgh, Shaw, et al. (2018) used this concept of the dynamic link between the social

environment, social actors, and technology in the multi-factorial NASSS framework, shown in Figure 2.9. Along with structuration theory, the framework is the result of a combination of existing technology implementation frameworks and analysing case study data. It aims to predict and evaluate the success of health technology programs (Greenhalgh et al., 2017). The NASSS model comprises seven domains (numbered 1 to 7 in Figure 2.9) which reflect components of the health system. Questions are posed in each of the domains to be considered reflexively by designers, program implementers, and evaluators. Formulated specifically for healthcare, the first domain considers the medical condition for which the technology (domain 2) is being used. The third domain asks if a new technology is worth it and where the value lies (for patient or supplier). Domain four considers the 'adopter system' which is defined as adoption and continued use of the technology by providers, patients and families and considers provider changes in roles and practices. The organisation is examined next (domain 5) with questions about its capacity and maturity for innovation and change.

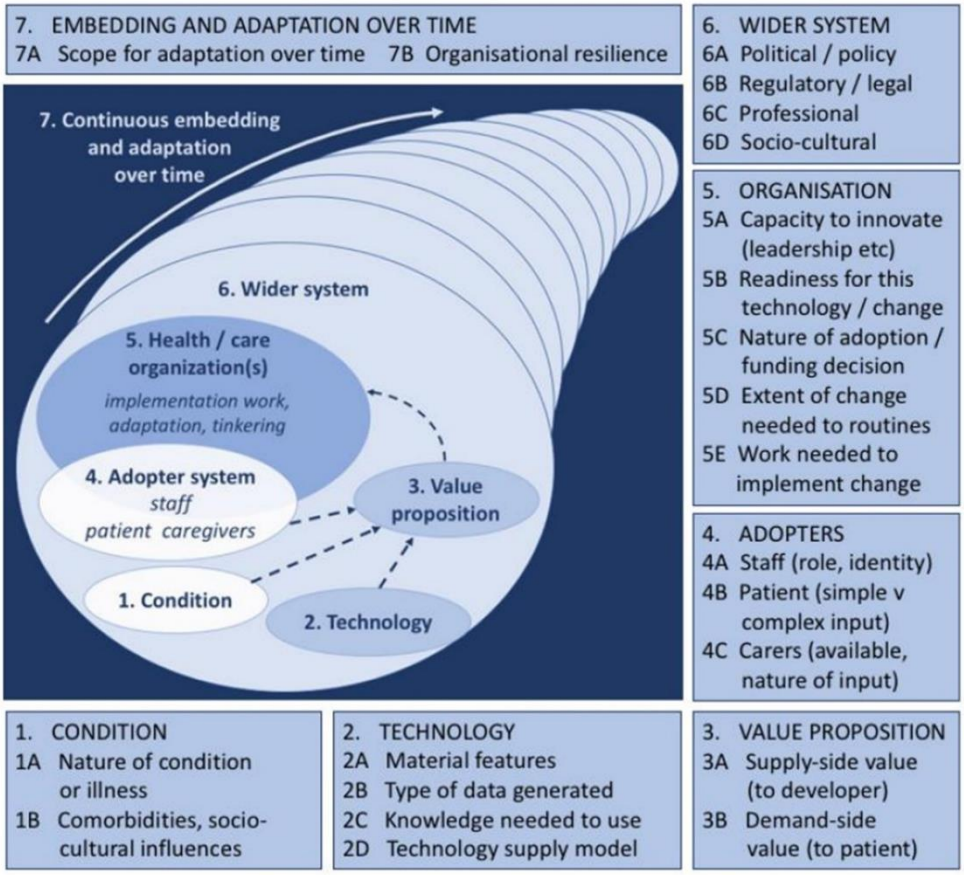


Figure 2.9 The NASSS framework (Greenhalgh et al., 2017, p.11)

In domain six, the wider socio-political, cultural, and professional environment is considered in the context of introducing technology. Finally, the embedding and adaption over time is questioned in terms of scope and resilience.

Greenhalgh et al. (2017) suggest that empirical data is classified in each domain as simple, complicated, or complex. They propose that the likelihood of embedding a program into usual practice is less as the number of domains characterised as complex increases. In their application of the NASSS framework to a THVCS case (Greenhalgh, Shaw, et al., 2018; Greenhalgh, Wherton, et al., 2018) they found that the medical condition (domain 1) largely determined the success (or failure). Consistent and predictable (simple) check-up consultations were successful and 20% of all consultations were THVCS. However, more complex conditions were associated with increased risk aversion by providers or assumptions made about the patients and therefore THVCS were offered to few patients. Additionally, they note the value proposition for THVCS is complex with respect to technology platforms and equity. The adopter system was also considered complex with significant differences between clinicians in willingness to change their practice. Finally, there was complexity in the wider system in the funding models and provision of suitable technology for THVCS.

The NASSS framework's strengths are that it recognises complexity, the sociotechnical nature of the system, and considers multiple levels of analysis. It focusses on the interactions of clinicians and patients with the organisation and considers wider context (Harst et al., 2019). However, it is argued it is not explicitly a human-centred model as it is limited in its consideration of the interactions between people and technology, collaborative work, or relationships between providers and providers and patients. While it includes a continuous adaptation and embedding aspect it is not clear how this may impact on the components of the systems. Moreover, the outcomes, beyond success or failure, are not determined, that is, it is not clear how the technology impacts on the outcomes for patient, providers, and organisations. To date, the NASSS has been used to evaluate the success or failure of programmes in a retrospective way so it is not certain if the framework would be useful in designing or implementing a THVCS system. In contrast, the theory examined next focusses on facilitators and barriers of processes in embedding telehealth into usual practice.

2.4.5 *Normalisation process theory*

Unlike the TAM, DI theory and other approaches which have been developed in other fields and then applied to telehealth, the NPT was developed in telehealth research. NPT is a sociological theory which has been promoted as a way in which implementation, embedding and integration of innovation in a healthcare setting can be understood (May & Finch, 2009; McEvoy et al., 2014). The concept asserts that a linear diffusion model is inadequate to assess the potential for complex interventions to be made workable and integrated in everyday practice, and that the political and organisational contexts need to be considered (May et al., 2003). It focusses on the factors which inhibit or promote the routine incorporation of complex healthcare interventions in practice (May et al., 2007), and emphasises the processes by which the new technology and practice become normalised by the individual and collaborative work of people (Finch, Mair, O'Donnell, Murray, & May, 2012). The work of implementation is operationalised through four mechanisms: coherence, cognitive participation, collective action, and reflexive monitoring, each having immediate and organising factors (Table 2.5).

Table 2.5 NPT theoretical constructs and exemplar questions in practice- adapted by the researcher from Mair et al. (2012) and May & Finch (2009)

	Coherence Sense-making work	**Cognitive participation** Relationship work	**Collective action** Enacting work	**Reflexive monitoring** Appraisal work
Immediate factors	Differentiation *Is there a clear understanding of how the new service differs from the existing?* Individual specification *Do individuals have a clear understanding of their specific tasks, responsibilities in the new service?*	Initiation *Are key individuals willing to drive the implementation?* Legitimation *Do individuals believe it is right for them to be involved?*	Interactional workability *Does the new service make people's work easier? To what extent does it fit with existing system?* Relational integration *Do individuals have confidence in the new system? To what extent does it fit with the existing relationships?*	Systematisation *How are benefits or problems identified or measured?* Individual appraisal *How do individuals appraise the effects on them and their work environment?*
Organising factors	Communal specification *Do individuals have a shared understanding of the aims of the new service?* Internalisation *Do individuals understand the value, benefits, and importance of the new service?*	Enrolment *Do individuals 'buy into' the idea of the new service?* Activation *Can individuals sustain involvement?*	Contextual integration *Is there organisational support?* Skill set workability *How does the innovation affect roles and responsibilities or training needs?*	Communal appraisal *How do groups judge the value of the new service?* Reconfiguration *Do individuals try to alter the new service?*
Investments	Meaning	Commitment	Effort	Comprehension

The normalisation of a practice requires investments from individuals and organisations over time of meaning, commitment, effort, and comprehension (Finch et al., 2012; May & Finch, 2009). The interactions of the components of the theory are shown in the model of NPT in Figure 2.10.

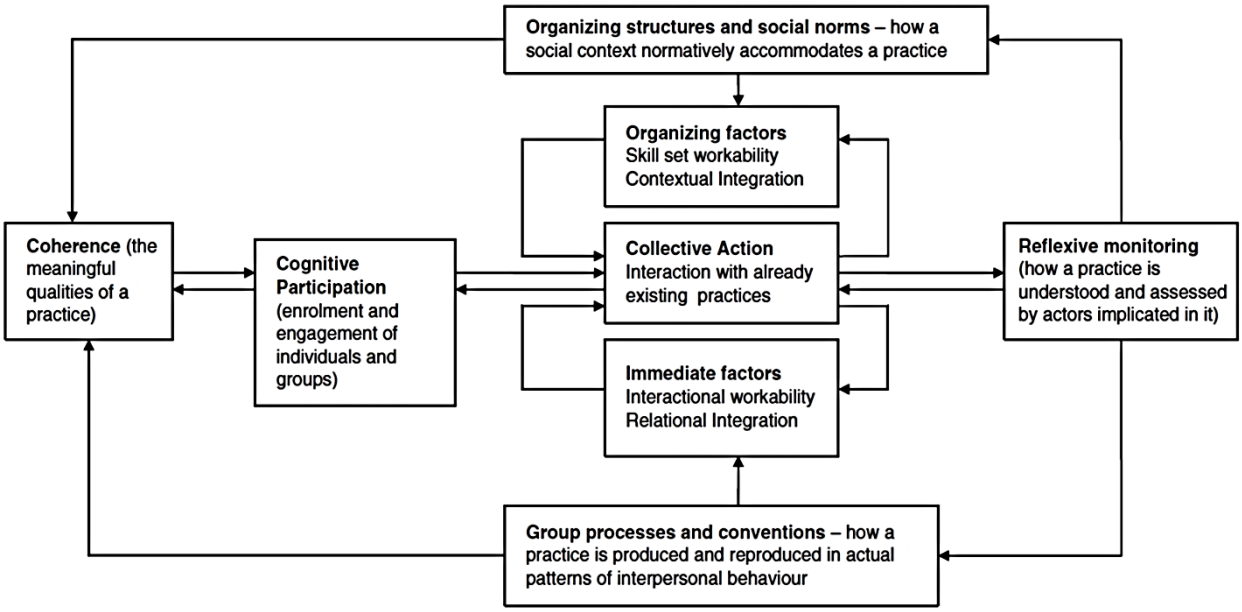


Figure 2.10 Model of components of NPT (May and Finch, 2009, p. 541)

The theoretical concepts of NPT have been formulated into questions in practice (Greenhalgh, Swinglehurst, & Stones, 2014; Mair et al., 2012) and examples of these are shown in orange in Table 2.5. The theory has been used in several healthcare settings beyond its telehealth origins and found to be generally useful as a framework for analysing implementation processes of new technologies (McEvoy et al., 2014). Godden and King (2011) used NPT to assist with analysing their interview findings on the potential for telehealth in respiratory medicine. May et al. (2011) and Mair, Hiscock, and Beaton (2008) applied the framework to identify factors inhibiting the implementation and integration of telecare systems for chronic disease management and chronic lung disease, respectively. Gibson et al. (2016) used the NPT concepts as a framework to analyse patient and carer views of their experience with telestroke.

Criticism of the theory has been concerned with difficulties interpreting and applying the constructs and the lack of ability to map attitudinal or emotional work constructs in the framework (McEvoy et al., 2014). Others have criticised NPT for lacking a theoretical

perspective on the technology and its assumptions that the system will behave rationally (Greenhalgh, Swinglehurst, et al., 2014). Though it does not include wider societal influences, the theory does encourage a systems perspective with multiple stakeholder input and emphasises the work people do, including patients (May et al., 2007; May et al., 2011; May et al., 2003). In addition, it has been developed specifically in the telehealth field which may increase its contextual value. NPT has been described as a 'middle range theory of sociotechnical change' (Finch et al., 2012) though it has a more narrow focus on how new practices become routinely embedded than other sociotechnical theories which are now described.

2.4.6 *Sociotechnical systems theory*

STS theory was created to help explain the human and organisational consequences of the introduction of mechanisation into coal mining and other industries (Trist, 1981). The theory was developed as a conceptual reframing in which work organisations were envisaged as STS rather than as social systems (Trist, 1981). The people and the tools were the fundamental factors, while performance and job satisfaction were the outcomes, determined by the goodness of fit of the factors. A sociotechnical system is defined as "the synergistic combination of humans, machines, environments, work activities and organisational structures and processes that comprise a given enterprise" (Carayon, Hancock, et al., 2015, p. 550). STS theory recognises that work systems are open and subject to a wide range of environmental factors including technical and regulatory developments while being comprised of people with inter-relationships (Eason, 2014). It provides a means of representing the input, throughput, and output to a work system within a changing environment with which the system needs to cope (Eason, Harker, & Olphert, 1996). It is in this way that STS theory assists with analysing the effectiveness of work systems in achieving their objectives and evaluating the outcomes of a technical change. Berg (1999) was an early champion of an STS approach for HIT, noting the complex nature of healthcare work and suggesting that,

> Getting such technologies to work in concrete healthcare practices appears to be a politically textured process of organizational change, in which the users have to be put at center-stage. (p.88)

In addition, Peddle (2007) argues that telehealth is a social practice involving healthcare providers, patients, and technology and that technologies must be examined in the contexts that they are used to understand their function and role. Two models used in the health technology field informed by STS theory are Sittig and Singh (2010) and Carayon et al.'s (2006) SEIPS model. These models are explored in the subsequent two sections.

2.4.6.1 Sittig and Singh

Acknowledging the sociotechnical challenges of designing and implementing HIT within the complex, adaptive healthcare system, Sittig and Singh (2010) developed an eight-dimensional model. The dimensions are hardware and software computing infrastructure; clinical content; the human-computer interface; people; workflow and communications; internal organisational policies, procedures, and culture; external rules, regulations and pressure and system measurement and monitoring. These dimensions and their relationships illustrated in Figure 2.11.

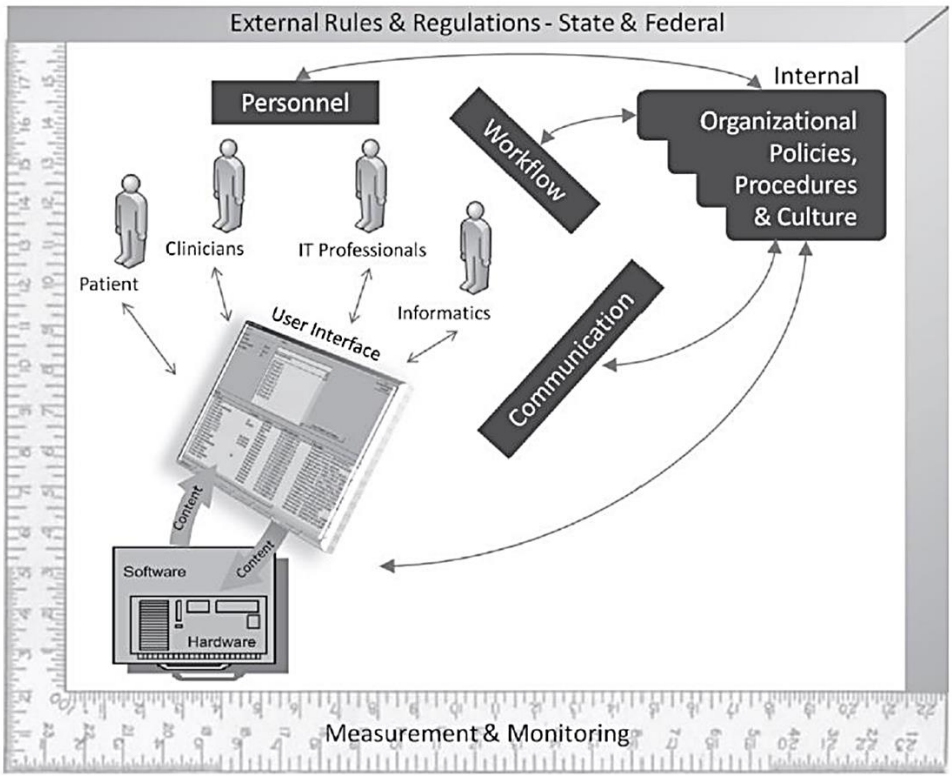


Figure 2.11 Sittig and Singh (2010) sociotechnical model, p. 69.

While seeking to understand the sociotechnical aspects of HIT implementation the development of this model did not consider STS theory explicitly. The model is intended

to examine interdependencies and interactions of the identified dimensions, though it is not clear how outcomes are considered or the mechanisms to account for adaptation over time. Indeed, one study using this framework suggested that it be extended to account more fully for change, both in implementing technology and responding to emergent properties (Or, Dohan, & Tan, 2014). Developed specifically for HIT, there was no telehealth applications of the model identified in the literature. The model is techno-centric rather than human-centred, in contrast to the SEIPS model which is explored below.

2.4.6.2 SEIPS models

The SEIPS framework (Figure 2.12) has been used to understand the structures, processes and outcomes in healthcare and their relationships (Carayon et al., 2006). It builds on Donabedian's (1966) structure-process-outcome model by including interactions and interdependencies among system components. Based on an HFE approach, the SEIPS uses a work system model of people, technology and tools, tasks, organisation, and environment to emphasise the interactions between people and their environment which shape outcomes of performance, safety, health, and quality. The work system affects the work and processes which then influences the individual, group, and organisational outcomes. SEIPS helps to explore how the design of the work impacts on key stakeholders of the healthcare system. Changes to any aspect of the work system will, depending on its design, implementation, and resultant interactions, affect the work and processes positively or negatively and therefore, the outcomes as well. Outcomes in turn affect the work system, indicated by the feedback loops.

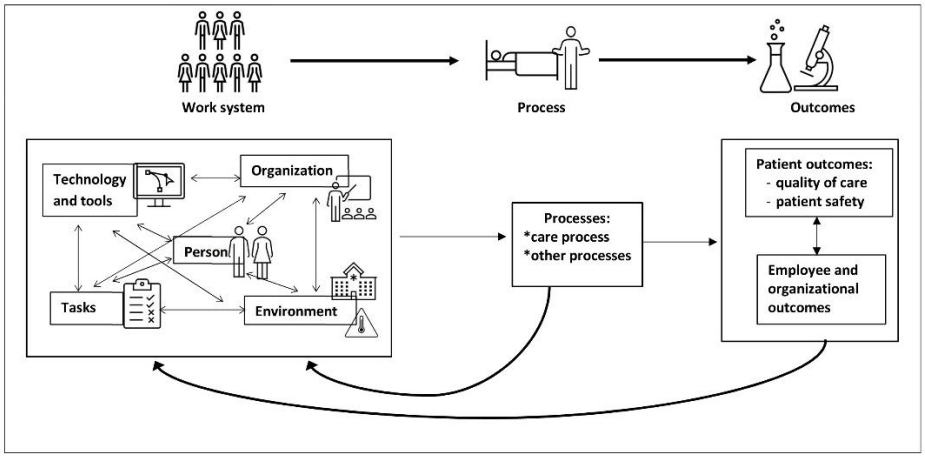


Figure 2.12 SEIPS model of work system and patient safety (redrawn from Carayon et al., 2006)

The SEIPS model has been used in many aspects of healthcare including HIT and medical device introduction (Carayon, Alvarado, & Schoofs Hundt, 2012; Holden et al., 2013). While not extensive in the published literature identified in this review, the SEIPS model has also been used in some telehealth research. Hoonakker et al. (2013) studied motivation and job satisfaction of tele-ICU nurses using the SEIPS model as a conceptual framework, as did Khunlertkit and Carayon (2013) looking at the impact of tele-ICU technology on care processes and patient outcomes. Guise, Anderson, and Wiig (2014) framed their literature review of patient safety in telehealth in a homecare setting using the SEIPS model.

The original SEIPS model was updated in 2013 to reflect research and practice developments (Holden et al., 2013). SEIPS 2.0 (Figure 2.13) includes an extension of 'external environment' to incorporate societal, economic and policy factors outside of an organisation. The concept of 'person' is also extended to refer to both patients and healthcare professionals (and other individuals and groups) simultaneously in recognition that all these groups may 'do the work', for example managing health related information, using digital technologies. Thus, the relevant attributes of these individuals, such as computer literacy, must be considered.

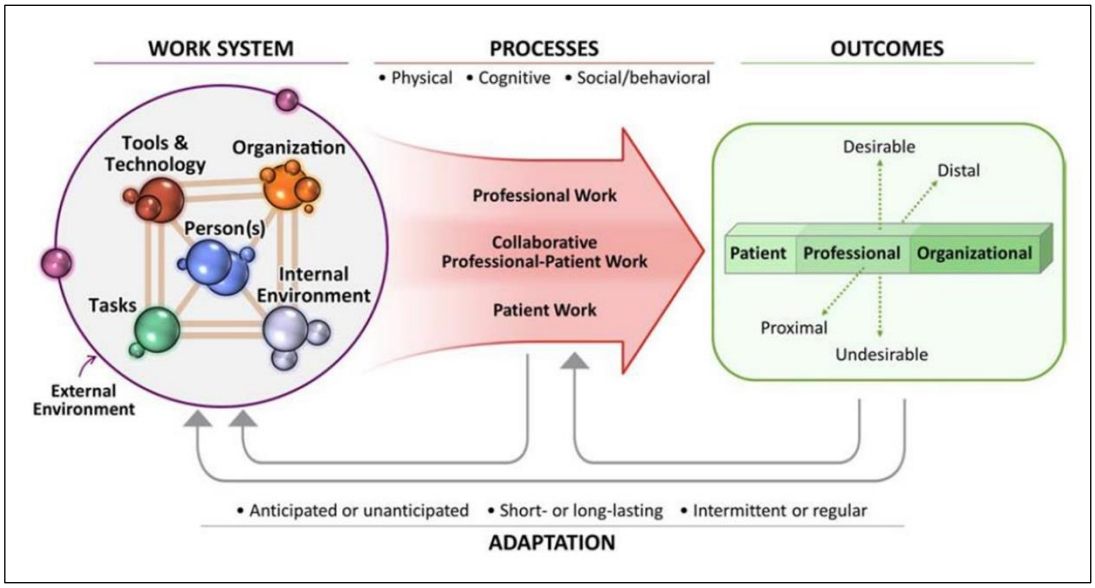


Figure 2.13 SEIPS 2.0 model (Holden et al., 2013, p.1672)

Work processes have been divided into physical, cognitive, and social/behavioural performance processes. Work activities are differentiated by who is actively engaged in

performing them. The original feedback loops of SEIPS have been extended to provide a feedback to work processes from outcomes and the concept of adaptation made explicit. This is to recognise the changing nature of work systems; this is especially relevant to the introduction of technology. Adaptation can be anticipated or unanticipated, short, or long in duration or intermittent or regular. The performance of the system is considered the emergent property of the whole interacting system rather than its separate parts (Holden et al., 2013).

The model's additional concept of configuration is that while all components of the work system potentially interact, it is likely that only some of the possible interactions will be relevant in specific situations. Relevance will depend on the strength of the interactions on outcomes and provides a way in which these factors can be configured. This idea is shown in the varied sizes of spheres in the model illustrating that some interactions are more important in influencing the work processes (Holden et al., 2013).

A 2020 review of research applying the SEIPS model, identified ten articles that used SEIPS 2.0 to study patient work in the peer-reviewed literature (Werner, Ponnala, Doutcheva, & Holden, 2020) though none of these were in a telehealth context. Martinez, Marquard, Saver, Garber, and Preusse (2017) used SEIPS 2.0 to explore patients' and clinicians' experiences of an asynchronous telehealth intervention. They found SEIPS 2.0 effective for identifying work processes and outcomes, including those beyond traditionally used clinical measures, and determining key interactions between system components.

SEIPS 2.0 is identified as a useful framework in which to examine the complex sociotechnical system within which telehealth programs sit. It is a more comprehensive theoretical lens, considering all parts of the system and their interactions, in which to view telehealth in comparison to other models presented in this chapter. The development of SEIPS 2.0 was intended to recognise the changing and complex nature of work systems; this is especially relevant to the introduction of technology as seen in THVCS.

2.4.7 *Summary*

The frameworks discussed in section 2.4 were used in a small percentage of the overall body of telehealth research identified in the literature search, with the remainder being atheoretical and limited in their applicability to the current inquiry. The key premise of

each approach, along with main strengths and weaknesses identified are summarised in Table 2.6. While each of the approaches offer advantages, the SEIPS 2.0 model appears to offer the most comprehensive way to examine the THVCS work system, its interactions and multi-level outcomes with temporal considerations. It has also been used for telehealth research, however, to the best of the researcher's knowledge it has not been used for THVCS.

Table 2.6 Comparison of key approaches used in telehealth research

Approach	Key premise	Strengths	Weaknesses
Economic evaluation models (section 2.4.1)	Quantitative analysis determines cost effectiveness of telehealth	▪ Compares financial costs of telehealth with other models of care	▪ Difficult to monetise outcomes ▪ Criticised for poor quality, few examples ▪ Does not consider social, organisation or wider environmental aspects
TAM (section 2.4.2)	Use of technology is determined by perceived usefulness and ease of use	▪ Well evaluated in technology introduction ▪ Commonly used	▪ Too simplistic for telehealth ▪ Does not consider external variables, interaction between tasks and users or social environment
DI (section 2.4.3)	Technology innovation is adopted by a process of diffusion by communication through social systems	▪ Most common in telehealth ▪ Considers time ▪ Useful to identify barriers to adoption	▪ Does not consider outcomes beyond adoption ▪ Assumes integration of technology is linear ▪ Centred on the technology
NASSS (section 2.4.4)	The success of health technology programs can be predicted and evaluated by examining seven structural domains	▪ Considers multiple aspects of the work system ▪ Specific to healthcare ▪ Recognises complexity ▪ Multiple levels of analysis	▪ Wider outcomes not considered ▪ Limited considerations of interactions ▪ Retrospective
NPT (section 2.4.5)	The normalisation of telehealth practice is examined through processes that facilitate or impede the implementation of technology	▪ Developed in telehealth ▪ Useful to analyse implementation processes ▪ Emphasises the work people do	▪ Difficulty with constructs ▪ Assumes rational system behaviour ▪ Does not consider the wider external environment
Sittig and Singh STS model (section 2.4.6.1)	The design and implementation of HIT requires an eight-dimensional STS approach	▪ Developed in healthcare ▪ Considers the work system and interactions	▪ Technology-centric ▪ Outcomes are not clear ▪ No clear mechanisms for adaptation
SEIPS models (section 2.4.6.2)	STS/ HFE work system model to understand structures, processes, outcomes, and their relationships	▪ Human-centred ▪ Developed in healthcare ▪ Focusses on work system interactions ▪ Considers multi-level outcomes over time	▪ Concept of configuration not well tested ▪ Not used in THVCS

Mapping the issues that the research literature addressed more broadly, the predominant questions that were considered included:

- Does telehealth result in satisfactory health outcomes? That is, are clinical outcomes using telehealth equivalent to in-person outcomes?
- Is telehealth cost effective?
- What are the barriers to using and sustaining telehealth services?

The literature review in the next section (2.5) is structured around these questions.

2.5 Predominant themes

The three key themes emerging from the telehealth literature concern health outcomes (2.5.1), cost effectiveness (2.5.2), and barriers to implementing and embedding telehealth in healthcare systems (2.5.3). These themes in the literature are considered from the various viewpoints of the key stakeholders across the work system, namely the receivers of healthcare (patients and their families), the providers of healthcare (individual and groups of practitioners), organisations, and society as a whole. Examples from the New Zealand context and research specific to THVCS are included throughout the discussion.

2.5.1 *Does telehealth result in satisfactory health outcomes?*

The large literature base considering the impact of telehealth on health outcomes is mostly quantitative, positivist studies. The evidence is equivocal, although on the whole there is evidence that telehealth produces either the same or better health outcomes compared to usual care (Bashshur et al., 2016). Most conclusions from reviews tend to come with a caveat regarding low quality methodologies and low numbers for comparability due to wide ranges of conditions and interventions. Evidence of health outcomes for patients are exemplified in reviews published since 2012 and are described in the next paragraphs before broader potential impacts on health outcomes are considered.

Flodgren, Rachas, Farmer, Inzitari, and Shepperd (2015) conducted a Cochrane review comparing real-time VC or remote monitoring telehealth with usual care across a variety of conditions. They found that telehealth for the management of heart failure appears to lead to similar health outcomes as in-person or telephone delivery of care and it can improve the control of blood glucose in those with diabetes**.** They found some evidence

for improved quality of life in some studies. Overall, they concluded the effectiveness of telehealth may depend on a number of different factors such as the severity of the condition, function of the intervention, the healthcare provider and healthcare system involved in delivering the intervention. A review that looked at telehealth interventions for primary prevention of cardiovascular disease in community settings found insufficient evidence of changes in health outcomes compared to controls (Merriel, Andrews, & Salisbury, 2014). Another review of telehealth in psychotherapy found telehealth clinical outcomes to be equivalent to in-person treatment in a range of conditions including depression, anxiety, and substance abuse (Gros et al., 2013). Using telehealth to support the treatment of acute stroke is reported to reduce death and disability in a comprehensive review (Birns et al., 2013). McLean et al.'s review (2013) concluded that telehealth seems to improve health outcomes in patients with more severe illness. However, they criticise the quality of the research and suggest that contextual information is needed, and that telehealth should be studied as part of a complex sociotechnical system. It can be also argued that health outcomes are a result of complex interaction of people and context which moves beyond simply direct clinical outcomes. The evidence base for broader aspects of health outcomes are considered next.

Health outcomes for patients could be affected by the safety of telehealth. Discussions of patient safety in the literature focus on data protection and confidentiality but safety issues could also include problems of interoperability, error and malicious actions through communication systems and social risks of inequitable access (Monteagudo, Salvador, & Kun, 2014). Using the SEIPS model as an assessment framework, Guise et al. (2014) found risks to patient safety in telehealth as a result of lack of in-person care; lack of ICT system functionality; knowledge and understanding; issues with technology; lack of guidelines; dependency on the technology or anxiety stemming from its use; poor system integration; poor compliance and environmental factors. They also found, and other authors concur, that there is a dearth of literature in the telehealth patient safety sphere (Hoonakker, 2012; McLean et al., 2013; Monteagudo et al., 2014).

One of the key drivers for telehealth is to improve access to services for isolated communities (World Health Organization, 2016). Improving access could improve health outcomes for patients simply by providing care which is difficult to capture with outcomes focussed on clinical measures comparing telehealth and in-person services. In

Australia, telehealth for rural communities is increasing with most services developed to increase accessibility (Bradford et al., 2016). The Department of Veterans' Affairs in the United States of America report an increase in patients accessing psychotherapy for posttraumatic stress disorders via telehealth (Lindsay et al., 2015). A program in Brazil found that access to specialist care was improved with a telehealth program that connected specialists to primary care providers in remote areas (Alkmim et al., 2012). Similar benefits of improved and timely access to expert and emergency treatment for stroke have been reported in several countries (Birns et al., 2013; Kazley, Wilkerson, et al., 2012; Lyerly et al., 2016). Additionally, access to THVCS may decrease the frequency of unplanned visits required for complex cases (McKissick, Cady, Looman, & Finkelstein, 2017).

Indirectly, health outcomes for patients may be improved through the opportunities of professional knowledge transfer and educational opportunities that telehealth offers. Increased interaction between rural and urban providers has been found to be beneficial for experiential learning, networking and collaboration in New Zealand and Australian studies (Al-Qirim, 2007; Funderskov et al., 2019; Goodwin, McGuirk, & Reeve, 2017; Moffatt & Eley, 2010) and linked to positive clinical outcomes (Knight et al., 2016; Weinstein et al., 2014). THVCS has also been found to improve care coordination for complex patients across provider groups (Appleman, O'Connor, Rockefeller, Morin, & Moo, 2020)

As healthcare services try to move to more patient-centric models of care, an increasingly important outcome is patient satisfaction with the services provided. A number of studies has found high levels of patient satisfaction with THVCS (Orlando, Beard, & Kumar, 2019; Polinski et al., 2016; Powell, Henstenburg, Cooper, Hollander, & Rising, 2017; Slightam et al., 2020; Wood et al., 2017). For families, THVCS can reduce the stress involved with managing a chronic health condition (Patton, Clements, Marker, & Nelson, 2020) and can be beneficial as a way to support groups of patients (Scriven, Doherty, & Ward, 2019). However, some studies have raised concerns about THVCS hindering communication and the limitations of the physical examination (Gordon, Solanki, Bokhour, & Gopal, 2020). In addition, satisfaction can be mediated by circumstances, for example, broadband access or type of relationship with provider (Slightam et al., 2020).

Overall, the literature suggests that when THVCS is appropriate for the clinical situation, it results in positive health outcomes for patients and families. If the health outcomes are satisfactory then there may also be flow-down social and financial benefits for families, communities, and society. The literature has tried to address the important question: is telehealth cost-effective?

2.5.2 *Is telehealth cost effective?*

Telehealth programs incur additional costs to traditional care, particularly in technology equipment and connectivity expenses (Wade, Karnon, et al., 2010). From the perspective of organisations, there are mixed results regarding cost-effectiveness of telehealth. This is partly due to the scarcity of economic evaluations and their poor quality (Mistry, Garnvwa, & Oppong, 2014). While a review of telehealth services in Japan found them to be cost-effective (Akiyama & Yoo, 2016) other reviews could not draw clear conclusions (Bashshur et al., 2016; Grustam, Severens, Van Nijnatten, Koymans, & Vrijhoef, 2014) and some large studies have found telehealth not to be cost-effective (Henderson et al., 2014; Henderson et al., 2013). Wade, Karnon, et al. (2010) reviewed economic analyses of telehealth using THVCS and found that cost-effectiveness depended more on the organisational model of care than the technology or health condition. They found THVCS was cost-effective for home care and access to hospital specialists. It was not cost-effective however for delivery of services between local hospitals and primary care, and the results were mixed for rural service delivery. A more recent review analysed 'break-even point', that is, the period of time before a financial return on a telehealth service investment (Snoswell, Taylor, & Caffery, 2019). These researchers found that there was a less than one-year to nine-year range to break-even and that THVCS required a longer period of time than asynchronous telehealth services to reach this point.

In the primary sector, Nord, Rising, Band, Carr, and Hollander (2019) found that on-demand THVCS resulted in short-term cost savings related to diverting patients from more expensive services. However, other research has indicated that healthcare spending by health insurers may increase as the access to convenient care via THVCS increases utilisation (Ashwood, Mehrotra, Cowling, & Uscher-Pines, 2017). In contrast, the literature consistently reports cost savings for patients and their families in receiving telehealth services compared with traditional care (Bator et al., 2015; Horn, Barragan,

Fore, & Bonham, 2016; Jacobs, Hu, Slightam, Gregory, & Zulman, 2020; Müller et al., 2016; Sevean et al., 2009). A New Zealand based dermatology THVCS study found the cost benefit for the patient was greater for than for the health provider (Oakley et al., 2000).

These varied findings of economic evaluations may be due to the assumptions they make, and reductionist approaches necessary for such evaluations. For example, while costs of additional staff to support telehealth is usually considered in determining cost-effectiveness there may also be provider costs associated with the provision of telehealth which are not always anticipated such as changes in workflow efficiencies (Cady & Finkelstein, 2013; Stevenson, Hutchins, & Smith, 2010). Indeed, Freed et al. (2018) argue that economic evaluation of telehealth will always produce equivocal results due to the large effect of context. They conclude that telehealth technology is worth it but the return on investment depends on broader aspects such as the model of care, readiness of patients and providers and leadership. These factors are examples of barriers to using and sustaining telehealth and attention is turned to the literature that identifies these now.

2.5.3 *What are the barriers to using and sustaining telehealth?*

The barriers to implementing, adopting, and embedding telehealth as routine practice have been reported across the system. The literature is summarised in the following paragraphs, broadly structured around the work system concept of people (patients in section 2.5.3.1 and healthcare providers in 2.5.3.2); technology (2.5.3.3), organisations (2.5.3.4) and society (2.5.3.5).

2.5.3.1 Patients

A review across different countries found that greatest patient barriers to the adoption of telehealth included age, level of education and computer literacy (Kruse et al., 2018). Sanders et al. (2012) found that those who declined to participate in a large telehealth trial in the United Kingdom or who withdrew expressed a lack of confidence or literacy with technology and a reluctance to change the services they already received. In an Australian study Bradford, Caffery, and Smith (2015) noted potential barriers to adoption of telehealth as lack of awareness of benefits, trust and misconceptions of what telehealth actually is. However, when it is implemented, patient acceptance of THVCS is not a

barrier with high reported satisfaction (Al-Qirim, 2007; Gibson et al., 2016; Greenhalgh, Shaw, et al., 2018; Müller et al., 2016).

2.5.3.2 Healthcare providers

Healthcare providers' attitudes, perceptions, and resistance to change have been identified as a key barrier to the acceptance of telehealth (Brewster et al., 2014; Kruse et al., 2018; MacNeill et al., 2014). Concerns have been expressed by medical practitioners over potential changes in the quality of care and the interruption of traditional practices with telehealth (Brewster et al., 2014; Yarbrough & Smith, 2007), along with scepticism of telehealth being able to address staff shortages (Shahpori, Hebert, Kushniruk, & Zuege, 2011).

Fears over workflow and workload issues and the resultant effect on efficiency and effectiveness are also identified as barriers to adoption and sustainability (Brewster et al., 2014; Guise et al., 2014; Kazley, McLeod, & Wager, 2012; Moffatt & Eley, 2011; Peddle, 2007). Reluctance to accept telehealth by providers has also been reported to be due to the potential implications it has on the nature of caring and their relationship with the patient (Brewster et al., 2014; Greenhalgh, Stones, & Swinglehurst, 2014; Solli et al., 2012). In addition, concerns around the changed nature of communication have been noted (Bradford, Young, Armfield, Herbert, & Smith, 2014) and the change of role and responsibility for doctors that a new way of working evokes (MacNeill et al., 2014).

The TAM model (Figure 2.5) has been used in several studies to determine the factors that contribute to telehealth acceptance by healthcare professionals. Generally, these show that perceived usefulness is the most significant factor (Asua, Orruño, Reviriego, & Gagnon, 2012; Gagnon et al., 2012; Hu et al., 1999). However, in other reviews technical challenges experienced by staff, that is ease of use, is cited as a key barrier to accepting telehealth (Kazley, McLeod, et al., 2012; Kruse et al., 2018; Moffatt & Eley, 2011). This includes a lack of knowledge and understanding about the technology. Following on from this, healthcare professionals acceptance of telehealth can also be related to their perceptions of obtaining adequate training and technical support (Asua et al., 2012).

2.5.3.3 Technology

Despite technological advances, technology remains a barrier to telehealth adoption both in terms of infrastructure, hardware, and users' abilities. Kruse et al.'s (2018) worldwide review found barriers to telehealth adoption related to the lack of high-speed bandwidth, a factor raised by other reviews (Kazley, McLeod, et al., 2012; Moffatt & Eley, 2011). Interoperability between endpoints is also a cited barrier with many different standards adopted by different countries (Hoonakker, 2012; Kruse et al., 2018). Previously, case studies have reported difficulties with stability and image quality in VC (Al-Qirim, 2007; Peddle, 2007) though these barriers have lessened with improvement in ICT (LeRouge & Garfield, 2013). However, Taylor, Morris, Pech, Rechter, and Kidd (2015) found the audio and video quality of VC was significantly associated with patient comfort with the technology and the provider ratings for THVCS effectiveness. Recent studies note that challenges in the interaction between users and technology remain an issue in THVCS (Wootton, McCuistian, Packard, Gruber, & Saberi, 2020).

2.5.3.4 Organisations

Implementing a telehealth program involves significant costs for the technology and infrastructure both in set-up and ongoing connectivity expenses (Hoonakker, 2012; Kane & Gillis, 2018). Kruse et al. (2018) identified cost and concerns over return on investment as a primary barrier. Legal liability, privacy and confidentiality are also listed as key concerns by some scholars (Adesina, Agbele, Februarie, Abidoye, & Nyongesa, 2011; Kazley, McLeod, et al., 2012). Change management challenges to adopting and embedding a new way of working are an additional barrier for organisations (Abimbola, Li, et al., 2019; Cresswell & Sheikh, 2013) as are finding, effectively utilising, and sustaining both management and clinical champions (Al-Qirim, 2007; Wade & Eliott, 2012). Peddle (2007) describes issues of culture and trust with the introduction of a VC service in rural Canada and Moffatt and Eley (2011) identify preference for the traditional approach as a barrier to change. Human resources capacity and competition with existing programs also present barriers (Shaw et al., 2013).

2.5.3.5 Society

General healthcare policy of government and related organisations can facilitate or impede the use of telehealth (LeRouge & Garfield, 2013; Peddle, 2007). For example, in

the United States the Affordable Care Act, which rewards efficiency in healthcare delivery, has spiked the interest and use of telehealth (Weinstein et al., 2014). While other research has found that governmental implementation policies have impeded the acceptance of telehealth programs when there is a mismatch between national policies and local implementation needs and capabilities (Greenhalgh, Stones, et al., 2014; Hendy et al., 2012). In addition, governmental policy, and funding of infrastructure for high-speed broadband and other technical standards impact on the adoption of telehealth. Policies of national regulation and licensing bodies can also pose barriers to the use of telehealth; this can be through different licensure requirements in various areas (Kazley, McLeod, et al., 2012; Kruse et al., 2018) or as in New Zealand, through restrictions placed on providing care and prescribing medication via technology (Medical Council of New Zealand, 2016).

Although these barriers to telehealth are discussed separately for clarity, they are clearly interacting parts of a complex, sociotechnical system. The interactions of barriers such as these are considered to be part of the explanation for the failure of trials becoming part of routine healthcare (Al-Qirim, 2007; Wade, Eliott, et al., 2010; Zanaboni & Wootton, 2012).

The preceding review of both the theoretical and research literature has revealed some gaps in THVCS knowledge. These are summarised in the following section and serve to inform the research questions that are addressed in this inquiry.

2.6 Gaps in knowledge and research questions

The review of the literature shows that diverse disciplines have an interest in telehealth research. In many cases, their research lens examines one aspect of telehealth but does not clearly consider all the aspects of the system. It has been noted that healthcare is a complex, adaptive system (Berg, 1999; Carayon et al., 2011) and several reviews have recommended that telehealth would be better examined from a STS perspective (Eason et al., 2014; McLean et al., 2013; van Dyk, 2014) although few studies have done this.

Much literature notes the difficulties of implementing, adopting, and embedding telehealth into the healthcare system. Technology introduction is a disruption and changes the nature of work for key stakeholders. There is a complex relationship between

the user, technical, social, and organisational sub-systems and it is not clear how they interact, adapt and what impacts this has on key stakeholders and the wider system.

Published research of telehealth in the New Zealand context is sparse and the research regarding synchronous telehealth is dated. The telehealth stocktakes undertaken in 2014 and 2019 (New Zealand Telehealth Forum, 2014, 2019) provide reports of THVCS use. However, despite a reportedly high availability of VC at DHBs in New Zealand, there is no clear understanding of the facilitators, barriers and impact of the processes and outcomes for key stakeholders in the current healthcare system context.

The application of theory in the telehealth field is lacking and the theories that have been used predominantly were not specifically designed for the healthcare context. While various theoretical approaches have examined elements of telehealth, few have considered all the elements of the systems and their interactions. The SEIPS 2.0 model (Figure 2.13), an HFE approach grounded in STS theory and developed in the context of healthcare provides a comprehensive framework to assess to impact of technology on work systems. The model has not been used extensively in the telehealth environment, and to the knowledge of the researcher not at all for THVCS.

This inquiry therefore seeks to make contributions to knowledge by exploring how the impacts of THVCS on work systems are perceived by key stakeholders in New Zealand. The inquiry is guided by four research questions:

1. What are the current characteristics of THVCS in use in New Zealand?
2. How do THVCS impact key stakeholders in the work system?
3. What are the facilitators and barriers to THVCS for key stakeholders in New Zealand?
4. How can the work system adapt for THVCS to be sustained practice in healthcare in New Zealand?

These questions are explored using the human-centred SEIPS 2.0 model as a theoretical touchstone and to help inform the methods used. The framework assists in analysing and addressing research questions two and three and the combined findings explore question four. Overall, the findings contribute practical knowledge for THVCS design and theoretical and methodological developments for the THVCS field and telehealth more

broadly. The methodological choices made in this inquiry are explained thoroughly next, in Chapter 3.

CHAPTER 3 Research methodology

3.1 Introduction

As evident from the scoping review of the literature, much of the telehealth research does not have a theoretical base and investigations into the impact of THVCS on key stakeholders are often quantitative in nature. However, people's experiences with telehealth involves complex interactions within the social and technical systems of healthcare. Their experiences occur in the context of the health system, which is itself complex. For people seeking care, it can be a vulnerable and emotionally charged situation. For people working in healthcare organisations, there are quantitative (e.g. time pressures, amount of work), cognitive, physical, and emotional demands. Moreover, the broader environment influences the system through politics, legislation, and societal pressures. With this backdrop, the objective of this inquiry is to explore how the impact of THVCS on work systems are perceived by key stakeholders in New Zealand. What are the current characteristics of THVCS in use in New Zealand? How do THVCS impact key stakeholders in the work system? What are the facilitators and barriers to THVCS for key stakeholders in New Zealand? And how can the work system adapt for THVCS to be sustained practice in health in New Zealand? How these questions are explored is explained in this chapter. First, the foundations underpinning the research design are established in section 3.2, then the details of the processes conducted for data collection and data analysis in the project are described in section 3.3.

3.2 Research design

This section is structured around Figure 3.1, which incorporates research design concepts of Crotty (1998), Goodrick (2007), O'Gorman and MacIntosh (2015), Denzin and Lincoln (2018) and Lincoln, Lynham, and Guba (2018). The top half of Figure 3.1 shows the philosophical position of the research design. This includes the researcher's perspective (3.2.1), the research paradigm considering ontology, axiology, and epistemology (3.2.2) and the interpretive framework of the research (3.2.3). The blue circles around these concepts in the figure indicate that they are inter-related. These positions inform the choice of methodology and methods (central part of Figure 3.1) which are described in sections 3.2.4 and 3.2.5 and demonstrate that the qualitative methodology and methods

chosen fit with the research paradigm. Explanations and justification for the choices made in interpreting and evaluating the data collected in the project is set out in 3.2.6 and shown in the lowest part of Figure 3.1. Surrounding the research design are contextual factors shown as the left-hand column of Figure 3.1. The context of the inquiry such as time, budget, and research audience are recognised and considered throughout the design.

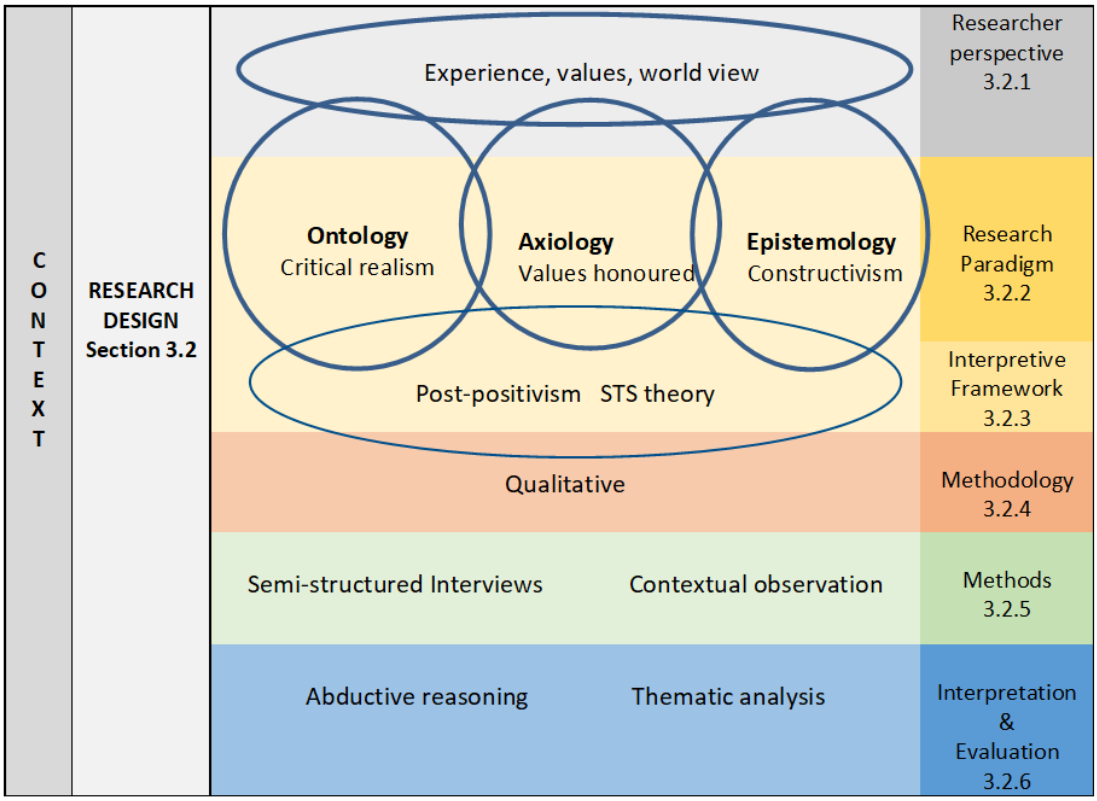


Figure 3.1 **Philosophical location of research, methodological choices, and structure of section 3.2.**

3.2.1 *Researcher perspective*

Consideration of the overarching philosophical position of research recognises the role of the researcher in emergent knowledge and research as an interactive process (Creswell & Poth, 2018; Denzin & Lincoln, 2018). The researcher in this inquiry has an academic and professional background in allied health, business psychology, and human factors/ ergonomics. This converges in a perspective that values the perceptions of people and appreciates the influence of the context on their beliefs and behaviours. This background aligns the researcher to a systems thinking approach with a focus on human-centred design, as outlined in section 2.4.6.2. Moreover, experience as a consultant has developed

the researcher's pragmatic and problem-solving approach. This grounding and training influence the basis of knowledge claims made throughout this inquiry and the research paradigm with which the researcher identifies.

3.2.2 *Research paradigm*

The design of this inquiry is based around the connections between the assumptions we hold about reality and how valid knowledge might be developed (O'Gorman & MacIntosh, 2015). The ontological view taken for this inquiry is critical realism; there is a reality independent of ourselves though this is difficult to determine (Creswell & Poth, 2018). The epistemological position is constructivism; reality can only be approximated and knowledge is constructed through research (Creswell & Poth, 2018) where there are multiple perspectives that are socially constructed (Denzin & Lincoln, 2018) and shaped by contextual influences (Levers, 2013). The axiological position in this inquiry is one in which the values of individuals are honoured and discussed (Creswell & Poth, 2018). In addition, values guide the choices made in the research design and how the research is conducted (Lincoln et al., 2018). It is acknowledged that the inquiry is not value-free (Crowe, 2018), and there is an awareness of values, attitudes, and biases and how these might influence research praxis (Hesse-Biber & Johnson, 2015). The impact that THVCS have on people is central to the inquiry, therefore this value is embedded into ethical considerations throughout the design, data collection, and dissemination of the research and explicitly addressed in section 3.3.3 (research ethics). This paradigmatic stance guides the interpretive framework adopted to gain knowledge and address the research questions.

3.2.3 *Interpretive framework*

The inquiry lens for this project is post-positivism. This interpretive framework fits with the ontological, epistemological and researcher perspectives of the project. A post-positivist approach reasons that phenomena can be identified, and agreement developed to explain the whole through glimpses or partial fragments (Levers, 2013) and that knowledge is constructed from multiple perspectives from participants (Creswell & Poth, 2018). Post-positivism also emphasises the importance of multiple measures, observations, and triangulation to corroborate findings and enhance rigor (Creswell & Poth, 2018). Given that the inquiry seeks to explore perceptions of those involved in

THVCS at multiple levels of the work system, this framework is considered to be appropriate.

With a social science theoretical lens, post-positivism seeks to identify factors that generate events, and through these generative mechanisms has potential to introduce change that modify the status quo (Bryman & Bell, 2007). This fits with the research objectives of exploring facilitators and barriers of THVCS and how the work system might adapt to enable sustained practice. Moreover, a post-positivist approach is compatible with the project's setting as it supports consideration of context, mechanisms, and outcomes (Kowalczyk, 2004). Examining the impact of THVCS within this framework is valuable since new technologies arguably drive contextual change and facilitate social, cultural, economic, and political shifts (Saukko, 2018). Additionally, the systematic processes associated with post-positivism (Crotty, 1998) align with the researcher's background and tendencies. Post-positivist frameworks tend to follow logically related steps, and use rigorous methods (Creswell & Poth, 2018). Including these factors in the design of methodology and methods fit well with the approach the researcher brings to this inquiry.

Another feature of the post-positivist interpretive framework is that it starts with a theoretically informed perspective. The literature review (Chapter 2) identified a gap in the application of theory in THVCS, especially in considering the whole system. Systems thinking is a compelling approach to observe, anticipate, and influence dynamic health systems (de Savigny, Blanchet, & Adam, 2017). In the HFE field, STS theory forms the basis of systems thinking (Waterson, 2015) and is used as the theoretical framework in this project. STS theory posits that effective performance (e.g. outcomes, well-being, satisfaction) is a function of the 'fit' of the social and technical systems. In addition, it emphasises the importance of human-centred design and involvement of stakeholders in any change to an existing system or the design of a new one (Waterson, 2015). As an STS model, SEIPS 2.0 fits with the people-centric research design of this project. Specific to healthcare, the SEIPS 2.0 is a work systems framework that aims to understand the interaction of people with technology, tasks, organisation, and internal and external environments, and the impact on the processes of healthcare delivery and the outcomes for stakeholders (Holden et al., 2013). The limitations of other predominant theories used

in telehealth critiqued in section 2.4 further justifies the selection of the SEIPS 2.0 model as a theoretical touchstone.

The choice of the post-positivist, STS, and SEIPS 2.0 interpretive frameworks helps informs the choice of methodology, methods, and aids in sense-making through interpretation and evaluation of collected data. These aspects of the research design are addressed in the following three sections, 3.2.4 to 3.2.6.

3.2.4 *Methodology*

A two-phased, qualitative approach was applied in this inquiry. Phase I explored the perceptions of an expert group which informed Phase II, where the perceptions of providers, receivers, and decliners of THVCS were investigated. The qualitative methodology used in this inquiry is a natural fit with the research design chosen. One purpose of a qualitative approach, in which non-numerical data are generated, is to explore how people view their world (Creswell & Poth, 2018). Valdez, McGuire, and Rivera (2017) suggest that applying qualitative research in healthcare is particularly relevant to understanding, designing, and evaluating processes that are within varying contexts e.g. technological, organisational, and physical. These authors propose that there are opportunities for qualitative research in the healthcare and systems approach domain. For this exploratory inquiry, qualitative methodology is consistent with the aim of understanding the perceptions and experiences of stakeholders of THVCS to help determine the impact on the work system. Moreover, previous studies have effectively used qualitative methodology and STS theory to gain deeper understanding of health professional and patient work (Holden et al., 2017; Valdez, Holden, Novak, & Veinot, 2015). Examining the 'work done' is a principal element of the THVCS work system under investigation.

Choosing a qualitative approach over a quantitative approach goes beyond paradigmatic consistency. It may be argued that the research questions could be addressed through a quantitative survey. However, this inquiry explores the perceptions of stakeholders and thus a qualitative approach to understand the meaning of action is more suitable (Bryman & Bell, 2007). It is accepted that this methodology limits generalisation though it aims to generate rich data to contextually understand behaviour, values, and beliefs (Bryman & Bell, 2007). This fits with the objectives of this

exploratory inquiry and its overarching research philosophy. These underpinnings guide the selection of methods of data collection, to which attention is now turned.

3.2.5 *Methods*

The choice of semi-structured interviews as the method to address and explore the research questions established from the literature review (Chapter 2) fits with the ontological, epistemological, and interpretive frameworks underpinning the research design. Moreover, semi-structured interviews are aligned with the qualitative methodology approach to the inquiry discussed in the previous section. Brinkmann (2018) defines the semi-structured interview as "an interview with the purpose of obtaining descriptions of the life world of the interviewee in order to interpret the meaning of the described phenomenon" (p. 580). As a social construct of the communicative process (Brinkmann, 2018), semi-structured interviews emphasise the exploratory nature of a study (Bryman & Bell, 2007) which fits with the aims of this inquiry. It is a flexible process by which the participants can explain and describe their views and experiences. The semi-structured design strikes a balance between allowing the interviewer the latitude to ask further questions when replies are significant, while maintaining a degree of standardisation. In addition, compared to an unstructured interview approach there is a focus on addressing the research questions and a pragmatic and axiological consideration of the time resources of the participants and the researcher (Bryman & Bell, 2007). The iterative development of the semi-structured interview schedules is described in section 3.3.5. Along with the content of the interview considering the mode of delivery is also important in determining the method for the inquiry.

In-person interviews have been assumed to be superior to other modes of interviews (Deakin & Wakefield, 2014; Holt, 2010) as they provide opportunities for observations and evaluation of non-verbal cues (Brinkmann & Kvale, 2015). In contrast, telephone interviews have been found to be advantageous since interviewees can control their private spaces and decrease the intensity of interaction, making it more comfortable for participants (Holt, 2010). While duration of interviews for in-person and telephone modes have been found to be of similar duration (Vogl, 2013), telephone interviews are often more convenient for both parties with time saved from travel and from the general context of meeting in a public place, workplace, or home. Convenience may encourage participation and enable access to geographically dispersed participants. However,

without the presence of visual cues in telephone interviews, Holt (2010) notes difficulty balancing interjection with letting the participant know the researcher is present and listening. Using VC for interviews may overcome this shortcoming while retaining the benefits of convenience, the ability to reach participants who are spatially distributed and the maintenance of comfort (Hanna, 2012). The disadvantage of using VC for research interviews are the frequently reported technological issues, including the availability of resources and internet capability (Deakin & Wakefield, 2014; Hanna, 2012; Sedgwick & Spiers, 2009). Thus, there are positives and negatives associated with in-person, telephone, and VC interviews. It was determined that providing participants a choice of interview mode best aligned with the axiology of honouring the values of participants in this inquiry.

As an adjunct to the semi-structured interviews, contextual observations were chosen to provide context and familiarisation of THVCS to the project. Contextual observations involve learning about the behaviour and activities of people in a real-world setting and provide insight of how real conditions impact on the way technologies are used (Kirk, McClelland, & Fulton Suri, 2015). This enables triangulation of methods to add depth and breadth of knowledge to the data collected through the semi-structured interviews (Flick, 2018). While specific task analysis methods may have been an alternative way to specifically assess the requirements for people and systems (Wilson & Sharples, 2015), as this exploratory inquiry is not limited to a specific THVCS health discipline or to a specific model of care, it was determined that the value of this would be limited. The goal of contextual observation is to get a holistic view of the usage circumstances under investigation (Kirk et al., 2015) which suits the inquiry design. Moreover, logistically and ethically a task analysis was difficult due to the personal healthcare nature of a 'live' THVCS interaction. The contextual observations in this project add knowledge on a different level beyond what was found through the participant interviews. Use of contextual observations is supported by the inquiry's post-positivist interpretive framework and systems thinking. Wilson (2014) argues that understanding context is vital in complex STS and that systems ergonomics should be "carried out in the wild" (p.7). The contextual observation processes used in the inquiry are outlined in section 3.3.7, while attention is now given to the research design to analyse the data collected.

3.2.6 *Interpretation and evaluation*

The premise of this inquiry is that knowledge is gained through the identification of patterns from the participants' experiences, meanings and reality (Braun & Clarke, 2006) and reasoned through an abductive approach. A thematic analytical approach with rigorous methods was chosen as the most appropriate to interpret and evaluate the data collected in this inquiry. This approach sits well with the methodological underpinnings of the research design. The way the research findings are reported to stakeholders and participants upholds the axiological premise that the participants values are honoured. These methodological choices are discussed further in sections 3.2.6.1 and 3.2.6.2.

3.2.6.1 Abductive approach

Reichertz (2014) suggests that the basis of all research is observation and logical reasoning. The reasoning may be in the form of deduction, induction, and abduction to connect and generate ideas. The key elements of these inferences are shown in Table 3.1.

Table 3.1 Definitions of reasoning processes (Dudovskiy, 2017; Folger & Stein, 2017)

Type	Definition	Structure	
Deduction	The truth of the conclusion is *guaranteed* by the truth of the premises	General rule →	Specific conclusion (always true)
Induction	The conclusion of an argument is *probably* true based on the evidence of the premises.	Specific observation →	General conclusion (may be true)
Abduction	We have reason to suspect that the conclusion of an argument is worthy of pursuit based on an observation.	Incomplete observations →	Best prediction (may be true)

This inquiry takes an abductive approach to reason the relationship of observation, method, and theory (Tavory & Timmermans, 2014). Abduction can be described as a type of reasoning that justifies the probable truth through inference to the best explanation (Denzin & Lincoln, 2018). Earlier theorists saw abduction as a product, that is, an explanation to a question, while more modern scholars have focussed on abduction as a process where arguments or explanations take shape (Folger & Stein, 2017). This inquiry takes the view that abduction is a process of discovery and as an exploratory inquiry, this is appropriate.

An abductive process aims to make sense of a surprising or unexpected finding (Tavory & Timmermans, 2014). Folger and Stein (2017) explain the concept of abductive 'triggers' where the initial interpretation of existing knowledge does not fully explain what has been happening. Possible explanations are then sought from evidence which might increase the prospects of further insights into the situation. This trigger then guides the abductive process, with observations contrasted in light of background knowledge and directed to search for explanation in alternative theories or extensions through mediators or moderators, or theory synthesis (Folger & Stein, 2017).

Applying these ideas to this inquiry, the literature (Chapter 2) suggests that THVCS have not been adopted or embedded in usual practice as widely as anticipated. Further, a lack of theory or limitations of the theories in the telehealth field was identified, which possibly limits the explanations on why this is the case. This inquiry seeks evidence from semi-structured interviews and observations in two sequential phases which may aid in increasing understanding of this situation. Taking an abductive approach throughout the inquiry also aligns with systems thinking through the concept of emergence whereby attention is paid to unexpected events, behaviours, or unintended consequences (Wilson, 2014).

In addition, Tavory and Timmermans (2014) describe an abductive approach that engages in theory, identifies what is missing and stimulates insights. Value is also seen in the community of inquiry, seeking feedback as part of the abductive process, and recognising relevance of observations for the broader community. The processes of transcription, memo writing, note taking, mapping, and reflexive practices that are present in abductive analysis (Tavory & Timmermans, 2014), were used in this inquiry and fit with the method of thematic data analysis, which is explained now.

3.2.6.2 Thematic analysis

Thematic analysis is an interpretive process to identify patterns, differences, commonalities, and relationships across a qualitative data set to explore, describe and explain the phenomenon being investigated (Gale, Heath, Cameron, Rashid, & Redwood, 2013; Smith & Firth, 2011). The process results in the development of themes which capture important elements about the data with respect to the research questions (Braun & Clarke, 2006). From the cluster of themes insights can be drawn. For this inquiry, a

systematic approach to data analysis is supported by the post-positivist stance of the research design. While thematic analysis is widely used in qualitative research, two examples of structured approaches were developed by Braun and Clarke (2006) and Ritchie and Spencer (2002). The framework method for data analysis was chosen since it is a systematic, analytical approach and one which is generative, driven by original accounts of the people it is about, thus fitting with the research philosophy of this inquiry (Ritchie & Spencer, 2002). Furthermore, it has been applied in healthcare contexts including telehealth, and is suitable for use with interview data sets and field notes from observation or reflexive considerations (Cook et al., 2016; Gale et al., 2013).

The framework method provides a stepwise process that emphasises the transparency of the process and creates an audit trail which strengthens the rigor of the inquiry (Smith & Firth, 2011) while facilitating dynamic, analytical thinking (Ritchie & Spencer, 2002). The main procedural steps for interview data are shown in Table 3.2.

Table 3.2 Summary of procedural steps in thematic analysis using the framework method (Gale et al., 2013)

Stage	Procedure	Description
1	Transcription	Audio recordings are transcribed.
2	Familiarisation with the interview	Repeated reading of interview transcripts and audio. Making notes of thoughts, impressions.
3	Coding	Applying labels ('codes') to excerpts of the transcripts to describe what is interpreted as important so the data can be classified and compared with other parts of the data set.
4	Developing an analytical framework	After some transcripts are coded, codes are grouped into categories which are defined. This is refined as the process continues.
5	Applying the framework	Subsequent transcripts are coded using the framework.
6	Charting the data into the matrix	Summarising the data from each transcript by category, retaining original words of participants.
7	Interpreting the data	Throughout the process interesting ideas are explored through analytic memos, typologies, mapping connections, and interrogating theoretical concepts to enable findings to be written up.

The process begins with transcription and familiarisation of the audio and textual data. Coding is applied to some transcriptions to draw out significant elements and from this initial coding, categories are developed and defined to develop a framework. The remaining transcripts are then coded to this framework which is refined as the process continues. The verbatim text of the interviews is then summarised into a matrix generated from each participant and the coded categories. Continual reviewing of the data, writing

memos of interesting points, asking questions, considering, and mapping relationships between categories, coding and participants occurs throughout the process and culminates in writing up the findings. Stages three to seven can also be applied to non-interview textual data (Gale et al., 2013).

Advantageously, the framework method fits with using computer aided qualitative data analysis software (CAQDAS) analysing of the data across and within cases while retaining the context of the data. NVivo 12 12 (QSR International Pty) was chosen as the tool to be used throughout the project as the researcher had prior experience with the software and it has the capacity to generate framework matrices and included tools that can be used to ask questions of the data.

The final step in thematic analysis is writing and reporting the findings (Braun & Clarke, 2006; Gale et al., 2013). While this thesis is one avenue for reporting, the axiological and methodological foundation of this inquiry (Figure 3.1) supported reporting of findings throughout the project. To value the participants, stakeholder reports were written and distributed to participants and feedback sought. Supported by the abductive concept of a community of inquiry (Tavory & Timmermans, 2014), three conference presentations were made reporting on the research process and Phase I findings. This provided opportunities to engage with stakeholders for feedback on the inquiry, provide context for the research and assist with iterative design of data collection processes. The specifics of data collection are explained in section 3.3 after this research design section is concluded with a summary.

3.2.7 *Summary*

This inquiry into the impact of THVCS on work systems for key stakeholders is located within a clear philosophical and theoretical framework with aligned methods for data collection and analysis (Figure 3.1). It has a critical realism ontology, a constructivist epistemology, and an axiology that respects the values of individuals grounded in the perspective and experience of the researcher. The inquiry lens draws on post-positivism and an STS theoretical base. Using a qualitative methodology, data were collected in two sequential phases with interview and contextual observation methods. An abductive reasoning approach informed the exploratory research processes, and the framework method was used as the approach to thematic analysis. These methodological choices

determine how the data is collected and analysed to address the research questions and the next section explains the data collection and analysis processes.

3.3 Data collection and analysis

3.3.1 *Introduction*

To address the four research questions, data collection processes were designed for Phase I of the inquiry (exploring the perceptions of an expert group) and these informed the processes for Phase II which explored the perceptions of providers, receivers, and decliners of THVCS. Initially, the key stakeholders in THVCS were mapped (Figure 3.2) using a human-centred model with the consumers, such as patients and their families, at the centre radiating out to the healthcare professionals, managers, and to wider stakeholders such as the MOH and professional bodies. The stakeholder map helped to direct the design of data collection and participant selection. A summary of the two phases of the inquiry is shown in Table 3.3.

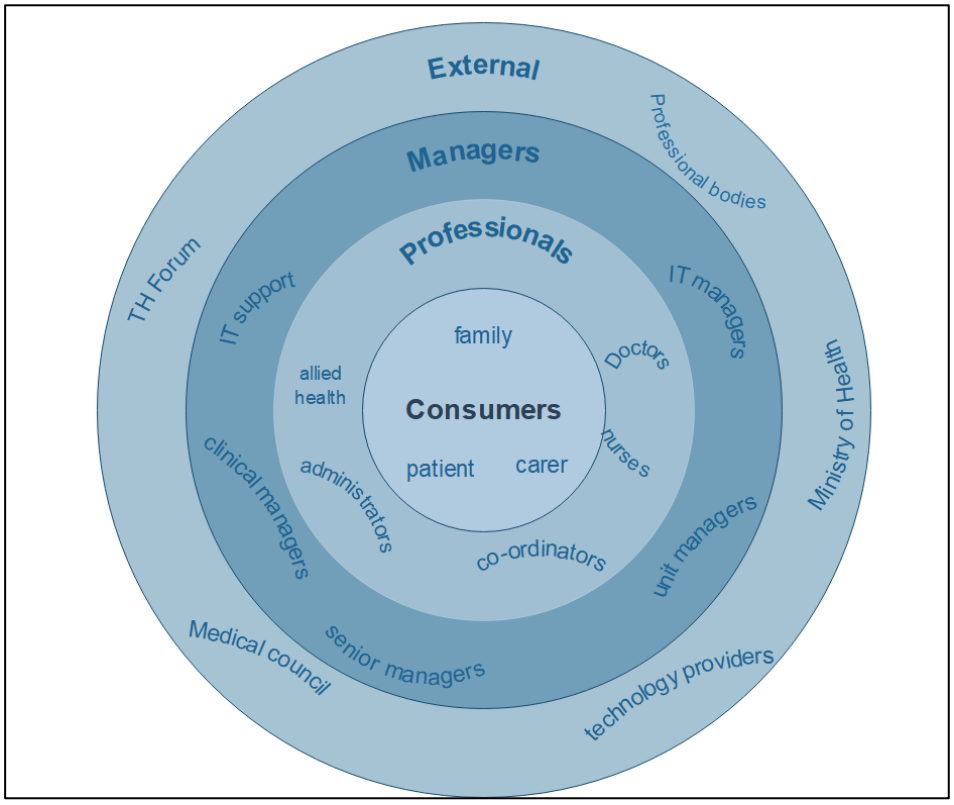


Figure 3.2 Stakeholder map for THVCS

Table 3.3 Summary of the two phases of data collection for the inquiry

	Phase I	Phase II
Research questions	1. What are the current characteristics of THVCS in use in New Zealand? 2. How do THVCS impact key stakeholders in the work system? 3. What are the facilitators and barriers to THVCS for key stakeholders?	2. How do THVCS impact key stakeholders in the work system? 3. What are the facilitators and barriers to THVCS for key stakeholders?
Methods	Semi-structured interviews with THVCS experts	Semi-structured interviews Contextual observations
Participants	New Zealand Telehealth Forum leadership group (n=20)	Consumer and professional THVCS users and consumers who prefer not to use THVCS (n=20)
Timeframe	October 2017 to February 2018	June 2019 to December 2019

While the Phase I processes informed Phase II, for clarity both phases are described together with sections 3.3.2 to 3.3.4 explaining participant selection, ethical considerations, and participant recruitment. The design for the semi-structured interviews is outlined including the piloting processes (section 3.3.5.1). The interview process is explained in section 3.3.6 along with a description of the data management plan (3.3.6.1). Data collection with contextual observations is described in 3.3.7 and the process for analysing the data is recounted in section 3.3.8 to end the chapter.

3.3.2 *Selection of participants*

The New Zealand Telehealth Forum Leadership Group (the Forum) was selected as a purposive sample for the first phase of this inquiry. This expert stakeholder group were in a unique position to understand THVCS, its current status and the impact it has on stakeholders in the work system. As an expert group supported by the MOH and to whom they report, the Forum promotes the use of telehealth in the provision of healthcare in New Zealand. The Forum is led by the Leadership Group, a group that span a range of roles and disciplines including clinicians, policy makers, planning and funding managers, ICT experts and industry representatives. The role of the group is to advise the MOH on requirements and priorities for telehealth and background considerations for this, for example, barriers to uptake, technical considerations, protocols, guidelines, and standards (Ministry of Health, 2017a). The Forum was well placed to present a range of perspectives of the challenges and opportunities of THVCS across the healthcare sector

as the members were representatives of professionals, managers and external bodies involved in THVCS shown in the three outer layers of the stakeholder map (Figure 3.2). Moreover, the choice of this group as a purposive sample fits with the systems approach of the theoretical framework supporting the research design by seeking views from a wide range of people involved in various aspects of THVCS. From the researcher's experience of attending Health Informatics New Zealand (HiNZ) conferences as part of the research scoping process, it was evident that the members of the leadership, in addition to their influence at a national level, were also considered experts by the industry and associated organisations. The discussion with contacts made at these events helped support the feasibility of recruiting the Forum as participants and provided confidence that they were likely to support the inquiry.

While the data from the Forum in Phase I provided significant insights, the perceptions of the consumer stakeholders (e.g. patients and their families) at the centre of the stakeholder map (Figure 3.2), were not directly gathered. Although clinician providers of THVCS were included in Phase I through their membership in the Forum, their perspectives might be different from a provider in a 'grass-roots' situation who is using THVCS without broader involvement in leadership, governance, or policy. Moreover, as one of the forum's roles is to promote THVCS, a more positive perspective may have been reflected from this group. In addition, the findings from Phase I identified that the perspectives of people who were offered THVCS but preferred to continue to receive in-person care were not well understood. Recognising these gaps, Phase II participant selection was designed to target providers, receivers, and decliners of THVCS, and these groups are defined in Table 3.4 below.

Table 3.4 Definition of Phase II participant groups

Participant group	Definition for inclusion
Providers	People who have provided healthcare or an aspect of healthcare to patients and their families using videoconferencing at least on one occasion.
Receivers	People who have received their healthcare or an aspect of their healthcare using videoconferencing at least on one occasion and are over the age of 16 and able to provide informed consent.
Decliners	People who were offered the choice of receiving their healthcare or an aspect of their healthcare using videoconferencing but preferred to continue with in-person consultations and are over the age of 16 and able to provide informed consent.

To ensure geographical and health sector spread, the participants for Phase II were targeted from one North Island DHB, one South Island DHB, and primary care. Given the research involved human participants in the healthcare context, ethical issues were considered throughout the planning process and embedded into the research methods of both phases. This process is discussed in the next section.

3.3.3 *Research ethics*

Universal ethical principles of autonomy, non-maleficence, beneficence, justice, and special relationships (Massey University, 2017) were considered in the context of the Phase I inquiry. For Phase I these principles guided the development of the information sheet (Appendix A), the informed consent form (Appendix B) and the subsequent low risk application. The ethics approval for this is included in Appendix C. Participation was voluntary with informed consent and a right of withdrawal. While anonymity could not be guaranteed given that the forum membership is publicly available and the specialist nature of the expert roles may make it possible for them to be identified, it was assured that participants names and names of organisations would not be used for confidentiality. As the participants were involved in their capacity as experts with enquiries based around their professional experience, it was judged that they would not be subjected to any harm whereas the research has potential benefits for consumers and providers of healthcare and wider society. Special relationships were reflected on as the researcher had contact with some of the potential participants at conferences. As this was in relation to scoping and developing the inquiry and there were no ongoing dependencies this was not considered a conflict of interest. Moreover, connections with those involved in the field was invaluable for recruiting participants and informing the research methods.

As Phase II participants included patients and their families, assessment of the proposed research by Massey University Human Ethics Committee was sought and approval gained (Appendix D). As well as the ethical considerations discussed in Phase I above, this application reflected more on Te Ara Tika- Guidelines for Māori research ethics (Hudson, Milne, Reynolds, Russell, & Smith, 2010) as it was anticipated that some participants may be Māori and the inquiry was likely to have direct relevance to Māori as healthcare providers and consumers. The ethics application reflected on the ways in which the research project may impact Māori and how Māori may be included in this

project appropriately and respectfully. Two Māori academics were consulted to ensure that these aspects had been considered satisfactorily.

While the New Zealand Health and Disability Ethics Committee's flowchart determined that their review was not required for this inquiry (New Zealand Health and Disability Ethics Committee, 2014) it was necessary to seek approval from the DHBs to recruit their patients and staff for the inquiry. The North Island DHB and the South Island DHB (identities are withheld for confidentiality) had their own approval processes including a requirement to have a site sponsor. Contacts of the researcher were drawn upon to gain support for the research in both DHBs. Additionally, one DHB application required a submission to their Māori Health Research Committee for Māori consultation and one required submission of a scientific peer review of the research methodology. These requirements were completed and approval to proceed with the research was given in both jurisdictions.

The ethical principle of autonomy was considered carefully when designing the recruitment strategies for patients in Phase II. As the access to invite patients to participate was through their healthcare provider it was important that this relationship did not place any pressure on them to participate. To ensure that there was no coercion it was determined that patients willing to be involved would be asked to contact the researcher directly rather than a connection being provided by their healthcare provider.

The contextual observational methods included in Phase II of the inquiry also considered that there may be incidental contact with other stakeholders in the system during observations, for example, administrators or nurses that may be involved in the THVCS process. An information sheet was developed for 'other personnel' in case of this scenario.

These ethical reflections and approval processes helped to refine the information sheets for providers, receivers, and decliners (Appendix E), the informed consent forms (Appendix F) for participants, and ensure the inquiry was ethically sound. In addition, the ethical decisions made in the research design informed the strategies used for recruitment of participants. The way that participants were engaged in each phase of the inquiry are presented in the next section.

3.3.4 *Participant recruitment*

3.3.4.1 Phase I

A list of the members of the Leadership group, as at 8 August 2017, was retrieved from the MOH website (Ministry of Health, 2017a). Contact was made with the Chair of the Forum to explain the inquiry, provide the information, and consent forms (Appendices A and B) and seek permission to contact the Leadership group members. This consent was given, with one listed member removed as they were no longer a member of the group. Twenty members remained and all became participants for this phase of the research. The participants' email details were easily accessible publicly or were provided by another Forum member on request. Each member was contacted by email to ask if they were interested in participating and to offer an in-person interview at an upcoming Health Informatics New Zealand (HiNZ) conference or an interview by VC or telephone. Many participants responded quickly and those who did not were followed up subsequently by email and telephone. All interviews were completed between October 25, 2017 and February 16, 2018.

3.3.4.2 Phase II

Given that use of THVCS was identified as being more prevalent in secondary care than primary care from the Phase I findings (Chapter 4) it was determined that 80% of participants would be sought from secondary care providers, receivers, and decliners and 20% from primary care. Additionally, it was not expected that decliners could be identified in primary care as using THVCS in this setting is typically booked by the patients rather than offered specifically by the provider. The initial part of the recruitment strategy occurred concurrently with ethical considerations and processes required to gain access to the DHBs as previously described in section 3.3.3. Contacts were made with DHB staff who were likely to be able to support the applications and help to identify potential participants. These contacts had been formed primarily through HiNZ conferences and networks of the participants in Phase I. Through this provider network, multiple channels and methods were used to recruit participants. Table 3.5 summarises these strategies.

Table 3.5 Recruitment strategies for Phase II participants

	Providers	Receivers and decliners
Contact through	Network of contacts Emails Telephone calls Staff meeting attendance	Providers distributing information sheets Providers displaying information in clinical areas
Materials	Information sheets Contact cards Advertising posters	
Additional methods	Conference presentation 'call-out'	Facebook posts in private health groups Site visits to promote research

Along with email and telephone calls, providers were invited to participate by other providers. The researcher was offered an opportunity to attend a staff meeting via VC in one hospital department to explain the project and request help with recruitment of participants. In this way information was made available to receivers and decliners who may be interested in participating and hard copy materials were prepared for providers to give to potential participants and to display in their clinic areas, including contact cards and posters (examples are provided in Appendix G). Receivers and decliners were offered a $20 petrol voucher to acknowledge the time required for their participation.

Generating interest to participate within receivers and decliners was challenging and required "polite persistence" (Bryman & Bell, 2007, p.481). Following advice from a health researcher in the field, the recruitment strategy was extended to social media. An extension to the Massey University Human Ethics Committee application was made and approved in August 2019 to include recruitment from closed, health support social media groups. Two organisations who administer private Facebook pages to support people with specific health conditions were contacted to request posting an advertisement for the research on their page. Both the health conditions were known to use THVCS in some circumstances and the posts were made on the respective pages. A further push for participants was made during the contextual observations at one DHB and at a HiNZ conference presentation. Semi-structured interviews with nine receivers, eight providers and three decliners were completed between June 2019 and the end of participant recruitment in December 2019.

3.3.5 *Semi-structured interview schedule design*

Designing the interview schedules for each phase of the project was an iterative process, drawing on the: literature review; theoretical approach; industry engagement; interview guidelines and a piloting process for its development. These aspects are explained in the next paragraphs prior to recounting the piloting processes. The final schedules that were used in the interviews are included in Appendix H (Phase I) and Appendix I (Phase II).

The literature review (Chapter 2) identified gaps in knowledge in the field and informed the development of research questions. The interview schedules were formulated by considering the type of questions that would help answer the research questions (Bryman & Bell, 2007), contribute thematically to knowledge production and promote good interview interactions (Brinkmann & Kvale, 2015). In addition, an understanding of the field gained from the literature review and engagement with industry helped to inform relevant language, terminology, and potential prompts in the interview schedules. The survey questionnaire used for previous research in the New Zealand Telehealth Stocktake (New Zealand Telehealth Forum, 2014) was examined for applicable questions for the Phase I schedule and to develop a consistency of terminology.

The theoretical SEIPS 2.0 framework used as one lens for the inquiry (see section 3.2.3) also helped to inform the interview schedules. Reflecting on the work system, processes, outcomes, and potential adaptations helped to guide the development of the schedules and to ensure that all components were considered. Engagement with the THVCS community through conference attendance aided a deeper understanding of the field. Learning about lived experiences of developing THVCS, service change, change processes and embedding practices as 'business as usual' helped identify what kinds of questions would be useful to include.

The structure of the interview schedules was composed using interview guidelines (Brinkmann & Kvale, 2015). An introduction was prepared at the beginning of the interviews to build rapport and general information was asked first as a type of 'face sheet' to help participants begin to talk (Bryman & Bell, 2007). The questions were mostly open-ended to allow participants to express themselves freely. The inclusion of probing questions facilitated follow up of any interesting points. Incorporating prompts was to engage and encourage the participants to express their opinions and experiences.

The questions were ordered in a way that enabled an even flow while allowing for the sequence to be varied depending on the direction the interview took. Recognising the value of the participants time the schedules were designed to be a reasonable length for the participants (up to 60 minutes in Phase I and for Phase II providers and up to 30 minutes for receivers and decliners). Piloting processes were the last aspect of the iterative interview schedule design and are explained in the next section, concluding with a description of the final versions of the semi-structured interview schedules.

3.3.5.1 Piloting processes

Drawing upon the concept of the hermeneutic circle and recognising that engaging in practical activity and reflection aids in understanding (Kezar, 2000), the Phase I and Phase II semi-structured interview schedules were both piloted. The aim of this was to aid iterative development and to increase confidence that they were robust instruments capable of gathering appropriate data to address the project's research questions.

The Phase I interview schedule was piloted in a three-stage process. To enable all data collected from the Forum census to be retained for analysis the design of the Phase I pilot was to seek advice from people who were not Forum members. First, the researcher's supervisors reviewed language, wording, and logical relevance to the research questions. Reflecting on this feedback resulted in the number of questions being reduced, wording improved and the differentiation between questions and prompts clarified. Second, an experienced researcher and ergonomist colleague of the researcher participated in cognitive testing whereby the wording, structure and scope of the interview schedule was assessed. Provision of the information sheet and consent form allowed for feedback on these documents also. This pilot was especially useful in elucidating question wording and flow and resulted in adjustments to include more open questions to capture experience such as "Can you tell me / how do you feel about…?" In addition, the schedule was clarified to differentiate between the researcher question and the more conversational language appropriate for the interview question (Brinkmann & Kvale, 2015). An audio recording of the pilot interview enabled reflection of the process. Overall, the scope and length of the schedule was determined to be appropriate. In the third stage of the pilot, a health professional with a good understanding of the health system participated in a role-playing interview using the revised interview schedule. The purpose of this was to further evaluate the schedule, practice interviewing skills and to prepare the data management

and transfer process. Considering the responses helped to evaluate if the data generated would be satisfactory to address the research questions. In addition, this process aided in further refinement of the questions, their delivery, and ways they could be presented if clarification were needed. Feedback given on general interviewing skills including providing a more engaging introduction, more effective use of pause and appropriate use of prompts was also helpful.

Based on the experience and knowledge gained from Phase I piloting and data collection, the piloting processes for Phase II were simpler and focussed on ensuring that the schedule would satisfactorily address the research questions and was targeted appropriately to the participants. This was important as the Phase I participants were an expert group that had high-level knowledge of THVCS whereas the Phase II intended participants were those with more practical and direct experiences of THVCS. With these aims, after a similar check by the project supervisors as in Phase I, a pilot interview was conducted with a clinical manager in April 2019 (this interview was not included as part of the final analysis). The manager had used THVCS as a clinician and was involved with establishing and supporting THVCS in their department. A VC was held, the interview questions were posed, and the manager responded to them or provided comment on how they may be answered by receivers or decliners, based on the manager's experience. In addition, the manager provided feedback on the nature and wording of the questions. Notes were made during the interview, reviewed and changes made to the interview schedules. Generally, the interview schedule flowed and evoked responses without difficulty. Minor changes were made to the wording of some questions, some prompts were added, and a final supervisory review was completed. After incorporating the feedback, the interview schedules were finalised. The content of each schedule is summarised now, with the schedules included in Appendix H and I.

3.3.5.2 Final schedule content

The first questions in the Phase I semi-structured interview schedule explored the expert's role and experiences in telehealth generally and THVCS specifically. Then the next question asked about their experiences with THVCS technology, management, and funding, along with perceptions of changes in THVCS and what helps and hinders THVCS becoming part of usual business. Aligned with STS theory, participants were asked if they had experienced any surprises or unintended consequences with THVCS.

Finally, opinions on the impact of THVCS in the health system and the future of THVCS were sought.

In Phase II three different semi-structured interview schedules were developed for provider, receiver, and decliner participants to reflect their distinct roles in the THVCS interactions. The schedule for providers firstly asked about what THVCS was used for and with what technology. A question about the logistics of the THVCS process and the participants experiences of these was included. Following this, the provider schedule asked participants to consider what makes THVCS 'work well' for them and what does not. Their perspectives on the impacts of THVCS was then collected. Lastly, the schedule asked if their experiences included any unintended consequences or surprises. For receivers, the schedule starts with asking how the participant came to use THVCS and how the appointments are arranged and how this has been experienced. Questions about what works well and what does not work well for the receiver followed before asking how THVCS has influenced the experience of receiving healthcare. Finally, the schedule again asked if the participant had experienced any surprises with using THVCS and if they would wish to continue to receive services this way in the future. To explore the perceptions of decliners, following the introduction and confirmation that they were offered THVCS, the schedule asked why they preferred to continue with in-person appointments. Questions about whether any changes would alter their perceptions about using THVCS and if they would consider its use for other healthcare services were then posed. Finally, the schedule asked decliners about their experience with use of VC for other purposes and their access to technology resources and the internet.

The pilot processes enabled the development of robust instruments for data collection and to evaluate the proposed methods. In addition, these processes aided in development of a data management strategy which focussed on data protection. The next section (3.3.6) describes the interview processes and then the data management plan is outlined in section 3.3.6.1.

3.3.6 *The interview processes*

A similar process was used for the semi-structured interviews in both Phase I and Phase II of the inquiry. After contact had been made with participants, it was confirmed that they had an information sheet, understood it, and agreed to participate. If they did not

have an information sheet, one was sent to them either electronically or by post. Once their participation was established, a convenient time was established to conduct the interview. Interviews were offered either in-person, by telephone or by VC. When the participant preferred VC, the platform that they were most comfortable with was used. This was either Skype, Zoom, Facetime or the platform that they used within their organisation. Informed consent was obtained either through signing of the consent form in person or returning it electronically. In the occasion that this was not able to be completed before the interview, consent was discussed and recorded at the beginning of the connection.

The potential weaknesses of the mode of interviews (as discussed in 3.2.5) were mitigated with careful attention to conducting the interview by using the interview schedule (see 3.3.5) flexibly, building rapport, using a relaxed conversational style, listening carefully with a reflective approach, and probing where necessary (Brinkmann & Kvale, 2015; Bryman & Bell, 2007). These skills were also used when conducting contextual observations which are explained in section 3.3.7. Before this, the process used to manage the risk of technical difficulties is described in the data management plan.

3.3.6.1 Data management plan

Using the experience of running and recording the pilot interviews (section 3.3.5.1), a data management plan was established and tested in preparation for data analysis following the interviews (Figure 3.3). This was important for ensuring data security and ensuring that the data was available for listening, transcribing, storage, and analysis. An evaluation of Digital recorders, iTalk application on iPhone (iTalk Premium 4.75, Griffin Technology Australia), Voice Recorder (Tomsoft Apps) on iPad and Echo Smart Pen (Livescribe Inc) found that they provided excellent sound quality recordings. Using two devices for each interview mitigated the risk of technical failure. After the interviews, the audio files were transferred to the researcher's personal computer through a USB cable, iCloud, or Wi-Fi Sync (Smart Pen, iPhone, iPad respectively). The files on the mobile devices were then deleted to aid data security. The interview audio could be listened to repeatedly and transcribed with the aid of Express Scribe Transcription software (NCH Software).

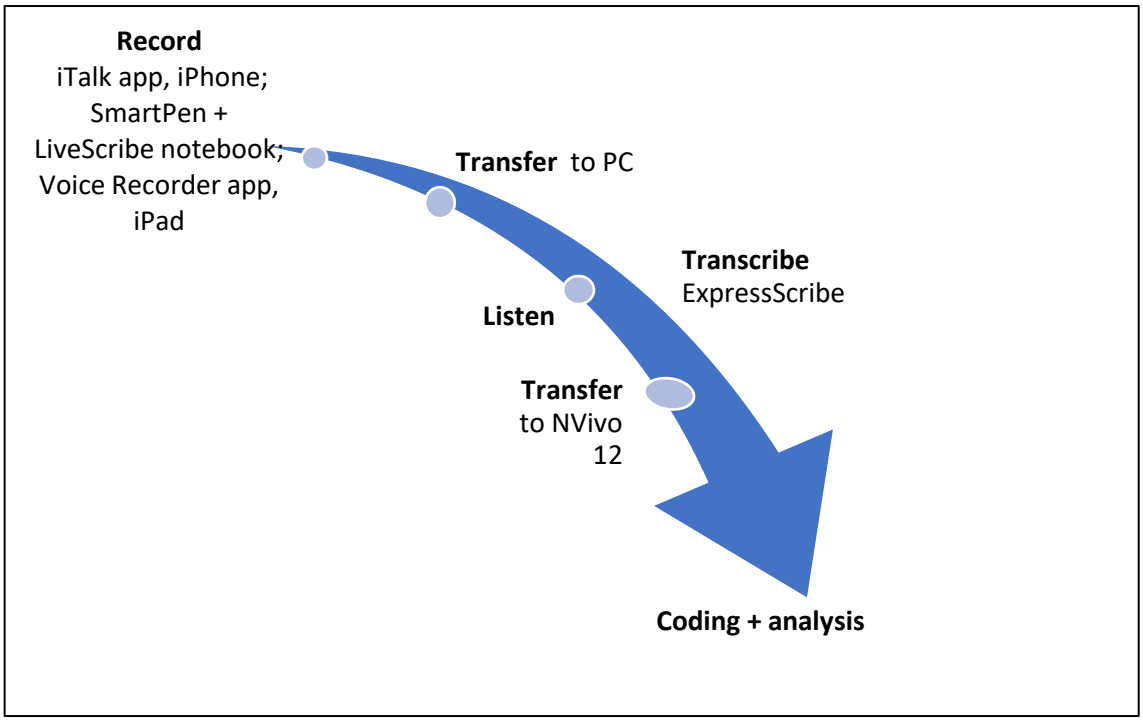


Figure 3.3 Data management plan for Phase I and Phase II interviews

Transcription was by completed by the researcher in Phase I and by a paid transcriptionist, who signed a confidentiality agreement, in Phase II. Once completed, the transcript documents were transferred into NVivo 12 (QSR International) for storage, subsequent coding, and data analysis. The iTalk application on the iPhone was used for recording during contextual observations along with the iPhone camera applications. The process taken for these observations are described now.

3.3.7 *Contextual observations*

Three site visits were arranged in October 2019 to the North Island DHB that was used for participant recruitment. As explained in section 3.2.5, contextual observations were chosen to provide context to the project, to learn about the behaviour and activities of people using THVCS in a real-world setting and provide depth and breadth of knowledge to the data collected. HFE methods were drawn upon for the direct observation of the work site to build a rich picture of the environment, capture information and develop an understanding of practices and behaviours (Wilson & Sharples, 2015).

Contextual observation data were collected at three sites, one at the 'hub' hospital of the DHB and two at rural 'spoke' hospitals (termed A and B). The THVCS observed at

the ‘hub’ were for a direct-to-patient model in an allied health discipline while the ‘spoke’ hospital models of care were for patient consultations connecting to clinicians located at the ‘hub’ across several disciplines. Participation and permission to observe in these locations was established through contacts made through the recruitment process (section 3.3.4). The types of data collected from each location are illustrated in Table 3.6.

Table 3.6 Contextual observation data collection methods at each location

	Unstructured interviews	Guided tour	Photographs	Collection of documents
Hub	✓	✓		✓
Spoke A	✓	✓	✓	✓
Spoke B	✓		✓	

Unstructured interviews were held with an allied health professional and manager at the ‘hub’ hospital, a nurse coordinator at ‘spoke’ A, a clinical nurse manager and two booking clerks at ‘spoke’ B and the DHB’s telehealth coordinator who is familiar with all areas. The purpose of these was knowledge elicitation from those involved in providing, coordinating, and managing THVCS ‘in the wild’, providing an opportunity for the researcher and the participant to discuss the area in an informal setting (Shadbolt & Smart, 2015). Field notes were taken during these conversations and typed into a text document following the interviews. The unstructured interviews provided an opportunity to conduct other observation and these methods are described next.

Drawing on the contextual observation method that Kirk et al. (2015) term ‘guided tours’ whereby an expert in the task shows and explains to the observer how the task is done, the THVCS provider at the ‘hub’ hospital was asked to demonstrate the process of scheduling a THVCS appointment. This was completed and a THVCS connection was simulated with the researcher. Throughout this process the provider was asked questions to explain and reflect on how the process is done with notes taken by the researcher. This method was extended to a provider at ‘spoke’ hospital B who demonstrated and explained the process of using a THVCS clinical room with the researcher asking questions or for clarification. This ‘guided tour’ was audio and video recorded and partially transcribed. In addition, documents relevant to the THVCS processes or points that arose in the unstructured interviews were collected. The contextual interviews were written up as field notes and included in the data analysis, which is detailed next.

3.3.8 *Data analysis*

Data analysis of the interview data followed the framework method outlined in section 3.2.6.2, shown in Table 3.2 and graphically in Figure 3.4 below.

Figure 3.4 Framework method of data analysis (Gale et al., 2013; Ritchie & Spencer, 2002)

The same data analysis process was followed for Phase I and Phase II data though the analysis was done separately for each phase due to the sequential nature of the design. The way the data were analysed is summarised in the following narrative.

In each phase the participants were assigned a pseudonym. In Phase I this was a number and in Phase II a name was chosen that was popular in the approximated era of the participant (Loviglio, 2012). This was to protect anonymity while reflecting gender and generation of the participants and providing personalisation to the data (Allen & Wiles, 2016). In the contextual observations the participants were identified through their work role titles.

The Phase I interviews (n=20) were transcribed by the researcher. The transcription took an 'intelligent verbatim' approach whereby a full, accurate transcription was completed but repeated, unnecessary words and fillers were omitted (Chege, 2015). Using Express Scribe Transcription software (NCH Software) the audio was able to be slowed and moved forward and back so that it could be transcribed accurately. This also aided the second stage of familiarisation (Figure 3.4) as the interview audio was listened to repeatedly as the transcription was performed.

In Phase II, the transcription was outsourced to a professional transcriptionist who signed a confidentiality agreement. The interview audio was uploaded to a cloud storage facility and a secure link sent to the transcriptionist to access the file. In all transcriptions names and places that might identify participants were removed during transcription and replaced with a bracketed descriptor (e.g. [name]). Familiarisation in Phase II was aided by listening to the audio files after the interviews were completed and by listening to them while checking the transcripts for accuracy when the transcriptionist had returned them.

During the transcribing and familiarisation stages memos were written to note possible themes or record ideas of connections in the data (Richards, 2005). This helped to generate ideas of initial codes as the analysis moved to the third stage of coding the transcripts.

Following the release of transcripts by the participant when they had requested to review them (n=9), they were uploaded into NVivo 12. Extracts of the transcripts were assigned to codes generated from the interview data. The definitions of the codes and the code structure were constantly reviewed as the process proceeded (Bazeley, 2009). Six transcripts were coded and reviewed to ensure that the process was capturing the data and less additional codes were being generated. The definition of the codes was refined, and the subsequent codebook became the analytic framework for the remaining fourteen transcriptions. Though as Gale et al. (2013) note, "the analytical framework is never 'final' until the last transcript has been coded" (p.5), and the coding hierarchy and content was constantly being adjusted and considered as concepts developed. An 'other' code was used so that data that did not fit was not ignored. Annotations, memos and 'see also' links were added to text or project components in NVivo 12 when ideas or questions arose as the transcripts continued to be coded. Gale et al.'s (2013) stage five of charting the data into a matrix (Table 3.2, section 3.2.6.2) was aided by NVivo 12 with matrices easily generated with the software and referred to while interpreting the data. Additionally, the tools available in NVivo for example, matrix queries, comparison diagrams, and charting were used to ask questions of the data (Richards, 2005).

Data from the contextual observations were combined with the main analysis for Phase II at stage five (see Figure 3.4). The field notes were familiarised during the process of writing up including reflection through organisation of the onsite notes and adding thoughts and reflection to the document as it was developed (Maharaj, 2016). The 'guided tour' (see 3.3.7) that was recorded was partially transcribed from the audio files. The field notes were then coded a priori using the established framework and analysed together with the Phase II interview data.

Using this stepwise process, the characteristics of the data were developed including relationships between themes and theoretical concepts. The culmination of this process are the findings of Phase I and Phase II which are presented in Chapters 4 and 5 respectively, before which this chapter is summarised.

3.4 Summary

The research methodology for this inquiry was based on the research design illustrated in Figure 3.1. The researcher's world view, experiences and values led to following a research paradigm of critical realism, constructivism, and axiology where the values of individuals are honoured (Creswell & Poth, 2018). A post-positivist interpretive framework sought to construct knowledge from multiple perspectives to develop explanations from incomplete fragments (Levers, 2013) and to identify factors that generate events (Bryman & Bell, 2007), matching well with the exploratory aims of this research. Drawing on STS theory which underpins systems thinking in HFE, the SEIPS 2.0 work system model was used as a theoretical touchstone to guide method development and to aid in sense making. A qualitative methodology was chosen as most appropriate for the paradigm and the abductive reasoning approach taken (Tavory & Timmermans, 2014) supported the exploratory nature of the inquiry with attention given to possible explanations and unintended consequences.

Following ethical approval processes, interview schedule design and piloting, and participant recruitment strategies the data were collected in a two-phased approach (Table 3.3). In Phase I semi-structured interviews exploring the perceptions of all twenty members of the New Zealand Telehealth Forum Leadership Group were completed by February 2018. In Phase II semi-structured interviews were conducted (June to December 2019) with eight participants who provided THVCS, nine who received the services, and three patients who preferred to continue to receive in-person care. Contextual observations were made at three sites in a DHB, providing additional data from unstructured interviews, guided tours, photographs, and documentation.

The data were analysed thematically following the framework method (Gale et al., 2013). Interviews were transcribed, familiarised and an iterative coding process carried out (Table 3.2) before the findings were compiled (Chapters 4 and 5).

The design of this inquiry, data collection practices and analytical methods aimed to be rigorous and trustworthy (Lincoln & Guba, 1985). The design strived for credibility through prolonged engagement and observation within the field, triangulation of methods and sources, peer review and drawing on multiple voices (Lincoln & Guba, 1985; Tracy, 2010). Robust and structured methods, such as the framework method, aid the

dependability of the inquiry while also demonstrating its rich rigor (Tracy, 2010). Transferability, showing that the findings have applicability in other contexts (Lincoln & Guba, 1985) is supported as part of the framework method by using memos to link ideas and mapping to elucidate interactions and relationships. The use of NVivo provides an audit trial while thick description through detailed accounts of the data and rich description through the use of verbatim quotes also support confirmability. This is evidenced in the findings of Phase I which are presented now.

CHAPTER 4 Phase I findings: Experts' perceptions

4.1 Introduction

Phase I of this inquiry explored the perceptions of all members of the Telehealth Forum Leadership Group about THVCS in New Zealand, in semi-structured interviews undertaken between October 2017 to February 2018. The twenty members of this expert group provide advice to the MOH on telehealth and promote its use in New Zealand. The 10 male and 10 female participants were located throughout New Zealand, with nine of the twenty DHBs represented and seven participants performing a nationwide role. The area of expertise or role of the members interviewed is shown in Table 4.1. Three participants were involved in the primary care sector, eleven in the secondary care sector and six across the healthcare sector. Each participant was interviewed either in-person (n=6), by VC (n=10), by telephone (n=3), and one was a combination of video and then telephone. The semi-structured interview schedule is shown in Appendix H. The interviews ranged in length from 33 to 98 minutes with a mean length of 58 minutes.

Table 4.1 Area of professional expertise or role of Phase I participants

Area of expertise or role	Number of participants
Clinical doctor	4
Telehealth programme manager /coordinator	4
Telehealth consultant	1
Technical	3
Consumer panel	1
Professional body /regulator/industry group	3
Governmental	1
Administration	1
Research	1
Clinical governance	1

This chapter presents the analysis of the findings from the perspectives of these expert stakeholders to address research questions one to three:

1. What are the current characteristics of THVCS in use in New Zealand?
2. How do THVCS impact key stakeholders in the work system?
3. What are the facilitators and barriers to THVCS for key stakeholders in New Zealand?

The analysis begins with describing the current characteristics of THVCS in use in New Zealand in the next section (4.2). Section 4.3 addresses the impact of THVCS on the work system before attention is given to the facilitators and barriers to THVCS in Section 4.4. A summary of the Phase I findings concludes the chapter in section 4.5.

4.2 Findings: Current characteristics of THVCS in use in New Zealand

4.2.1 *Introduction*

To investigate the Forum's perceptions of current characteristics of THVCS, interview prompts included the types of disciplines, services and technologies that are used in New Zealand. The following sections outline the characteristics expressed by the Forum members in terms of history, geographical areas, health disciplines and services, sectors involved, technologies used and the extent of use (4.2.2 to 4.2.7) before a summary in 4.2.8.

4.2.2 *History*

THVCS were reported to be in development in the early 1990's with the first implementation of a telehealth network in New Zealand using an Integrated Services Data Network (ISDN). A trial of clinical telehealth in dermatology was reported in 1994. One participant noted,

> Waikato really was the pioneer in New Zealand for hospital based, tertiary services to secondary hospitals and even into GP practices and that was in 1995.
>
> Participant 11

In 2012, a 'call to arms' forum was held at the National Institute of Health Innovation (NiHi) to call for an establishment of a telehealth interest and advisory group. This led to the establishment of the Telehealth Forum and leadership group as an expert advisory group for the MOH.

4.2.3 *Geographical areas*

The provision of New Zealand's healthcare is organised through District Health Board areas (Figure 4.1). DHBs plan, fund and provide health services. Currently, most regions in New Zealand are reported to be using THVCS albeit to varying extents. The more

developed services are in the Northern, Auckland, Waikato, Canterbury-West Coast and Southern regions.

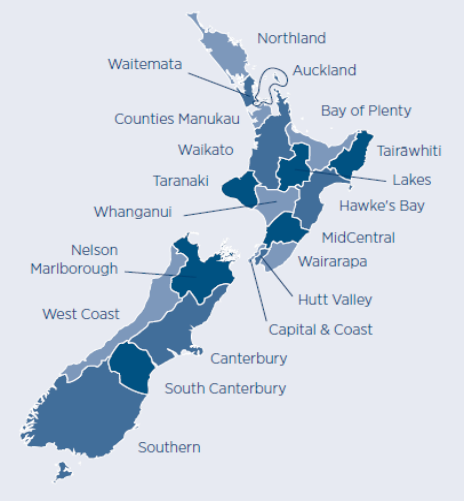


Figure 4.1 District Health Board areas

There are less services in the central regions, as explained by one participant,

> Central region, they are a big vacuum, a huge big vacuum right now…so the South Island is in good shape, Northern region really good shape, Whangarei and up and down into Auckland hospital, that region in there, Waikato's coming on stream, across to the Coromandel, some of them like Rotorua, they're trying but they don't have the money to participate, Central regions, jeez, we've tried Capital Coast, Hawkes Bay.
>
> Participant 11

Some of the variation around the country is attributed to the funding models and to organisational size, for example,

> If you look at who's doing a lot, it has a lot to do with population-based funding formula and the size of the organisation. You look at Waitemata who's done quite a bit, they have the biggest increment in income every year, for the last decade.
>
> Participant 16

In addition, regional differences are also recognised to be due to champions and to changes in personnel,

> People changed, I had a telehealth clinical leader, he was based at [hospital name], when they amalgamated…they restructured some of the management people, I had a telehealth sponsor, very good, tried to get things going, we had nurses between [hospital name] and

> [hospital name] for some plastic surgery, it's gone, just gone, just dropped into a huge deep vacuum, people have changed.
>
> Participant 11

4.2.4 *Disciplines and services*

Across New Zealand, THVC is used for a range of different services, across many disciplines and for different levels of acuity. Drawing on the information provided by the participants, the range of services are outlined in Table 4.2, organised into overlapping categories of acute services (tele-acute), outpatient type care (tele-ambulatory) and professional support (tele-workforce).

Table 4.2 Range of healthcare specialities and services using THVC in New Zealand

Tele-acute	Tele-ambulatory		Tele-work force
Emergency care	After hours services	Allied health	Case review
Intensive Care Unit	Cardiology	Anaesthesiology	Grand round
Adult	Diabetes management	Community alcohol and drug services	Morbidity and mortality meetings
Neo-natal	Endocrinology	Direct Observed Therapies	Multi-disciplinary meetings
Retrieval teams	Epilepsy	End of life discussions	Primary care support
Stroke care	Gastroenterology	Family meetings	Rural clinician support
Ward rounds	General medicine	General surgery	
	General practice	Mental health	
	Healthcare of the elderly	Midwifery	
	Nursing	Nutrition/dietetics	
	Oncology	Orthopaedic surgery	
	Palliative care	Prison services	
	Paediatrics	Public health	
	Plastics	Respiratory	
	Rehabilitation medicine	Rheumatology	
	Renal	Transplant services	
	Speech language therapy	Vascular services	
	Urology		

4.2.5 *Sectors involved*

THVCS are predominantly in the tertiary and secondary hospital sectors where services are provided from hospital to hospital. However, there are examples of direct-to-patient services, wherever the patient is located, to their own device from a DHB. For example, TeleDOT (Tele- Direct Observed Therapies) provide monitoring of medication compliance in tuberculosis management (Pye & Westbrooke, 2017). This type of direct-to-patient service is also being developed in some DHBs, for example, Waikato DHB is developing an infrastructure to support any device to be used anywhere with a secure, browser-based link. In primary care, when offered, it is mainly in rural areas connecting satellite clinics. Though again, direct-to-patient services are being developed with some

medical practitioners offering general practice services (Meier, 2018). THVCS also seem to be in an early stage of development in the social care sector. Generally, the sector occurrence is summed up by the following participants,

> Where a lot of VC technology happens at the moment, the patient still has to travel.
>
> Participant 15

> From a primary care perspective, it hasn't been adopted at all.
>
> Participant 3

> …support worker types, not registered and with that sort of workforce and that sort of client base, it's a whole different game, as opposed to a clinician in a hospital, or even a GP in a GP practice. It's very much coal face stuff and the use of technology is absolutely essential in those settings, but we are very much an immature stage in New Zealand for the use of that.
>
> Participant 15

4.2.6 *Technologies*

The technologies used to provide THVCS are varied throughout the regions though they mainly rely on fixed, hardware end points with recent development into more mobile environments using software technologies.

> …transition now is to software-based end points that are more likely to be primarily put into clinic spaces and then there is a bit of work starting from those end points into patients' homes.
>
> Participant 2

The vendors that are used to provide VC are also varied in different areas,

> So, there are a mix of technologies, some other DHBs like Auckland DHB, use Vivid [Vivid Solutions], Canterbury DHB use Vivid [Vivid Solutions], there are a whole raft of different flavours of providers, some people use Spark as their video provider, like the MOH, and other people use Dimension Data.
>
> Participant 19

4.2.7 *Extent of use*

The extent to which VC is used to provide healthcare services remains low with estimates of one to five percent of consultations delivered by VC.

> I sense that all of things are small, so none of them are embedded into somebody's system so it's a big percentage. No one is doing 30 % of anything, or 20 % or 10 %, its probably 2% or 1% of consultations, so it's pretty patchy, all of them.
>
> Participant 7

While participants commented that the uptake is still 'disappointingly low' this seems to be increasing, albeit slowly, with a larger range of services available.

> …you do see a lot more, if we listed all the things that were available 5 years ago, there is a lot more specialties involved for example. Like Southern DHB has got a list of them and there's probably 20, 25 things they are doing. Each one is still new and only very small numbers but it's starting to, it's on the radar of a lot more groups than it was.
>
> Participant 7

4.2.8 *Summary*

In summary, THVCS are seen across a range of healthcare specialities and services in New Zealand with some apparent regional differences. THVCS have existed in New Zealand for more than two and a half decades, though the extent to which it is used remains low. However, there appears to be a gradual increase of use in the last five years.

The next sections explore how THVCS impact the work system for key stakeholders from the perspective of the expert group. This addresses research question two: "How do THVCS impact key stakeholders in the work system?"

4.3 Findings: The impact of THVCS on the work system

4.3.1 *Introduction*

Several key themes emerged from the semi-structured interviews with the Forum about the impact of THVCS on the work system. The work system components include technology, tasks, people, organisation, the environment, and the interaction of these with processes and outcomes. Table 4.3 lists the themes and sub-themes and provides a short explanation of each. The themes interact and overlap but are presented in turn in the

discussion below: 'best for patient', 'dependence on technology', 'new ways of working', 'system disruption' and 'trust'.

Table 4.3 Themes and sub-themes for the impact of THVCS on the work system

Theme	Description	Sub-themes	Section
Best for patient	THVCS influences healthcare that is best for patients and their families	Better for clinician? Patient-clinician relationship Collaboration	4.3.2
Dependence on technology	THVCS effects a dependence on technology	Infrastructure Models of care Funding Vendor behaviour	4.3.3
New ways of working	THVCS impacts on the way healthcare providers work	Models of care Business models Role change Legislation and professional guidelines Challenges with change	4.3.4
System disruption	THVCS disrupts established services	Public health system disruption Consumer demand Business vulnerability Funding disruption Information fragmentation Loss of regulatory control System duplication	4.3.5
Trust	THVCS impacts on public safety, security, and privacy	Safety, security, privacy Ethics Informed consent	4.3.6

4.3.2 *Best for Patient*

The results indicate that THVCS impact clinicians, patients, and their relationships with each other. The sub-themes shown in Figure 4.2, 'better for clinician?', 'patient-clinician relationship' and 'collaboration', interact around the concept of 'best for patient' (i.e. that THVCS are a way that healthcare services can be delivered with positive impacts on patients, their families, and communities). Elements of the positive impact of THVCS on the patients' experience cover five areas: cost, travel, and convenience, worry, quality of care, engagement, and patient satisfaction (highlighted in ***bold italics*** in the following text).

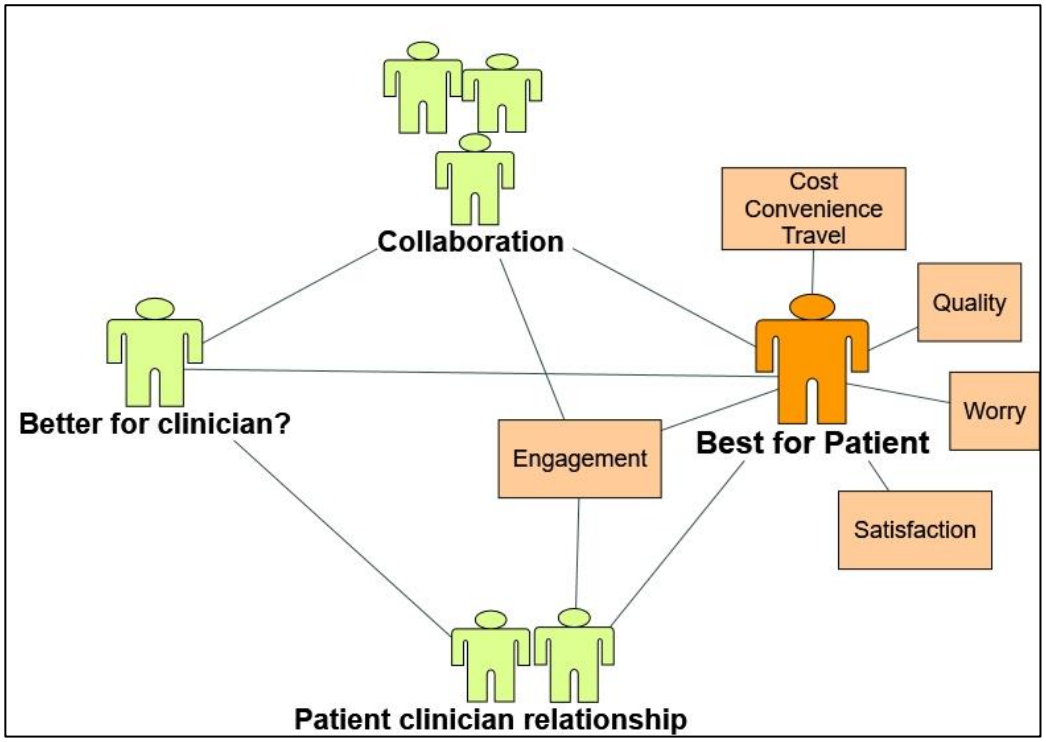


Figure 4.2 Themes around the Best for Patient concept

Not having to ***travel*** or not travelling long distances to attend appointments in person offers ***convenience*** and ***cost*** savings for patients and their caregivers. While there are obvious savings of travel costs, time and in some cases accommodation costs, the savings extend to the wider community in terms of work productivity through not having to take so much time off work. There are additional cost and convenience benefits of not having to arrange childcare, and potentially lower consultation costs for consumers in the primary care sector. The cost, convenience and travel benefits for patients are summed up by two quotes of interviewees,

> We get people coming from throughout the country for follow up, particularly if an oncology or a neuro type of thing and they come, and they say 'ok, you're fine, we'll see you in a year'. And that is a tremendous amount of time and inconvenience to the client as well as right back to the economy of taking people out of the workforce, taking support people out of the workforce, particularly if it's a child coming, those parents have had to leave, take leave, sometimes they have to take their other kids out of school because they have nowhere else to handle it, so there are lots and lots of impacts with that.
>
> Participant 18

> …guy in [place name] who said it would take him all day really, by the time he drove over, found parking, had lunch, whereas he had a telehealth appointment at [place name] to [hospital name], he left his veggie garden and he went to [hospital name], had his telehealth consult and was back in his veggie garden an hour later.
>
> Participant 10

Another aspect of 'best for patient' is ***worry***. There seems to be a positive potential impact on receivers of THVCS through the alleviation of worry. Accessing care through VC means that advice can be more immediate than having to travel to a provider as described by one participant in a primary care example,

> If you only need to see a GP to say 'hey, my baby's just been coughing all night, and I'm a bit worried about it, should I bring it in or should I talk to a pharmacist?' And all you want is a clinical opinion…get an answer quick and a little bit of peace of mind, than ring a GP practice, my GP I can't see for 10 days.
>
> Participant 1

Accessing specialist care from a secondary or tertiary facility from a more remote hospital by VC allows the receivers to be supported by the people that they already know, potentially alleviating anxieties,

> …they know that the nurse is around, or they may stay with them, so they feel safe with a nurse, they feel comfortable in their little own home hospital, makes a difference I think.
>
> Participant 10

Similarly, THVCS can provide reassurance for those that are managing illness at home as described by a participant,

> Safety and support for the patients and that sort of comfort blanket for the patient that they feel that they can do it at home and there is someone available. And it's not scary as it would be otherwise.
>
> Participant 17

Participants, overall, expressed opinions that THVCS are 'best for patient' as the ***quality of care*** can be improved in some circumstances. This tends to be through enhanced continuity of care either through more frequent consultations that would be difficult in-person due to travel or scheduling. In addition, it might be consultations at the appropriate time from a clinical perspective not necessarily adhering to the standard follow-up time

often seen with in-person clinic setting. This is well explained by several participants, for example,

> I say to someone, 'let's get together in a month' and I know that's never going to work because there is no clinic space for three months, I'd feel bad about that, but because of being able to use telehealth I can see them in a month. So, they are getting what they should be getting.
>
> Participant 2

> Some of them are doing speech therapy by VC and they can actually see a patient for five minutes, rather than waiting three weeks to see them, so there can be certainly an improved quality of care.
>
> Participant 11

THVCS is also seen to positively impact quality of care through enhanced opportunities for collaboration particularly in the form of multi-disciplinary meetings as described by an interviewee in the next quote,(see also discussion about collaboration in 4.3.2.1).

> I think particularly in the multi-disciplinary environment and the case review environment you see the benefits in terms of improving the patient journey and those are around sharing decisions.
>
> Participant 6

This collaboration can also involve the patients and their families in the form of ***engagement***. In an example a participant retold an anecdote where a patient felt that there was more engagement in a virtual consultation than with an in-person visit,

> 'Oh, it was wonderful I was on the TV, I was on the TV and the Dr looked at me the whole time. Normally when I go to his office he always on the computer, and he doesn't look at me'. A lady said that.
>
> Participant 11

This is echoed by other participants who feel that offering a service remotely assists in clinical engagement as it shows a commitment to the patient's care. This is expressed by one participant in the following excerpt,

> It also symbolises a greater willingness to be involved. People in small places often have a sense that they were left on their own a bit, or that it's quite easy to disengage from a phone call it's not so easy to disengage from over video, and if you can see the pressure they are under.
>
> Participant 2

Other participants expressed positive effects on engagement from people receiving health services via VC, this may be for privacy reasons or in sensitive situations where consulting someone not in your area and not in person may be beneficial. These ideas are related in the passages below,

> And they even put someone on [a telehealth program], reluctantly, because they didn't think it was going to work, on someone who had actually been quite non-compliant and total change in that person, once we could do it as a [VC consultation], she had more control, she wasn't been invaded all the time and from a non-compliant she actually did really well on the program.
>
> Participant 18

> And different people like it for different reasons, some people if they are hard of hearing they like to be able to turn up the TV, so they can hear, some people feel they're a little bit removed, if it's a psychiatrist or something, from the people, so they'll speak a bit more freely , in person sometimes that's a bit awkward for people…
>
> Participant 7

The previously discussed themes of cost, travel, and convenience, worry, quality of care and engagement all are likely to contribute to ***patient satisfaction***, which seems to be generally positive from the expert group perspective when services are received using THVCS, particularly when costs and benefits are weighed up. An example from a public health service that was shared by a participant,

> It really improved the patient satisfaction, because people weren't coming into their homes anymore, and they weren't trying to tie down times.
>
> Participant 18

Another example was provided by an interview referring to a specialist service provided by THVCS to a rural area,

> The families like it, all our evaluations are generally positive, but like all things they are tempered against what the price would have been to not do it.
>
> Participant 20

Though the Forum members felt that patient satisfaction of THVCS was positive this is moderated with experiences of some people who do not accept THVCS or did not find them satisfactory. The reasons for this seem to be an area which is not well understood. Some comments from participants follow,

> I can't overstate enough how positive the impacts seem to be for most patients, it's not everyone for sure, because sometimes, occasionally people don't have a good experience, maybe they didn't get the information they want, or they would have preferred to have face-to-face but they are in the minority.
>
> Participant 6

> There are few downsides, there are a few people that don't do it or don't do it for whatever reason but for many reasons people like it.
>
> Participant 7

While 'best for patient' has emerged as a clear impact of THVCS for patients and their families in the work system there are interactions between 'best for patient' and 'better for clinician?'. This is considered in the next section.

4.3.2.1 Better for clinician?

THVCS is seen in some circumstances to be better for clinicians. This may be travel and time saving and improved job satisfaction. However, depending primarily on clinician attitudes, THVCS may not be considered better for clinicians. The positive impact on cost, convenience and travel for patients can have a negative impact on clinicians, with an effort shift from patient to hospital to provide THVCS. When the effort required by patients to receive healthcare is recognised and there is a commitment to patient-centric care then this impact is accepted, and there are attempts made to mitigate any extra workload through streamlining processes. This was articulated by participants, for example,

> So it works quite well for them [clinicians] to just turn up to clinic and have people come and go and all the background is run quite efficiently in the hospital but it relies on the patient doing lots of travelling so you have to become more aware of the efforts patients put in to be seen before you want to do something different because it takes a lot more work on the part of a clinician and not even counting the extra work for the system and their booking clerks and that sort of stuff to get their patients seen by telehealth.
>
> Participant 2

The degree to which the effort shift is accepted is partially dependent, on clinicians' attitudes. The variety of attitudes is shown in the three quotes that follow,

> Actually, there is quite a huge saving for patients, and I think the key thing is that not all of the specialists think that way.
>
> Participant 6

> The ones who would be willing to do it at the start would be ones who just thought 'oh this is a better thing to offer patients' – they'd find a way.
>
> Participant 2

> I am not interested in, like I say, it's sounds selfish I guess but from a clinician, from a user perspective I want it to not be any more, and I think that's why, there's sometimes not as much uptake as you might imagine because if people have to fluff around a bit, do their own admin and stuff, then it's, they might want to do it but to get that extra little bit of enthusiasm to get it going is a lot harder.
>
> Participant 20

THVCS as a tool to decrease clinicians' travel is seen as a positive impact on maximising the clinicians' time and decreasing the risks associated with travel (for example, accidents, fatigue, and delays). Clinics run with THVCS may also provide time efficiencies for clinicians. Participants provide several examples of these points in the narratives below,

> I spend between 6 and 8 hours driving so that's unproductive time and it's just how it is sometimes but if I don't go I've got 6 or 8 hours that I can do other stuff.
>
> Participant 2

> It can be safety because a clinician who's travelling in the wintertime, in nasty situations in nasty conditions and if we can reduce some of that it reduces some of the risks of them suffering injuries or something like that on the road.
>
> Participant 10

> We had one [specialist] who was very sceptical at the beginning and ended up being a real advocate because she was able to say, 'If I don't have to fly I can see more patients, I am not so fatigued and it's much easier because I get to sit in my office and do these clinics, not have a big day out in [region name] and I'm not arriving home exhausted for my family'.
>
> Participant 6

Another impact of THVCS for clinicians is a potentially positive effect on job satisfaction. This might be related to feeling good about easing the burden of patients, improving their access to healthcare or through enhanced opportunities for collaboration (see section 4.3.2.3). This is expressed by participants in the next quotes,

> …seems quite satisfying if you can provide a better service to people.
>
> Participant 2

> And I think the clinicians like it from the point of view that Mrs Bloggs doesn't turn up to all her appointments and they are doing their best to help Mrs Bloggs get on top of her diabetes or something but she just can't get through, but this way [via VC] they have got a far more consistent history with her so they can see her every month or whatever, and so they can continue to see what's happening with her.
>
> Participant 10

This positive impact may be moderated by clinicians' attitudes (see also 4.4.4.2). Those, for example, who see the travel as a benefit as related by one interviewee,

> We were talking about running clinics up to [place name], we said we'd be able to reduce specialist travel, we can see more patients, one guy says 'hell, no, I like getting out of this place, I'm not doing that, I'm not doing those clinics, I like getting out of this place'.
>
> Participant 11

Additionally, it can be the clinicians' preference that patients come to them for ease of practice or because of a perceived change in the patient-clinician relationship. This is considered in the next section.

4.3.2.2 Patient-clinician relationship

One perception is that the patient-clinician relationship is altered when using THVCS and an in-person initial consultation is preferred as explained by the following participant quote,

> I feel as though, it is still important to have that face-to-face, that physical connection as your first meeting. Thereafter, potentially you can do it by VC, you can mix and match, sometimes its video, sometimes its face-to-face. And you're still building up that rapport.
>
> Participant 17

The impact of THVCS on the relationship between healthcare providers and receivers is both potentially positive and negative. One clinician suggested,

> Sometimes the fact you can't examine someone means that you are actually chatting more, and you get a lot more information that you wouldn't get otherwise.
>
> Participant 17

While another suggested it is a compromise between disadvantages and advantages,

> …[VC] is fine, it's much better than the phone… it's just not quite the same, you don't quite understand what's happening around, you are not immersed in the environment…so the bit that loses a tiny bit is the personal touch, but not a huge amount and most of the people would say they would gladly sacrifice that to not [drive], depends on how far you are driving.
>
> Participant 20

Interestingly, one participant expressed concern over the change in relationship resulting from using THVCS, creating a less formal interaction and possibly less engagement from people receiving services,

> Sometimes there is a price if there is an informality about telemedicine that sometimes means people, not always, but there is the risk that they might take it less seriously than if they were coming in. It's less of an event, sometimes the whole drama of an event, creates a seriousness which is sometimes is worthwhile. I don't know what the long-term impact of that is.
>
> Participant 20

The potential impact of the change in service delivery mode could also change expectations that may develop in the patient-clinician relationship. The resultant

pressures of this may impact on healthcare outcomes. One participant expressed this idea clearly,

> Often where GPs are coming from is that concern is that if something becomes accepted, patients will be very unhappy if, for example we were having a [VC] consultation and we'd been doing this for a long time and I was a bit concerned and said actually I'd like you to come in and what your reaction might be, 'oh now that's going to be a real inconvenience'. And that almost psychological pressure on the GP to proceed with the VC even when they are uncertain or it is unsafe to do so. So, I think that is a genuine concern from GPs, that the patient's expectation reaches a point that I might feel obliged to act when I don't feel it is safe.
>
> Participant 8

In addition to patient-clinician relationships THVCS can impact on clinician-to-clinician relationships in the form of collaboration. Attention is turned to this now in the next section.

4.3.2.3 Collaboration

THVCS enables enhanced collaboration and sense of belonging to a team when the team members are dispersed. For example, a rural nurse can feel less isolated, seek advice more easily and feel more part of a specialty team based in another location by using VC. This positive impact was emphasised by a participant in the next excerpt,

> The staff who do it with me, [place name], we've been running that one the longest, in fact they love it, firstly our relationships are better now, so we've got a much stronger relationship with those staff who felt a bit isolated in the past. So, they are much more willing to call me and talk and we know each other much better, so actually the telehealth in that sense has been a great thing, we are much stronger as a team.
>
> Participant 20

Access to specialists' advice can also be enhanced with THVCS,

> We have very good doctors but they are more generalists, consultants in the rural areas so they may get something come into the ED [emergency department] and they think I just wouldn't mind a second opinion here and so they will telehealth with the [tertiary hospital] …so they can actually call from the ED room and say to our experts up here…this is the patient, this is what's happening, this is their records, so the ED person up here can either say , 'look get that person on the helicopter and get them straight up

> here now' or …'look you're doing OK, this is how you stabilize them, send them up in the morning' or they may say 'no, no you're actually Ok' , 'we'll stay in touch by telehealth' and you probably can keep them in their own hospital…
>
> Participant 10

In addition, there is easier access to ongoing education using VC facilities and greater contact with off-site specialists that improve knowledge and skills,

> …outpatient telehealth clinic setting, because you are actually getting exposed to the way they [specialists] are thinking because you are sitting there with the patient, it's really helping them work to the top of their scope.
>
> Participant 9

The multi-disciplinary meetings (MDM) using VC are a well-established form of collaboration between multiple specialists in multiple locations across disciplines and are considered a powerful tool for shared decision making, peer support and learning,

> When you attend these meetings, whether it's renal, whether it's tumour streams, whether it's the primary care one and you see the types of thought processes going on, it's that shared peer environment, it is phenomenal to see the benefits, it's very, very clear.
>
> Participant 6

The increased collaboration, extension of role scope and access to professional support has potential impact on staff retention as explained by participant nine,

> Certainly, I think we have held onto staff in [place name] that we may not necessarily have because they like where they are living but they see they have got potential in terms of their work to extend themselves, which in the past reflected a concern that they may need to move to a bigger centre.
>
> Participant 9

The opportunities for collaboration also extend to wider family and carers. Using THVCS to involve carers may enhance understanding of treatment plans and condition management. This may positively impact on engagement as suggested by the next two interviewees,

> It can be used for a wider group can be involved in the conversation, so if you have to do an in-person consultation there is generally the patient and the specialist but if you can do telehealth then actually in the community then maybe the GP can be involved and your

> family…and often they are the best person to understand what the specialist are saying, so it can often be better care.
>
> Participant 7

> …we could also do it (VC link) for family members who are in another city, who really want to know what's going on and the patient might really want them there but previously haven't been able to do that, now we can actually include other family members…
>
> Participant 5

There is a logical assumption and a shared belief amongst the Forum members that increased collaboration and professional support using THVCS, results in better care and is 'best for patient'.

4.3.2.4 Summary

As depicted in Figure 4.2, the themes of 'better for clinician?', 'patient-clinician relationship' and 'collaboration' interact around the concept of 'best for patient'. The findings show clearly that THVCS impact people in the work system. For patients and their families this is mainly through changes to the costs and quality of healthcare. For providers, THVCS can impact on their workload and their relationship with patients both positively and negatively. Generally, THVCS result in increased collaboration between providers which impacts positively on the care patients receive.

Considering the technology aspect of the work system, the findings identified a theme of 'dependence on technology'. This theme discussed in the next section before, 'new ways of working' is considered (section 4.3.4).

4.3.3 *Dependence on Technology*

Provision of health services using VC is, by definition, dependent on using technology in the work system as one way to deliver care. The concept of 'dependence on technology' emerged from the interviews with the expert stakeholders (i.e. THVCS impact on the work system by requiring the use of technology). This concept is composed of inter-related sub-themes of infrastructure, vendor behaviour, models of care and funding as shown in Figure 4.3. The following sections examine these aspects (emphasised in ***bold italics***).

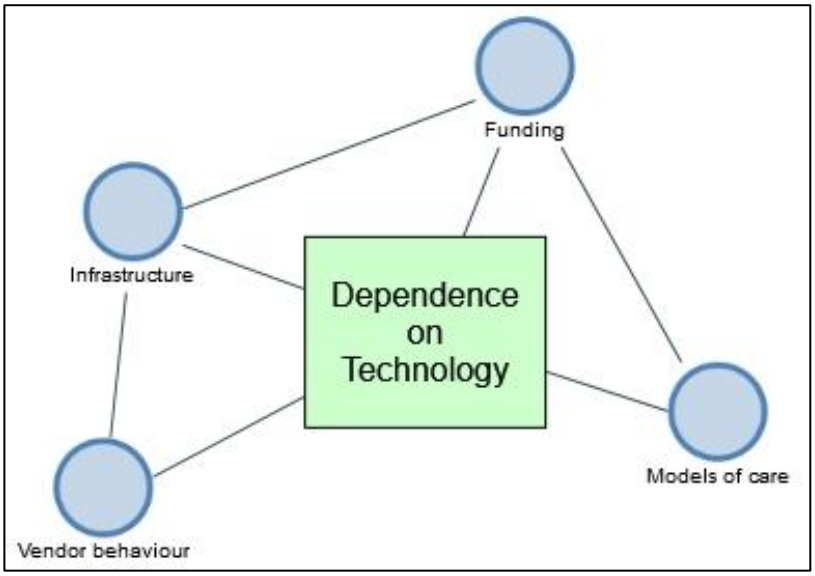


Figure 4.3 Sub-themes around the Dependence on Technology concept

Using VC to deliver healthcare depends on the technological ***infrastructure*** being reliable and available for users to access. In New Zealand, there are areas that are not well served by broadband coverage and this is seen as both a limitation in development of THVCS into peoples' homes and also as a potential impact on the access to healthcare. THVCS may therefore have an unintended consequence of increasing inequities rather than decreasing them, as an interviewee articulated,

> It requires the technology to be more flexible and available, and then you come to the newest social determinants of health, which is broadband Wi-Fi access…One of our key goals is to reduce health inequalities. And what we will end up seeing if the disadvantaged communities don't have access to available and affordable and flexible broadband, it will increase health inequities.
>
> Participant 16

THVCS impact on the wider technological environment with a requirement to work with the organisations that sell and support the technology required. Most participants talked of challenges associated with the varied ***vendor behaviour*** particularly in terms of interconnectivity, the ability of VC users to easily communicate with each other regardless of the system and provider they use. As the demand for services increase and more providers are offering different technologies, some vendors are seemingly unwilling to allow connections from their network to the network of others despite this being

technically achievable. This impacts on the collaboration and support that THVCS have the potential to offer, as a participant explains,

> It's been difficult for us to get our work done when we've got different networks, different systems that we can't connect and by definition telehealth disregards any geographic or DHB boundary, but we run into them when we're with one vendor here and [place name] is with another.
>
> Participant 2

Traditional business models have been based around controlling calls in and out of networks and though there are existing standards and protocols to enable interoperability some vendors have been reluctant to adopt them. As the scope of THVCS expand there is increasing demand for greater responsiveness and usability resulting in organisations looking to other providers for their solutions, an interviewee explains,

> Traditionally there has been a main provider of VC in New Zealand, …and that was fixed and quite expensive so that's a barrier for people taking it up and then it doesn't interconnect with other services so there is a gradually change in terms of providers… that organisations are looking at because they want more functionality and they want more flexibility and they want reduced costs.
>
> Participant 4

Increased use of THVCS alongside the rapid development of technologies such as applications and mobile devices impact on the number of vendors available, the relationships between users and vendors and their business models. This is emphasised by a participant,

> The other aspect is commercial and it's around business model maturity and that's around vendors being open to these business models which are absolutely destructive or disruptive in terms of the old closed and anti-competitive behaviour which we have seen a lot from the large VC providers in New Zealand, so you've got the new upstarts coming through with new browser based technology and business models that completely challenge the old school, and so we've got a very volatile environment at the moment, and in our view, those old school business models need to mature, they need to get with the program otherwise they'll be left behind.
>
> Participant 6

To be successful when it is used THVCS needs to support the ***model of care*** used to deliver healthcare services. A model of care (discussed further in 4.3.4) can be defined as an overarching design for the provision of a particular type of healthcare service (Davidson, Halcomb, Hickman, Phillips, & Graham, 2006). THVCS is noted to have a negative effect if there is a mismatch between the technology and the model of care. As participants noted,

> Telehealth [VC] is just an enabler, it is based on what the model of care is, and so if you are just trying to apply it in the same model of care, that actually may not be right, you need to actually start at 'what's the model of care we are doing and how can it be used to do it?'
>
> Participant 18

> If your telehealth is all about video you'll probably fail. It has to be about treating the patient and either maintaining or training a new clinical model of care and then you use the tools that are appropriate, as appropriate.
>
> Participant 1

Developing models of care that include THVCS require ***funding*** of technology infrastructure, hardware, software, logistics, and support. In addition, there are impacts on wider funding models particularly how the service provided is paid for. In the secondary and tertiary sector, the provision of THVCS technology has created some challenges within and between DHBs. Firstly, coding systems were only able to recognise and therefore receive payment for consultations that were in-person.

Secondly, using a traditional model of care, specialists might travel to another DHB to spend time seeing patients in-person. For this service one DHB would pay the other for the specialists' time and travel expenses. Using THVCS means that no travel is required. As one participant described this has created a dilemma for service managers' budgets,

> The video systems are all in place, but who's paying for what? So currently without VC for outpatient clinics, [name] DHB charges [name] DHB for that doctor to go up there and then they pay his travel expenses for his time. So now he's not travelling he's sitting in [place name], so [place name] says we're saving that money, because he's not having to travel. So now you've got two service managers, one who says they are going to save

> money in their budget for those clinics, and the other one says we're not earning as much in our budget, so they have to renegotiate.
>
> Participant 11

Thirdly, some tertiary hospitals provide services for patients from around New Zealand whose home DHB is different. This requires service contracts between DHBs to outline the financial arrangements. Providing services remotely using THVCS results in a cost shift. For example, the patient may go to their own DHB and use THVCS facilities to have a consultation with the tertiary hospital specialties. Both ends of the consultations require the technology, logistics, and support though the tertiary hospital is providing the clinical expertise. This is explained further by an interviewee,

> The other issue that we've had, and we are just now solving is that a lot of our work, or 50% of our DHB work is done for people who don't live in our DHB. Which means that the funding for those people comes from other DHBs. Which means you need to have the contracts with those DHBs to deliver the care so that has actually taken a long time to work through as what the contract is and working out a pricing for telehealth-type consultation. Because telehealth shifts where the costs are actually. When they send them to us, it is our cost for meeting rooms and doctors and everything else. When you do a telehealth [consultation] you've got bits and pieces on both. Because they turn up in their local DHB, or we do this into the homes as well from time to time, so it's what services they are willing to buy too.
>
> Participant 18

Fourthly, using THVCS may be a way to increase collaboration between primary and secondary care providers, or to have a specialist consult with a patient at their local general practice clinic. Using THVCS in this model of care has potential impacts on funding. As these services are not yet well-developed Forum members speculated on these issues,

> To say to patients, look don't come in here [hospital] go to your GP and the GPs were willing to do that, it would be really interesting to see how that would be funded because the GP would say well I'm providing this space for this patient to come to but they are coming to a public hospital appointment so would the patient pay the GP or does the DHB pay the GP?
>
> Participant 2

Fifthly, in primary care when the services are partly funded by the public health system it relies on a remote consultation to be considered equally to an in-person consultation in terms of funding. This does not always seem to be the case as this participant outlined,

> Often for GPs, it depends on how funding contracts are interpreted. In a lot of regions, GP receive funding, their contracts are run from the DHB, PHO and all those incredibly complex mechanisms, for a consultation, and in many parts of the country that is interpreted to mean that the person has to be in the same room.
>
> Participant 8

Despite this, using VC technology for primary care in a private healthcare model is seen as a simpler from a funding as the health providers can charge the patients a fee directly. However, THVCS remain not well developed in the primary care sector.

THVCS impact on the work system through a dependence on technology. Using technology as a tool for providing healthcare services changes the way the work is done, and this is further explored in the next section.

4.3.4 *New Ways of Working*

THVCS compel 'New Ways of Working'. This was another key concept that was drawn from the interviews with the Telehealth Forum members. This includes change in the model of care and business models, role changes for people working in the system and adjustments of professional practice guidelines and legislation. In addition, 'New Ways of Working' are associated with challenges of change. These themes are depicted in Figure 4.4, are discussed in turn and highlighted in ***bold italics*** in the following text.

As previously discussed, delivering care using THVCS impacts on the ***model of care***. This change is best undertaken with examination of the needs of the service and ensuring that using the technology is the best fit for the service goals. Participants related examples of failure when the model of care wasn't considered alongside the implementation of new technology,

> Unfortunately, people got enthusiastic about it and they started trying to shoe horn videoconferencing into telemedicine, where it didn't fit…The business model hadn't really been thought through. And so, that was an example of saying 'yah we've got video' let's try and make it do everything.
>
> Participant 1

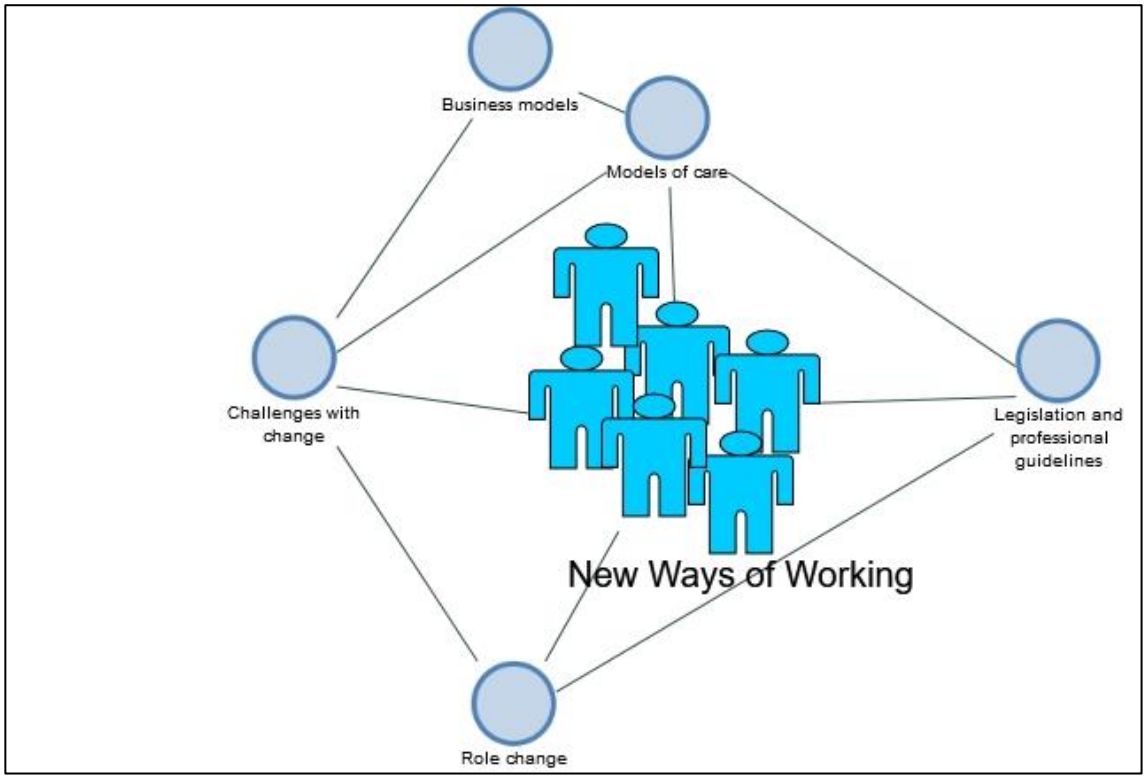


Figure 4.4 Themes around the New Ways of Working concept

The importance of using technology to support the model of care rather than using technology for technology sake was emphasised by participants, along with considering the ***business model***, the plan of the organisation to meet its goals. These goals might include increasing access, improving attendance, reducing waiting lists, improving efficiencies, enhancing the patient experience and better use of resources. Participants explained that the technology enables the model of care as does the business model and the fit between these elements is vital. This is summed up by a participant,

> Looking at what they were trying to achieve business wise was what was important it wasn't about the technology. It was about finding the technology that could support that.
>
> Participant 1

The impact of THVCS on the care and business models necessitate and offers some ***role change*** for those involved in the work processes. For clinicians delivering THVCS there is an adjustment to make in the workflow processes and relationships that may be different virtually than in-person. In the secondary care sector there is often another clinician with the patient at the 'other end' of the consultation, so some information is conveyed via this person, for example, blood pressure measures and weight. The clinician

with the patient may also need to do further physical examination. This requires a shared responsibility for the consultation, good communication and trust between practitioners. This is well described by a participant,

> …they've got to be able to tell me what they can do, and I've got to be able to, I guess, to be sure that they are doing something competently because if I ask someone else to examine a patient and tell me, we are both taking a bit of responsibility. So…we're kinda sharing it, it's not passing from one to the other, its sharing it and being responsible for aspects of it.
>
> Participant 2

In addition, using media to deliver a service presents an extra dimension to the patient-clinician relationship which requires training and adaption. Participants expressed opinions that THVCS impact positively on the opportunities for nurses, nurse practitioners, allied health professionals and medical practitioners by offering potential for expanding roles and scope. Professional resources may be better allocated using remote consultations to account for shortage in specialists, over-flow management and reduce travel. Scope of practice may expand with the extra support available through VC and the additional positive impacts of THCVS on professional development and collaboration (discussed in 4.3.2.3). THVCS have also resulted in the creation of specialty roles such as telehealth coordinators and telehealth programme managers providing opportunities for people in some areas.

THVCS also have an influence on the roles of booking clerks and other support staff who are required to learn how to schedule and support a consultation via VC. Some participants talked of some apprehension from these roles with a concern over increased or changes in workload. This is articulated in the following quotes,

> They will have to facilitate it and it can be time consuming for them [booking clerks] because instead of just booking a room, and sending out a letter and the patient comes in and the specialist comes in, they may have to book up to 3 rooms and 3 different people…
>
> Participant 14

> …for our OP clinics I suspect there is an element of concern about their jobs particularly our booking clerks…if we push services out into the community what does that mean for my work, I don't know whether that's something that they voice but I certainly know that there is a certain amount of reluctance, becoming involved in those booking processes, and they are absolutely vital for that.
>
> Participant 9

Much of THVCS are technically supported through IT departments and IT professionals and technicians. The roles of people in these areas may be enlarged as expertise is required in media, audio-video and visual communications areas which is not always typical of those in an IT position, as one participant describes,

> IT people typically, your hard-core traditional IT people are not media people. So it's taken, it's a slow process in getting them to have an interest in, or to understand, any of the video-based stuff…
>
> Participant 11

In addition, new ways of working impact on ***legislation and professional practice guidelines***. The MCNZ set the standards of clinical competence, cultural competence, and ethical conduct to be observed by registered doctors. In 2016 the MCNZ 'Statement on telehealth' (Medical Council of New Zealand, 2016) was reviewed and updated to reflect the changes in the sector. The statement provides general guidelines for doctors practicing telehealth. The key principle is that doctors providing THVCS are expected to provide the same standard of care as they would provide in an in-person consultation. Other professional bodies have either generated their own position statements on telehealth or are working towards this in anticipation of the broadening of scopes of practice and changes in models of care. The participants generally found the MCNZ statement on telehealth to be helpful to set nominal standards and expectation for professional involvement and protection of the public. THVCS remains impacted upon by prescribing regulations, as explained by a participant,

> The medicines regulations require currently that for a prescription to be legal it has to be handwritten so that means even though the consultation can happen via video a doctor still has to write a piece of paper and that has to be delivered to the patient who has to go to a pharmacist, so you have this very archaic three-step process for a patient to obtain a medicine from a video consultation.
>
> Participant 8

This is particularly limiting for the primary care sector where video-consultations might occur without a clinician at the patient end, so the impact of legislation depends on the model of care.

Alongside impacts on models of care, role change and professional guidelines, the theme of ***challenges with change*** emerged from the interviews as an interacting impact of THVCS on new ways of working. The difficulties of moving to new ways of working include technology reluctance, risk aversion and the demands on time. These points are more fully discussed as implementation facilitators and barriers in section 4.4.4.

THVCS impact on the work system by requiring new ways of working. More broadly these new ways of working may have a disruptive impact on the work system. The disruptive potential of THVCS on established services is considered in the next section.

4.3.5 *System disruption*

Technology enables a change in business model which necessitates new ways of working. As well as the impact this can have on work processes and roles, as discussed above, THVCS have the potential to disrupt established services in the wider health system. It was acknowledged that this can be positive or negative,

> …that sort of technology [Babylon health] is coming to New Zealand whether we like it or not and it's a disruptive technology and it can be disruptive in a good way or a bad way.
>
> Participant 1

The participants discussed system disruption in terms that can be grouped into interrelated points of public health system disruption; consumer demand; loss of national control; business vulnerability; funding; information fragmentation; and duplication of systems (Figure 4.5), which are discussed together in the following sections.

Interviewees talked about the likely influence from THVCS providers from outside of New Zealand, particularly in the primary care area, and that these external pressures may force a change in paradigm for health service provision. This change is also likely to be pushed by consumer demand. If THVCS providers from overseas, or in New Zealand but outside the current model of primary care, are to gain a foothold in the market this may reflect that consumers are seeking the service that best fits their needs. This is alluded to in the following quote,

> I guess that's their choice to do that, but maybe they are doing that because they don't get offered that opportunity here [to have THVCS] by their usual doctors.
>
> Participant 2

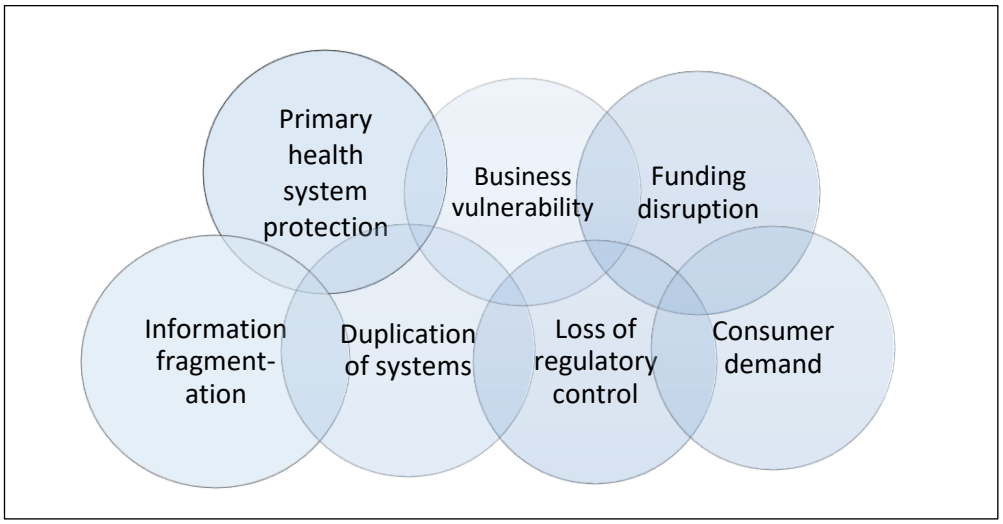


Figure 4.5 Possible elements of disruption from THVCS

The current challenges in the healthcare system may also provide opportunity for disruption through the introduction of technology enabled models as the current model struggles to meet the needs of stakeholders. For example, the next two quotes indicate areas of concern,

> If I was looking at the health system at the moment…I'd say I am not going to come up with a solution that is based on the public sector, I'd be looking at the private sector, the insurers and the Babylon-type approach and or going off shore.
>
> Participant 15

> We've got to change, we can't afford our distributed [spread] [healthcare] system anymore. And there is no way, shape, or form to think are we going to get away with no

> changes in structure in the health system. Because we are in a structural deficit and if you've got structural deficit you've got to change the structure.
>
> Participant 16

Concurrently, there are concerns about protecting the primary health system and ensuring that technology does not increase fragmentation and inequities of access to care. This is expressed in the next quotes.

> I think in New Zealand we need to value and look after our primary care system and, put other tools into it, like telehealth, but not separate it off.
>
> Participant 2

> And I certainly think that we need to be very careful not to leave anybody behind and I think we need to be careful in our provision that we don't, particularly in primary care, that we don't create services which only people with income and devices can get. Because this technology does have the potential to increase inequity.
>
> Participant 9

Along with this is the possible resultant lack of regulatory and professional control over practitioners and the quality of care they deliver. This has implications for patient safety (see also 4.3.6) and is elucidated by the following participant quotes.

> If you are a New Zealand based GP then you are held up to the highest standard but if you are providing those services from off shore or you're a large multi-national, then you can flout the law, or skirt round it or ignore it really.
>
> Participant 7

> A whole lot of companies that just tout for business from the general population to come and have their stuff done by telehealth and so that removes them from a primary care system and because they [the patients] are paying I think there is a driver to answer their question on telehealth even when you might be exceeding the capacity of that technology.
>
> Participant 2

The ways in which THVCS impact on funding models, creating issues around who is paying in the secondary sector, has been previously discussed. In addition, THVCS providers may disrupt funding models in a broader sense. For example, questions may be asked about capitation-based payments (funding based on the numbers of people enrolled in a Primary Health Organisation) if someone is registered with a New Zealand based GP but using THVCS from another provider. The disruption of the funding model

can also extend to disruption of the structure of the New Zealand workforce creating business vulnerability for private practitioners. One participant uses an overseas experience to exemplify,

> UK [United Kingdom] Babylon, anecdotally, has caused some rural GP practices to shut down because a lot of their patients could get their consultations at a very low price via Babylon Health.
>
> Participant 1

THVCS also have the potential to fragment the information that is available to healthcare practitioners. There are implications for patient safety in fragmentation of health records. For example, if a person receives healthcare from an overseas provider or a provider who is not a person's regular GP there may be no record of the THVCS consultation leaving a gap in the health record. One participant explained the situation in the quote below,

> It's going to happen if you look at the overseas providers, they are already in the market, they are already doing consults in New Zealand, but they are never recorded against the New Zealand [health] record.
>
> Participant 3

Fragmentation of wider systems can also be from the duplication of systems when THVCS are introduced or developed. One example provided was a DHB and a PHO in the same geographical area concurrently developing technology applications that included THVCS and had similar functionality. Participants attributed this to competitiveness between various health providers, lack of positive collaboration and lack of a consistent approach. Despite the apparent inevitability of external influence and disruptive influences, the importance of keeping up with technology introduction to minimise any negative effects was emphasised. The sense is that the New Zealand system should work to achieve the technology enabled models of care so as not to 'have things done to us', highlighted with the next quote.

> We don't necessarily want how it is going in the US, for example, so I think that it just means that we need to be pro-active in the public health system and say actually 'how are we going to use this within our health system because we don't want it coming from the outside and disrupting necessarily. We, the public health system, needs to keep up with where this is going and work out just how to do it well within our system.
>
> Participant 5

Generally, the consensus is that potential for system disruption from THVCS should be anticipated, managed, and used as opportunities for improvement of service delivery. This is summarised in the next quote.

> If the leadership and the health providers are pro-active about adoption then…we should be thinking about how to not blow the rural GP workforce apart. We should be thinking about all the things that can be the negative side of the disruption caused by telehealth and to sort of mitigate all those risks up front, think them through and mitigate them.
>
> Participant 1

THVCS have the potential to be a disruptive influence in the New Zealand health system according to the expert group. This may also have an impact on trust in the system and this theme is explored now in section 4.3.6.

4.3.6 *Trust*

THVCS impact on public safety, security, and privacy to varying degrees according to the participants. The theme of trust encompasses safety, security, and privacy in technical and clinical areas. These are linked to the notions of ethics and informed consent and are all underpinning trust. These connections are illustrated in Figure 4.6 and are discussed below with the key ideas in ***bold italics***.

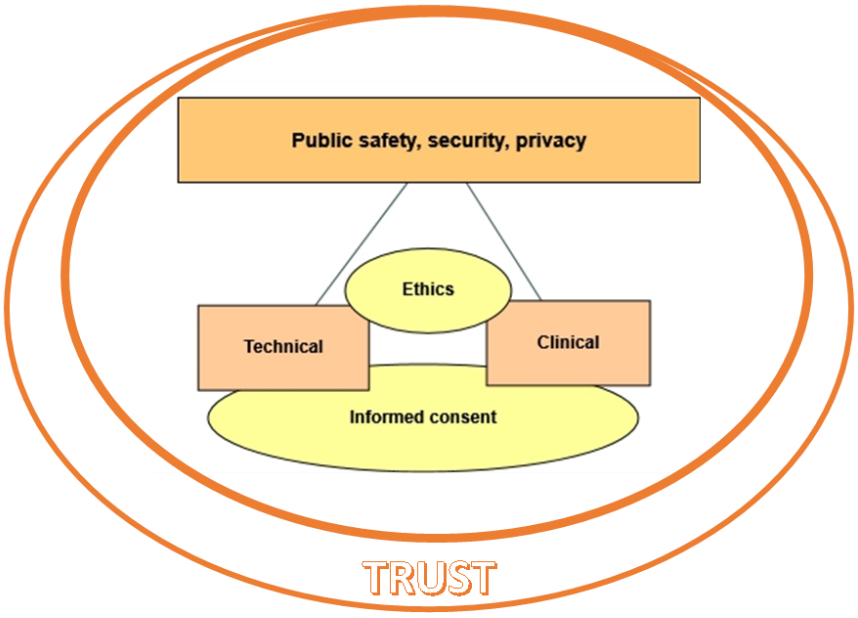


Figure 4.6 Safety, security, and privacy themes

The ***technical security and privacy*** risks of THVCS are not seen as a key impact on patient stakeholders by the Forum experts. Participants suggest that overall the risk was low, and patients were willing to accept this to receive a service they feel is beneficial, as described in the following quotes,

> I have to say probably the fears around privacy and stuff, if you look at them at a very pragmatic level the risk is relatively small and for the average patient, they are not particularly worried.
>
> Participant 20

> There is a lot of talk about security and a need for privacy, but the reality is that most patients given the choice will consent to having a VC call as they consent to having a phone call. If someone is there to help, they just go 'yep', this saves me money, this saves me travel time, this gets me an answer now.
>
> Participant 6

However, there is an acknowledgement that there is increasing risk as the volume of services increase. This brings with it a need to protect privacy and data security through robust technical mechanisms such as encryption, private networks and development and compliance with technical standards and regulations. Moreover, underpinning safety, security, and privacy of THVCS needs to be trust. This is trust in the security, privacy, and quality of the technology and in data storage, access, and use. This is summarised by an interviewee,

> It comes back to the confidence and safety and security of how the data is stored, who's got access to it, whose doing what with it. To me that's just a building block of insuring that the technology or the model, gives confidence to the users of it. Because why would you have a model of care that has a lack of confidence. We go to our GP and we trust that our GP is not going to tell other people about us.
>
> Participant 15

Ethics are important from a technical perspective in ensuring that the consultations are private, and that the patient knows who is present. One participant explained this,

> Other systems you can have people observing, so I would want to make sure that, [and] there are also regulations that say that, there will either be a two-room virtual meeting room or a 3-room virtual meeting room so you can have yourself and you can have your father in Australia join in for a consult but it must be exposed to the patient.
>
> Participant 19

In addition, the quality of the THVCS technology can impact on ***clinical safety***. The quality must be acceptable to both parties so that clinicians and patients can see and hear each other well enough to convey relevant information. The standard of care provided should be equivalent to an in-person exchange and the use of the technology should not compromise safety. This is a key remit of the Medical Council of New Zealand's Statement on telehealth (Medical Council of New Zealand, 2016). One important aspect of THVCS is the inability to physically examine a patient when it is necessary. Mitigating this risk relies on robust clinical decision making to select appropriate cases for the use of THVCS and ensure there is appropriate support. For example, the ability to use other health professionals with the remote patient to conduct any physical examination that is necessary or to discontinue a consultation and change to an in-person model of care. ***Clinical ethics*** also play a role in this process and it is important that clinicians discontinue a consultation when they feel that it is in some way limited by using the technology. There may be real or implied pressures to this, for example from a paying consumer as expressed in the quote below,

> Because they are paying I think there is a driver to answer their question on telehealth even when you might be exceeding the capacity of that technology.
>
> Participant 2

The complexities of this are explained in the quote below.

> So even though you can see people you can't see them the same, so you might miss some things that are subtle, you've got to be really careful in the consultation if you think well, I would actually examine them now, if they were here, that you don't dismiss that but you find a way to complete the assessment and so it's tempting, because you think well actually its quite a lot of, how would I do that, I'd need to get them to come here anyway, will I be letting them down if I then say "come and see me personally".
>
> Participant 2

Similarly, patients should also have the right to discontinue a teleconsultation in favour of an in-person one. This choice is part of the ***informed consent*** process. Patients should be provided with a clear explanation of the THVCS process, the technology, and its potential limitations, including that it may be necessary, or they may wish to discontinue the video-consultation and reschedule an in-person assessment. In addition, information should include who will be involved in the consultation, what will happen with audio or images and what recourse patients have if something goes wrong in the course of providing care using THVCS. Finally, patients and their families should have the opportunity to have any questions they may have addressed.

4.3.7 *Summary*

Exploring the impact of THVCS on the work system through the perceptions of the expert stakeholder group has been discussed across the themes of 'best for patient'; 'dependence on technology'; 'new ways of working'; 'system disruption' and 'trust'. These themes were summarised graphically in Figures 4.2 to 4.6 in the preceding sections 4.3.2 to 4.3.6. The findings show that THVCS impact people in the work system. This impact is through changes to the costs and quality of healthcare for patients and their families, and the workload and relationships with patients for providers in the 'best for patient' theme. Positive impacts of THVCS are evident in increased collaboration between groups of providers. The findings indicate that THVCS impact on the work system through a dependence on technology. This has implications for infrastructure, relationships with technology vendors, the models of care and funding used and developed for THVCS. As a 'new way of working', THVCS has implications across the work system. These include changes to business and care models, role changes for providers and other staff in healthcare organisations, legislative and professional practice guidelines, and the challenges associated with change. Moreover, THVCS can create disruption to the healthcare system as a whole and the participants perceived risks to primary care, business, and regulation with potential resultant fragmentation, duplication, and funding issues if there is not action to anticipate and manage any disruption. Finally, the findings elucidated that while the impact of THVCS on public safety, security, and privacy is considered low by the expert participants, there remains a need to consider the implications of using technology in terms of clinical and technical safety, ethics, and informed consent and develop trust in THVCS for providers and receivers. The themes

emerging from the perceptions of the Forum members are interrelated and interact, suggesting that THVCS have a significant impact on the work system, processes, and outcomes for providers, receivers, and the wider healthcare system. Attention is now turned towards exploring the facilitators and barriers to THVCS for key stakeholders.

4.4 Findings: Facilitators and barriers for THVCS

4.4.1 *Introduction*

This section presents a discussion of the analysis of data from the interviews with the expert stakeholder group related to the factors that act as facilitators or barriers to establishing and maintaining THVCS for key stakeholders. This addresses research question three: 'What are the facilitators and barriers to THVCS for key stakeholders in New Zealand?'. The three key areas of barriers and facilitators of THVCS, which were identified in the analysis are considered in turn in this section starting with 'business case' (4.4.2) and 'leadership' (4.4.3) before practical implementation is considered in 4.4.4 and the section is concluded with a summary (4.4.5).

4.4.2 *Business case*

A business case is identified as an important facilitator to adopting and sustaining THVCS to outline the expected organisational or patient benefits which reflect positively on the goals of the organisation, as outlined by a participant in the quote below,

> So, the first thing is you really need a good, solid business case and it should be the projections and, we all talk about equity of access, that's the really important thing and quality of care, that's the important thing.
>
> Participant 11

> I am still a great believer in money, and a business case, because the health pie is only so big…So you have to do a really good job of demonstrating, that's number one.
>
> Participant 11

Not having a robust business case was considered a large failing in one case described by an interviewee,

> One of the disappointing aspects with [name] DHB's virtual health app was that it had cost millions but there had not been a comprehensive business case put together before purchasing the health app.
>
> Participant 13

Participants discussed many projected benefits of THVCS for organisations and patients and these are shown in Table 4.4. However, they also highlighted the current challenges with developing a business case that facilitates the development of THVCS programs. The challenges can be summarised into the five main areas which are shown in Figure 4.7. These are discussed in turn in a clockwise direction, beginning with 'quantifying benefits', in the next paragraphs.

Table 4.4 Expected benefits of THVCS

Organisational benefits	Patient benefits
• improved use of staffing resources, access to expertise • risk management in the reduction of clinicians travelling • lower cost for consultations • increased number of patients seen • reduction in waiting lists • reduction in fleet vehicles required • improved organisational reputation -'fore front' in service delivery • reduction of non-attendance • improved team interactions, staff developments, clinical support to remote sites • reduced pressures on physical infrastructure • reduced national travel assistance cost • avoid non-compliance with waiting times • efficiency • environmental benefits (less travel) • infection control	• improved patient experience, a better service • improved access to care • cost savings • time savings • convenience • infection control • less risk associated with travelling

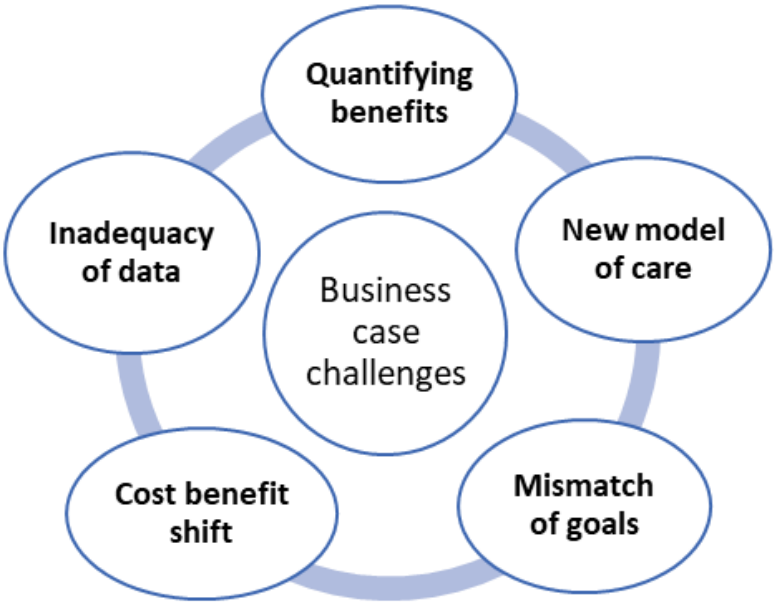


Figure 4.7 Business case challenges

First, it is difficult to quantify some of the benefits of THVCS, for example the patient experience or team interactions and development, as explained,

> The trouble with telehealth measures is that they are very, very hard to quantify, it's very hard to quantify a business benefit and a financial benefit and I think to a certain extent there often isn't one. They are pretty soft benefits and trying to capture those isn't easy and we perhaps don't highlight those as much as we could.
>
> Participant 9

Second, as a new model of care it may not fit into the current cost-benefit analysis processes that organisations use. This is described by a participant,

> Most of the benefits of telehealth are very difficult to quantify. You can say 'hey look, we know', we did quite a detailed evaluation with [service name] a couple of years ago and looked at the whole amount of use, but we couldn't compare apples with apples because the service didn't exist prior… because telehealth is new, and wasn't on peoples' radars before, trying to fit that into a comparative cost analysis is quite tricky.
>
> Participant 6

Third, outcomes that organisations seek are not necessarily those that can be delivered using THVCS or do not have the highest priority to those providing or receiving the services, resulting in a mismatch of goals. For example, outcomes that focus primarily on cost as described by these interviewees,

> I think they [the DHB] see the use of telehealth as a way to save money, I am not seeing it that way, it may even cost them more but the outcomes may well be better if you look at the whole health service rather than a particular section of it.
>
> Participant 17

> There is a general enthusiasm for this stuff, again as I hinted at before sometimes I think sometimes the enthusiasm is in the wrong, everybody wants patients to start to get care closer to home and good quality care but I think sometimes though they are more motivated by the thought that it might somehow save money.
>
> Participant 20

Fourth, the business case for a service typically justifies the investment for the organisation. However, THVCS has two ends of a service: the provider end and the receiver end; and often the financial benefits can more easily be demonstrated at the receiver end. In order to facilitate THVCS the organisation must value broader outcomes such as improved patient access or experience. One participant describes this as a cost-benefit shift,

> It's what we call a cost-benefit shift. So the cost of providing the service will be the provider's cost, the benefits often are accrued at the patient end and to try and quantify in a business case, or to get people to say 'well, the patient's saving money, well ok that's fine'. The question is at this end. So it's costing us for the equipment, for the infrastructure, and the workflow and everything else and the patient's the one whose benefitting but we don't see that, we can't see that.
>
> Participant 11

Fifth, the participants noted difficulties with presenting a business case due to the lack of robust metrics around THVCS in New Zealand to demonstrate its effectiveness. This was explained by one interviewee,

> I am not aware, and I've asked the question, where are the business cases, or the case study, that prove that the use of virtual consult are more effective than not using it? So intuitively we say yes, oh they must be and a clinician like [name] says yes they definitely are.
>
> Participant 15

Along with a lack of relevant evidence base there has been limited ways to measure THVCS usage to help build business cases. Recent efforts to add 'by VC' to the coding systems DHBs use to collect data on the mode of service delivery is seen as important.

However, the uptake of the system has been difficult and variable across the country, as a participant describes,

> So we've got a case where six DHBs are using it, but inconsistently and the information's not really that reliable, the others ones are either not using it and we'd better find out why they aren't using it…because the system hasn't been updated, or because the training hasn't been there, or the instructions haven't been there. After two years, it is all well and good to develop this stuff but you have to have the follow through. It's the compliance, and we're not getting the benefit, the value proposition of that data so that's going to be a bit of an effort on all parts to try and get that uptake improved.
>
> Participant 10

Some organisations have developed their own patient-focussed metric framework gathering data such as patient travel distances, time spent and number of hours of use that specialities use THVCS. Other organisations are just beginning to ask questions around 'how many people want to be seen by THVCS and how many could be from a technical perspective?' This allows information sharing to executive boards and leadership teams and can be used for business cases and to benchmark THVCS alongside other areas to stimulate use or to investigate differences. This idea is expanded by a participant's quote,

> And also to be able to benchmark over time so that if cardiology here are able to use VC 50% of the time, then what about cardiology in Christchurch, what about cardiology in Northland it should be able to be roughly the same and if we see, great increases or great decreases in usage within the DHB over time then what's happened there? Why has it increased? Why has it decreased?
>
> Participant 14

A business case based on solid figures is seen as a facilitator for THVCS. However, a strong business case is not a guarantee of support for a THVCS program. This typically also requires leadership, and this is discussed now.

4.4.3 *Leadership*

Aspects of leadership are seen by the participants as a facilitator of THVCS, and limitations of leadership as a barrier. Leadership can be high-level governance and ground level champions. Governance can be at a national level or organisational level. Generally, participants see setting a strategic direction at an organisational level important

for facilitating THVCS, particularly in terms of financial and human resourcing as described below,

> He came in saying that we needed virtual healthcare and when the CEO is saying you need virtual healthcare, the money is a little easier to obtain and the staff come on board just a little bit easier and that sort of started, his directive actually got it started.
>
> Participant 10

> That obviously is top down and there needs to be that support and there needs to be what used to be the old expression 'the leap of faith'. If you have CEOs, like for example, [name] DHB's [name], he is a leap of faith leader, in terms of he [says] "give me a half way decent business case, go make it happen, and come back to me and show me that it works". But he has shown some leadership.
>
> Participant 11

National governance is perceived to be lacking in tangible action. The National Health Strategy (Ministry of Health, 2016) is acknowledged as supporting innovations such as THVCS in the concept of providing healthcare 'closer to home' but there is a perception that without 'walking the talk' with action and resources this is not currently an important facilitator for developing services. This perception is illustrated by these participants,

> I am not seeing from the Ministry yet really a shift that will encourage and give confidence to the adoption of new ways of providing care and the changes to the business models and then the technology needed to support all that.
>
> Participant 15

> You know the 'care closer to home' and all the wonderful catch phrases. Great catch phrase, resources for that nil.
>
> Participant 17

Clinicians, usually doctors, that have an assigned telehealth role in an organisation are considered important to facilitate THVCS. This is seen as a clear link to success as one participant states,

> You look at the DHBs that have been successful or are having some success, in general, they have a telehealth lead.
>
> Participant 1

Clinical leaders or clinical champions are seen as critical to developing and building THVCS by sharing knowledge, experience and being role models. This is summarised by one interviewee,

> Clinical leaders of innovations are just the most important part of change management basically because they understand what the issues are, and they can address them appropriately and they can communicate that to their peers way more than project managers and technology people can.
>
> Participant 5

Quality leadership seems to be an important facilitator of successful THVCS particularly in the initial development stages. Embedding THVCS in business as usual depends also on effective implementation of the services. This is considered in the next section.

4.4.4 *Implementation*

The themes that emerged from the interview data as facilitators and barriers of THVCS for key stakeholders that are related to implementation fall into four interrelated areas of: co-design; clinician attitudes; excellence experience; and logistics and support. These components are illustrated in Figure 4.8 and are discussed in the sections below (4.4.4.1 to 4.4.4.4).

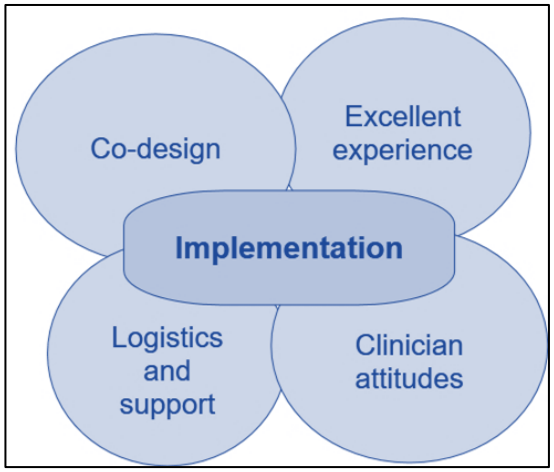


Figure 4.8 Components of facilitators and barriers in implementation

4.4.4.1 Co-design

Implementing a service that will be successful is facilitated by using a co-design approach. Participants emphasised that without the buy-in of clinicians there will be no service. This is highlighted by one participant,

> So if the provider doesn't back it, then a provider doesn't want to do it, and the provider can't see the way they can do it within budget, it simply isn't going to happen.
>
> Participant 11

Involving those responsible for planning and funding is also important if the service is to be sustained practice so it can be designed and planned as a 'business as usual' service from the outset. In addition, during the design stages a collaborative and iterative approach is likely to have a more successful outcome. This is particularly important between technology and health providers. One participant related an example,

> It's one of those things where you have people with bright ideas who aren't necessarily clinical, putting in technology thinking that will solve things when actually they need to involve…they did involve, but they didn't listen. There was clinicians and others at the coal face saying 'hey it doesn't work it doesn't do what you're saying, it's not user friendly'. I think that is one of the issues, where we've learned that there is no point saying is here's your VC unit, here's your VC, here's your telehealth system, go away and use it, it's a case of 'well what do you do, how can we do it better how will this fit into what you do?' That's a far better way of doing it.
>
> Participant 17

In addition, implementation of THVCS is facilitated by a robust change management approach. Interviewees described entrenched ways of working, a need to think differently about ways of working, a requirement to have support for change and for change management processes when THVCS is introduced. For example,

> Dealing with clinicians, and I don't just mean doctors, I mean anyone in the clinical service, it's like herding cats of varying sizes so unless you've got buy-in, it's not going to happen, it doesn't matter who says it...and again that's been something we've discovered, it's a change process and if someone's willing to change, willing to do something differently it will happen.
>
> Participant 17

A key barrier to implementation is often seen as the busyness of the health system. Those who work in it feel that they do not have the time to introduce anything new, even if they appreciate it may be beneficial in the long term. This is emphasised by interviewees in the following quotes,

> These things do need to be thought through so if people are nose to the grind stone trying to survive on a daily basis then you come along with the best idea in the world it might be just a lack of time in which to think that holds you back.
>
> Participant 6

> Trying to put a new thing into already tight services so it does take a fair bit of time and effort to get it up and running and there's not a whole lack of slack in the system.
>
> Participant 2

In order to facilitate the introduction of a service collaborative support and resourcing, both human and financial, is required at all stages. One participant described the poor outcome of a project when this was not done,

> They put all the equipment in and then the people sat around, it sat there for about a year without very much being done with it because the planning hadn't been there, you take nurses, they've got a full time job, so you've got to allocate people to properly carry out a pilot and to give them the time, to do it properly, to do the analysis, give them a project manager and that's the stuff that nobody spends the money on.
>
> Participant 11

Consumers of healthcare also can play a role in facilitating THVCS. Two interviewees described examples of patients driving the use of technology which encouraged reluctant providers to adopt technologies to deliver services. These anecdotes are related in the excerpts below,

> Our families were traveling eight-hour round trips to see me… so we kept saying we were going to do it…it takes a little bit of effort to get going, these things are still not really straight forward sometimes… and especially when no one else is doing it, and but in the end the final kick for us was one of our families who lived in [place name] saying 'I don't want to, I want to do my next appointment by VC', so we were alright , better do it.
>
> Participant 20

> We have an older nurse workforce in public health…and so the use of technology for some of them was a little bit foreign so we decided…to use a video-telephone in the

> homes because that's what South Australia had done, so the nurses felt more comfortable if it had been done there then we could do it here. So we started the first two patients on the video-telephone and very quickly the patient said 'look, why can't we use the computer, we can Skype'.
>
> Participant 18

Ensuring provider buy in, facilitating co-design and change management processes helps with successful implementation of THVCS. The degree to which this is achieved depends, in part, to the attitudes of clinicians and this is discussed now.

4.4.4.2 Clinician attitudes

Five main points are identified as key clinician attitudinal barriers to implementing THVCS: a reluctance to change the way they work, aversion to risk, technology reluctance, stage of career and patient centricity (emphasised in ***bold italics*** in the discussion below).

Firstly, the participants attributed negative attitudes to a ***reluctance to change*** the way they work and a different way of practicing, as this next quote suggests,

> A lot of clinicians and it doesn't have to do with age either, a lot of people have been practicing in a certain way and then they feel that VC is a different way of practicing and just reassuring them that it's not a different way really, it's just a different mode of delivery.
>
> Participant 14

There can also be a reluctance to change their business models as is described in the following excerpt,

> GP practices frankly, one of the inhibitors at the moment is primary care and GPs in particular. They are a really good example of a business model that the majority are fighting like crazy to maintain, retain, whilst at the same time the technology and the models of care are starting to change around them.
>
> Participant 15

There can also be a reluctance to potentially give up an aspect of their work that they enjoy. This may be travel (as discussed in 4.3.2.1) or working with certain colleagues. Reluctance to change can also be due to concerns about extra time and effort required to make the change. THVCS require effort to plan, develop, introduce, and learn and spare

time in the current work environment tends to be very limited. Participants' thoughts illustrate this point,

> The doctors didn't have the time to spend to invest in actually implementing the work practices to get it going because they were too busy chasing fires to do it.
>
> Participant 11

> How can you fit innovation and change in when you are just trying to keep the ship afloat?
>
> Participant 16

Secondly, ***aversion to risk*** associated with change is attributed to more negative attitudes of THVCS. Risk aversion might be any perceived clinical risk, perceived change in attendance rates, unpredictability around scheduling, safety, privacy, or a concern over any potential failures. The following quotes sum up potential concerns to change,

> If they perceive any increase clinical risk , if they perceive a change in attendance rates or a lot more effort on their part , or a lot more kind of unpredictability about scheduling, that type of stuff, then they're less keen on it.
>
> Participant 2

> There is just a big question mark over it [THVCS], 'what is this? It's scary, I don't know how to use it, I don't know, what happens if it goes wrong', that sort of thing.
>
> Participant 14

> We knew of telehealth stroke, years ago, there was a clinician trying, attempting, to run it with clinicians in Scotland, so you had 24-hour cover taking into account the time zones, perfect idea, sounded wonderful, we brought back here and were faced with 1001 what-if, what if this, what if that, and it's taken such a long time for people to go , actually why don't we just try it.
>
> Participant 17

Thirdly, there can be ***reluctance to use technology*** and concerns that it will not work and how it might affect workflow and outcomes. This hesitancy to use technology as a tool to provide services is present in varying degrees amongst clinicians. Some of the reluctance comes from not feeling comfortable with using the technology and how will it be managed if something goes wrong. Other reluctance comes from the technology necessitating a change in the way that they work, including what this might mean for the patient and their relationship (see also 4.3.4). A participant explained it well in the quote below,

> There's a combination of reluctance in terms of technology 'what if it fails, what if this what if the other' and also around concerns about how patient will feel about it and particularly around safety, patient safety, which is totally understandable. 'If I can't see and examine my patient, how am I going to make those decisions?'
>
> Participant 9

Technology reluctance seems to be allayed by seeing THVCS in action. As one participant explained,

> And it is not until people can see the images that they get and have that relationship that they realise the benefits.
>
> Participant 9

Fourthly, clinicians' appetite to change the way they work may be related to ***stage of career***. Nearing retirement is seen as a barrier to adopting THVCS while those at the beginning of it may just expect technology enabled models of care. This is summarised well in a participant's words,

> …some of them are just so embedded in their ways that they never going to get out of there. Some of the baby boomers they just want to retire soon so they are not interested in anything new, they just want to see their days out. I think it's the new doctors that come through that will challenge the status quo and will make fundamental change within their own industry to support that.
>
> Participant 3

Fifthly, clinicians who are perceived as more ***patient-centric*** who appreciate the effort patients make to see them in-person, the amount of travel required, and other social costs associated with in-person visits, are more likely to be prepared to consider an alternative model of care (see also 1.3.1). One participant highlighted this perspective,

> … it's not even a clinical need, it's more a case of, will this help deal with patients better, for the patient, in terms of travel, in terms of ease, will it help me and my team travel less, be able to support each other from a distance better.
>
> Participant 17

In addition, though negative clinicians' attitudes can be a barrier to THVCS there is evidence of attitudinal change over time. Participants talked of examples of clinicians who were opposed to using the THVCS model of care but who then changed to supporting it. This occurred when time had passed and the value of using it was demonstrated to

them from observing colleagues or working in other places where the technology was used more widely. An anecdote exemplifying this is retold by a participant,

> I used to be leader of telehealth here in [place name], and I said we're doing these clinics etc, and I remember this clinician saying, 'yes but the technology doesn't work, patients don't want it, I can't examine the patient', blah blah blah. And now this clinician is involved in a tele-stroke project now five years later, which I actually, it's wonderful to see, but it's taken that long.
>
> Participant 17

If barriers of attitude can be overcome, sustaining interest in THVCS to develop an effective service depends to a large extent on the experience of using the service. Attention is turned to this now.

4.4.4.3 Excellent experience

Ensuring that the experience of THVCS is excellent for providers and receivers is seen as a facilitator of sustaining and embedding a service. The first experience is particularly important to develop confidence and demonstrate the value of using THVCS. The components of achieving an excellent experience can be separated into 'good' technology, training, and being able to provide a service that is equivalent to an in-person service. These points are highlighted in ***bold italics*** in the discussion below.

The participants identified the ***reliability and usability*** of the VC equipment as paramount in providers' and receivers' positive experiences of THVCS. Ensuring the technology is simple and reliable helps the provider to focus on the work they are doing rather than the technology they are using. Usability and reliability then facilitate the acceptance of THVCS and aids in the process of embedding this model of care as part of usual practice. This is well described by a participant,

> Having really good technology so we don't have technology failures, is the other way that we will help this to take off. If we've got good, slick technology, that is really useable, really easy to use, doesn't fail, then….
>
> Participant 5

Conversely, a poor first THVCS experience can evoke a negative feedback loop where providers and receivers are put off using technology and dismiss it as a viable care delivery option. This is exemplified by the following quotes,

> When they go into an MDM [multi-disciplinary meeting] room they press the button to call and it comes up saying call failed. It only takes a few seconds and then a room full of clinicians will get up and walk out.
>
> Participant 1

> If we don't make it easy and a good experience that people see as worthwhile then they'll be very quick to withdraw and disengage from it. And that's from both ends, clinicians end as well as the patient end.
>
> Participant 5

Training is considered an important part of assisting with a good first experience for providers. This includes training in the use of audio-visual media such as where to be positioned or to look and how to engage with patients using the technology. Quality training with a focus on modelling the practice through observations of clinicians already using it, demonstration trials, and one on one support for initial consultations is considered optimal. One participant described this as coaching,

> People are well trained and supported. Genuinely, rather than someone showing up and showing them how to do it…you need to be able to coach them properly, to let them do it, and they can ask questions, but you don't grab the remote off them, they need to be able to do it. You need coaching.
>
> Participant 7

For providers, the systems, and processes around the THVCS need to be smooth and not impede their workflow or the care provided so that a THVCS consultation is perceived as ***seamless as an in-person consultation***. This includes the ability to see patient records and bookings, order tests or procedures and prescribe medicine. The provision of the same standard of care using THVCS as an in-person consultation is also a key expectation of the New Zealand Medical Council (see also 4.3.6). A participant related an ideal scenario,

> Normally you're in your office and the TH we use, it's on their PC so you come into their consult room and they see you and then they turn around and they have their [technology] open and then they see someone in [location place name], then they see the next patient that comes into their consult room so it flows beautifully really.
>
> Participant 10

For an excellent experience to be provided there is a back drop of logistics and support that can impede or enhance the processes. This is explored in the next section.

4.4.4.4 Logistics and support

Logistics and support were identified as important facilitators or barriers to a THVCS program by the Forum members. They covered three key aspects: specific telehealth roles, scheduling and support which are considered in turn in the following discussion and indicated in ***bold italics*** before a summary of the findings of facilitators and barriers for THVCS are presented.

Where organisations have ***specific roles*** for telehealth coordinators or programme managers, they are perceived to facilitate THVCS. This role is generally to support, promote, plan, and organise the programme. Their influence depends on if the telehealth role is dedicated or part of another role. If it is part of a broader role their efforts to promote and support THVCS can be diluted as described by one participant,

> Some of them they start with a hiss and a roar and they get pulled a lot of different directions. And some of them stay focussed and some of them it's one of several jobs that they have, some of them are in the IT area, some of them report into a business area, some of them in a visual communications area.
>
> Participant 11

In addition, other levels of support are required to ensure that THVCS are well coordinated, as explained by an interviewee,

> You need the support of that support network, you need, whether its admin person in the department, say in an outpatients department, someone who can liaise with the booking clerks, someone who can make sure the rooms available, who can, just make sure that things are running smoothly.
>
> Participant 6

Scheduling processes for THVCS within the system is critical to providing an effective service. With the two ends of providing and receiving this process presents several challenges as outlined by this participant,

> To make those work from the provider end, you need booking systems, and that means booking at both ends, so where is an outpatient clinic booked? Is it booked at the receiving end? Is it booked at the provider end? And you've got rooms, this is hospital to secondary

> hospital, that's one scenario, so you've got rooms that have to be booked, you got clinic times that have to be booked, you've got patients to book, consents, especially if it's first time.
>
> Participant 11

The design and implementation of booking systems are currently perceived as significant barriers to THVCS. The logistics of booking requires coordination of people, spaces (virtual and physical) and integration into the current booking system through IT solutions. Developing the support and buy-in of staff involved in these processes is vital. One participant highlights the difficulties,

> Then comes the issue of booking. How do you book it in terms of time slots, how can you make it flexible when you've got a fairly bureaucratic mechanism? How can you book in VC as well as in-person in one clinic, and I think that may well, sadly, prove an issue.
>
> Participant 17

Another participant proposed an ideal scenario for a booking system to facilitate THVCS implementation,

> I think also that having an outpatient booking system that puts telehealth consultation at the top of that list, 'I would like to see my patient by telehealth' -click.
>
> Participant 9

To deliver THVCS requires an umbrella of ***support***, which impacts on other stakeholders in the work system. Community support, work group support and technical support are the three forms of support that emerged from the data. Community support encompasses the support provided from the wider telehealth community. This includes the Telehealth Forum and its sub-groups such as the Telehealth Programme Managers Group and the Telehealth Resource Centre and professional IT and health informatics groups. Participants expressed the positive impact of the community support,

> The forum is really great, you are able to contact the other project managers, 'how do I make contact with a rheumatologist whose being offering consultation via VC, so they can have peer to peer conversation about what might work and how and in what context' so I think that's been really good, that networking.
>
> Participant 14

> The really important thing for us is the collaboration that we do nationally with people that have, not necessarily the exact same role as I have, but are involved with this, so we have regular monthly VC meetings where we tell what we've been doing, the challenges, and get to share and things because you know somethings going on down there when something comes up in this DHB I think well actually I'll talk to them about that because this areas being doing some work in it, so that collaborative sharing…
>
> Participant 18

When THVCS are provided work-group support is required from other clinicians or administrators. This includes patient and doctor support, coordination, and booking. Quotes from participants include,

> To do a clinic well, using VC I think you definitely need a good nurse with the patient. Not anyone, simply because not only can they do blood pressure, height, weight that's fine but they also know, … what's their fluid state, their peripheral oedema, are they breathless, maybe… 'we ought to link you in with the local social services' or whatever, they are there to read between the lines and help.
>
> Participant 17

> There's also the clinic assistants so whether they are a nurse or a CNS [clinical nurse specialist], if they're willing to take up the mantel then it's much easier for a specialist to take that on, they feel that their CNS is going to make sure everything runs smoothly. So that can really help.
>
> Participant 14

THVCS may broaden, alter, or create new support roles, such as telehealth coordinators and participants discussed support roles required to facilitate THVCS, for example,

> You need the support of that support network, you need, whether it's admin person in the department, say in an outpatient department, someone who can liaise with the booking clerks, someone who can make sure the rooms available, who can, just make sure that things are running smoothly. We provide some kind of user and technical support but also at the far end too, so the whole thing needs kind of needs to be seamless.
>
> Participant 6

A further type of support is technical support; aiding and training the users of THVCS so they can deliver health services. This is described by participants as training, one on one coaching, and on-call support for troubleshooting, as exemplified in their own words below,

> Another support package that we have been developing is some training…some interactive online type stuff and just support anyone really, but clinicians to be able to be self-sufficient in it and to go ok, it's not that scary, if I can operate a mobile phone I can operate this.
>
> Participant 14

> We usually go and hold their hands…and make sure the program goes as it should do and talk them through it and look, the ones who are keen pick it up just like that, which is great.
>
> Participant 10

> Technical onsite support, I suppose I'm thinking of if you've got someone who is slow to uptake new technology… those who at the first glitch their hands will go in the air and they'll go forget it , it's not going to work, so you need actually some support for those individuals so they can call up so and so and he'll be there to sort it for you and you can learn to do it.
>
> Participant 17

4.4.5 *Summary*

This section discussed the key facilitators and barriers to implementation of THVCS as perceived by the expert stakeholders. The importance of buy-in, collaborative design and developing support of people involved in the system were recurring themes. This includes developing robust metrics to build business cases and strong leadership at all levels. Implementation is challenged by these aspects and by clinicians' attitude to technology and change. These barriers are best overcome through developing an excellent experience of using THVCS with good technology, training, seamless logistics, and multiple levels of support.

4.5 Summary of Phase I findings

This chapter has presented the findings from Phase I of this inquiry. All twenty members of the New Zealand Telehealth Forum Leadership Group were interviewed to explore their perceptions of THVCS in New Zealand. Semi-structured interviews were used to investigate the first three research questions:

1. What are the current characteristics of THVCS in use in New Zealand?
2. How do THVCS impact key stakeholders in the work system?
3. What are the facilitators and barriers to THVCS for key stakeholders in New Zealand?

The interviews were recorded and thematically analysed using the framework method shown in Table 3.2 (section 3.2.6.2). The resultant themes were explained, discussed, and exemplified with verbatim quotes from participants in sections 4.2 to 4.4.

The findings in section 4.2 identified that at the beginning of 2018 THVCS were in use at low volumes in New Zealand across a range of healthcare specialities and services (Table 4.2), with some regional variation and predominantly in the secondary healthcare sector. The perceptions of the expert group were that use of THVCS in New Zealand was slowly increasing.

The impacts that THVCS were perceived to have on key stakeholders are outlined in Table 4.3 and extend over the work system, are interrelated, and interact. Generally, THVCS are considered to have a positive impact for patients and their families through convenience, and for providers through opportunities for collaboration. The dependence of technology that THVCS effects has implications for healthcare organisations and wider society through infrastructure, technological, models of care, and funding requirements. Significantly, THVCS compels new ways of working (Figure 4.4) which impacts on healthcare staff roles, business and care models, and legislative and professional practice guidelines. This creates change, which is a challenge in the complex, healthcare system. In addition, the participants identified the disruptive potential of THVCS to the healthcare system which presents risks and opportunities. The last theme that emerged from the data in section 4.3 is explained in 4.3.6, recognising that THVCS potentially impact the safety and privacy of health consumers and that trust in the THVCS system is important for providers and receivers.

The findings that explored the facilitators and barriers to THVCS for key stakeholders from the perspectives of the Forum are detailed in three main themes in section 4.4. First, a robust business case was identified as an important facilitator to THVCS though there are challenges to developing this which are illustrated in Figure 4.7. Second, leadership at all levels of the work system was perceived to be a significant facilitator, or barrier if absent, in developing THVCS (section 4.4.3). Third, aspects of implementation emerged as key facilitators and barriers to THVCS (Figure 4.8). Co-design, an excellent experience, and support were identified as important facilitators while negative clinical attitudes can function as barriers to developing THVCS.

The Phase I findings of this inquiry identified that the impacts of THVCS extend across the work system at multiple levels and are inter-related. Similarly, facilitators and barriers to THVCS for key stakeholders were identified in the external environment, at the organisational, group, and individual level, and in the tasks and technology of the work system. These findings were from the perspectives of an expert group, and now the lens of inquiry is shifted to the perceptions of providers, receivers, and decliners of THVCS as the findings of Phase II are presented in Chapter 5.

CHAPTER 5 Phase II findings: Providers', receivers', and decliners' perceptions

5.1 Introduction

The findings of Phase I of the inquiry provided insights into the facilitators, barriers, and impact of THVCS from the point of view of experts (a census of the Telehealth Forum Leadership Group). Their perspectives reflected their high-level work roles and their membership of the national telehealth leadership group. While invaluable, it was identified that their perceptions may differ from those of stakeholders involved with THVCS at a more 'grass roots' level. Seeking insights from providers using THVCS to deliver their services, and patients and their families (termed 'receivers' in this chapter) receiving the services, was, therefore, considered necessary. In addition, the Phase I findings could not fully address the question about why some patients and their families decline to use THVCS despite been offered it by their providers. To explore the perceptions of this group 'decliners' were included in the Phase II group of participants. Thus, twenty semi-structured interviews were conducted between June 2019 and December 2019 with providers, receivers, and decliners. In addition, contextual observations were made concurrently at three sites providing THVCS to provide real world context to the inquiry and to add depth to the data collection through triangulation of methods. This chapter presents the findings from the semi-structured interviews with pertinent findings from the field observations to address research questions two and three:

- How do THVCS impact key stakeholders in the work system?
- What are the facilitators and barriers to THVCS for key stakeholders in New Zealand?

Following a description of the characteristics of the data collection in the next section, section 5.3 addresses the impact of THVCS on the work system for this group before facilitators and barriers are addressed in section 5.4. The way in which the facilitators and barriers of THVCS and the impacts of THVCS interact is explored as costs and consequences in section 5.5, before the chapter is concluded with a summary of the Phase II findings.

5.2 Characteristics of Phase II data collection

5.2.1 *Sample characteristics for semi-structured interviews*

Table 5.1 presents the number of participants interviewed in each sector. In total, eight providers, nine receivers and three decliners were interviewed. Two of the receiver interviews involved two people: one patient and one family member.

Table 5.1 Number of participants interviewed by sector

	North Island DHB	Private secondary care	Primary care	South Island DHB	**Total**
Providers	3	0	2	3	**8**
Receivers	3	1	2	3	**9**
Decliners	3	0	0	0	**3**
Total	**9**	**1**	**4**	**6**	**20**

Nine interviews were conducted by telephone, eight using VC and two a combination of the two. The mean length of interview was 28 minutes with interviews with providers the longest at 36 minutes on average (range of 34-71), 31 minutes (16-44) for receivers and 16 minutes (13-20) for decliners. The gender spread for each type of participant is depicted in Figure 5.1 with a total of 12 males and 10 females interviewed. Two of the females were family members interviewed together with two male receivers. The participants ranged in age from young adults to elderly.

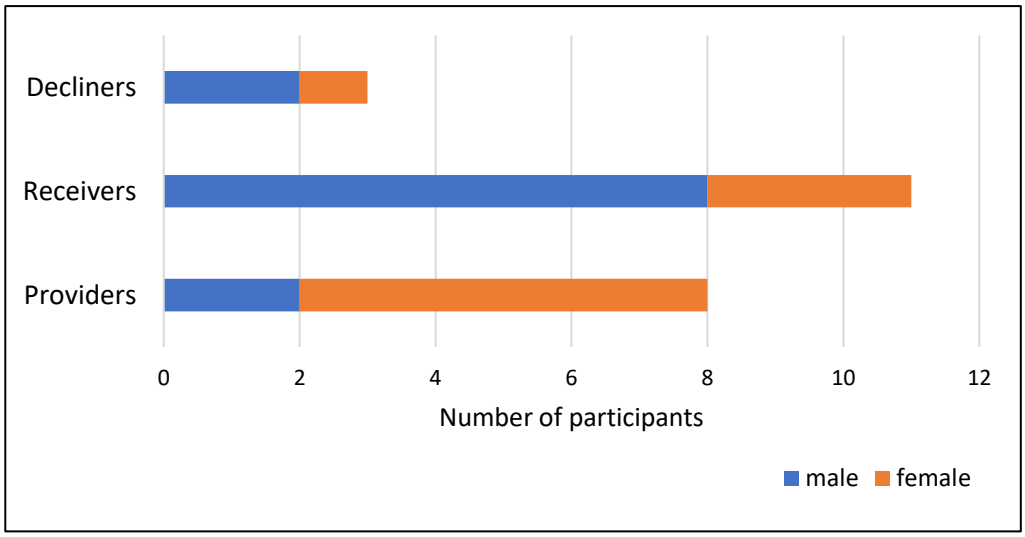


Figure 5.1 Gender spread for participant type

The interviewees came from different areas of healthcare, reflecting the range of services and disciplines using THVCS. This included speech language therapy (n=7), pain services (n=3), haematology/oncology (n=2), general practice (n=4), psychiatry (n=1) and endocrinology (diabetes) (n=3). The participant type and the service area are shown in Figure 5.2.

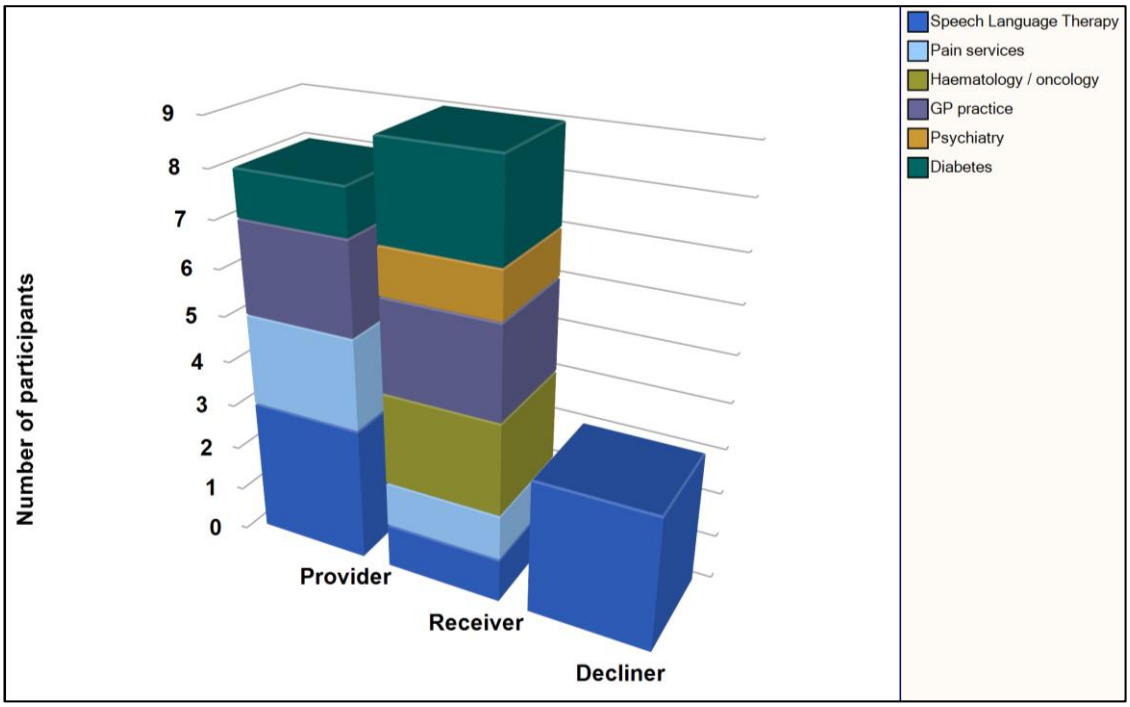


Figure 5.2 Participant type and healthcare area of THVCS

5.2.2 *Sample characteristics for contextual observations*

As outlined in 3.3.7, site visits were made to one 'hub' hospital and two 'spoke' hospitals (termed A and B) within one DHB to collect contextual observation data. Spoke hospital A is 100 km from the hub and spoke B is 76 km away in a different direction. The characteristics of the sample used for the contextual observation are shown in Table 5.2. The visits occurred on 16th October and 17th October 2019.

The equipment, physical spaces, and processes used for THVCS were observed while unstructured interviews were held with seven, female staff members working across the facilities. The 'guided tour' method (Kirk et al., 2015), as explained in section 3.3.7 was used to understand the activities of the participants more fully in the real-world context. Notes, photographs, and audio recordings were taken during these interactions and were

developed into a field note document and analysed with the Phase II semi-structured interview data (see section 3.3.8).

Table 5.2 Contextual observation sample characteristics

	Hub	Spoke A	Spoke B
Distance from hub hospital	0 km	100 km	76 km
Model of care observed	Direct-to-patient allied health service	Spoke to hub: varied specialities	Spoke to hub: varied specialities
Roles of participants (n=7)	○ Allied Health manager ○ Allied Health provider ○ Telehealth coordinator	○ Nurse coordinator	○ Clinical nurse manager ○ Booking clerks
Data collection	○ Unstructured interviews ○ Guided tour ○ Documents	○ Unstructured interviews ○ Guided tour ○ Photographs ○ Documents	○ Unstructured interviews ○ Photographs

5.3 Findings: The impact of THVCS on the work system

5.3.1 *Introduction*

The impacts of THVCS on the work system emerged as interrelated themes from the interviews (Figure 5.3). THVCS force a change in the work done by both providers and receivers and this mediates the outcome of their interactions. Being familiar with technology is a mediator of work change for both patients and providers, that is, familiarity helps to explain how the work changes are experienced. To have an impact THVCS need to be accessed, which depends on THVCS structure at the provider end including models of care, technology resources and booking processes (section 5.3.2) and technology resources from the patient end (section 5.3.3).

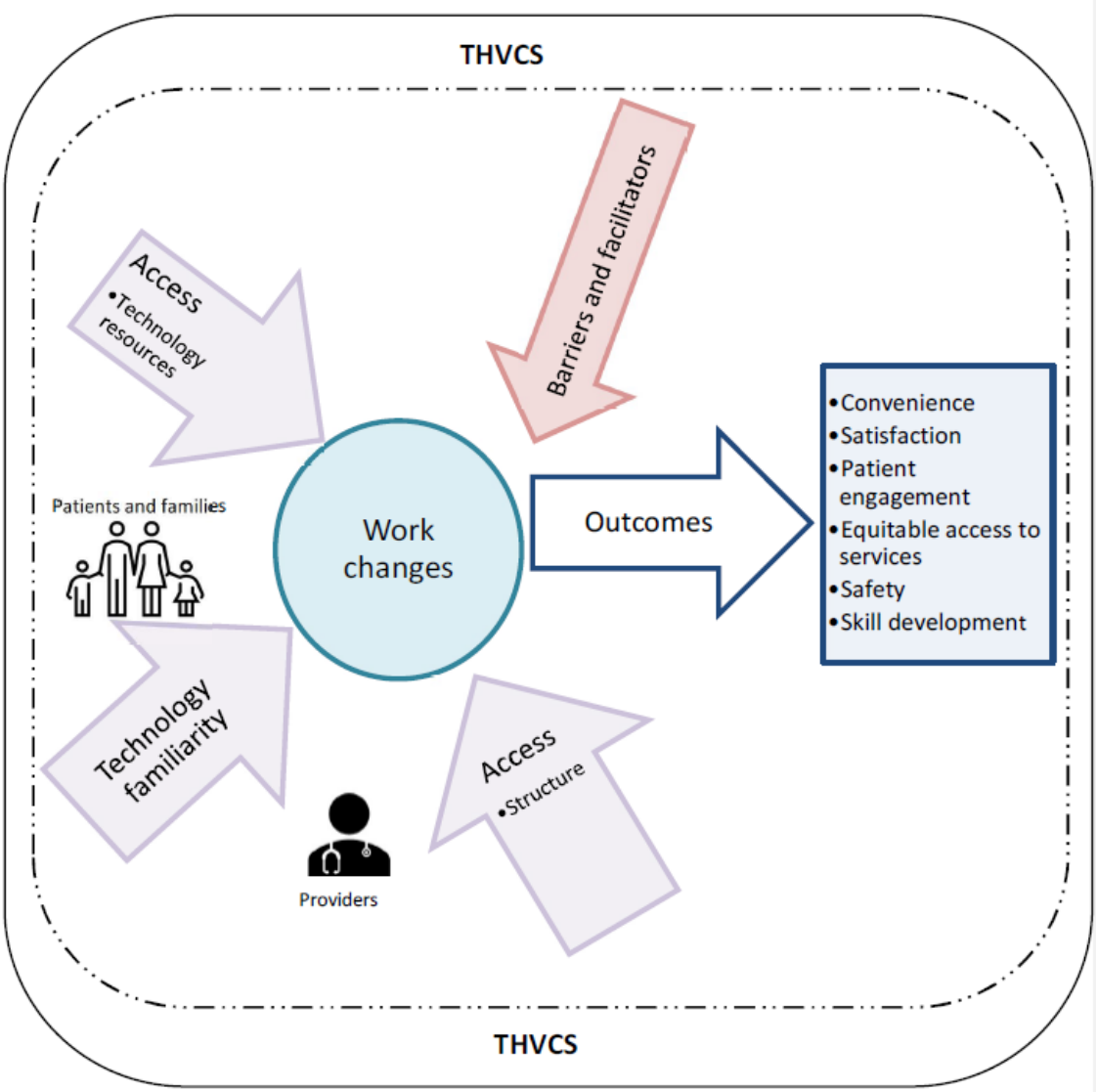


Figure 5.3 **The impacts of THVCS on the work system: perceptions of providers, receivers, and decliners**

Work changes (section 5.3.4) and outcomes (section 5.3.6) are moderated by the barriers and facilitators to THVCS, that is, barriers and facilitators help to explain why or for whom the changes and outcomes of THVCS impact upon. The key outcomes of THVCS use that emerged from the data were convenience, satisfaction, patient engagement, equitable access to services, safety, and skill development. These interactions are illustrated in the model in Figure 5.3 and are discussed in the next sections while facilitators and barriers to THVCS are addressed in section 5.4.

5.3.2 *THVCS structure*

The way in which THVCS impact providers depends on the model of care that is chosen, the technology resourcing and booking process of these models. A service can be direct from either a hospital or a medical centre to a patient at home, or wherever they are using their own device, or from a satellite hospital to a larger hospital (hub-and-spoke model). A direct-to-patient service makes the process simpler from an organisational perspective as they are responsible only for organising the provider end of the service. Whereas a hub-and-spoke model requires allocation, booking of technology capable rooms and duplication of support staff at both ends of the service. The extra logistical planning in a hub-and-spoke model are exemplified in these quotations,

> In which case, that requires a little bit more because it's not the patient's home so we have to make sure there is a room available at [name] Hospital, that the STAC [secure VC unit] is available for them to use, so I usually email the admin lady down there, who is wonderful, and make sure that that's booked for us and then the patient turns up.
>
> Hannah, provider

> I've just been a coward with the other hospitals. The problem is …when we have, it might be one patient in the clinic we need to do telehealth with and the others are all people who just come to the appointment, and I've been a bit of a scaredy-cat trying to think about well, do we get all the people from [place name] to just go to [place name] Hospital or do we have to, but I mean they come on different days. You might have one [place name] one this week, and there might be one two weeks later and you've got another [place name], so trying to put one person into our doctor's available clinic time.
>
> Cathy, provider

Appropriate resourcing of THVCS technology at the provider end impacts on the delivery of care. Often, in hub-and-spoke models services are provided using specialised, dedicated VC units or 'carts'. The carts need to be in a clinic room where the patient can be seen. The limited number of carts impact on the ability to provide THVCS. In a direct-to-patient model in the public, secondary sector there can be a limited number of software platforms and technology capable equipment as well as a competition for physical space. A manager in the contextual observations provided an example whereby clinic space is allocated with the knowledge that some therapists will be absent to travel to a rural hospital; if these therapists were to remain on site and use THVCS there would not be

enough clinic space in the current environment. In addition, the physical environments available may not be optimal for the use of technology. Issues of lighting, positioning and noise were noted in the interview data. Additionally, the availability of technology limits the use of THVCS and the limited scale in turn is a barrier to embedding a service, as the next remark illustrates,

> There are other services that could be using it but they are not, and my ideal would be to have every single clinic room set up with it, so that it's not a hassle wondering if the equipment is still there, you know.
>
> Cathy, provider

5.3.3 *Technology resources: patients and families*

The availability of technology resources impact on access to THVCS for patients and their families in the direct-to-patient model. Despite increasing ubiquity of technological devices and the internet, barriers to accessing these remain including availability of a device, adequate internet, cost of data and devices and confidence in the use of technology. These impediments are described by decliners and providers,

> We can't get fibre or fast fibre, we can only get, it drives me nuts our internet, and it cuts out all the time, and that's another thing too you know, because we are rural and I've tried lots of times with different providers but it doesn't come where we live at the moment.
>
> Mary, decliner

> Yes, I think I might be connected through the phone, yeah, but I don't have a computer.
>
> Alec, decliner

> So they have to have good internet, that's usually our biggest barrier in the region particularly with rural, or they need to have some form of technology which has been another barrier. So if it's a lower socio-economic family, often they live rurally so it would be great to be able to have it, but they have poor Wi-Fi or they don't have technology that is available to use. Or sometimes it will be like their child's device or something, but it's just not a reliable device that we can guarantee.
>
> Hannah, provider

Once accessed, THVCS changes the nature of work done by providers and receivers.

5.3.4 *Work changes*

THVCS impact on the way work is done for providers and others involved with arranging and providing care. At times it falls to providers to ensure they have the technical capability in the physical space, contributing to a change in their work demands, as a provider explained,

> I have to use some specific clinic rooms…Yeah, that makes it sometimes a little more complicated, because also our room booking system here is not the best one and I sometimes have Monday mornings where I come in and my room is definitely booked and they say, oh, you have to switch to another room. And I say 'no I can't because I have my [VC software] in that room and it is set up on that computer so I need that room', so that is sometimes a complication.
>
> Kristin, provider

As discussed above, scheduling of THVCS is an important function that creates a work change which impacts on the wider provider group. As Ashley explained,

> I was used kind of like the guinea pig pilot to book the patients using [patient management system]…our team and another department in the hospital were asked if we could trial it within our department for three months, and so I was taught how to do the bookings and how everything was to work.
>
> Ashley, provider

As noted in the contextual observations the workload of booking clerks is reported as being increased with booking THVCS as the process is more time consuming and requires completing at 'both ends' of the service. For providers, depending on the model of care, there can be an increase in travel to a 'spoke' location to support patients when they connect to the 'hub' for specialist medical services. Karen explains that she does the travelling instead of the patients which increases and expands her workload,

> … which is a bit of a pain, it's more workload for me but then when you actually balance it up with the families coming down and them taking the whole day off work, it's actually very cost effective because I spend half the day doing the videoconferencing in the morning with the kids, kids and family, and then in the afternoon I see all the adults… up there because they don't have a clinical nurse specialist, so it actually saves them coming down as well. So, it's a big day.
>
> Karen, provider

THVCS may also require other practical work changes for providers, for example, rehabilitation providers may need to adjust their planning so that the content of the consultation can be delivered remotely. This might include considering how any resources might need to be sent ahead of the consultation time or how a screen can be shared. The contextual observations detailed that the nurse coordinator rearranged the furniture in the physical space of the THVCS consulting room to better meet the needs of the exchange. In addition, the contextual observations noted a potential for THVCS to enable nurse providers in 'spoke' locations to enlarge their roles through more leadership of clinics and patient support without the physical presence of a specialist. A hub-and-spoke model for THVCS is less work for receivers based on traditional models of care (i.e. a patient attends a medical facility and is seen by a provider albeit using technology). In contrast, a direct-to-patient service shifts the technological work to the patients who are charged with providing and managing the technology at their 'end' of the service. Along with workflow and demand implications THVCS require a shift in thinking about the way a provider is delivering healthcare and how a patient receives the service, as exemplified by the following quotations,

> It's just slightly changing the way you think about things, I think, more than actually like providing a different service.
>
> Hannah, provider

> Not just me, but I think a lot of them in my age group want to talk to a doctor, want to talk to a person, we've always done it, all our lives, and suddenly we are talking to a machine.
>
> Jerry, receiver

The impact of this change depends in part on the familiarity with technology and previous VC experience of providers and receivers.

5.3.5 *Technology familiarity*

Reluctance to consider and be open to THVCS is often due to uncertainty about using the technology. This can apply to a patient not wanting to try it when offered, a provider not offering it to a patient assuming they do not have the skills needed or a provider having reservations about integrating technology into their practice. As a provider explains about receivers in the next interview excerpt there can be a generational divide, though this is

not always the case depending on the background of the receiver and the support available to them,

> It always makes a difference if you have a patient who actually feels confident and comfortable with using the technology, so the younger population groups, that's very ageist, but generally like those that have been working or are still currently in the work force are a lot more kosher with Zoom and things like that, so it's not an unusual foreign concept, although a lot of elderly have used Skype and things like that, but usually independently can be a bit difficult.
>
> Hannah, provider

Familiarity and confidence with technology also impacts on providers' attitudes to THVCS as Megan explained about some of her colleagues,

> You need at least a little bit of prior computer knowledge. I mean I don't think you need a lot, but you just need to be comfortable with computers. I think sometimes, some people aren't as comfortable with new kind of systems on the computers and that's almost already a mental block type thing.
>
> Megan, provider

This was also noted in the contextual observations and described as a 'fear of technology' related to level of technology skills and work changes, one example given of this was nurses concerned about losing the caring aspect of their role associated with physical touch.

Depending on the inter-relationship of the THVCS structure, technology resourcing, work changes and technology familiarity, THVCS impact on the outcomes of the consultations between providers and receivers (Figure 5.3). The outcomes are explained next.

5.3.6 *Outcomes*

Using THVCS to deliver healthcare influences the outcome of the exchange between providers and receivers. The outcomes of convenience, satisfaction, patient engagement, equitable access to services, safety, and skill development were evident in the semi-structured interview data and corroborated with the unstructured interviews during the contextual observations. Whether the outcome is positive, or negative depends on the

moderating effect of facilitators or barriers which are discussed in section 5.4, while the themes of outcomes are considered in turn in the next section.

5.3.6.1 Convenience

From the perspective of the providers and the receivers THVCS are a convenient way for patients to receive healthcare. It saves on travel, time, and opportunity costs as Nathan, a patient, explained,

> I thought it was amazing. I was first year high school, quite a lot of learning, I wasn't missing out [to attend appointment], I didn't miss much. Maybe half an hour to forty-five minutes if that, compared to missing a whole day, so no, it was really, really good.
>
> Nathan, receiver

For patients and carers THVCS reduces stressors associated with attending an in-person consultation such as arranging time off work, car parking, waiting and fatigue. These benefits were identified in the next quotation,

> I mean it's good that you don't have to sort of take half a day off to go and sit in a waiting room kind of thing and go through all that rigmarole which can be quite sort of stressful so in that regard it was helpful, yeah.
>
> Ben, receiver

In addition, the contextual observation data notes THVCS for unplanned consultations where patients receive sensitive information from a trusted specialist without the need to travel. This reduces stress and allows the patient to have supporters with them in a familiar environment and receive the information without a time delay. While the convenience tends to be patient centric as providers put in more effort to use THVCS compared to the traditional model of care, providers also recognise time saving from their perspective. This can be because the consultations tend to be shorter, possibly due to the changed interaction type, and there are efficiencies of multi-tasking. As a primary care provider noted,

> I think it is because one of the things which is definitely evident is that they are faster. The consultations are quicker. People are a little bit keener to leave the consultation room. My average consults are about four minutes faster, virtually… But it's interesting because there tends to be less chit chat, there tends to be less enquiry about what the family are

> up to and how are the kids…There is a little bit less of that. From my side, I can talk and type at the same time. That is a massive bonus.
>
> Michael, provider

5.3.6.2 Satisfaction

Drawing on the experiences of providers and receivers, THVCS impacts positively on satisfaction with the healthcare service. This is mediated by convenience for some, the contextual observations note this is especially due to the decrease in travel required, and for others it provides access to a service that is not provided, or provided less frequently, in-person in their area. In addition, some participants reported enjoying the THVCS experience as they felt less pressure discussing their health issues or valued being in their own environment, this is highlighted in the following patient excerpt,

> It was really good. I'd seen quite a few doctors in-person over the years for various things, and it felt really natural actually. [name] was really personable, so it didn't seem strange or weird or anything like that. It felt comfortable you know, talking about psychiatric stuff. Yeah, yeah, it was probably one of my better experiences with a doctor, to be honest.
>
> Ben, receiver

Participants who were expecting an in-person consultation, while initially being displeased with the change to connecting to their specialist using THVCS then expressed satisfaction with the experience, as the quotation below indicates, and were willing to use THVCS in the future.

> So yes I was a bit pipped, but then I saw the guy and he was very friendly and he made me feel comfortable and I think that was the whole thing, that the person on the other end is showing a genuine interest in you, you know, and whereas possibly you might get some that would be busy looking at their computer the whole time. This guy actually looked at me.
>
> Jerry, receiver

Providers report satisfaction with being able to provide a service that meets the needs of the patients, offers a choice and in some instances would not otherwise be accessible. In addition, an enthusiasm is reflected in being involved in something new that can improve healthcare delivery and the potential of the service in the future for patients and also for providers to work flexibly, for example from home or from other locations.

5.3.6.3 Patient engagement

Higgins, Larson, and Schnall (2017) define patient engagement as "the desire and capability to actively choose to participate in care in a way uniquely appropriate to the individual, in cooperation with a healthcare provider or institution, for the purposes of maximizing outcomes or improving experiences of care" (p.30). THVCS can impact on engagement and the findings of the interviews with providers, receivers and decliners elucidated the range of this. Decliners chose not to participate in THVCS and preferred to continue with the in-person, traditional model of care. The possible reasons for this are explored more in the prefer in-person theme (section 5.4.4) but are also influenced by the resourcing and familiarity of technology discussed above. As the previous quotation highlights an experience of THVCS can evoke a willingness to engage further, although the service still must meet the needs of the patients as Bob explained,

> And the other thing is, where I live it's an hour and fifteen minutes away from town so it's still not just a little short journey, and there is [closer place name] here with multiple sites I would imagine where videoconferencing could be done. And that would have been very nice to have just gone into [closer place name] to have the video conference.
>
> Bob, receiver

THVCS can influence patient engagement by including family members who may not have been able to travel to the clinical setting or by increasing ease of access, as described in this quotation,

> She [daughter] did it on her phone actually and I think they found it quite fun to do together actually. He was like 96, I think . That was one of the reasons it was really hard for him to get in here, and they seemed to be really enjoying doing it together.
>
> Hannah, provider

Providing THVCS as a service option can increase active participation by reducing fatigue and stress of attending a large medical facility and enhancing comfort by being in the home environment or at a smaller facility. The receivers felt that THVCS helped to increase ease in discussing difficult, sensitive, or personal issues compared to an in-person interaction while providers felt it helped attendance rates. The following quotations illustrate these points,

> Yeah, and we are still face-to-face. We can't physically touch each other but at the same time they are in the comfort of their own home or in a space they feel comfortable to be able to speak and the words might not come out correctly. You know, especially for our patients, so for them to be in their home and practise saying words or yelling because they are working on voice control, versus being in a clinic room, they might not give it their 100 percent.
>
> Ashley, provider

> Yes, sensitive issues, skin stuff, birth control or stuff like that…and I think that provides another rut to those services which people might otherwise avoid for embarrassment reasons or something like that.
>
> Ben, receiver

In contrast, some participants also noted that THVCS can potentially impact negatively on engagement by the virtual setting not creating enough formality or seriousness or there being interruptions from their home environment, as explained in the extracts below,

> I think if I was really, really rubbish at looking after myself… then doing the videoconferencing wouldn't work at all because it's like, spending the trip you go down to [city name], it's not a big trip, but it's a trip, obviously you are not just going to go to [city name] and not pay attention, but then just crossing the road to go to the hospital here, just for like 20 or 30 minutes… isn't, you know, engaging enough.
>
> Dan, receiver

> There is a detrimental thing in that you've got to make sure that they understand, please can you make sure that there is not going to be interruptions coming along all the time. You know, like kids coming in and asking for a sandwich or something. This is a formal appointment, you know.
>
> Cathy, provider

Associated with the capability to engage patients in a service is access to a service, which impacts on equity in health provision. Patients and their families may not be able to engage in a service because the access to it makes it difficult. This scenario is summed up well in the quotation by Megan,

> I think if it's a lot easier for people they are going to want to engage in it more… I don't think I would have got them in for a block of therapy if it wasn't for telehealth. I think they would have kind of thought of the costs and that time off work. Often our patients feel really bad if they are making their family members take time off work, they are like,

> oh no don't worry about it, don't worry about it, so you know it stops that from happening, so it means I could see them.
>
> Megan, provider

Other aspects of access to service are discussed in section 5.3.6.4 below.

5.3.6.4 Equitable access to service

THVCS enables provision of a service for some people that would not otherwise be possible given the existing structure and service constraints. For example, speech language therapists are able to travel only infrequently to some 'spoke' hospitals from their 'hub' while THVCS allows them to provide urgent services and also frequencies which is equitable to people living in a location away from the 'hub', as explained in the excerpts below,

> I presume yeah, they only gave them, you know, once a fortnight treatment down in [place name], and that was one thing when I started the [place name] clinics I was like, this isn't fair. I can see some patients up in ['hub' hospital] once a week if I need, but I cannot provide that in ['spoke' hospitals], so that was when we started doing, on the alternate week that telehealth appointment, so they were still getting an equitable service.
>
> Hannah, provider

The aim of using THVCS was stated in a contextual observation as "to reduce the gap between hospitals". This refers to the physical distances between a hub-and-spoke location and to the difference in care experienced by patients receiving services at the hospitals. Some DHBs cover large geographical areas and shortage of resources both human and financial result in many services been available in only one larger location or the choice of providers is limited. THVCS allows a service to be provided by the person who best meets the needs of the patient regardless of where they live. Moreover, it allows patients to access a service when their circumstances make it difficult for them to attend in-person as explained in the next quotation,

> It should help for those we can offer it to, because a lot of the time the reasons for not coming are because cars have broken down or drivers aren't available, because a lot of our people don't drive… sometimes they are on medications which they don't feel safe driving long distances, or their tolerance for sitting at a steering wheel with a foot on an accelerator is not great.
>
> Cathy, provider

THVCS can help to manage the shortage of specialist medical providers and available consultations, providing access to more people as participants recognise,

> Yeah, they can access dozens of people in a morning as against seeing two or three and they don't have to move from their desk, they don't have to drive, they don't have to waste time in a vehicle, so I think it is very important that they try and do this.
>
> Jerry, receiver

> In the case of the one that came through on Monday, and the one with the guy who would have come for a long distance, it means that he could attend an appointment instead of having to cancel again and we wouldn't have been able to rebook him before Christmas either.
>
> Cathy, provider

The booking clerks interviewed in the contextual observations also noted that using THVCS helps then to be able to fit people into appointments and improves timeliness of appointments. However, for a service to be equitable it must also be equally safe as an in-person service and the theme of safety is considered next.

5.3.6.5 Safety of patients and providers

Participants perceive that THVCS can impact on safety by making consultations more or less safe than in-person exchanges for providers and receivers. Contrasting with the view of most that THVCS provided a more comfortable, relaxed setting as discussed above, one decliner was concerned about not being able to relax without being in the same environment as the provider in which the provider is in. On the other hand, THVCS was seen as positive for the safety for providers in the circumstances when an extended hours service could be delivered from home instead of alone in a clinic or when it reduced travel and the associated risks of travel such as fatigue and traffic accidents. Receivers and provider participants considered that THVCS were more likely to impact negatively on safety when the providers and receivers are less well known to each other and there is not the benefit of the in-person cues. These concerns are outlined in the following quotations,

> I just think, I suspect some doctors would do it more readily than others. I think if I was a doctor, I would probably want to see the people, more often than not, just to be sure. You get a closer up feel or view.
>
> Luke, receiver

> I mean I guess with any psychiatrist things, if you know what to say you can probably get what you want [medication], but maybe this lowers the barriers for that. Yeah, that is a concern I have…in my personal case it worked out really well but I still have some trepidation around the whole thing a bit, so yeah, I guess that's the summary.
>
> Ben, receiver

Providers perceived an element of clinical risk with using THVCS and not being able to observe or assess the patient in-person. However, this was risk was balanced pragmatically with the benefits of providing the service and using appropriate clinical judgment, as the next excerpt explains,

> I think if I felt like I couldn't manage it over the telehealth I would say that and I would either advocate for a home visit if it was from a mobility perspective or say look I think we really need to get you in. But I'm of the opinion that it's always worth a go.
>
> Hannah, provider

While THVCS enables clinical outcomes there are also developmental outcomes which are explained next in the 'skill development' theme.

5.3.6.6 Skill development

In a feedback loop, using THVCS develops skills which then encourages further use. Providers develop skills around familiarity with using technology and communicating using the interface, as a provider explains,

> People don't like the sight of their face on video, even when their screen is small, and they are looking at a big picture of my bald head. The reality is both of us feel uncomfortable, particularly at the beginning, and that's ok. It takes a while for patients to get used to it and then you look at patients who have been doing it regularly and routinely, and they are just not fussed, and you soon get used to it yourself.
>
> Michael, provider

> I think if we were using it every day, we would get round those, we would get so used to it that we wouldn't get into a flap.
>
> Cathy, provider

Receivers in the direct-to-patient model and those who attend a smaller centre to receive THVCS also develop skills and comfort with the technology with experience, as patients and their family members noted,

> He is not very familiar with it [using VC] but he is getting used to it.
>
> Clara, receiver family member

> He was sitting there looking at us [on screen] as we came in the door and he said hello to both of us, and immediately you felt, oh, that wasn't quite so bad.
>
> Jerry, receiver

Use of THVCS provide ongoing tests for the IT systems and allows feedback to be provided to those who design and support the system and to help with the development of documentation. In addition, experience contributes to broader organisational knowledge which can be shared with other services. Developing the skills and comfort with the technology and the change in the way of working takes time, practice and appropriate support from both 'ends' of the THVCS, as these providers describe,

> I had this 80 plus year old man who pretty much didn't really use a computer much at all… and we managed to catch up for his telehealth appointments. It worked fine. I mean I had to phone him up and talk him through connecting, but I figure, you know it only takes about a maximum of 5-10 minutes at any session, but it's kind of worth it for them and if they don't need someone to get them into the mobility van and drive all the way up here, you know, it's worth it.
>
> Megan, provider

> We always do the disclaimer with patients, you know, this is kind of new for us as well, so yeah, just bear with us while we figure it out.
>
> Hannah, provider

> We all need to get familiar with doing these appointments, so people aren't afraid of cocking it up.
>
> Cathy, provider

However, if an experience is not positive, for example if there is a poor connection, some difficulty with the audio or the interaction does not meet the needs of either the provider or receiver then this may create a negative feedback loop and the practice is then not sustained. The usability of the technology plays a large part in this and is discussed more in section 5.4.3. In the same vein, if THVCS skills are developed by individual providers and not embedded into usual practice, or not supported by other elements of the system (e.g. providers who determine its use, technical support, resourcing) then the skills and service can be lost when individuals change or leave roles. Several examples of services

or processes changing with staff changes were noted in the semi-structured interview data and contextual observations.

5.3.7 *Summary*

In summary, when established THVCS enable a service that is perceived as meeting the needs of patients though it requires an effort shift for providers and receivers. At the same time, those that participate in THVCS acknowledge the shortcomings and those who do not participate perceive weaknesses which inhibit their acceptance of the service. The experience of THVCS is moderated by barriers and facilitators and attention is turned to these now.

5.4 Findings: Facilitators and barriers for THVCS

5.4.1 *Introduction*

The interviews with providers, receivers and decliners identified barriers and facilitators for THVCS. This section presents a discussion of the analysis of the data and addresses research question three: "What are the facilitators and barriers to THVCS for key stakeholders in New Zealand?". Supporting examples from the contextual observations are included where relevant. Some factors enable THVCS while others make initiating and sustaining THVCS more difficult while the effect of other factors may depend on the degree to which they are present or absent. The inter-related factors are shown in Table 5.3, grouped into broad aspects of the work system that they represent and the section that they are discussed in, along with the definitions used in the data coding.

The inter-relationship of the barriers and facilitators are graphically represented in Figure 5.4 and show how the elements may be associated to others. This figure was developed in stage six of the framework method of data analysis, interpreting the data (Table 3.2 and Figure 3.4). Relationships were mapped by noting possible connections throughout the coding process and then the coding was compared using matrix queries and comparison diagrams in the NVivo software to support or refute the initial ideas. Figure 5.4 was developed using the concept map and refined as the analysis continued.

The barriers and facilitators in Table 5.3 and their interrelationship (Figure 5.4) are discussed in the next sections beginning with the organisational level 5.4.2, followed by

technology and process (5.4.3) and the individual level in 5.4.4. The narrative is exemplified by verbatim quotations from the participants.

Table 5.3 Barriers and facilitators for THVCS identified in Phase II

Work system aspect	Barrier	Barrier or facilitator	Facilitator	Definition
Organisational level Section 5.4.2	Structure			Aspects related to the design of the wider health system
			Leadership	Aspects of THVCS leadership
			Legitimacy	Perceptions of legitimacy which influence THVCS
Technology and process Section 5.4.3		Technology trust		Perceptions of privacy, security, safety, trust related to using THVCS technologies
		Usability		Perceptions related to THVCS technology ease of use
	Workflow			Perceptions of the workflow and processes required to use THVCS
	Integration			Aspects related to the integration of THVCS into usual systems
			Support	Support given or received to facilitate THVCS
	Limitations			The perceived limitations of using THVCS
Individual level Section 5.4.4	Prefer in-person			Perceptions related to preferences to receive / deliver healthcare in-person rather than with THVCS
	Reluctance			Unwillingness to use, provide, accept, or embed THVCS
	Patient selection			Perceptions on selecting people to use or offer THVCS
		Provider-receiver relationship		Perceptions about the provider- receiver relationship
		Consumer demands		Perceptions related to consumer needs now and, in the future.

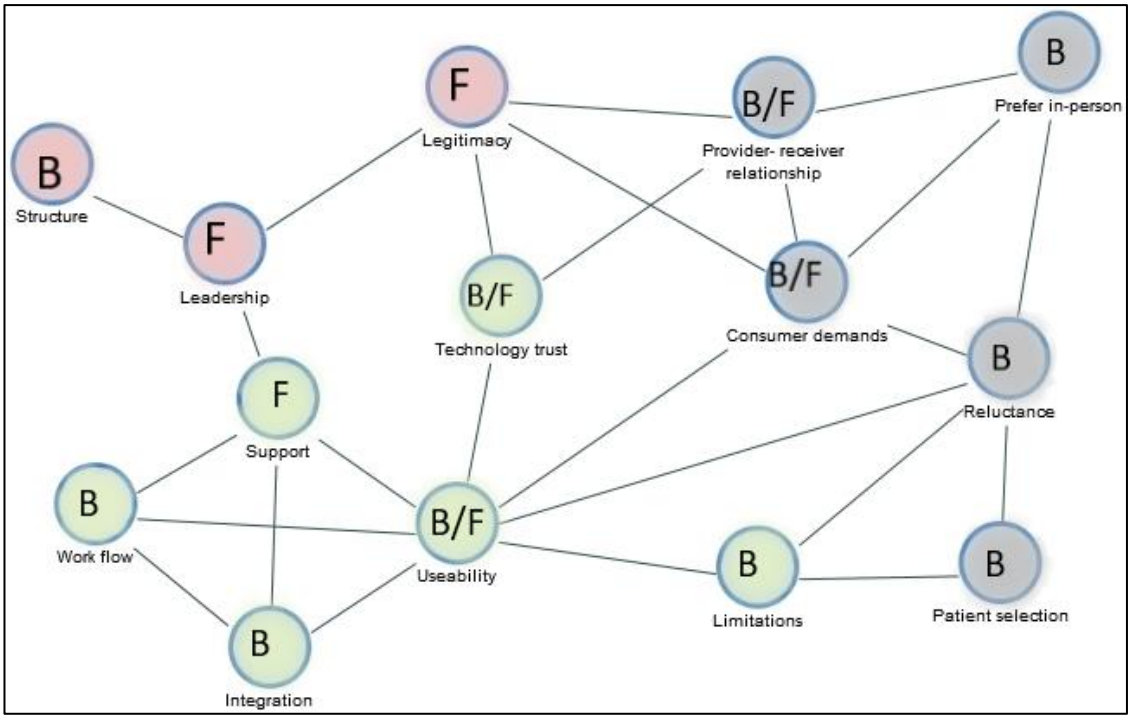


Figure 5.4 Inter-relationship of facilitators and barriers for THVCS, B= barrier; F= facilitator; B/F – barrier or facilitator, colours correspond to the groupings in Table 5.3

5.4.2 *Organisational level*

Three factors emerged from the interview data that relate to organisational elements of the work system: structure, leadership, and legitimacy. The existing structure of the healthcare system is a barrier in implementing and embedding THVCS. This can be through time constraints, existing processes, and legislation. Time is often a barrier within a busy system, and this makes implementing a new process difficult. For example, in a traditional model of care the patient is given an appointment time, attends in-person and waits for the provider to see them. THVCS require the provider to adjust the way in which care is provided but often within the traditional time schedule. This can be difficult particularly if there are technical difficulties or the equipment is not seamlessly available. Megan explained this in the quotation below,

> I know some of the doctors at the hospital are using it and I think they were running into difficulties… because they don't have a little bit of leeway with their time, you know, for their 15-minute appointments, and then you're onto the next.
>
> Megan, provider

Time pressures are also seen as a barrier in the primary care setting with little capacity in the current structure for change, as expressed by Michael, a provider,

> The barrier is time. If you want to set this up within your practice, you are going to have to spend a few hours planning it, spend a few hours testing it, you're going to have to spend some time thinking about which patients you might want to test it with. Firstly, you can invite them, and yet, you know we are getting smashed in primary care, so the time isn't there.

Existing processes can also be a barrier to THVCS as complex process changes may be required to implement a service. For example, for a rehabilitation provider to see a new patient there is typically a triage process by which a clinician determines the priority of a patient by assessing either written or verbal information and then the patient is sent an appointment by mail. Offering THVCS initially in this process is seen as challenging as not enough information may be available to determine suitability and the patient awareness of THVCS is currently low. These process problems are described in an allied health perspective in the next excerpt,

> Because if you just book in someone and they get an email they are not expecting… and they don't even know what speech therapy is, so it's like all those sorts of discussions and so I imagine getting an email in their inbox would be just like, well what is this to do with. They already think that when they get a letter in the post with our letterhead and everything, so, we would have to improve the processes significantly to increase that initial [consultation].
>
> Hannah, provider

Legislative issues also impede the use of THVCS. For instance, Michael explained how the Accident Compensation Act (2001) does not pay providers for THVCS and the frustrations around this,

> The legislation for ACC does not allow you to use virtual consultations in a claiming setting… So that's the only group where you do get stuck a little bit, because injuries and injury reviews, currently you can't do… It's a legislative requirement that needs legislative change and like most things, our rules are quite a few years older than our technology…it stipulates face-to-face, outside of some of the psychology claiming…that

> is a limitation that is frustrating because there are perfectly good ways you could do some of the ACC reviews without necessarily, concussion for example, you could easily do a good concussion review without necessarily having the patient in a face-to-face setting.
>
> Michael, provider

Structural barriers are difficult to overcome at a provider level but leading by example, just 'doing it' and encouraging others facilitates THVCS. This takes drive from providers with the underlying motivation that THVCS can provide an important service for patients and their families. This is exemplified in the next quotations from varying models of care,

> Within our practice it's probably me again raising it at clinical governance group and saying, 'hey look, I'm doing this guys, and who else wants'…what you do is say 'who else wants to pick it up?'
>
> William, provider

> I think we were the first team to use it. Because we have been using it for a couple of years now, but they are now using it for other teams, so we were just the instigator, really.
>
> Karen, provider

> I have to say I'm pretty terrible with technology, but I see the benefits of it for our patients, so I kind of persevere and push through…You do have to have a bit of drive to, you know, to do it.
>
> Megan, provider

While 'bottom up' leadership is vital for THVCS implementation without addressing structural barriers at all levels of the system sustaining and scaling up a service is problematic according to the provider participants and illuminated in the next quotations,

> People who are in primary care, they don't really love competition, you know, we don't want to set up a national health video consult service that treads on other areas or other regions of New Zealand. You know, you've got, there is a lot of other sort of regional politics and other bits that I think maybe inhibits some of that development…But I think if they don't do it broadly and in a well-structured way, then it's going to be slightly harder to get it done properly… if you're going to look at a national kind of telehealth service provision, I mean that needs clinical governance, it needs proper structure. You can't just do things in an ad hoc way; you need some quality in fact.
>
> Michael, provider

> Last year I got nominated three clinic rooms in [name] outpatients we would use for telehealth. I sent the [computer] numbers to IT and they put the [VC software] on it, but then they went to use it in January and February, and found, where's the app gone? When we logged in we couldn't find it, and it turns out in January IT had come and delivered a whole new load of computers so they had different asset numbers…so you don't realise the computer has been changed and that you have no longer got the app on it.
>
> Cathy, provider

The importance of top-down leadership was highlighted in the contextual observations with managers noting that there was insufficient high-level leadership, lack of strategy for virtual health generally and disconnect from higher management with policies lagging what was actually happening in practice. Leadership in THVCS can also be associated with legitimacy which is identified as a facilitator.

Legitimacy can be defined as an attribute of an authority that leads those connected to it to believe is it worthwhile and can refer to an organisation, a service, or an individual provider. Legitimacy facilitates THVCS by increasing awareness and trust in the service and is partly dependent on patient and families' relationship with the provider. The next quotations illustrate legitimacy as a facilitator to accepting THVCS,

> [Name] who I do trust, said to me, hey, will you try this, you know I was absolutely willing to do it. Like if I didn't have a lot of time for him or respect for him then I probably would have said no, I'm not really interested. You just trust them because they have built up that reputation.
>
> Luke, receiver

> When you go to the hospital it is very difficult to find a parking space and therefore she [provider] thought that, because she suggested about how we could use the telehealth. That's how we started.
>
> Clara, family of receiver

Conversely, an absence of legitimacy can be a barrier to THVCS as is suggested in the next excerpt where reasons for the failure of a THVCS program was discussed,

> I think they sort of missed that boat by not involving primary care in having a service which primary care would be happy to, you know, say to their patients, you should think about using this in an afterhours setting if you need care. I think had they involved them they would have seen a much higher degree of success.
>
> Michael, provider

Legitimacy is also linked to technology trust, which is considered in the next section along with the other themes of technology and processes associated with 'doing' THVCS.

5.4.3 *Technology and process*

Technology trust and usability workflow, support, integration, and limitations were identified as barriers and facilitators. Figure 5.4 shows the associations between technology and process factors and how they are also linked to organisational factors. These are explained in the following discussion and supported by the interview data and contextual observations.

5.4.3.1 Technology trust and usability

Trust in the technology and usability can act as either barriers or facilitators depending on the perceived levels of these aspects that providers, receivers, and decliners experience. Trust in technology refers to the way that issues of privacy, security, and safety of THVCS are perceived by people and how this may impact on their behaviour. Trust was high in the interview data with legitimacy as the moderating factor (shown in Figure 5.4). While participants acknowledged that security and privacy were important, they did not perceive THVCS to have particular privacy or security risks and trusted that the organisation or provider had addressed these aspects. This is exemplified by the quotations below,

> I am fairly clued in on computer stuff at my end [security, privacy] so I knew my end was fine. I mean you can only sort of hope that his end was fine, but to be honest, it didn't really occur to me at the time.
>
> Ben, receiver

> You trust the system, you trust the person. I didn't even think about to be honest. I mean, I think data is different versus a medical diagnosis. I mean it's still very personal, clearly, but you know I wouldn't do it via You Tube or something.
>
> Luke, receiver

While the security of the technology was not considered as a barrier to THVCS there was an expectation that the provider organisation was responsible for this and tacit acknowledgement that any breach in security would impact negatively on the perceptions of the service. This is demonstrated in the next excerpts,

> If you asked me what my wish list for things to have on the platform would be, security wouldn't feature but I do think they have to have, broadly speaking, they need to be secure. And once again if I read that [software platform] had a security breach, I'd be kind of tut tutting along with everyone else. So, I would judge them.
>
> Alana, receiver

> …we live in a day and age where privacy and security is a key strong point wherever you go and whatever you are doing, but I reckon there could be ways to make it more secure.
>
> Nathan, receiver

Trust in technology is broadly associated with usability as far as THVCS technology that does not meet security perceptions is not usable. However, systems that are chosen or developed for security may not have a focus on how the end users interact with the technology. The perceived degree of usability for receivers or providers facilitates or impedes THVCS. Two examples from providers recalling patient experiences are given in the next lines,

> Especially when we had our last system up and running. It was very complicated, it was hard to connect and yes, definitely. Some people said oh this isn't worth the time, I'd rather come in.
>
> Megan, provider

> I do have 90 plus year olds who don't have cell phones but who can use my video solution off their tablet, which is quite nice.
>
> Michael, provider

Technology usability needs to be high for the patients to be satisfied with THVCS and continue to use it. Patients in a hub-and-spoke model and a direct-to-patient model expressed this,

> If there's something there and he might point to the screen, but we really couldn't see what was on his screen…you know I don't know whether they have got the most advanced technology coming out of [place name] sometimes. Sometimes we have connection problems, it's not the most perfect thing.
>
> Dan, receiver

> You've got to do in the app, you can't do it online, which is annoying because sometimes you are sitting working and that's where you want to do things.
>
> Alana, receiver

The contextual observations detail a hub-and-spoke model where the VC technology is operated by the support staff so that it is useable for the patients without any effort on their part. However, attention is also paid to the usability of the virtual exchange with the nurse coordinator noting that she ensures that the window on the screen which shows the patients' image is removed to minimise distraction and create as 'real' experience as possible, this is evident in the conversation transcript,

> I will actually show them this [show yourself window] and then I'll get rid of it when the calls on because it can be really distracting to see yourself… So then they just see the doctor as that [seeing yourself] can be really distracting…and they don't like it and so it gives them the focus of the doctor and then they can have that normal face-to-face conversation that they normally would.
>
> Nurse coordinator

Similarly, from the providers perspective THVCS needs to have a high level of usability to minimise workflow disruption as a provider explains,

> You go yeah I want to do the video consult and really what I want to do is from the appointments screen, is say, well it's a video consult, click the video button, boom, over to i-frame, you are in the waiting room, the patient is there, but at the moment you have go, oh OK, open up [software], go to your appointment booklet in [software], hit the start video consultations, so there's some processes which could be better.
>
> William, provider

Associated with usability, workflow and integration are also barriers to THVCS and are discussed next.

5.4.3.2 Workflow and integration

For providers workflow was identified as a barrier to THVCS as it requires processes that are not part of the usual workflow for them, receivers, or support staff. In addition, any difficulties with processes interrupts workflow and can become more time consuming. For example, when receivers in the direct-to-patient model disconnect from a virtual waiting room if the provider is running late or delete the email that was sent with the THVCS link the provider needs to contact them by telephone or email to ask them to reconnect. Another example is given by a provider to explain the workflow barrier to THVCS,

> Sometimes I think they [patients] could easily have their needs met and have it [THVCS] offered. They get offered it when they book online but they might not necessarily get that offered to them when they speak to reception or the nurses are booking their review appointments and that's partly just because everybody is busy. It's not that we haven't tried, it's simple that you just forget, it's another step to look at.
>
> Michael, provider

Related to workflow, integration is a barrier to THVCS. When THVCS does not fit well into the existing systems it interrupts the workflow as described in the quotation below,

> But it means that then we've got to set it up again and try and work out which port the headphones go into and which ones the speakers go into, which might sound like minor stuff, but if you've only got a half hour appointment it would be a deterrent so I just had to swap the doctors clinic rooms to the other room where I knew it was still set up.
>
> Cathy, provider

If integration between the existing systems and the THVCS is missing there can be workflow confusion. Examples of this from participants include the organisation's booking system automatically generating a letter or a text reminder about their appointment that is sent to the patient which refers to an in-person appointment when it is scheduled as a THVCS from the software platform. A participant explains this,

> And I mean I would hate for them to receive one and whether or not it didn't line up or whatever the issue, and them getting even more confused, or the letter in the mail thinking they had to come into the department but they get the email saying it's done at home, I just thought no that's too much.
>
> Ashley, provider

The barrier to THVCS of integration can also extend to human resource practices. As the contextual observations note that THVCS is not specifically written into all job descriptions though the practice is facilitated when it is included in tasks that are expected of staff. This is likely to play a significant role in sustaining THVCS as it becomes a part of the role rather than the champion provider who may leave. In addition, revenue can be missed if the recording of the consultation is not integrated into the work processes. These types of integration shortfalls, changes in workflow and issues with usability make embedding THVCS as usual practice more difficult. However, these barriers can be moderated by support.

5.4.3.3 Support and limitations

Support for receivers can be from family members or providers and support for providers can be other colleagues or the from the wider organisation, for example IT or specific telehealth support staff. In the hub-and-spoke model there are staff to support the patients and their families to use THVCS as Jerry a receiver recalls,

> So the thing is, she set it up, she came out and said right, in you go, and when we walked in the room he was there looking at us, we didn't have to sit down and get prepared and all that sort of rubbish.
>
> Jerry, receiver

In a direct-to-patient model use is often facilitated by family members and the provider before and during the exchange, as the next quotation illustrates,

> If they are keen to go via telehealth, if they have a device with them that they use anyway, I'd try to download [software] while they are here, so it's a bit more streamlined, and it's one less thing for them to do.
>
> Megan, provider

The contextual observations identified support as an important element when introducing patients to THVCS, a nurse coordinator stating that it is important how the patients are approached, and they need to be warned that the doctor will be on a screen as some do not know what to expect. On the providers side, they are encouraged to use THVCS when support is available from their immediate colleagues or other sources of expertise. These scenarios are pictured in the excerpts following,

> We've got one [provider] who is pretty good with computers so I always annoy him. He will kind of go, oh my gosh, not again, but yeah, it's good to have someone who is like on to it.
>
> Megan, provider

> I always make sure that I've got a phone number handy, just for ringing the coordinator for telehealth and saying what are we doing wrong, that kind of thing, you know.
>
> Cathy, provider

Regardless of the support available there is an obvious barrier to THVCS for any interactions that require a 'hands-on' approach. This is a limitation in direct-to-patient models compared to a hub-and-spoke model where there may be other clinicians available to perform physical components of the consultations. However, these limitations are moderated by the approach of the clinician, their clinical judgement, and their assessment of the benefits versus the drawbacks. As Michael and Hannah explain,

> It may mean that I need to discuss with them the difference between my ability to diagnose something, where the limitations of the consultation sit, but a lot of the time, in those sort of settings where it is maybe not possible to do a physical exam yet would be ideal to simply shift from a diagnostic process to an advice based element.
>
> Michael, provider

> I think sometimes if they are voice, there is always the audio quality that can be a little bit of a concern… I've heard some clinicians say it's absolutely no problem, and I've had some clinicians say they would never do voice [therapy] over telehealth again.
>
> Hannah, provider

These limitations may be overcome by using a mixed model of care whereby some appointments are in-person and some with THVCS. This is also recognised by a receiver as the comment below shows,

> And then he has to do the hands-on job, so it's going to be limited, so all I can say is that the follow up, great, terrific, but it has its limitations.
>
> Jerry, receiver

However, there are consultations where there is a perceived requirement for an in-person interaction where it might not be necessary. This can be due to the change in workflow required or established processes that make initiating THVCS more challenging, such as has been previously discussed. The interviews with providers, receivers and decliners

also identified a barrier that extends into a less tangible theme, which has been termed 'prefer in-person' and attention is turned to this and other person-focussed barriers and facilitators now.

5.4.4 *Individual level*

Broadly aligning with the individual level aspect of the work system and related to various process factors (Figure 5.4) are the themes of prefer in-person, consumer demand, provider-receiver relationship, reluctance, and patient selection were identified from the perspectives of the participants.

5.4.4.1 Prefer in person

The theme of 'prefer in-person' emerged strongly in the interview data as a barrier to THVCS and was comprised of five sub-themes: efficacy of treatment, familiar way of working, human connection, privacy, and whole experience. Figure 5.5 shows the number of coding references in each 'prefer in-person' sub-theme adjusted by the number of participants in each participant type (eight providers, nine receivers and three decliners) to account for the different number in each category.

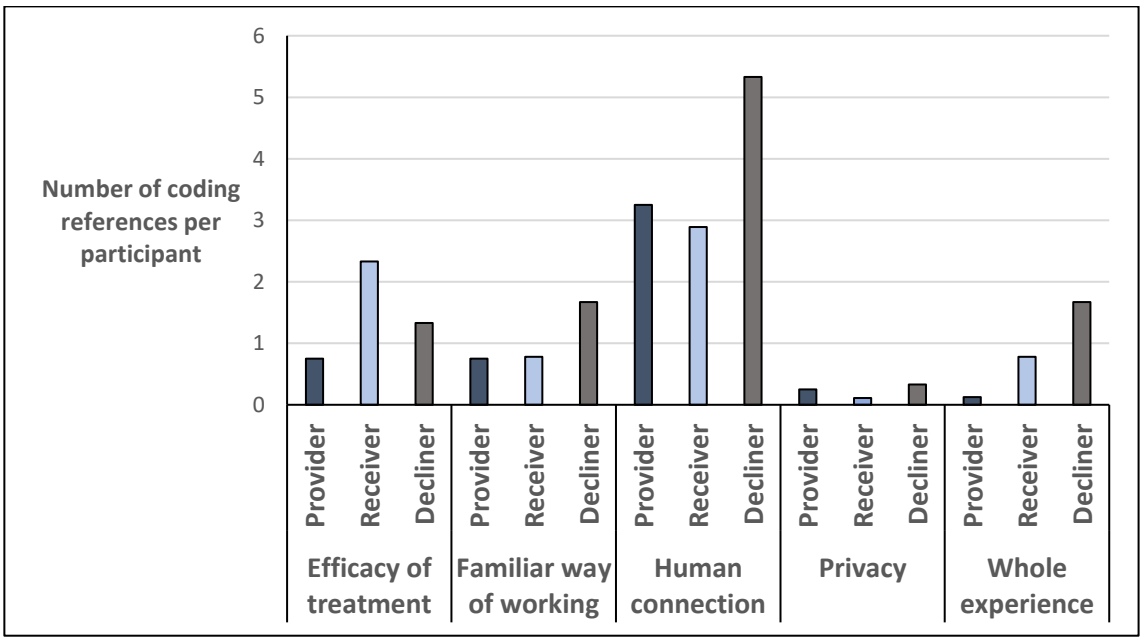


Figure 5.5 Number of coding references per participant in each participant group for the subthemes of the 'prefer in-person' theme.

While quantitative representation has limitations for this qualitative data it is interesting that the extent of coding assigned per participant varies depending on their role in this sub-theme. This indicates a variation in emphasis in the perceptions of the groups of participants, particularly in the human connection sub-theme. During the coding process human connection was defined as "perceptions that in-person social connections, human interactions and communications are more valued or superior in some way than virtual ones". This sub-theme was most pronounced amongst those who chose not to use THVCS indicating human connection as a key barrier to THVCS. Some of these feelings are expressed in the excerpts below,

> I just find it easier to talk to somebody and it doesn't bother me, coming up here. I'd rather be here and talk to the person or if I've got any other concerns, yeah, I'd just rather do that.
>
> Mary, decliner

> Oh it's just, it's quite comfortable to talk to somebody, I prefer talking to someone in-person rather than a screen.
>
> Alec, decliner

> I enjoy the whole process, from being greeted at reception, greeting that reception person, and being face-to-face with the therapist.
>
> Angus, decliner

The importance of the human connection is also evidenced in the experiences of providers who have noted that they wish to have their patients attend in-person at times and that receivers of THVCS also wish to attend in-person at times. These situations are described well in the next quotations,

> And people, even when they have used it, will sometimes come in, even for mental health reasons. You might have done two or three of them virtually and then they will come in in-person. And I'll ask them, you know, what made you decide this time to come in, and they will say well, actually, no I just wanted to see you in-person this time… It's really fascinating that it's kind of hit that… people still want that relationship. I think it's still key for people at the moment. That may change for consumers in the future, but where they have that relationship and rapport with somebody, I think they want to try and maintain that, so they do tend to mix and match at their own choice…which I wasn't necessarily expecting so much of.
>
> Michael, provider

> For some of my voice patients who we've been catching up by telehealth, especially those a bit rural, I catch up with them every now and then to do a face-to-face. Like you know, I don't know, just when I feel like I need to do that.
>
> Megan, provider

Providers and receivers of THVCS note the value of the in-person interaction for observing non-verbal behaviour, that 'something is missing' from a VC interaction and that 'feelings' are more apparent when providers and patients are in the same physical space, and the barrier this poses for THVCS. Three examples of this are evident in the next quotations,

> I mean what is limited, you can say, is observing really details of the patient's behaviour sometimes, you know, mimics and, I mean usually the connection is really well and you can see in very detail, but I think you could do better if you would have that person face-to-face.
>
> Kristin, provider

> Well, because you can't, the face-to-face conversation, you can't…it is something like watching rugby on the TV and actually going and being at the match, it is better… when you watch a match on the television…it is not like actually being on the side…the emotional element is not there.
>
> James, receiver

The need for a human connection and the limitations of achieving this with THVCS is a key barrier for increasing the use of THVCS and embedding it in usual practice. Michael explains why he thinks the number of THVCS he has been providing in primary care has not increased once it reached a certain level,

> Part of that is because people want to come in sometimes so they might choose virtual one time and come in the next. And so when you've got that across lots of people you just hit this kind of static level because even though they may be able to do it and they've used it before, it doesn't necessarily mean they are going to change their behaviours in the greater setting.
>
> Michael, provider

Aligned with the human connection theme is the notion of the 'whole environment' where perceptions are that in-person interactions are preferred over THVCS so that entire environment can be experienced. This is explained best in the next passage,

> I need to be able to see the whole person in front of me…Not just a head and shoulders, you know, if their foot twitches, I want to know about that…I can relax if I am in the whole environment.
>
> Angus, decliner

Other participants felt that the in-person environment allowed them to interact more fully with aspects such as being shown information on the provider's screen or with other providers and peers both in planned and incidental ways. As a receiver expressed,

> I like going to the clinic ['hub' hospital] and learning about what is actually going on, and how I'm actually going and you know, just doing it here ['spoke' hospital] and just seeing [nurse] isn't enough, but when we go there we probably see, like half a dozen, like dieticians, and what not that we all know and other people from [health] camp and it's just not quite the same at the ['spoke'] hospital.
>
> Dan, receiver

The preceding excerpt signals perceptions that efficacy of treatment with THVCS may be compromised leading to a preference for an in-person consultation. This may be related to the technology or the difference in processes as the next quotations describe,

> It never sounds as clear on this [VC] either, you know, that's another thing. Face to face I feel like you can hear how bad it [voice] is, whereas if I do it with [name] like this [using VC] I don't reckon she'll be able to pick up as much. I just think in the same room, when you are talking to somebody, that they can hear you more and better and gauge it.
>
> Mary, decliner

> When you are down there ['hub' hospital] and you are booked for clinics, there is a whole run of us, and I don't know if that's quite how the VC's are done, so [specialist] sort of just might get busy he'll get taken off doing other things, so sometimes you don't always end up catching up with him, whereas when you have got your [in-person] appointment, you know you are going to get a doctor down there of some description.
>
> Linda, receiver family

The perception that in-person treatment is superior to THVCS is held mainly by receivers or decliners and not providers. This maybe as providers only offer THVCS when they judge it to be appropriate and that their experience supports their confidence in its efficacy, as the next excerpt illustrates,

> Yeah, I don't know, I think they have this perception that somehow face-to-face kind of input will be better, but from my experience, it's not that much different. Like I haven't done any, you know, research into it, but to me it feels like my sessions are pretty much the same as if someone was in clinic with me.
>
> Megan, provider

While technological privacy and security (see 5.4.3.1) is not a significant barrier to THVCS, the availability of a private, physical space may be a reason for preferring to attend in-person, as two participants explain,

> The other thing that would be a concern for me is that in our house, our laptop computer is in a corner of the living room and if I was doing speech therapy practice through it, it would be kind of a public performance.
>
> Angus, decliner

> Yes, if I couldn't find a space, yeah, I'd be more reluctant unless I was around someone very trusted, like a family member or something. Naturally there is some stuff you don't want to be talking about with people around, especially when it comes to psychiatric stuff.
>
> Ben, receiver

The final sub-theme identified in the prefer in-person theme is 'familiar way of working'. This refers to the preference for receiving or providing healthcare in a way that is familiar and does not require a change in behaviour. These perceptions were attributed in part to generation and to habit as the following extracts indicate,

> I'm old school. I was born before Facebook and smart phones and all of that kind of stuff. I prefer meeting up with people face-to-face. Somehow seeing someone through a video screen doesn't seem quite real to me.
>
> Angus, decliner

Associated with the 'prefer in-person' barrier is reluctance, and this is considered now in section 5.4.4.2.

5.4.4.2 Reluctance

Reluctance was defined as "an unwillingness to use, provide, accept, or embed THVCS" (Table 5.3). A reluctance to change was one aspect of this theme and is exemplified in the passages below,

> I find the biggest barrier is some people just take a lot of, I don't want to say I try and push them into it, but convincing to do telehealth, to try it. Once they have tried it they are fine but I find that's also a barrier, not so much the system but in that people are a bit reluctant to try it.
>
> Megan, provider

> I just go do it, yeah. I just say, I'm doing this, and they [colleagues] go 'OK, fine whatever, I don't want to do it, just you [name] please. Just make sure they don't bloody try and book a video with me please'.
>
> William, provider

Reluctance can also be due to providers or receivers not feeling that THVCS is the right approach in the circumstances, outlined in the following quotations,

> I don't want to do videos of people I don't really know that well.
>
> William, provider

> I think I feel as a therapist more confident when I have my patient in my room. And it's actually hard to say but I feel I am more in control of the whole situation.
>
> Kristin, provider

> I think I'm not sure I want to do a video conference with my child if it was a long-term chronic issue, but I think if it was something obvious and short-term, then yeah.
>
> Luke, receiver

Clinician reluctance to use THVCS was a strong theme in the contextual observations. This was noted through a difference in THVCS use rate between 'champions' and other health professionals proving similar services. In addition, concerns about the human connection were voiced with a nurse asking a THVCS provider "how do you show empathy through a screen?" Fear of technology was also cited as a reason for the reluctance and examples included a specialist willing to use the telephone for a consultation but not VC, and a trial of using THVCS for wound care being 'difficult' with staff negativity towards using the camera attachment equipment. The reluctance from various specialties to use THVCS despite other clinicians assessing it as appropriate was

not well understood, though concerns about the coordination of care was speculated. Reluctance is a barrier to THVCS and may have wider ramifications for embedding or sustaining THVCS in a service as it impacts on the selection of patients as is explained in the next section.

5.4.4.3 Patient selection

The perceptions on selecting patients to use THVCS can be a barrier to the service as assumptions made about patients' ability to be technically able, have the necessary technical resources, and general interest in THVCS. An example of the possible skew in patients offered THVCS was the difficulty this project experienced in recruiting people who had declined to use THVCS (as discussed in section 3.3.4.2) and as one provider related,

> You see those ones are a bit biased, probably, the ones who don't use it, because, but on the whole the people I have asked are you interested in it, have said oh yes, that would be much easier.
>
> Cathy, provider

Another participant's experience, related below, is an example of how assumptions can be incorrect and may therefore be a barrier to THVCS access.

> I try and remember to offer it to everyone, every new person that comes through my clinic, and sometimes I go, I think in my head, well I will offer it but I don't know they'll go for it, and they say yeah, love, let's do it and I am surprised…I don't think, I've just learnt that you can't discriminate on age, as to who you are going to offer it to.
>
> Megan, provider

In addition, the contextual observations make note in the allied health example of a survey of practitioners which identified that practitioners made assumptions about whether patients would be interested in using THVCS or not. The hub-and-spoke contextual observations also offer evidence that patient selection is a barrier to THVCS use because of the gate-keeping role that specialist medical practitioners play. Clinical nurse managers note that using THVCS is the consultants' decision. At times nursing staff advocate for THVCS but this is not always viewed as their role and can add to their workload. In contrast, in a primary care setting some providers have learnt that patients are able to select appropriate times to use THVCS and that the structure of the model of

care needs to support that to reduce patient selection as a barrier, as Michael explains in the next excerpt,

> Patients can book any of my appointments that are available at any point that they want to, so I don't try and restrict them in time or process because I don't think that's the way forward…even though I don't set any parameters and I don't set any guidance about what's appropriate, people make actually really good decisions about it.
>
> Michael, provider

The barriers of preferring in person, reluctance and patient selection may be balanced by the next two factors: the provider-receiver relationship and consumer demands.

5.4.4.4 Provider–receiver relationship

The relationship between health professionals and patients and families is seen as an important one amongst the participants of this inquiry, as Ashley articulates,

> My biggest thing is for any clinician or any therapist, you just need to build that rapport with that patient, regardless if it's face-to-face or telehealth. If the rapport is not there, then your therapy is not going to work.
>
> Ashley, provider

The provider-receiver relationship links to the themes of legitimacy and technological trust and is a determinant of people trying THVCS and concurrently preferring to continue to attend in-person. As participants Dan and Ben relate,

> I mean it was a new experience, but the way [provider name] was and stuff, it made it a very sort of comfortable experience.
>
> Ben, receiver

> I think I'd only ever use it [THVCS] if it was like it is now, any more than every six months, nothing less than having someone as good as [provider name at 'spoke' end of service] helping you with it, if we were there with someone who didn't know what they were doing I'd say no, if it was more than twice a year I would say no.
>
> Dan, receiver

In addition, the skills of the provider to establish rapport and extend their relationship with the patient to the virtual medium is essential in the satisfaction of receivers. This was exemplified when THVCS was provided unexpectedly and the participants were irritated until the provider was able to connect with them effectively over the VC medium

and satisfy the receivers (see 5.3.6.3). The contextual observation confirms this with a nurse coordinator remarking that some clinicians have a better 'virtual presence' than others. However, the provider receiver relationship holds less importance in episodic care. This is outlined by the next two extracts,

> I mean if you are sick and you need to talk to someone, I don't think you're going to worry about it, but I guess it would be harder for someone to understand history and challenges in their life or whatever, like the background stuff. Versus [provider name] who knows me, knows my family, you know, I think that context is obviously important.
>
> Luke, receiver

> In terms of the casual stuff, people are fine to do that if they've got a stubbed toe or they have fallen over and hurt their arm at soccer, but they don't really necessary want to have a new mental health consult with someone that they don't know. You know, the value might not be there.
>
> Michael, provider

The previous quotations also introduce the importance of meeting the needs of patients and their families and this was identified as a 'consumer demands' theme from the data.

5.4.4.5 Consumer demands

The theme of consumer demands was defined as "aspects related to consumer needs now and in the future" (Table 5.3) and is represented as both a facilitator and a barrier to THVCS (Figure 5.4). Linked to the prefer in-person and reluctance theme THVCS is limited by the preference of patients to continue to attend in-person. As Megan explains,

> A lot of people don't want, they'd rather have that face-to-face contact so it's very hard to get, you know, weekdays where I'm all virtual and I could work from home.
>
> Megan, provider

In addition, participants had not experienced strong patient demand for THVCS. This was identified in primary care by a low uptake when it was offered, and in secondary care while there is more THVCS use this is more related to legitimacy, that is providers suggesting, offering, or just providing THVCS, than demand from patients and families. This is supported by the extract below,

> We have got a big sign on the main entry of the hospital to say it is available, but I've never had a patient ask about it.
>
> Hannah, provider

In contrast, when there is consumer demand it can be a strong driver of THVCS, particularly in encouraging providers to try the service, as exemplified in the next quotation.

> On Monday for that doctor, he [patient] actually emailed us and said "is there any chance of a video call because I don't think I can make a trip from [place] to [place]. I'm just not that great at the moment"…I thought yah, I can get this guy [doctor] on board [to use THVCS] because I know he was anxious to see this person because he'd been unwell for his previous appointment… and hadn't been able to come, I thought 'oh great', that was a great icebreaker that one, you know, I thought that is a real win so hopefully we will be able to book other patients for him through telehealth.
>
> Cathy, provider

Consumer demand is likely to play more of a part in facilitating THVCS in the future as awareness of the service increases and as consumers seek more convenient healthcare. Responding to the needs of patients and their families may facilitate the provision of THVCS to keep connected to their patient base, particularly in primary care where competition from overseas online providers already exists. As Michael speculates in the passage below,

> I think that we need to just shift primary care along a little bit because actually our patients will look for it if we're not providing it, and we will lose that opportunity to develop that relationship with them… the potential for us to lose contact with younger people who look for their healthcare otherwise, in a more convenient manner, suddenly we lose that relationship with them and we will end up managing really complicated multi-disease processes from missing opportunities to connect with young people and to show them the value in primary care.
>
> Michael, provider

In summary, the barriers and facilitators identified through the Phase II interview data and contextual observations are interrelated across the work system components of organisation, technology and processes and people. The impacts of THVCS and the barriers and facilitators of THVCS interact in a way which influences the providers',

receivers', or decliners' decisions to engage with, or continue to engage with THVCS. Whether THVCS is used or not seems to be determined by a weigh-up from the participants of the costs and the benefits of THVCS, this theme is termed 'cost and consequence' and is discussed next. Then this chapter is concluded with a summary of the Phase II findings.

5.5 Cost and consequence

How factors supporting and impeding THVCS are related and moderated depends on an informal assessment from providers, patients, and their families. The costs as well as the health and other consequences associated with the THVCS model of care are compared with the status quo which may be usual or no care for a health condition. The costs and consequences have different emphasis for different participants, for example a patient chose THVCS since it had been recommended by trusted advisors, was convenient and allowed then to access a service that was not otherwise available to them in their area, despite attending in-person being the familiar way of working and having some clinical and technology safety concerns. This scenario of balance is shown on the left in Figure 5.6.

Additional examples of receivers weighing up pros and cons to determine use are evident in the following quotations,

> I mean in this case it allowed me to access a service which I otherwise wouldn't have been able to and plus would have been getting fired from my job if I hadn't done it…I mean I guess there is always a possibility [of security breach] , but me accessing the medical services that are required trumps any concerns like that.
>
> Ben, receiver

> He likes face-to-face more than this [THVCS], but this is also in one way better because you don't have to go and, you know, and get there on time, she gets connected and then we have a chat (Clara)…Because this telehealth is the next best thing (James).
>
> James and Clara, receivers

> I can see now why [use THVCS], because everyone is in a hurry and so forth these days, all rush and bustle, and I would agree that some of these specialists they may be more importantly used over in … the big hospital, than coming out to [small hospital].
>
> Jerry, receiver

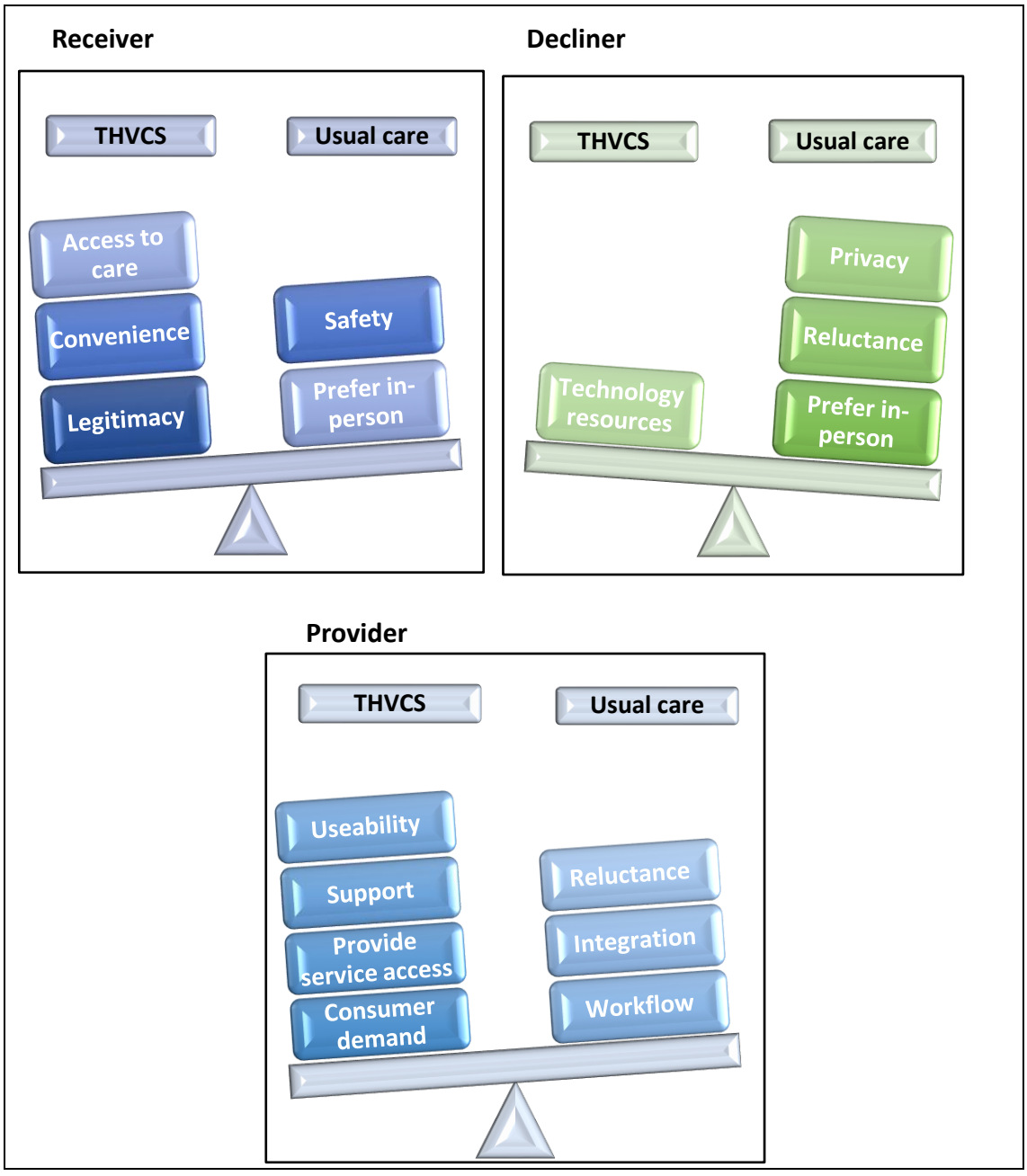


Figure 5.6 **Cost and consequence examples of a receiver (top left) choosing THVCS over usual care, a decliner (top right) continuing with usual care and a provider offering THVCS (bottom)**

In contrast, an example from a decliner was that despite having the technological ability they wished to remain with usual care due to a need to experience the whole environment, reluctance to 'talk to a screen' and lack of privacy in their home space (right side of Figure 5.6). Other examples of a cost and consequences assessment for decliners are illustrated in the next excerpts.

> Not really, no I don't really see the purpose of that [THVCS] I'm near enough to the hospital or the doctors you know to get there, because its only twenty minutes to [place name] or [place name].
>
> Alec, decliner

> For my own health I just want to, even if [name] said can you drive up once a week and see me, I would do that because I don't want to end up having cancer later on from it.
>
> Mary, decliner

> I'd be more inclined to think about it [THVCS] if I lived further away. If I was living out in the country I'd probably come into town nevertheless and do a whole lot of other stuff that I want to do in town, and then go back home.
>
> Angus, decliner

A provider's example (Figure 5.6, bottom) balances THVCS benefits to patients through access to services and convenience, degree of usability and support with difficulties with workflow and integration and reluctance to change. Balancing the costs and consequences is evident in the next verbatim selections,

> I mean if I put myself in my patients shoes, you know, would I rather drive into the hospital, come up a horrible carpark building only to find that the carpark building is full, go back down, you know, or would I just rather just link in? That's an easy one. It saves so much time for people.
>
> Megan, provider

> Of course it would be better to meet the person in a face-to-face contact but actually you can really manage it just meeting each other on the screen…otherwise I couldn't reach specific patients who just live too far away from [place] so it's just the only way to get in touch with them and provide them with at least some kind of support.
>
> Kristin, provider

5.6 Summary of Phase II findings

Chapter 5 presented the findings of Phase II of this inquiry which aimed to explore, from the perspective of providers, receivers, and decliners of THVCS, research questions two and three:

- How do THVCS impact key stakeholders in the work system?
- What are the facilitators and barriers to THVCS for key stakeholders in New Zealand?

Twenty semi-structured interviews (eight providers, nine receivers and three decliners) were conducted with participants drawn from a North Island DHB (n=9), a South Island DHB (n=6), primary care (n=4) and private, secondary care (n=1). The data were collected to provide a different perspective to that of the expert group who contributed the Phase I data. The interviewees came from six different healthcare services, illustrated in Figure 5.2. Contextual observations, designed to enhance the inquiry with the context of people using THVCS in a real-world setting, were carried out at three sites at the North Island DHB and included seven additional provider participants (detailed in section 5.2.2).

The data were thematically analysed following the framework method illustrated in Figure 3.4 and described in section 3.3.8. The analysis resulted in the development of Figure 5.3 which models the impacts of THVCS on the work system through interrelated themes.

THVCS force a change in the work done (section 5.3.4) by both providers and receivers and this mediates the outcome of their interactions. The degree of technology familiarity helps to explain how the work changes are experienced. Access to THVCS depends on the models of care, technology resources and booking processes at the provider end (section 5.3.2) and technology resources from the patient end (section 5.3.3). The main outcomes of THVCS identified in the data (section 5.3.6) include convenience, satisfaction, patient engagement, equitable access to services, safety, and skill development. The analysis suggests that the outcomes may be positive or negative depending on the moderating effect of the facilitators and barriers to THVCS. The facilitators and barriers identified in the data were grouped into organisational,

technology and process, and individual levels in Table 5.3 and their inter-relationship mapped in Figure 5.4. The structural barrier of time was an impediment to the changes required for THVCS at an organisational level, and leadership and legitimacy considered facilitators (section 5.4.2). Technology and process factors of technology trust and usability workflow were identified as both barriers and facilitators, while integration, workflow and limitations were considered barriers, and support a facilitator to THVCS. These were associated with each other and with the organisational factors of leadership and legitimacy (Figure 5.4). At the level of the individual the theme of 'prefer in person' was a key theme, highlighting the importance of the human connection in healthcare and identified as a barrier to THVCS. Related to this is the barrier of reluctance from providers, receivers, or decliners to use THVCS which in turn is associated with technology and process usability (section 5.4.4.2). Reluctance can also have ramifications for the selection of patients to offer THVCS to and it can be influenced by consumer demands.

The impacts of THVCS and the barriers and facilitators of THVCS interact in a way which influences the providers', receivers', or decliners' decisions to use, or continue to use THVCS. The analysis identified that this seems to be determined by an informal weigh-up of costs and consequences by stakeholders.

The Phase I and Phase II data collection steps in this inquiry has generated a rich data set which will be synthesised in the discussion in Chapter 6. Following this, Chapter 7 concludes this thesis.

CHAPTER 6 Discussion

6.1 Introduction

This inquiry aimed to explore how the impacts of THVCS on work systems are perceived by key stakeholders in New Zealand, by describing the characteristics of THVCS use and identifying the facilitators and barriers to THVCS. Overall, this has enabled an assessment of how the work system can adapt for THVCS to be sustained practice in healthcare in New Zealand. This thesis makes practical, theoretical, and methodological contributions to knowledge. Practical contributions are made in relation to the design of the THVCS system as a sustained practice. Theoretical contributions are offered using STS theory for THVCS, the use of SEIPS 2.0 as a framework and augmenting knowledge of the multi-level impacts of the introduction of technology into a complex system. In addition, the literature review process generated a conceptualisation of the telehealth research which contributes to the understanding of the field. Importantly, the inquiry also adds to the scant THVCS research in the New Zealand environment. Methodologically, this research contributes a qualitative approach to investigating THVCS, the use of a theory-based framework, and draws on the perceptions and experiences of a unique group of participants.

The findings of the inquiry reflect the multi-level nature of the impact of THVCS and the facilitators and barriers associated with the services. Significantly, the findings addressing the impacts, facilitators, and barriers of THVCS, presented in Chapters 4 and 5 intersect with various levels of the system as they interact. Thus, the discussion of the findings will be structured following a meso-approach (Karsh, Waterson, & Holden, 2014) whereby external environment, organisational, group and individual levels are integrated into the narrative synthesising the key Phase I and Phase II findings. The combination of the findings helps to explore how the system can adapt for THVCS to be sustained practice in healthcare in New Zealand (research question 4).

The key findings determined from Phase I and Phase II of the inquiry fall broadly into seven areas of impact shown in Figure 6.1. The areas overlap and interact, and the terms used are either drawn directly from Chapters 4 and 5 (i.e. new ways of working, human connection, best for patient, cost and consequence) or are themes that are represented

throughout the thesis that are integrated in this chapter for discussion (i.e. change, fit, equity).

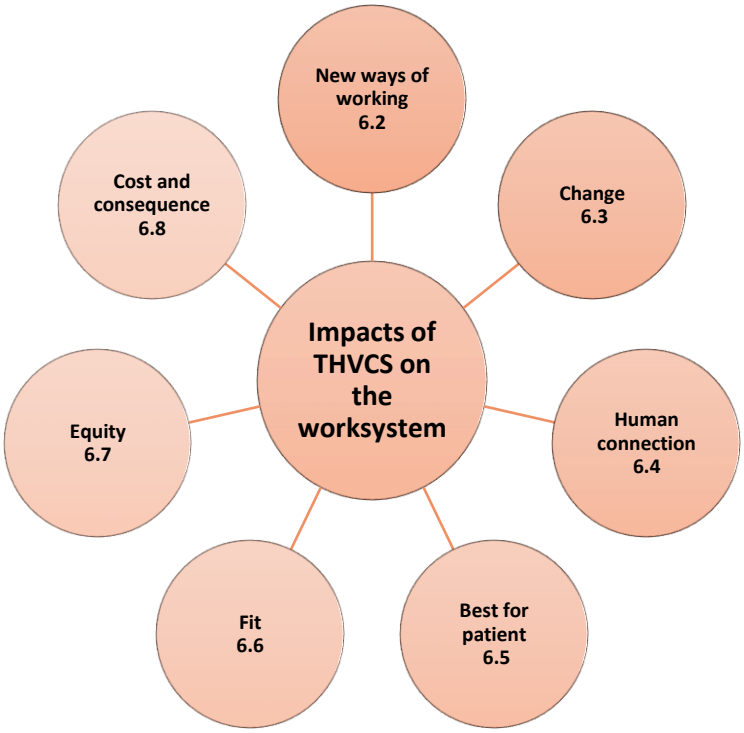


Figure 6.1. Key findings of the impacts of THVCS on the work system

The factors shown in Figure 6.1 are discussed in sections 6.2 to 6.8, clockwise starting with 'new ways of working'. Each section begins with a quote from the data collected across the inquiry to illustrate the section topic. To aid with navigation of the chapter a modified version of Figure 6.1 with the factor to be discussed highlighted in colour is also included from section 6.3. Then, in 6.9 to 6.11, the practical, theoretical, and methodological contributions of this inquiry are demonstrated. A summary concludes the chapter in 6.12 which leads to Chapter 7, where the final conclusions of this thesis are presented.

6.2 New ways of working

> *He [doctor] had to address for himself how he would operate, practice differently and then had to assist his clinical colleagues and the people who were going to be at the end of a VC clinic …because they were the ones who then had to help the patients who come in for that clinic, who were experiencing something totally different as they were used to seeing him in-person …he had to help those clinical people and administrators who were booking clinics because then they had to help the actual patients come to grip with this change.*
>
> *Participant 15*

THVCS require new ways of working and effect change in work processes. This was a theme clearly voiced from both the expert participants (section 4.3.4), providers and receivers (5.3.4). THVCS provide a service with a new model of care and the implications on work extend across the work system, as suggested in the quote that opened this section. Providers, support staff and patients are required to adapt to a new way of working. Key consequences of this are an effort shift, work roles changes, and disruption to the status quo. These points are discussed in turn now in sub-sections 6.2.1 through to 6.2.3.

6.2.1 *Effort shift*

THVCS as an alternative model of care creates an effort shift between key stakeholders. In the traditional model of care, a patient attends at an allocated time to a 'bricks and mortar' location where they wait for the healthcare provider to see them. In this model, the effort that the patient exerts, including time and money, is high. The patient may need to travel, take time off work, arrange childcare, negotiate carparking and hospital buildings, and wait in an unfamiliar environment. This effort by patients can be described as part of 'patient work' (discussed further in section 6.5) and defined as the exertion of effort and investment of time by patients or family to achieve an aspect of healthcare (Holden et al., 2017). In a THVCS model of care, patient work is lessened by technology eliminating or reducing the distance to the provider. The degree to which the work of the patient is diminished depends on the model of THVCS used. A direct-to-patient model may result in a significant reduction in patient work in terms of travel, time, and associated costs. In a hub-and-spoke model, travel may still be required although the distance is likely to be less and the work required to negotiate a smaller facility compared

to a large 'hub' hospital is also likely to be reduced. However, in a direct-to-patient model, while there is less patient work needed for travel, there is additional work required by the patient to supply and manage their own technology.

In contrast, THVCS, when compared to the traditional model of care, can shift the logistical and technological effort required to provide a healthcare service to the level of the organisation, individual providers or patients and their families. Abimbola, Keelan, et al. (2019) frames this concept of effort shift as a re-distribution of relative transaction costs (the effort, time, and monetary costs necessary to complete a clinical interaction) among supply-side (provider) or demand-side (patient) stakeholders. The findings from the current inquiry suggest that the effort shift required from provider stakeholders in THVCS is a barrier and if the effort shift is too great or too difficult THVCS are unlikely to be sustained or spread to other areas. Abimbola, Keelan, et al. (2019) concur with the importance of recognising the effort shift experienced with a change in model of care and suggest that the impact of patient facing digital health innovations on the transaction costs on providers and patients is important in determining their value. In practical terms, the value of the service is determined by the people in the work system weighing up the relative pros and cons of THVCS from their own perspective to decide if they are willing to use it and under what conditions. In this thesis this is termed 'cost and consequence' and it discussed more in section 6.8. The effort shift of THVCS towards providers results in work roles changes within the work system.

6.2.2 *Work roles changes*

The impact of THVCS on booking systems was a recurrent finding in the secondary sector and was a barrier in the implementation of THVCS. In a hub-and-spoke model, those responsible for booking appointments experienced an increase in workload as they had to schedule appointments in two locations or book the consultations in two parallel software systems. In addition, the booking systems often require extra learning for booking clerks or departmental administrators and at times the responsibility of booking THVCS falls to the individual clinicians. Given the negative ramifications on the delivery of THVCS if bookings are not effective, surprisingly the processes of booking and the impact on the people in the work system does not feature prominently in the vast telehealth literature. Challenges with the booking system were identified in a New Zealand THVCS pilot study and an increase in workload and decision making required by scheduling staff was noted

(Day & Kerr, 2012a, 2012b). Similarly, a large United Kingdom-based project detailed the tasks of support staff to book appointments, the need to reconfigure scheduling software to recognise THVCS appointments, and the challenges of integrating the traditional in-person model of care system into the THVCS model (Greenhalgh, Shaw, et al., 2018; Greenhalgh, Wherton, et al., 2018; Shaw et al., 2018). Beyond these examples, little attention is given to the impact of THVCS on the booking processes and the people tasked with them. Careful consideration to this part of the consultation process is vital if THVCS are to be a sustained practice embedded into 'business as usual.' Moreover, recognition of the role booking staff can play in 'gate-keeping' in a new way of working is worthy as it has implications on the wider work system. In the field notes of this inquiry, it was recorded that booking clerks "try to promote THVCS even though it is more work for them, as they see the benefits." In contrast, Brant et al. (2018) report that reception staff held, not always favourable, opinions about the merits of differing technological care models compared to in-person consultations and these had implications for how these were offered to patients. They found that receptionists were central in promoting and facilitating the use of such alternatives, managing demand, and ensuring patient safety. However, their roles were not always adequately considered when organising new models of care and despite experiencing changes in their work they had not been involved with the design of the services. Including booking staff in the design of THVCS and engaging them in the processes and in this new way of working is a critical link in the work system to achieve positive patient, employee, and organisational outcomes.

Another interesting finding of the current inquiry related to the impact of THVCS as a new way of working was the potential reframing of the status and role identities that clinicians feel is central to their essence as providers. An example of this was a perception that VC created a less formal occasion than an in-person interaction, one that the patient might not take as seriously and where the provider may not hold as much influence. Additionally, there was a view that THVCS, as an alternative to in-person, may create a reluctance from the patient to attend in-person and place a pressure on the provider to continue even when it might not be appropriate. From the perspective of nurses, there was a concern voiced that aspects that they felt 'made' them nurses may be lost, such as the provision of empathy and physical touch. The findings from this inquiry indicate that

using THVCS potentially changes the perceived position or identities of the providers. This aligns with literature which reports that providers feel their values are threatened as remote technologies keep them at a distance from their patients, fundamentally changing the nature of their role (Brewster et al., 2014; Segar, Rogers, Salisbury, & Thomas, 2013; Solli et al., 2012; J. Taylor et al., 2015). Taking a sociotechnical approach, Berg (1999) suggests, "a 'physician' is only a 'physician' in the modern western sense because of the network of which s/he is a part and which makes his/her work and responsibilities a reality", (p.89). This exemplifies the interdependencies of the sociotechnical work system where the elements of the system, providers in this case, acquire specific characteristics, identities, and roles as part of the system. Any change in part of the system can ripple to other parts of the system. Greenhalgh, Swinglehurst, et al. (2014), drawing on strong structuration theory, argue that when introducing technology into healthcare, questions should be asked about what change in social roles may result and what are the implications for professional identity. The findings of the current inquiry support the importance of this.

6.2.3 *Disruption of the status quo*

THVCS disrupts traditional ways of providing and receiving care, with positive and negative effects across the levels of the work system. Disruption at the individual level manifests as workflow changes (6.2.3.1) and altering of the traditional relationship between patients and providers (considered further in section 6.4). At the macro level of system, depending on the model of care, THVCS can be a disruptive innovation with far reaching implications (6.2.3.2). Between micro and macro levels, dynamics of the care team are disrupted at a group level with increased collaboration and development. Examples of these disruptions are discussed in turn in the following paragraphs.

6.2.3.1 Workflow

Disruption to workflow is a barrier to sustaining THVCS and was found to be mediated through the additional effort that is required by providers. Limitation of time constrains capacity for new ways of working and is a structural barrier in the healthcare environment (Moffatt & Eley, 2011; Shaw et al., 2018). In the secondary care sector, the findings indicate that minimising workflow disruption includes giving attention to the physical space design, physical space allocation, availability of VC equipment, technology

reliability, useability, and integration of THVCS into processes of usual care (e.g. booking systems, ways to share information). Much of this relies on 'fit', that is, ensuring that the processes match and meet the requirements of tasks (Cady & Finkelstein, 2014) and this is addressed further in section 6.6.

6.2.3.2 Disruptive innovation

While the Phase II participants in the current inquiry recognised the micro-level workflow effects of THVCS, the Phase I participants emphasised the potential disruptive impact of THVCS at a more macro-level. This included information and system fragmentation, loss of regulatory control, and business disruption (see Figure 4.5). Telehealth has been referred to as a 'disruptive innovation' (Bagot et al., 2015; Grady, 2014; Weinstein et al., 2014), and, as such, this inquiry's findings can be viewed through the lens of the theory of disruptive innovations (Christensen, Bohmer, & Kenagy, 2000). As defined by Christensen and colleagues (Christensen, McDonald, Altman, & Palmer, 2018; Christensen, Raynor, & McDonald, 2015), disruptive innovations are an offering of a product or service that has novel attributes that appeal to a portion of a market. Disruptive innovations are a process and are initially considered inferior by most of an existing provider's customers, until they are sure that the quality is satisfactory or there are significant other benefits (e.g. access to services, convenience) before they change their ways of working (Christensen et al., 2015). This can eventually disrupt an existing market, displacing established services.

While THVCS may create disruption of processes (Bagot et al., 2015; Grady, 2014), they are not necessarily a disruptive innovation unless the business model that the technology enables creates the disruption. A good example of THVCS as a potential disruptive innovation in New Zealand is in the primary care sector, when a patient sees a doctor for care using THVCS instead of attending a physical location. If the doctor they see via VC is from their enrolled medical practice, then while the model of care has changed to using VC, the business model has not changed. The payment system is unaltered, and the patient's health record is updated as an in-person consultation would be. However, if a patient uses VC to receive healthcare from a doctor who is not their usual provider, either in New Zealand or overseas, the business model has changed with VC technology enabling the change. If patients from the traditional model start adopting THVCS in volume, disruption has occurred (Christensen et al., 2015). This THVCS

business model impacts the traditional primary care model as it bypasses the New Zealand health system funding of primary care and may also fragment the patient's health record if the consultation details are not able to be recorded in the patient's record. Positively, the changed business model of THVCS as a disruptive innovation may improve access to healthcare for people where THVCS fits their needs better than the traditional model (section 6.5 discusses 'best for patient'), for example for convenience or episodic care. Negatively, it may create greater inequities (see also section 6.7) by providing more choice for those who have the resources to access THVCS while disrupting the current system and potentially decreasing the quality and availability of care that is able to be provided for all (Oliver, 2019). Further, the potential fragmentation of the patient record may result in difficulties in continuity of care as providers are not aware of previous history or interventions and creates a risk for patient safety. Additionally, if the THVCS are not located in New Zealand, the local regulatory system which is designed to provide safety for consumers does not necessarily apply, thereby creating further risks to patient safety.

Concerns about damaging the primary care system and risks to continuity of care and patient safety due to fragmentation of records were perceptions of participants in the current inquiry. Drawing on disruptive innovation theory, THVCS services outside the primary care structure could be considered to be taking the opportunity of the 'low end foothold' that is created since traditional primary care is fully occupied with serving its high-needs patients. Christensen et al. (2015) suggest that the best response to a disruptor is to "continue to strengthen relationships with core customers by investing in sustaining innovations", (p.39). Thus, to protect primary care and primary care business, developing THVCS within the primary healthcare environment is likely to be the optimal way to progress.

More broadly the theory of disruptive innovation may help to understand uptake of THVCS. The slow growth in THVCS in the past decade may indicate that patients and providers were not willing to change their way of working for the new disruptive innovation of THVCS until they are sure that the quality is acceptable and that there are other substantial advantages. During the COVID-19 pandemic, the significant benefits of THVCS in infection control and access to services were demonstrated (personal observation) and the use of THVCS increased (McBeth, 2020b) (this balancing of costs

and consequences is discussed further in 6.8). However, it cannot yet be determined if THVCS will disrupt the status quo to any large extent as a result of the pandemic and it remains to be seen if the increase in VC use for the delivery of healthcare is sustained. Additionally, the theory of disruptive innovation helps to provide some insight into the behaviour of vendors (see section 4.3.3) who were providing technology platforms for THVCS in DHBs. In Phase I, participants reported that organisations were requesting, and new vendors were offering, to provide a more functional, mobile, and integrated service. Christensen et al. (2018) suggests that when a disruptive innovation is beginning to gain some traction incumbents can get quite creative in the defence of their established products or services. This aligns with the perceptions of Phase I participants who felt that existing vendors were resisting the changes and creating roadblocks to interoperability which was a barrier to progressing with THVCS.

Christensen et al. (2015) report that their research suggests that "the steepness of a disruptive trajectory is a function of how quickly the enabling technology improves" (p.51). While the theory of disruptive innovation is an interesting way to consider some of the impact of THVCS and new ways of working, this thesis argues that the technology is just one part of a complex system, and that many interacting factors can inhibit or facilitate sustaining THVCS in usual practice. Moreover, the theory is focussed on business practices and competition, with little attention given to the role of people who are significantly impacted by disruption.

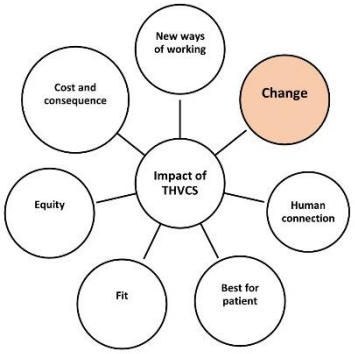
6.2.3.3 Collaboration and development

The disruption of THVCS to provider teams in the findings of the current inquiry were considered to be positive. Participants reported improved team cohesiveness and collaboration when they were geographically distributed. Benefits to professional development and role enlargement were also identified due to the enhanced support available using THVCS. Additionally, the field notes of the current inquiry records perceptions that there are opportunities for 'better caring' with the use of THVCS which links to the concept of 'best for patient' (section 6.5). This finding is consistent with other projects that report significant benefits from peer interactions using THVCS (Braun, 2013; Jarvis-Selinger, Chan, Payne, Plohman, & Ho, 2008; Moffatt & Eley, 2010). However, the realisation of these benefits of THVCS are challenged by the barriers of change, which the discussion turns to now.

6.3 Change

It's like herding cats of varying sizes so unless they've got buy-in, it's not going to happen, it doesn't matter who says it…that's been something we've discovered, it's a change process and if someone's willing to change, willing to do something differently, it will happen.

Participant 17



THVCS impacts the work system by necessitating change. The findings of the current inquiry suggest that reluctance and leadership are two key aspects in the change process that affect THVCS being a sustained practice. These are discussed now.

6.3.1 *Reluctance*

Reluctance to change the model of care to include THVCS is seen across the work system at all levels. The reluctance identified in the collected data is determined to be different from the binary concepts of acceptance and resistance that are often used in the technology adoption literature. Acceptance is defined as the employment of technology to perform a task and resistance as opposition by individuals or groups to change (Van Offenbeek, Boonstra, & Seo, 2013). Van Offenbeek et al. (2013) suggest a broader view of adoption behaviours is needed and offer a two-factor taxonomy to categorise degrees of acceptance and degrees of resistance or support (Figure 6.2). The findings in the current inquiry position 'reluctance' (shaded blue in Figure 6.2), in the central part of the framework, midway between support and resistance and between moderate use acceptance and non-acceptance, to account for the behaviour of decliners.

Reluctance was defined in the coding framework (see Table 5.3) as an "unwillingness to use, provide, accept or embed THVCS" and applies to the provider and patient side of the healthcare interaction. Reluctance can be associated with the effort shift and work change discussed in the preceding section, to the degree of comfort with technology, the perceived change of relationship between provider and receiver, or aversion to risk.

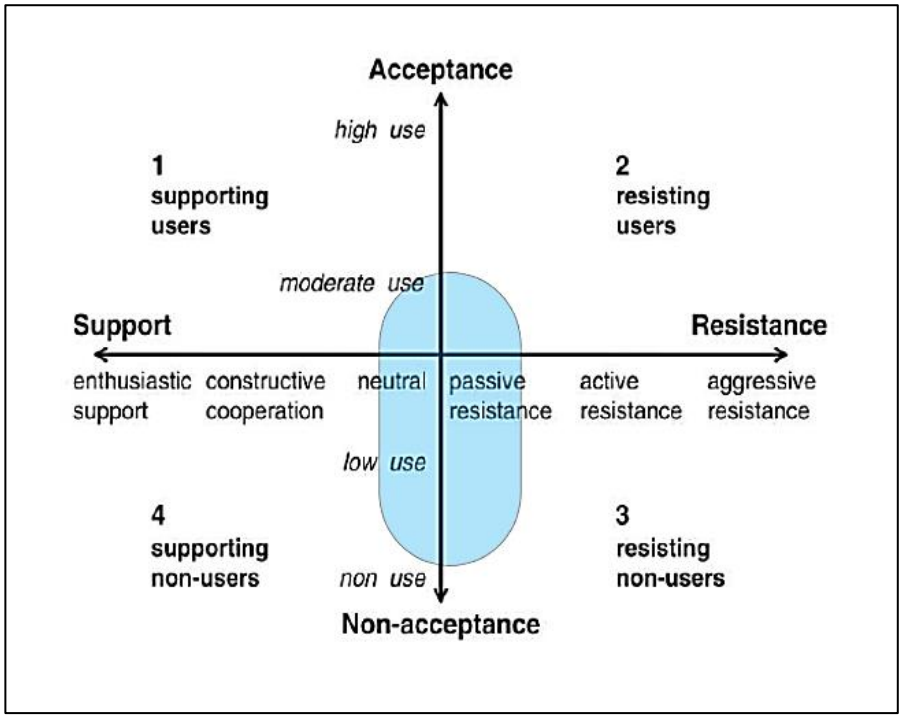


Figure 6.2 **Degrees of acceptance and support/resistance of new technology (Van Offenbeek et al., 2013), p.438. Blue shape added by researcher to indicate 'reluctance'.**

Attempts to predict and explain willingness to accepting telehealth (not specifically THVCS) occur in the literature most commonly using the TAM (Greenhalgh, Swinglehurst, et al., 2014). The TAM (Figure 2.5) uses measures of perceived usefulness and perceived ease of use to determine attitudes towards technologies and, therefore, their acceptance (see also section 2.4.2). The concepts of perceived usefulness and ease of use are important facilitators to THVCS and were seen throughout the findings in Phase I and Phase II data in advantages for patients and organisations (e.g. section 4.3.2 and 5.4.2) and in useability (5.4.3.1). However, the findings show that these variables are more complex and more interdependent than the TAM suggests. The limitations of the model to explain reluctance to use technology is well recognised since variables have been added in subsequent versions: TAM 2 and UTAUT (Figures 2.6 and 2.7). As expressed by Holden and Karsh (2010), the TAM is not fully suited to the complex adaptive system of healthcare. Moreover, Greenhalgh, Swinglehurst, et al. (2014) argue that resistance/acceptance to ICT use is a complex phenomenon particularly in the context of a clinical consultation which is embedded within a complex social environment. SEIPS 2.0, used as theoretical touchstone in this inquiry, was helpful in identifying factors that

contribute to reluctance that extend well beyond usefulness and ease of use and span the work system, work processes and their interactions.

At the external environment level reluctance was noted with legislative and professional bodies' cautious approach to the introduction of THVCS as a new model of care. For example, the Medical Council of New Zealand's statement on telehealth states that "before prescribing medicine for the first time, Council expects you to have an in-person consultation with the patient." p4. Similarly, the Accident Compensation Corporation (ACC) has restrictions on what THVCS they will pay for. At the group level there are the workflow changes and disruptions discussed in 6.2.3 which are barriers to THVCS and result in hesitancy from providers. At the individual level of the provider, reluctance towards THVCS is associated with an aversion to any risk that may come from change. This was identified in Phase I as any clinical risk, risk of change in attendance rates, risk to privacy (section 4.4.4.2) and in Phase II as an apprehension of the unknown and the risk of a change in patient and provider dynamics (5.4.4.2).

Common to the perceptions of all levels of stakeholders is that reluctance is associated with the use of technology. This can be the result of feeling unconfident with the mechanics of using technology or concerns about how to manage and proceed with the consultation if there are problems, and the consequences of this. Cimperman et al. (2016) termed this concept 'computer anxiety', anxiety related to using ICT-based services, added it to their UTAUT model as a contextual variable and found that it had a negative effect on ease of use. However, the current inquiry found that computer and technological ability did not necessarily correlate simply with a reluctance to use THVCS. Some participants were technologically able but still reluctant to use THVCS and those who were not confident but were willing to 'give it a go' because of the projected benefits. Reluctance to use technology encompasses more than the material processes required to carry out the consultation and includes the perceived change in relationship between providers and receivers; the perception that 'something' is lost when technology is used. The importance of the 'human connection' is discussed further in section 6.4.

An aspect that is not explained by the two-factor taxonomy (Figure 6.2) of acceptance/resistance/support but was identified through the findings using the SEIPS 2.0 model is the availability of technical resources. A patient may support and accept THVCS

but remain a non-user if the resources are not available in a direct-to-patient model of care. The potential emergent inequity that this creates is discussed in section 6.7.

Identification of the factors contributing to reluctance is useful to provide a road map for designing a work system in which THVCS is more likely to be sustained. A crucial aspect is leadership, which is discussed next.

6.3.2 *Leadership*

The findings of the current inquiry showed that changing to a new model of care using THVCS requires layers of leadership across the work system and is an important aspect in developing and sustaining a service. The external environment is considered in the next section, along with level of strategy and governance, and the organisational, group and individual level through champions and legitimacy.

At a macro-level, national strategy, and governance in New Zealand for telehealth and health innovation was perceived by the participants as vital, though often lacking. Scott and Mars (2013) state that strategy defines where you are going and why you are going there and that strategy development is the first step in designing technology into health. While the participants supported the National Health Strategy's "closer to home" concept (Ministry of Health, 2016), many were frustrated with the dearth of support of the strategy with action and resources. In the New Zealand context, national leadership is identified to play an important role in the strategic development of technology infrastructure (Whittaker, 2012), for example broadband initiatives and standards to facilitate best practice (e.g. security, interoperability, data collection). Participants in the current inquiry felt THVCS were underserved in these areas along with contracts for payment and that there was a disconnect between governance bodies and actual practice.

Although it is important that the national or organisational level governance structure and strategy sets and supports a path, flexibility for allowing autonomy in local areas and services to develop THVCS which meet their objectives must be enabled. When this is not the case and the complex sociotechnical healthcare system has been overlooked, failures to develop sustainable practices are seen in HIT implementation (Greenhalgh, Stones, et al., 2014; Waterson, 2014). The narrative from the participants also described many examples of THVCS failure when this was not the approach. This was also evidenced in the high-profile failure of the HealthTap telehealth and THVCS solution

experienced in New Zealand (Ernst & Young, 2018). From New Zealand research, Norris, Stockdale, and Sharma (2009) have suggested that development in the health technology space "demands a top-down strategy or framework to match and encourage bottom-up innovation by healthcare practitioners" (p. 244). Kierkegaard (2015) also sums up succinctly:

> Successful national eHealth implementation requires that countries act sensitive to the dynamics of governance, and specifically strive for the right balance between centralization and decentralization to nurture synergy and transparency between all stakeholders involved in the dissemination of eHealth systems. (p. 45).

This emphasises the importance of leaders within organisations and attention is now turned to champions. The findings of the current inquiry note the importance of clinical leaders or champions but also identify that a champion-led service is vulnerable if the champion is to leave the role, become frustrated or tired of promoting THVCS. Relying on champions is unlikely to result in a sustained service (Wade & Eliott, 2012).

An early New Zealand study, which draws on the DI theory (see section 2.4.3, Figure 2.8), reported on a failed THVCS program, and highlighted the importance of both management and clinical champions (Al-Qirim, 2007). This study suggested that the champion roles are relative to the stage of the THVCS introduction with management taking more of a lead initially and then the clinical champion has more influence as time progresses. However, the current inquiry would argue that the best approach is one of co-design where the model of care is considered by providers at the earliest stage, supported by organisational managers and, therefore, balancing and integrating the 'top down' and 'bottom up' approach discussed above. In addition, tailoring THVCS for local context allows for 'reinvention' which from a DI perspective enhances diffusion and sustainability (Rogers, 2003).

DI is useful to help explain why some of those providers who are reluctant to use THVCS do so after a period of time, following the example of champions as was evident in the data collected. Using Rogers (2003) terminology, this change may be supported by observability as colleagues demonstrate the benefits and ease of use of the technology. Additionally, telehealth coordinators or clinical leaders may support trialability by allowing experimentation with the technology. However, while this championing may

assist with the initial use of THVCS, they are no assurance that THVCS will be embedded in usual practice (Al-Qirim, 2007; J. Taylor et al., 2015; Wade & Eliott, 2012). As the DI does not consider outcomes other than use, it is limited in examining THVCS sustainability. Through the inclusion of outcomes and feedback loops the SEIPS 2.0 model enables examination of broader, interacting factors (Figure 2.13). For example, drawing on the data of the current inquiry, champions using THVCS demonstrate the value of increasing provider collaboration as a proximal outcome. This encourages colleagues to use THVCS in their work processes which in turn results in more distal outcomes of cost savings for patients not having to travel to receive care. Demonstration of value of THVCS for multiple stakeholders is important for embedding a service as usual business as it extends beyond the enthusiasm of a champion. Wade and Eliott (2012) noted that one aspect of clinical champions was the use of their legitimacy to facilitate THVCS amongst providers and Tsiknakis and Kouroubali (2009) report successful technology introduction had champions with abilities to influence strategy and decision making within the organisation. Building on this, the findings of the current inquiry argue that legitimacy is a mechanism through which the value of THVCS can be disseminated by leaders at all levels of the system.

Suchman (1995) defines legitimacy as " a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (p.574). The Phase II findings in particular highlighted how the legitimacy of providers influences patients to change their model of receiving care (section 5.4.2). Patients were willing to try THVCS when offered to them because they believed that the actions of the providers were appropriate, and they trusted the relationship. Conversely if a provider is reluctant to use THVCS their legitimacy from the patient's perspective promotes the status quo and is a barrier to change (Cimperman et al., 2016; Mair et al., 2012). In this way the buy-in from providers is a crucial part in developing sustainable THVCS which in turn requires legitimacy from other levels of the work system such as vendors of technology and the organisation. Zanaboni and Lettieri (2011) argue that in telemedicine applications legitimisation is gained through leaders respecting the perspectives of multiple stakeholders and the decision-making process being robust. The absence of legitimacy across levels of the work system was highlighted in Chapters 4 and 5 findings where

THVCS were not successfully established due to a lack of primary care involvement in a secondary care THVCS implementation and reservations about vendor behaviour (Ernst & Young, 2018). Moreover, Bunduchi, Smart, Charles, McKee, and Azuara-Blanco (2015) have explained failure of a THVCS innovation due to misalignments between the demands for legitimacy between private and public sectors.

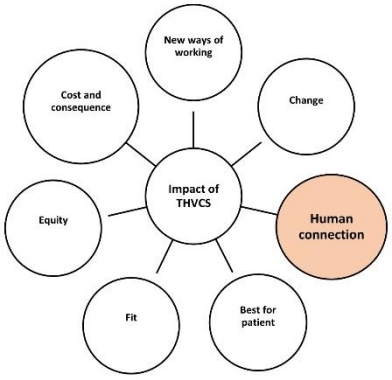
THVCS is also facilitated or impeded by high level legitimacy. Professional bodies play a key role in this implicitly and explicitly. Explicitly, providers and consumers seek 'approval' from available guidelines (e.g. (Allied Health Aoteroa New Zealand, 2018; Medical Council of New Zealand, 2016). Implicitly, the 'rules' of other bodies shape legitimacy, such as ACC (as discussed above in 6.3.1) not funding THVCS or the limitations on prescribing medicine in THVCS. The impact of high level leadership was accentuated when the Prime Minister of New Zealand and the New Zealand Director General of Health encouraged the use of telehealth during the COVID-19 pandemic and following this lead the Royal New Zealand College of General Practitioners asked doctors to work towards doing 70% of their consultations virtually (Jones, 2020). These actions of leaders not only increased the awareness of THVCS but legitimised their use.

In summary, it is essential that a change in model of care to include THVCS considers the perceptions of key stakeholders and is led through co-design, engaging providers and consumers and multi-level legitimacy. The following section considers an interesting aspect of the findings of the current inquiry, where stakeholders did not support THVCS due to the perceived loss of the human connection.

6.4 Human connection

I prefer meeting up with people face to face. Somehow seeing someone through a video screen doesn't seem quite real to me.

Angus, decliner



There are obvious circumstances when THVCS are not appropriate, such as when a physical examination or intervention is essential for diagnosis or treatment. However, there are also times when THVCS can be used safely and effectively, as determined by providers and patients, but one or both parties at times prefer to provide or receive care in-person. This preference is beyond a reluctance to change or disruption to the status quo, as discussed in the two previous sections, since it can be reflected in the adoption of a 'hybrid' model of care where there is a mix of THVCS and in-person consultations. The collected data in the current inquiry that included perceptions that in-person social connections are more valued or superior in some way than virtual ones were classified as 'human connection,' and this is discussed further in the following paragraphs.

The human connection was emphasised in the Phase II data from participants working more at the 'grass roots' level of THVCS. They often had difficulty definitively explaining why they felt this way and variably referred to a 'personal connection,' 'human contact', 'talking to a screen not a person' or that 'something was lost' when the care was not delivered in person. Moreover, the perception was that THVCS were 'less holistic' and it was more difficult to pick up cues or interpret body language or non-verbal communication. While some providers reported that they felt less in control of the situation when the patient was not in-person, some patients perceived a 'different connection', noting that 'something is switched off' or that 'the emotional element is not there' when using or contemplating using THVCS. Human connection is defined in the literature as the extent to which patients feel a sense of mutual understanding, caring, and trust with their healthcare providers and is associated with the therapeutic alliance; the collaborative bond between patients and their healthcare providers (Mack et al., 2009; Peplau, 1997). Human connection implies the subtle way in which people feel connected

to each other and might include behaviour cues, communication, and energy exchange between providers and receivers.

Esser and Goossens (2009) combine media richness theory (MRT) and social presence theory (SPT) to describe technology mediated communication in their framework of teleconsultation. MRT suggests that communication types can be used effectively by matching the richness of the medium with the degree of equivocality of the task (Daft & Lengel, 1986; Ishii, Lyons, & Carr, 2019). That is, the more nuanced the interpersonal interaction the richer the media required (Petersen, Morris, & Nielsen, 2016). The theory posits that 'richness' is determined by the availability of immediate, feedback, multiple cues, language variety and personal focus. Given these criteria, MRT ranks in-person as the richest medium followed by video and telephone. SPT overlaps MRT and is defined as the ability of an individual or the capacity of a medium to convey their sociality through a communication medium (Short, Williams, & Christie, 1976), that is, the degree to which participants feel like they are interacting with a 'real' person (Henry, Ames, Block, & Vozenilek, 2018). Thorne et al. (2005) term this as 'being known' and note the importance of the affective quality of the providers engagement with the patient. As with any patient-provider interaction, THVCS require task related and affective socio-emotional communication behaviours, including verbal and non-verbal information content, process cues and presence cues (Esser & Goossens, 2009). However, the technology and spatial separation can be a challenge to the perception of effective communication (Bulik, 2008).

MRT and SPT are useful to explain the pervasive perception from the findings that the first encounter between patients and providers is preferred to be in-person. Establishing a relationship with someone they do not know demands more nuanced communication behaviours than is perceived possible through the video medium, the degree of equivocality is considered too high for this task. However, once a relationship is formed and a social presence established parties are comfortable with the richness of the video medium. In addition, there is perhaps more of a focus on task related communication at subsequent consultations which requires less-rich media. Providers and patients who chose not to use THVCS are perhaps unconvinced that the video media would be rich enough for their purpose and that their sociality would be conveyed. Thorne et al. (2005) notes that there are significant differences in individual preferences for human

connection. For example, some perceive physical touch important while others do not and, depending on preferences, this could be an element that 'is missing' in THVCS. It is possible that the degree of perceived human connection needed by an individual and that which is perceived possible through the media is a factor in the extent to which THVCS is used and may function as a limit on the number of consultations that are performed. This was seen in the collected data, with examples of patients and providers choosing a mix of THVCS and in-person consultations and the general low uptake of THVCS.

LeRouge, Garfield, and Collins (2012) suggest that human connection needs are different depending on the service needs of the stakeholders. They propose a spectrum from a single service such as a spontaneous urgent care service to a service relationship (e.g. regular visits to a family GP), and differing needs dependent on with whom the relationship is held, for example a patient, provider, technology, support staff or organisation. They found that the connection between patients and providers was important across the spectrum and very weak ties were not well tolerated. The concept of variable human connection needs was supported in the findings from the current inquiry, as participants noted different scenarios where they would or would not prefer THVCS. This tended to be related to a cost and consequence assessment (discussed further in section 6.8), in that THVCS would be acceptable if there were limited other choices or the benefits outweighed the costs. The importance of the human connection impacts on the model of care selected for THVCS, for example, follow-up consultations only or clinical support at the patient end in a hub-and-spoke model compared to a direct-to-patient model.

Provider participants in the current inquiry and in the existing literature did not perceive their ability to communicate and provide a quality service to be significantly different with THVCS than in-person (Agha, Schapira, Laud, McNutt, & Roter, 2009; Simpson & Reid, 2014). Some receivers felt THVCS enabled better human connection through enhanced provider focus on the patient as evident in quotes such as "It was wonderful…I was on the TV and the Dr looked at me the whole time" and "This guy actually looked at me". However, it was acknowledged that some providers have better clinical presence using THVCS than others though it is argued that differences between practitioners equally exist in an in-person model (Brown-Johnson et al., 2019). Bradford

et al. (2014) found that integrating THVCS into routine care requires greater understanding of virtual communications for all parties. Developing a 'telepresence' with strong inter-personal skills, attributes and behaviours is considered vital for a successful THVCS to be successful collaborations between providers and patients and therefore sustained (Henry et al., 2018; Henry, Block, Ciesla, McGowan, & Vozenilek, 2017; Wünderlich, Wangenheim, & Bitner, 2013). Telepresence includes verbal and non-verbal communication and competency with technology. This has implications for training and the development of competencies when using THVCS, examples of these are given in Table 6.1.

Table 6.1 Examples of verbal and non-verbal communication competencies required for THVCS (Bulik, 2008; Henry et al., 2017, 2018)

Communication type	Example
Verbal interaction	Social talk, 'ice-breakers'
Non-verbal	Optimal camera placement, body language, eye contact
Relational	Fostering rapport, talk through actions such as consulting notes
Actions	Conscious attention to active listening
Consideration of the environment	Privacy, familiar space

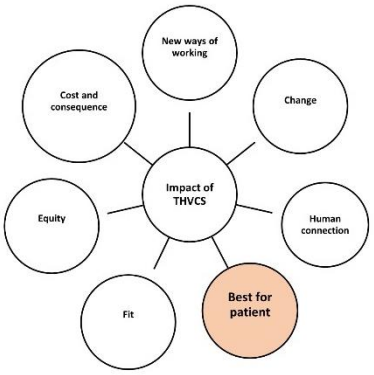
In addition, skills in managing the technology are important to support the human connection by ensuring the clinical encounter is not focussed on the technology (LeRouge et al., 2012; Thorne et al., 2005). This requires experiential learning based in practice (Shaw et al., 2018).

The demonstration that a human connection is possible with THVCS can only occur when a patient accepts a THVCS consultation and then has a positive experience with a skilled provider. The Phase II findings showed that those who declined a THVCS opportunity discussed the human connection more than other participants suggesting they value this highly (section 5.4.4.1). However, examples of patients who experienced THVCS without expecting to use it, experienced satisfactory human connection resulting in them changing their initial perceptions of THVCS. During the COVID-19 pandemic, more people experienced using video in working from home contexts, increasing the awareness of the media and its use in more formal settings. THVCS were encouraged as part of the pandemic response and in some circumstances were the only option. Some early research reports that experiences were positive (Health Services Research Centre,

2020) and a human connection through this media may have been demonstrated which will support embedding THVCS into usual care into the future. The efforts required to make the human connection using THVCS relies on the efforts of organisations and providers. The motivation to do this comes from a patient-centric approach and the concept of 'best for patient' is discussed next.

6.5 Best for patient

> *Certainly, the patients' lives are more efficient, and effective, so if they save themselves one or two days off work and the kids one hour off school instead of a day and a half, that's a community efficiency and clearly they save enormous amounts of opportunity cost and financial costs.*
>
> *Participant 20*



A key driver of an organisation or an individual provider for expending effort to use THVCS is to provide a better service for patients, a service that meets their needs better and engages and empowers them in their own healthcare. Concurrently, there is consumer demand for more convenient and accessible services that suit patients better (Schoenberg, 2015; Simon, 2015). These factors are discussed in the following paragraphs drawing on the inter-related concepts of patient engagement, patient-centred care, and patient work and how THVCS impact on these.

Higgins et al. (2017) conclude the concept of patient engagement is "the desire and capability to actively choose to participate in care in a way uniquely appropriate to the individual in cooperation with a healthcare provider for the purpose of maximising outcomes or experiences of care" (p. 33). They demonstrate that there are four attributes which contribute to patient engagement: personalisation, access to necessary resources, commitment, and a therapeutic alliance. The patient-centred care concept similarly emphasises patient preferences, needs and values and views patients as active participants in their own care with the objectives of access, dignity and respect, information sharing, participation, simplification, and coordination (Singer et al., 2011). Patient-centred care can be a result or an antecedent of patient engagement, that is engagement can lead to patient-centred care or patient-centred care can lead to engagement (Higgins et al., 2017).

Berwick (2009) argues that patient-centred care can be designed into the health system by asking patients what they need and how those needs could be better served. A person-centred approach is included in New Zealand Government health and digital health strategies (Ministry of Health, 2016, 2020a) and THVCS is included as part of these visions. The findings of the current inquiry support the notion that THVCS can provide a more patient-centred approach with increased access to timely services and a model of care that is designed to provide more convenient care to patients. Additionally, this is supported in this inquiry and in other research by the satisfaction reported by patients who use THVCS, indicating that THVCS is able to meet the needs of patients and families (Becevic, Boren, Shah, Banerjee, & Mutrux, 2015; Gibson et al., 2016; Morgan et al., 2011; Waibel, Cain, Hall, & Keen, 2017). However, patient-centred care is also about recognising diverse preferences and capabilities, and as discussed in section 6.4 some eligible patients choose not to use THVCS. Call et al. (2015) found that 43% of people surveyed were unequivocally averse to THVCS when presented with it as a hypothetical option to in-person care. Though in a real situation this may be less due to eligibility and the influence of legitimacy (6.3.2), patients who refuse THVCS are an interesting and under-explored group. No published literature was identified that explored the reasons *why* eligible patients decline THVCS beyond they 'prefer to see the doctor in-person.' Müller et al. (2016) reported 12% of their sample declined THVCS but no explanation for this was offered. Similarly, Shaw et al. (2018) provide no details of those who refused THVCS or why people withdrew from the service. Capturing the voice of decliners is challenging and difficulties were experienced in recruiting this group in the current inquiry. This is also reflected in the small number of 'non-user' participants in research that has explored why patients chose not to use telecare devices, for example monitoring alarms (Bentley, Powell, Orrell, & Mountain, 2014; Cook et al., 2016; Sanders et al., 2012). In an unpublished New Zealand report of a THVCS trial, 55% of people declined THVCS when offered it and of those 64% reported they would 'rather see someone in person' (Waitemata District Health Board, 2019). Unfortunately, there was no probing into what the components of their reason were. While a small group (n=3), the participants in the current inquiry who declined to receive their care with THVCS did so for a variety of reasons (see Figure 5.5), including aspects around 'the human connection' discussed in 6.4 and lack of technology resources (5.3.3). Understanding why patients

choose not to use THVCS is important if a service is to be successful (Rixon et al., 2013). Interestingly, those in the current inquiry who were not provided a choice and who used THVCS unexpectedly were dissatisfied with this despite being satisfied with the outcome of the THVCS consultation. Ensuring that there is patient choice has implications for designing THVCS and equity (see 6.7). It is likely that parallel in-person services and realistic organisational goals of the extent of THVCS use are required, allowing for individual differences and a patient-centred approach to flexibly provide what is best for patients and their families to promote engagement. As Higgins et al. (2017) suggest, patient engagement also requires commitment, cognitive, and emotional factors that empower patients to put effort into their healthcare journey. This effort, framed as patient work, is contemplated in the next paragraph.

Section 6.2.1 discussed how the THVCS model of care changes the effort structure between providers and patients, and consequently the balance of provider and patient work processes. SEIPS 2.0 considers professional, patient, and collaborative professional-patient work processes as physical, cognitive, or social performance activities which result in an outcome (Holden et al., 2013). Examples of patient work are taking medication, performing exercises or logistics required to attend appointments. Professional-patient work processes are activities such as communication between patients, families, and healthcare providers. The findings of the current inquiry found that hub-and-spoke THVCS can lessen patient work through easing of logistical challenges (e.g. childcare, time off work) with less requirement to travel though professional work may be increased (e.g. booking clerks, technology support, providers). In a direct-to-patient model, logistics and travel work are reduced though patient work of technology related processes may be increased, for example, providing and using a device. The findings also suggest that THVCS have positive implications for patients mediated through improving professional work processes of collaboration and support (see section 4.3.2.3). Collaborative professional-patient work processes can also be improved with THVCS enabling family members or other health professionals to be involved when they are not physically co-located.

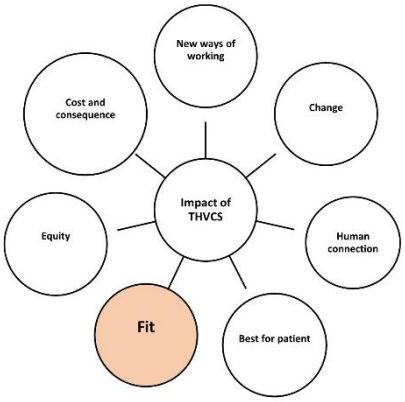
SEIPS 2.0 as a human-centred approach (Holden et al., 2013) that focusses on the work system, and not solely on tasks, is a valuable framework for considering the multiple aspects of the THVCS needs, wishes and experiences of patients, their families and wider

support networks. As the evidence suggests, the preferences of individuals' for THVCS are varied and often include a combination of service models. This strengthens the findings of the current inquiry that sustainable THVCS services need to be embedded in usual practice and this requires consideration of the entire work system, work processes and their interactions and adaptations. Moreover, it is likely that the weigh up of relative costs and benefits and determining if there is a 'fit' with the objectives of stakeholders will determine if THVCS are sustained. Cost and consequence are discussed more in section 6.8, and attention is now turned to the concept of 'fit' in the following section.

6.6 Fit

We've learned that there is no point saying here's your VC unit, here's your VC, here's your telehealth system, go away and use it, it's a case of 'well what do you do, how can we do it better, how will this fit into what you do?"

Participant 17



An STS approach posits that outcomes of a system are a result of multifactorial interactions within and between systems (see section 2.4.6). The quality of the outcomes depends on the degree of fit between the system factors. At the individual or group level with the introduction of technology, fit occurs when the interactions are perceived to be compatible with existing work practices and are useful for getting work done (Karsh et al., 2009). However, the enduring success of technology depends on how well the technology is designed and integrated into the whole work system (Carayon et al., 2013; Karsh et al., 2009). The complex, 'messy' nature of the healthcare system (Berg, 1999) means that achieving quality care requires balancing of people and technology and goals at different levels within the broader organisational context (Carayon et al., 2013; Holden et al., 2013; Karsh et al., 2009). Drawing on the data collected for the current inquiry, Figure 6.3 presents a multi-level model of fit for THVCS.

The model is based on Holden and Karsh (2009) which they developed in a HIT context. The model is supported by the findings presented in Chapters 4 and 5, indicating that for THVCS to be used and sustained they must 'fit' at all levels of the system. The

significant aspects of the work system found in the inquiry relevant to fit are represented on the left of Figure 6.3. The central part of the figure illustrates the nested hierarchy of the multi-level system to indicate the interactions between the work system features and the between-levels interactions. The way that these factors combine determines fit and, therefore, outcomes. In THVCS the outcomes may be use and extent of use, limited or non-use and the practice may be sustained or abandoned.

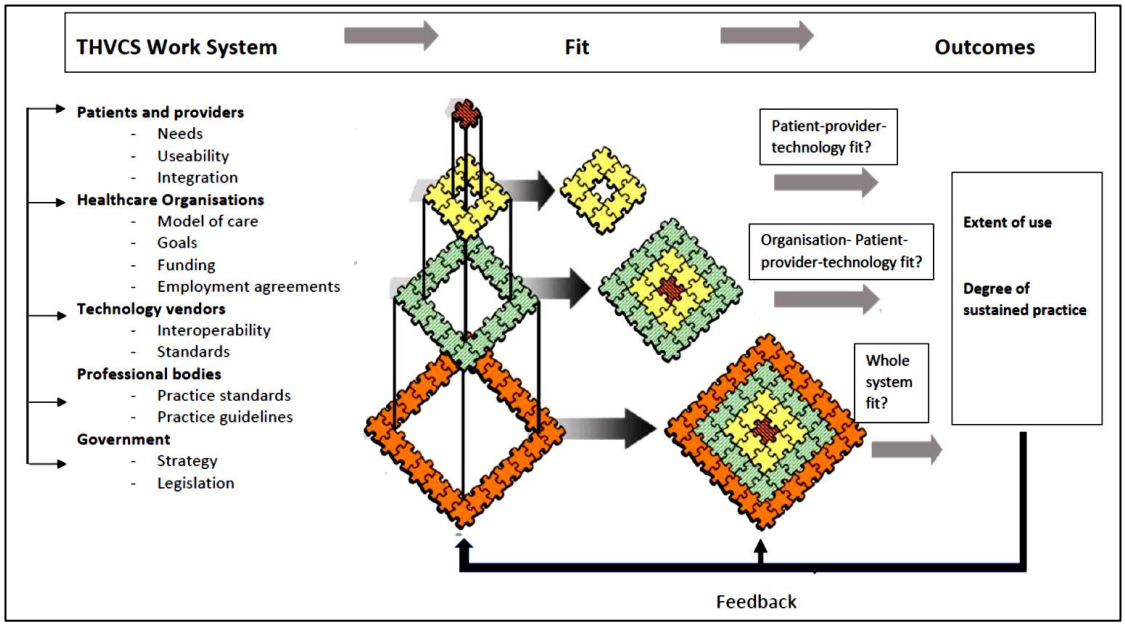


Figure 6.3 **Multi-level model of THVCS work system and fit (modified by researcher, based on Holden and Karsh (2009)**

Importantly, the way that the system is designed determines the fit. Examples of system interaction and the requirements of fit that were identified in the data collected are discussed in the paragraphs below.

At the individual level, THVCS needs to fit with the needs and preferences of patients, as discussed in the preceding section. Moreover, THVCS needs to fit with a service need or objective that is consistent with the goals of the providers and organisation. In one of the first studies to use the TAM (section 2.4.2 explains this model) in the context of telemedicine, Hu et al. (1999) found that perceived usefulness was a significant influence on intention to use telemedicine technology. This finding has not changed in the more than two decades since this study, with perceptions from this inquiry (see 4.3.4; 5.4.2) indicating that there must be clear objectives for using THVCS, such as better access to timely care, travel reduction or reduction of non-attendance, and not as one participant

expressed, introduced "video for video-sake." The value of business modelling has been argued by van Limburg et al. (2011) stating that "the development of eHealth technology should focus more on the context by emphasising what this technology should contribute in practice to the needs of all involved stakeholders" (p.1) This is supported by the participants in the current inquiry who emphasised the importance of fit between models of care and business models. Moreover, administrative fit is required, for example, funding models need to suit THVCS with consideration of the implications of spatial distribution (4.3.3) and employment contracts and job descriptions reflecting the inclusion of the use of THVCS (5.4.3.2). For example, a participant in the current inquiry felt that it would be difficult for THVCS to be sustained as usual business until it was included in employment contracts as a part of normal duties. The field notes indicated progress towards this with inclusion as a task requirement for some staff. Wade and Eliott (2012) noted just two of the 37 telehealth services in their research included it as an expected part of a clinicians' role in job descriptions. They concluded that while THVCS remain optional for providers, they rely on champions which makes them vulnerable. Similarly, other scholars argue that organisational structures are required for sustainable technology-based services and highlight the importance of fit between policy and practice to achieve this (Krupinski et al., 2011; May et al., 2011; Whitten, Holtz, & Nguyen, 2010).

For individuals and groups the technology must fit with the skills of the users, the nature of the tasks and be integrated into workflow, as evidenced in the findings in sections 5.3.5 and 5.4.3 and supported by the existing literature. LeRouge et al. (2012) note the importance of providers having sufficient technological skills so they can manage the technology without detracting from the primary goal of focusing on the patient. While developing skills is important, using technology which is user-friendly and with a high degree of 'ease of use' is important for providers and patients (Agnisarman et al., 2017) . Moreover, the technology needs to fit with the other processes of providing the service (Cresswell & Sheikh, 2013; Vuononvirta et al., 2011; Waterson, 2014). This integration is important for limiting workflow disruption (Ammenwerth et al., 2006; Cady & Finkelstein, 2014) at the level of individuals or groups but also has implications for more widespread use and embedding as usual practice at an organisational level. Ammenwerth et al. (2006) modified the task-technology-fit model (Goodhue & Thompson, 1995) to included the attributes of individuals (e.g. reluctance, technological skills) as part of the

fit required for technology adoption in their FITT (Fit between Individuals, Task and Technology) framework. This takes note of the important interaction beween users of the technology and the tasks they are doing. Tsiknakis and Kouroubali (2009) used FITT to analyse technology introduction in healthcare and highlighted the importance of organisational structures. They concluded a strong organisational fit with strategy, management, roles, skills and technology was required for diffusion. Moreover, recognising the changing nature of the healthcare environment they propose that the concept of fit is dynamic, demanding adjustment as it is changed by external factors. While the FITT framework may be able to consider the organisational factors at a hospital or clinic level satisfactorily it does not consider the influence of the external environment and indirect stakeholders (Figure 3.2) such as technology providers, professional bodies and government. The work system model in Figure 2.2 and SEIPS 2.0 (Figure 2.13) allow these broader influences to be considered as well as including feedback loops for adaptation in a dynamic system.

Designing sustainable THVCS considering the fit with national strategies and initiatives is important to avoid problems of inter-organisational and national technical integration and interoperability (Waterson, 2014). This has relevance for technology vendors and the role they play in the THVCS system. The findings in Phase I of the current inquiry identified the behaviour of vendors and their relationship with organisations and government bodies as barriers to THVCS in terms of competition, interoperability, and industry standards (4.3.3). The lack of fit between the service and products of vendors, the needs of organisations and individual providers and business goals have been identified as barriers to healthcare technology development and sustainability by others (Cho & Mathiassen, 2007; Greenhalgh et al., 2015; Or et al., 2014). The consensus from these studies is that a more collaborative or human-centred design approach across the system is advantageous.

At the macro or external environment level, findings of this inquiry identified that THVCS need to fit with legislation and the requirements of professional bodies (4.3.4; 5.4.2). In the New Zealand context, for providers and patients this relates mainly to patient rights, health practitioner competency (with specific professional registration authorities) and the prescription of medicine (Hedley, 2015). For organisations and technology suppliers there are technical standards for health information and security

(Medical Council of New Zealand, 2016). The data collected suggested that aspects of legislative and professional requirements for THVCS were perceived to be a barrier to widespread use particularly when they restricted integration into work practices and workflow. For example, the Allied Health Guidelines (Allied Health Aoteroa New Zealand, 2018) suggests an in-person consultation should be offered prior to a telehealth consultation in the first instance, while generally preferred by providers (see human connection, 6.4) this creates limits on potential models of care and implications for business economics. Similarly, there are restrictions for prescribers in the guidance from the New Zealand Medical Council: Section 16 of the Medical Council's Statement on Telehealth (2016) states:

> Before prescribing medicine for the first time to a patient, Council expects you to have an in-person consultation with that patient. If that is not possible because of exceptional circumstances, consider a video consultation with the patient.

While there may be circumstances in which medicines may be prescribed following THVCS, there are limitations included in the Medicines Regulation 1984 (Medical Council of New Zealand, 2016) as quoted below,

> Prescriptions must be legibly and indelibly printed and personally signed by the prescriber with his or her usual signature (not a facsimile or other stamp). Therefore, those issued only by email or other electronic means do not meet current New Zealand legislative standards under regulations 40-41 of the Medicines Regulations, (Section 14).

The requirement that a prescription for medicine is signed in hard copy creates an impediment to workflow and increased workload for prescribers, patients and pharmacists. As participant 8 in the Phase I interviews (4.3.4) stated:

> Even though the consultation can happen via video, a doctor still has to write a piece of paper and that has to be delivered to the patient who has to go to a pharmacist, so you have this very archaic three-step process for a patient to obtain a medicine from a video consultation.

This illustrates how the importance of fit extends to other intersecting legislation such as reimbursement, privacy, and cross-border policies if THVCS is to be a sustained model of care (Ionescu-Dima, 2013). While other jurisdictions have different legislative and professional regulations, these barriers to THVCS are common throughout the world

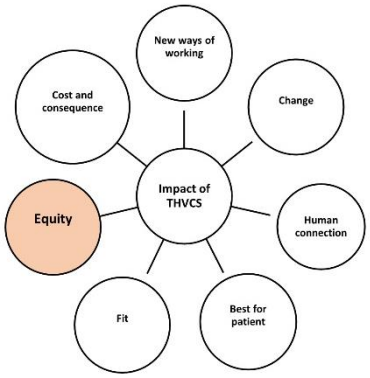
(Baker & Bufka, 2011; Chopard, Hubert, Moulin, & Bustos, 2012; Weinstein et al., 2014). Interestingly, the COVID-19 pandemic has resulted in rapid changes to some of these barriers. For example, in New Zealand the ACC extended the services for which it would fund THVCS (ACC, personal communication, April 3, 2020) and the MOH issued a waiver to allow for 'paperless' prescriptions from approved electronic systems and a temporary waiver which authorised specific prescriptions that are not signed by a prescriber to be recognised as legal prescriptions (New Zealand Telehealth Forum and Resource Centre, 2020a). It is yet to be determined to what part the relaxing of restrictions has impacted on the substantial increase in THVCS use observed in the course of the pandemic or is this a result of the change in cost and consequence balance (discussed further in 6.8). In other words, have the infection control benefits outweighed any potential negatives of THVCS?

In summary, Figure 6.3 and the ensuing discussion illustrate that the THVCS work system is multi-level with features that interact between and across levels. The degree of fit that is perceived or achieved determines the outcomes (Karsh et al., 2014). The extent of use and the sustainability of THVCS will be determined by the fit of the interactions of the system. The fit in turn will be determined by the design of the system (Carayon et al., 2013). Drawing on the facilitators and barriers to THVCS identified throughout the findings of the current inquiry and consideration of these through the lens of fit, designing sustainable THVCS requires a co-design and participatory approach, multiple level leadership and support to integrate THVCS into the complex work system. It is important that the design is evaluated and adapted in response to change and unintended consequences (Brant et al., 2018). One potential significant consequence from THVCS, if the fit is not optimal, is the introduction of further inequities into the health system and this is considered in the next section.

6.7 Equity

I certainly think that we need to be very careful not to leave anybody behind and I think we need to be careful in our provision…that we don't create services which only people with income and devices can get. Because this technology does have the potential to increase inequity. It can decrease inequity but only if we are very brave.

Participant 9



The United States Institute of Medicine (IOM) report "Crossing the quality chasm" (Institute of Medicine Committee on Quality of Health Care in America, 2001) includes equity as one of the six components of quality in healthcare and defines equitable care as "care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socio-economic status" (p.6). Alongside equity, effectiveness, timeliness, patient-centred care, patient safety, and efficiency are the other dimensions of quality healthcare presented by IOM, and Carayon et al. (2011) suggests that the latter three are particularly relevant in an STS approach to healthcare. The findings of this current inquiry argue that an STS approach is also useful to consider equity or inequity through multiple system levels and the emergent properties of THVCS system. Much of the telehealth literature claims that telehealth can reduce inequities while there is less attention given to the possibility of inequity as an emergent property of the system (Cresswell & Sheikh, 2013; Glasgow, Phillips, & Sanchez, 2014; McLean et al., 2013). Wilson (2014) explains that recognising emergent properties is a significant feature of a systems HFE approach. These can take the form of unintended consequences or surprises and can be a result of the interactions of any part of the system. SEIPS 2.0 is a valuable framework as the outcomes of the work system and its processes can be depicted as an emergent property of the whole interacting system (Holden et al., 2013). Inequity may be an emergent outcome of THVCS as a distal, undesirable, societal outcome. This outcome associated with the external environment would be an extension to the current patient, professional and organisational outcomes shown in the model (Figure 2.13). Equity and inequity are discussed in the next paragraphs through the ideas of the geographical gap, the digital divide, providers as gatekeepers, and inequities for Māori.

6.7.1 *The geographical gap*

The New Zealand Health Strategy (Ministry of Health, 2016) states an aim of improved equity for all populations and notes THVCS as one way to achieve this. Additionally, there are many examples in the literature where the stated business case or benefits of THVCS include reduction of healthcare inequities for geographically dispersed populations (e.g. Al-Shorbaji, 2013; Bashshur & Shannon, 2012; Bradford et al., 2015; Dorsey & Topol, 2016). In the current inquiry, the Phase II contextual observation data note that one aim of THVCS for the DHB is to "reduce the gap between hospitals". This has multiple meanings; first, using THVCS reduces travel for patients and providers and second, it provides timely access to expertise that is not available at a small, rural hospital. This can improve healthcare equity between geographical areas for those living in rural communities by making patient work (e.g. travel and related costs to attend appointments) and access to services more in line with that of their urban counterparts. However, achieving nationwide equity relies on all DHBs offering this service and this is not consistent throughout the country (see 4.2.3). Participants in Phase I noted significant differences in THVCS depending on geographical location, available funding, and leadership. The gap between areas can be increased as the DHBs with more capacity, often in the least socio-economically deprived areas, develop more THVCS services while development remains limited in other areas. Reducing the geographical gap in this context relates primarily to secondary and tertiary hub-and-spoke models of care where technology is provided and supported by the organisations and does not account for direct-to-patient models which rely on the technology availability of individuals. This is discussed as the digital divide in the following section.

6.7.2 *The digital divide*

The digital divide has been defined as an economic and social inequality of access to, use of, or impact of information and communication technologies (van Gemert-Pijnen, Kelders, Hanneke, & Sanderman, 2018). Gaps in access to the internet, technology resources, and technology skills have been persistent in socioeconomically disadvantaged, minority ethnic, older age groups and among those with poorer health. These discrepancies can intensify health inequities (Kontos, Blake, Chou, & Prestin, 2014; McLean et al., 2013). Indeed, there is evidence of uneven adoption with educated, employed, urban people with access to technology more likely to use THVCS (Donaghy

et al., 2019; Liaw et al., 2019; McLean et al., 2013; Uscher-Pines & Mehrotra, 2014). This has potential to negatively disrupt the current health system (Liaw et al., 2019) (discussed also in 6.2.3.2), reduce quality for those accessing traditional models of care while increasing the gap between those with resources and those without.

One participant in the Phase I interviews described access to wireless broadband as the "newest social determinant of health" and dependence on technology (4.3.3), access to technology resources, and technology familiarity (5.3, figure 5.3) were synthesised in the findings as themes of impact of THVCS. Khoja, Durrani, Nayani, and Fahim (2012) suggest that policies and planning impact on improving the digital divide. Policies such as those that affect the cost of telecommunications and provide universal, unlimited access to the internet. The New Zealand Government's ultra-fast broadband and rural broadband initiatives (Crown Infrastructure Partners, 2018) are policies that are necessary to achieve some of these objectives. Evidence that policies and actions can affect technology resources and that access to technology barriers are not insurmountable given the right conditions was experienced in a response to COVID-19. Agreements with the MOH and telecommunications companies resulted in removal of the data charges for critical information internet resources, the contact tracing App and data caps were removed (Daly, 2020; Keall, 2020). For THVCS to be part of usual care and sustained similar policies are likely to be required if there is to be an equitable choice of service. However, the provision of technology resources is not a panacea to the digital divide or health inequities. Andreassen and Dyb (2010) and Gilbert, Masucci, Homko, and Bove (2008) argue that provision of devices and skills will not result in greater use of technology in health if the social structures and behaviours of individuals and communities are not considered. In the Phase II findings this was evidenced by participants who declined to use THVCS despite having technology resources available and the skills to use them. Moreover, ensuring the provision of technology for patients does not impact on the behaviours of providers who determine if a patient is suitable for THVCS. The digital divide is often attributed to age, with older people perceived as less willing and able to use technologies than younger people (Sugarhood, Wherton, Procter, Hinder, & Greenhalgh, 2014), but evidence of this was mixed in the findings of the current inquiry. There were older participant receivers in the sample and provider participants who noted many older THVCS users. However, concurrently there were

examples of assumptions made about patients that would be 'suitable' for THVCS. The roles of providers as gatekeepers are considered now.

6.7.3 *Gatekeepers*

As discussed in 6.7.1, THVCS can increase inequities between patients in different geographical areas when there are differences between the services that DHBs offer. This also spreads to the provider level where some providers prefer not to use THVCS (see 6.3.1) even when THVCS structures are available. Moreover, some choose not to offer THVCS to some patients even when the patients may be suitable from a clinical perspective. This was seen in the findings of Phase II and described in section 5.4.4.3. The assumptions made by providers as to whether patients may be interested, have suitable technical abilities, devices or are the 'right age' may create inequities in delivery of THVCS. Potential gatekeepers extend beyond clinical providers to support staff, for example, receptionists (Brant et al., 2018) and booking clerks as discussed in 6.2.2. These issues of gatekeeping could be managed with clear processes to determine eligibility (e.g. patient questionnaire) integrated into usual processes, and expectations of providers to provide a choice to all clinically suitable patients. The assumptions made about a patient's abilities to receive THVCS may impact on equity and this may be amplified for those in already disadvantaged sections of communities. This is considered for Māori in the next section.

6.7.4 *Inequities for Māori*

In New Zealand, there are socio-economic and health disparities between the indigenous Māori population and non-Māori. Throughout the life course health measures are worse for Māori compared to non-Māori: services are less accessible for Māori; services do not provide the same benefits to Māori as non-Māori; and efforts to improve healthcare do not always improve equity for Māori (Health Quality & Safety Commission New Zealand, 2019). While THVCS are a way in which access may be improved it is not certain that these benefits will be available to Māori and broader social determinants need to be considered, including access to technology. In 2015, 68% of Māori households had access to the internet, 15% below the national average. Access via broadband is 16% less than for New Zealand Europeans. Māori household and individual access to mobile phones is around the national average (Crown-Māori Economic Growth

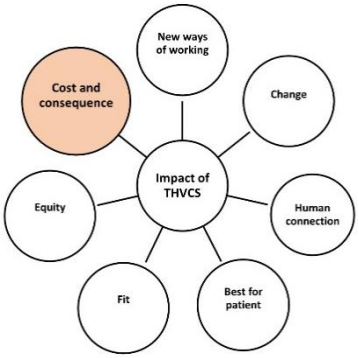
Partnership, 2015) but the current inquiry's findings identified that while people may have access to smart phones they may not be suitable for THVCS due to privacy (e.g. a shared device, shared living spaces) or to data costs. Andreassen and Dyb (2010), considering technology in an indigenous context, argue that simply providing technology and skills to 'solve' the digital divide does not take into account that the practice and performance of health are specific to local context. Similarly, Gilbert et al. (2008), in examining ICT use in poor communities, noted the importance of understanding that people are embedded in their communities and social networks and how this can be drawn upon to empower the development of skills and use. Henry, Spiller, and Newth (2017) in their analysis of a telehealth initiative in a Māori community, provided support for this approach as they found that if grounded in the context, technology can provide opportunities to disrupt an underserving system and empower disadvantaged communities.

While no data on THVCS usage by Māori was identified in the literature, the current inquiry noted examples of positive engagement with Māori communities and acceptance of communication over video. This is of particular interest as kanohi-ki-te-kanohi (face-to-face) communication is of particular value to Māori (Hudson et al., 2010) and it seems that high quality video may be an acceptable substitute. While the data in this inquiry found that Māori use services and there are specific services for Māori planned (New Zealand Telehealth Forum, 2019) the perceptions of Māori and the impact of THVCS on access for Māori remains an under-investigated area.

In summary, there are existing inequities in health and while THVCS are a potential way to address some inequities there is a possibility that perversely they may widen the gap. To avoid this there must be careful consideration of this in the design of THVCS and evaluation of unintended consequences (Glasgow et al., 2014). Initiatives for this include provision of technology resources (McBeth, 2020a), social and cultural location of THVCS, for example in marae and in schools (E. Henry et al., 2017), and integration to primary care (Donaghy et al., 2019; Liaw et al., 2019). For THVCS to provide benefits and be sustained in all communities, vigilance around potential unintended consequences is needed and an assessment of the possible advantages and disadvantages of THVCS. In other situations, this type of assessment was seen throughout the inquiry as an informal

weighing up by providers and patients and the theme of 'cost and consequence' is explored more now.

6.8 Cost and consequence



I mean I guess there is always a possibility [of security breaches], but me accessing the medical services that are required trumps any concerns like that.

Ben, receiver

If the consumer engagement is going to be better over telehealth, then as long as the patient understands the limitations and we accept that as well.

Hannah, provider

As discussed in the Phase I findings reported in section 5.5, the way benefits and drawbacks of THVCS are balanced against usual care is a determinant of use. Evidence of the weighing up of costs and consequences was also a common finding in Phase II (e.g. 4.3.2, 4.3.2.2, 4.3.6) and can be seen as a determination of value. Where this balance sits, and the assessment of value is likely to impact on the sustainability of THVCS. Though there are clear advantages of THVCS, there are also disadvantages and overall, from the perspectives of key stakeholders, THVCS are 'the next best thing' when compared to in-person care. The idea of cost and consequence is discussed in the next paragraphs with reference to the concepts of the value proposition, transaction costs and the configuration concept of SEIPS 2.0.

The meaning of value is varied among scholars and stakeholders. Emerson (1976), in an early critique of the social exchange theory, defined the value proposition as "the more valuable to a person is the result of his action, the more likely he is to perform the action" (p. 340). Specific to the introduction of innovation, Rogers (2003) used the term relative advantage (see 2.4.3) to describe the extent to which a potential user believes that the innovation is better than what has been used before and the TAM's (2.4.2) construct of perceived usefulness (Davis, 1989) are also reflections of value. These perspectives focus on the value for individuals whereas the importance of value in the economic business case for telehealth is emphasised from the viewpoint of organisations, technology vendors, or government bodies (Chen, Cheng, & Mehta, 2013; Cusack et al.,

2008; Lehoux, Miller, Daudelin, & Denis, 2017; Peters, Blohm, & Leimeister, 2015). However, van Limburg et al. (2011) stresses the importance of all key stakeholders when considering value and Greenhalgh et al. (2017) in their development of the NASSS framework (see 2.4.4) considered the value proposition as an assessment of whether a technology was likely to be worth introducing. They refer to the value of the business case for technology developers to generate revenue and the value for patients (e.g. desirable, safe, cost-effective). The findings of this inquiry show that THVCS are used and valued by providers and receivers when the perceived benefits (e.g. access, satisfaction) outweigh the costs (e.g. increased effort) and the limitations are accepted (e.g. reduced human connection). In contrast, decliners and those reluctant to use THVCS do not perceive the advantages to be greater than the costs and limitations. In effect, providers and patients perform a cost and benefit assessment of THVCS compared to what they are able to receive or provide from a traditional in-person encounter (Bentley, Powell, Orrell, & Mountain, 2018). Similarly, organisations determine the value of THVCS by the achievement of goals, for example access and decreasing non-attendance (Table 4.4) balanced with costs of implementation. Having a robust business case was identified as a facilitator for THVCS in the findings (see 4.4.2) though there are challenges with this, including quantifying benefits and availability of data (Figure 4.7).

Abimbola, Keelan, et al. (2019) suggests determining value, and therefore helping to build a business case, in THVCS needs to go beyond clinical outcomes to consider process outcomes and separate the effects of different models of care e.g. telephone versus video versus in-person. They used transaction costs as a theoretical foundation to explore the costs incurred by the work done by patients or providers in the course of workflow or consultations. As discussed in 6.2.1, transaction costs reflect the effort, time, and money necessary to complete a transaction and the extent of the costs is influenced by how care is organised, and these can be redistributed in THVCS. Supporting the findings of the current inquiry, Abimbola, Keelan, et al. (2019) review found the degree of uptake by patients and providers of THVCS is based on how they assess the cost and benefit of past interactions and their goals. Identifying transactional costs on both the provider and patient sides and the level of satisfaction from the service are important in assessing the value of THVCS and may help to improve access equity, scaling up and sustainability by addressing or adjusting the factors contributing to these costs. From the data collected in

the current inquiry, an example may be that in the hub-and-spoke model, patients who while experiencing THVCS positively identify the transactional cost of still having to travel a significant distance to the 'hub' hospital and would prefer to be able to access THVCS even closer to home in their own communities. They weigh up this benefit of less travel with the perceived downside of not seeing their provider in-person before deciding to continue with THVCS. If there was no travel, for example, a direct- to-patient service the transactional cost of travel would be removed but there would be the addition of work associated with providing and managing their own technology and the balance may shift again. Thus, Emerson (1976) definition of the value proposition could be updated to include all key stakeholders: the more THVCS use is perceived or demonstrated to have value, the more likely they will be used, repeated, and sustained.

Finally, it is proposed that the idea of cost and consequence could also be viewed in terms of the configuration concept in the SEIPS 2.0 model. As explained in section 2.4.6.2, configuration in the SEIPS 2.0 model refers to the idea that while there is potentially interaction between all parts of the work system, only a subset is likely to be relevant in a given situation. Relevancy is determined by the strength of the effect on the work process performance. In this way, in a particular scenario, the parts that interact the most to shape a performance can be identified. In the SEIPS 2.0 model (Figure 2.13) this is illustrated by different sized spheres of the relevant elements in each work system component. The varied sizes indicate that different elements have a different influence on performance. Taking the perspective of configuration, the outcome of a process is the emergent property of the whole interacting system. Holden et al. (2013) suggest a variety of ways that configural diagrams could be used including to assess differences in systems that account for different performances. In the current inquiry, this configuration is useful to illustrate the varied importance placed on aspects of the work system and their interactions in determining the outcomes of THVCS and how this may change if the balance is altered, that is, if the transactional costs are increased or decreased. For example, in a scenario from the Phase II data a receiver was seeking care for a medical condition that was having serious implications on their life, including employment. The specialist care needed was not available in the local area and on connecting with an online health community they were able to connect with a THVCS service. The patient was familiar with technology and, while aware of possible technology security issues, did not

perceive this as a large enough issue when compared to their health concerns and needs. They had a private space for the consultation and were familiar with the VC technology platform used by the provider. While there was a financial cost for the consultation, the receiver was able to pay especially as the THVCS meant that they did not have to take time off work to attend the consultation, and the medical care helped them continue their employment. These trade-offs made to receive care are in summarised in Table 6.2 and illustrated in the configural diagram in Figure 6.4.

Table 6.2 Configural work system concept exemplar from the Phase II data showing the combinations that most strongly shaped the outcome of THVCS

Factor	1	2
Person (P)	Urgent medical needs, P1	Technology literacy and availability, P2
Task (Ta)	Booking communications, Ta1	Connecting process, Ta2
Tools and Technology (T)	Availability, T1	Security risk, T2
Organisational (O)	Shortage of professional resource, O1	
Internal environment (IE)	Private space available for consultation, IE1	
External environment (EE)	Connection with health community, EE1	Cost of consultation, EE2

In Figure 6.4, O1 (shortage of professional resource) and P1 (urgent medical needs) were the most importance elements of the system in determining the outcome, in this case, the decision to use THVCS. If other models of care were available when they were needed the person may not have sought THVCS. To be aware of the THVCS option, P1 required connection with the health community (EE1). Seeking a consultation required T1 and Ta1 (technology availability and booking communications). Ta2 (connecting for the consultation) required technology to be available (T1) and the person to have the skills to use it (P2). The private space available for the person (IE1) enabled the connection process (Ta2). The consultation cost (EE2) was accepted due to the person's urgent medical needs (P1) as was the security risk (T2). Using the configural diagram it is clear to see the connections between the elements of the work system. In a practical application, this may be useful to visualise the effects of changes. For example, if technology was not available, then T1 would be removed and all the other connections

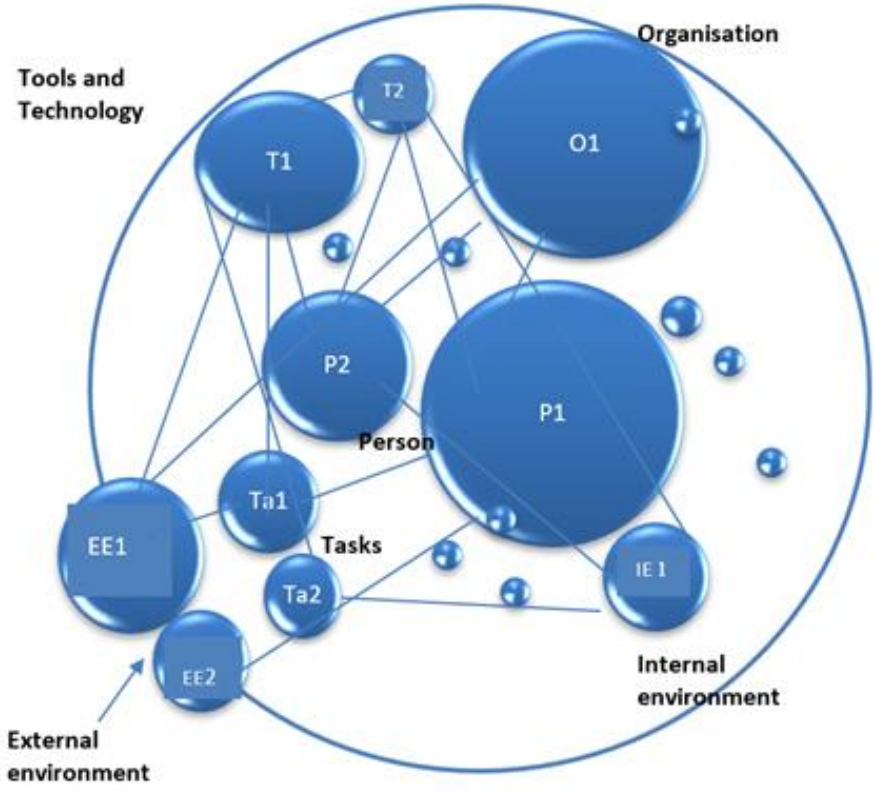


Figure 6.4 **Configural diagram developed by the researcher as an exemplar. Relative size of spheres indicates relative importance of the element in shaping the outcome.**

would not be available, and the outcome would be no ability to access THVCS. Thus, the SEIPS 2.0 concept of configuration and configural diagrams provide a visual representation of the multi-level interactions in THVCS.

Considering the preceding discussion in sections 6.2 to 6.8, the synthesis of findings of this inquiry leads to a summary that addresses the fourth research question:

> How can the work system adapt for THVCS to be sustained practice in healthcare in New Zealand?

It is proposed that to be a sustained practice the impacts of THVCS on the work system, shown in Figure 6.1 need to be recognised, considered, and managed. This provides several practical contributions of this inquiry to the telehealth field and these are explained in the next section. This will be followed by demonstrating the theoretical and methodological contributions this inquiry makes (sections 6.10 and 6.11 respectively).

6.9 Practical contributions

By examining, following a systems approach, the facilitators, barriers, and impact of THVCS on key stakeholders in the work system, the findings of this inquiry offer practical contributions for adapting the design of the THVCS system to enable a sustained practice. Addressing the dominant factors, illustrated in Figure 6.5, is the approach most likely to achieve this goal. These factors are interrelated, cross levels of the work system and work processes, are facilitated by a co-design approach, and have the aim of ensuring fit across the THVCS system. Practical contributions from the analysis of the inquiry are outlined at each level of the system (external environment, organisational, group, and individual) and discussed in the following paragraphs.

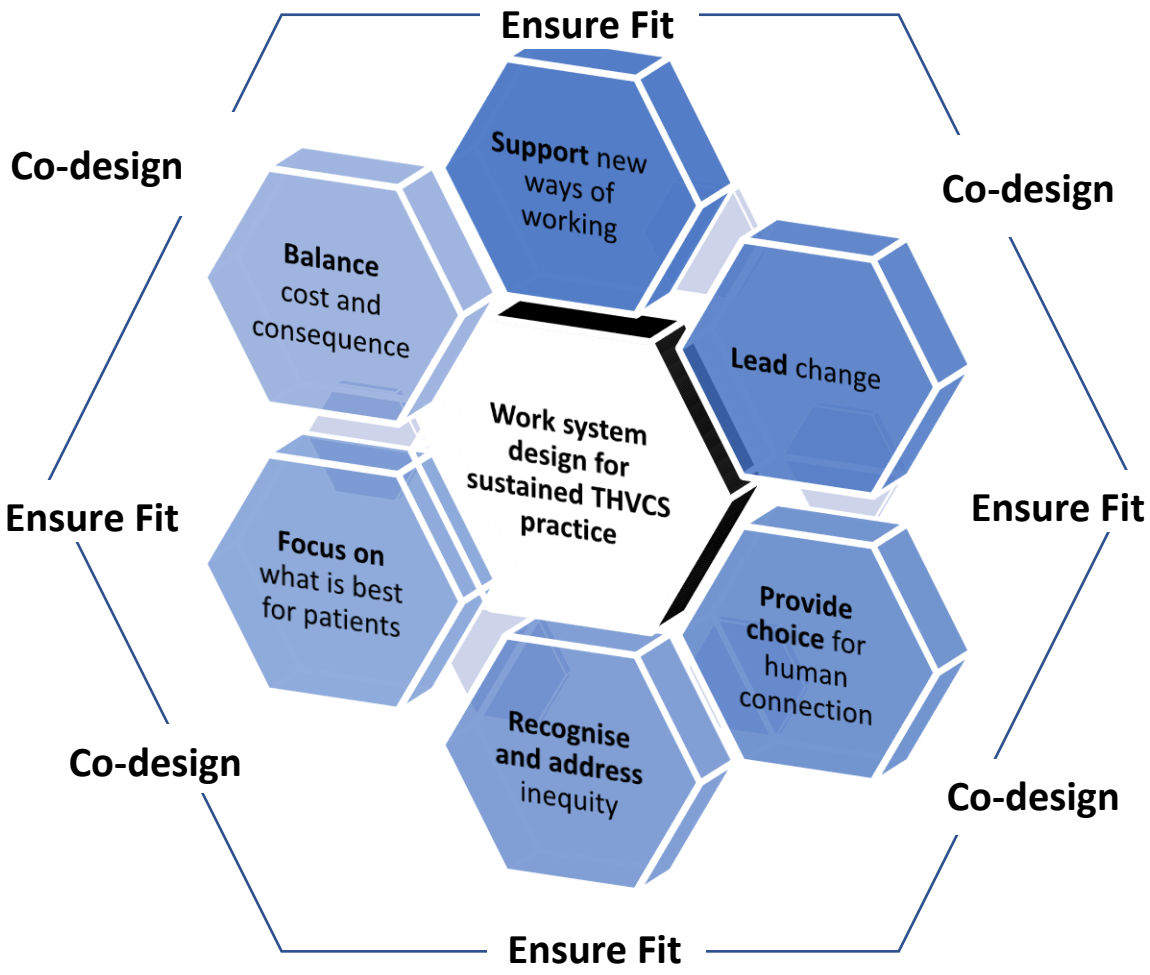


Figure 6.5 Interrelated key factors for the design of the THVCS work system

At the macro-level, or in the external environment of the in-direct stakeholders, (such as the MOH, professional bodies and technology providers), design is needed to lead change through strategic direction and providing support for new ways of working. There needs to be 'fit' between healthcare strategy (e.g. 'closer to home' and 'patient centred') and resource provision (e.g. funding), and between technological strategy (e.g. access to mobile Broadband) and technology development (e.g. interoperability, costs of access). Care should be taken to design THVCS to avoid system fragmentation or increase inequities (e.g. support THVCS to develop in the existing primary care structure, in patient-centred communities and across the nation). Additional design is needed to fit THVCS with legislative and professional guidelines (e.g. prescribing of medicine, funding of services).

At the organisational level, for direct stakeholders (e.g. managers of healthcare), a focus is required on how it is best for patients to achieve health goals and designing work for providers to enable achievement of this. This may include workflow integration through the design of booking systems, the design of physical space; the design of technology that is reliable, highly useable, and integrated; training and integrating THVCS into job descriptions. Processes need to be designed so that they fit with the requirements of the tasks. Balance of costs and consequences is needed with alignment of clinical goals and models of care (e.g. business model fit with THVCS). Designing the work system needs to include evaluation and monitoring so that emergent inequities or other unintended consequences are monitored (e.g. patient safety, healthcare fragmentation) and addressed through iterative design (e.g. THVCS hubs or technology prescriptions to improve access). Organisations can also lead change through development of support and champion roles.

At the group level of core stakeholder groups (such as provider teams, patients, and families), balancing the costs and consequences of using THVCS will aid in achieving optimal outcomes. For example, supporting an increase in provider effort to enable improved access to care for patients. THVCS design needs to value the importance of the human connection and provide choice for patients and providers with adaptability to allow for this to change over time (e.g. a hybrid design). Leading change can be affected by groups by the identification of clinical champions who are able to support new ways of working by providing legitimacy, experiential learning, and demonstration of efficacy.

For individuals in the system, THVCS as a new way of working requires support through education, training, and demonstration of benefits. THVCS must fit with the capabilities of patients and providers particularly in technology useability, resourcing and within their social structures. Moreover, the design of THVCS must fit with the needs of patients, families, and communities so that the benefits outweigh the drawbacks in a cost and consequence assessment (e.g. THVCS in the community, at home, or a hybrid design).

To consider the multiple factors and needs of key stakeholders across the levels and to fit within a complex system, design of THVCS requires a collaborative, co-design, or participative approach. The goal of this is to avoid a mismatch between the design and the perspectives and requirements of key stakeholders (Van Velsen, Wentzel, & Van Gemert-Pijnen, 2013). Engaging key stakeholders is a fundamental principle of HFE (Wilson, 2014) and in an STS approach in healthcare (Carayon et al., 2011). Co-design has been promoted by other scholars in recent THVCS initiatives (for example Abimbola, Li, et al., 2019; Beattie, Morrison, MacGilleEathain, Gray, & Anderson, 2020; Shaw et al., 2018), but has been largely overlooked in telehealth programs, exemplified by retrospective critiques (e.g. Greenhalgh, Swinglehurst, et al., 2014; Waterson, 2014). To develop THVCS as a sustained practice requires a co-design approach across the levels of the system including booking staff, clinical staff, technical staff, support staff, patients and their families and the broader community. Such an approach can lead change with the development of multi-level legitimacy to develop buy-in. Moreover, across the system a balance is required between top-down and bottom-up leadership with THVCS adaptable enough to enable tailoring for local contexts. Drawing on the SEIPS 2.0 model contributes a useful way to engage stakeholders in understanding the interactions of the work system in shaping processes and outcomes.

Finally, an additional practical contribution of this inquiry is for HFE practitioners. Drawing on the SEIPS 2.0 model as an existing STS model may help HFE practitioners build the telehealth knowledge base, develop STS based methods (for example, Hughes, Clegg, Bolton, & Machon, 2017) or redesign systems (Xie et al., 2015) in THVCS implementation to improve patient, provider and organisational outcomes.

6.10 Theoretical and knowledge contributions

The literature review in Chapter 2 identified a large body of diverse literature in the telehealth field, much of which is atheoretical. While using an STS perspective to examine the complex, adaptive telehealth system was recommended (Eason et al., 2014; McLean et al., 2013; van Dyk, 2014), few studies have used this approach. Moreover, further gaps in the literature (2.6) were identified in terms of the impact that the introduction of technology has on key stakeholders across the work system, and the scarcity of research in the New Zealand context.

The inquiry presented in this thesis bridges the fields of telehealth and HFE and contributes to theory and knowledge in these areas in five main ways. First, the development of a conceptual model of telehealth literature. Second, grounding the research within STS theory and an HFE STS model. Third, considering the barriers, facilitators, and impact of the introduction of technology at multiple levels of a complex system. Fourth, contributing to the empirical base and the understanding of SEIPS 2.0 in the THVCS context. Fifth, this research adds to the limited THVCS research base that is situated in the New Zealand context. These contributions are expanded on in sections 6.10.1 to 6.10.5 that follow.

6.10.1 *Conceptualisation of the telehealth literature*

Following a systematic process (Figure 2.1), the literature search identified a broad range of telehealth literature, much of which was atheoretical. To aid understanding and conceptual thinking, the literature was mapped in a model based on existing work systems models (Smith & Sainfort, 1989; Moray, 2000; Wilson & Corlett, 2005). The resultant model, shown in Figure 2.2 (section 2.2), provides a contribution to knowledge through the novel presentation of the literature base and the robust process to developing it.

6.10.2 *Grounded in STS theory*

The large body of telehealth literature identified through the literature review (Chapter 2), infrequently had a theoretical foundation. Considering theory is important because it aids in the understanding of the nature of the research while influencing the research questions and methodologies (Alderson, 1998; Gammon et al., 2008; Holden & Karsh, 2009; Wade et al., 2017). In addition, theory can offer generalisable frameworks

and assistance in analysis while helping to generate knowledge and how to use the knowledge generated (McEvoy et al., 2014).

The literature review also identified that a broader approach to examining telehealth was required to examine the problems of acceptance, embedding, and sustaining initiatives. Using the theoretical foundation of STS provides a clear recognition of the complexity of the healthcare system and how THVCS may sit within this (Waterson, 2014). STS, which emphasises the way technical and human resources interact to achieve outcomes (Eason, 2014) is well suited to examine THVCS as it involves multiple human actors, change and the introduction of technology. The STS theory grounding of the SEIPS models and their development in the healthcare environment meant that this approach was also a good fit with the current inquiry. Moreover, the review of the theories that have been used in telehealth (section 2.4) identified that the SEIPS 2.0 model facilitated a systems approach which was more comprehensive than the frameworks that have been used previously. Thus, the current inquiry contributes to the theoretical basis of THVCS research. Concurrently, using SEIPS 2.0 as a framework contributes to its advancement as a dynamic theory (discussed further in 6.10.4) and provides an approach for a multi-level systems analysis.

6.10.3 *Multi-level systems analysis*

Previous studies have shown that telehealth can have positive benefits for patients while providing care which is equivalent to an in-person consultation. In the studies which consider the perspective of patients, high levels of satisfaction are reported. However, many of the studies are discipline specific, examining the impact of THVCS on the management of a particular medical condition in a particular service. When the perspectives of providers and patients are considered they are typically within the same system, that is part of the same service. The current inquiry contributes to the theoretical base by considering THVCS in a system-wide approach, exploring the perspectives of participants across work systems and the health system as a whole. This contributes a broader perspective of varying services with the commonality of delivering care with THVCS. This promotes greater consideration of the interactions across the system. In contrast to studies that have examined specific outcomes, for example, extent of uptake by providers or comparison of THVCS care outcomes with in-person care, this inquiry broadly explores how THVCS impact key stakeholders and identifies barriers and

facilitators from multiple perspectives. This has enabled an analysis of how adapting the work system through design may enhance sustained practice of THVCS (see also 6.9).

6.10.4 *Contributing to SEIPS 2.0*

While this inquiry did not set out to 'test' the SEIPS 2.0 model, using it as a theoretical framework enabled an assessment of the model's utility in the THVCS setting contributing to the empirical base and understanding of SEIPS 2.0. Beyond it being a systems approach, there are several potential advantages of using the SEIPS 2.0 model in THVCS that have been highlighted in the course of this inquiry and these are discussed next.

The increasing efforts of healthcare systems to place people centrally in models of integrated health and social services (Canterbury District Health Board, 2013; Singer et al., 2011) aligns with the person-centred framework of SEIPS 2.0. The framework supports the concept that many people, including patients, 'do the work' and is relevant to the trend of increasing healthcare research focus on patient-centred care and patient work (Holden, Cornet, & Valdez, 2020; Werner, Ponnala, et al., 2020). This was valuable in a THVCS context as previous telehealth research has focussed on clinical efficacy of initiatives with less emphasis on the work required of providers and patients to achieve the outcomes. The findings of this inquiry showed THVCS had significant impact on patient and provider work.

The multi-faceted dimensions of outcomes depicted in SEIPS 2.0 were important in evaluating the impact of THVCS, given that they span the work system components over space and time. Drawing attention to proximal and distal and desirable and undesirable outcomes, helped to accounted for micro and macro level impacts that occur immediately, in a different part of the system or over a different time span. For example, patient satisfaction with THVCS was often a proximal outcome while a distal outcome may be improved control of health through access to care. For providers, THVCS may increase workload proximally though distally the outcome is increased satisfaction through enhanced collaboration with colleagues. At an organisational level, THVCS may have a proximal outcome of increased costs though distal benefits of reducing non-attendance rates.

Attention to possible and actual outcomes and for whom has implications on how a service is designed to meet its goals. The findings of the current enquiry suggest an external environment extension of the current patient, professional and organisational outcomes shown in SEIPS 2.0 model, as shown in Figure 6.6. This addition reflects outcomes of THVCS which may be broader than the organisational level. For example, inequity may be an emergent outcome of THVCS as a distal, undesirable, societal outcome. THVCS as a disruptive innovation resulting in health system fragmentation is another example of an external environment, distal and undesirable outcome. Demonstration of the utility of THVCS in the COVID-19 pandemic may result in an emergent outcome of change in ACC funding for THVCS service, this could then be reflected in the external environment as a proximal and desirable outcome which results in adaptation of the THVCS work system.

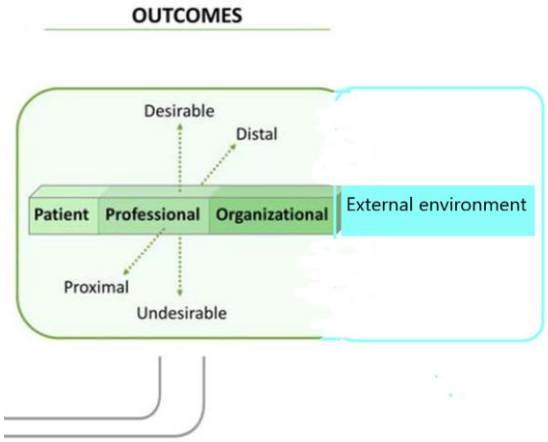


Figure 6.6 Addition of 'external environment' to the outcomes part of SEIPS 2.0

Challenges of implementing change are common in the healthcare environment generally given the complexity of the system (Hignett et al. 2013), and this holds true for THVCS. The SEIPS 2.0 model provided a useful tool during data analysis to represent the complexity and still recognise that the complexity and 'messiness' is an important feature of the system (Berg, Aarts, & Van Der Lei, 2003; Greenhalgh & Papoutsi, 2018) The impacts of change could be considered in terms of the processes and outcomes at different levels, and the adaptation feedback loops were helpful to consider 'surprises' or unintended consequences.

During this inquiry, it was found that this definition of SEIPS 2.0 engagement did not completely fit with other interpretations of engagement in the healthcare field and there was some confusion between this term and the concept of work done by patients, professionals and collaboratively. The SEIPS 2.0 concept of engagement (Holden 2013) is stated to convey:

> That various individuals and teams can perform health related activities separately and collaboratively. Engaged individuals often include patients, family caregivers and other non-professionals. p. 1669

Higgins et al. (2017) in their review of the concept of patient engagement concluded that:

> The concept of patient engagement can be defined as the desire and capability to actively choose to participate in care in a way uniquely appropriate to the individual in cooperation with a healthcare provider or institution for the purposes of maximizing outcomes or experiences of care. p. 33

Higgins et al.'s definition (2017) conceptualises patient engagement as both process and behaviour shaped by the provider-patient relationship and the healthcare environment and is focussed on the individual patient. Further, clinical engagement has been explained by Pannick, Sevdalis, and Athanasiou (2016) to involve staff:

> Actively contributing within their normal working roles to maintaining and enhancing the performance of the organisation, which itself recognises this commitment in supporting and encouraging high quality care. p. 717.

Dellve, Strömgren, Williamsson, Holden, and Eriksson (2018) includes attitudes, cognitive state, and behaviour towards organisational development of patient safety and quality care in its definition of clinical engagement. The SEIPS concept of engagement reflects more the concept of doing healthcare work, emphasising who is actively 'engaged' in the work. It is included as a work process (physical, cognitive, and social-behavioural) with the three categories of professional, patient, and collaborative work proposed as being along the 'continuum of engagement'. This suggests that 'engagement' is the same as patient and professional work (i.e. someone is engaged in work), and the terms are used interchangeably. Using the term engagement in this way is confusing, particularly given the other ways 'engagement' is used in the healthcare field. To avoid confusion, it would be beneficial in the SEIPS 2.0 model to use work

processes, or the doing of work to encompass professional work, collaborative professional-patient work, and patient work without the term ‘engagement’.

The SEIPS 2.0 concept of configuration provided a way to explain the cost and consequence assessments identified in the data and discussed in section 6.8. This was a constructive tool to highlight the importance of the HFE systems concept of interactions (Wilson 2014). Using configuration diagrams in THVCS can be used to explain the resultant outcomes. The concepts of configural diagrams included in SEIPS 2.0 was explored in this inquiry as a lens to explore the cost and consequence balancing seen in the findings. The configuration diagram (Figure 6.4) illustrates the varied importance placed on aspects of the work system and their interactions in determining the outcomes of THVCS. The application of configural diagram in THVCS is novel. However, while developing the configural diagram highlighted the interactions of the work system elements, even in a simple scenario the process has limitations. It is not clear in the model how the relative size of the work system elements (spheres) is determined. In Figure 6.4 this was qualitatively estimated based on what perceived to have the greatest degree of influence but there are no clear guidelines on how this should be determined. Werner, Rutkowski, et al. (2020) examined the SEIPS 2.0 concept of configuration (the only example identified in the published literature) in a care transition context and chose to depict the spheres as equal in size. They note, concurring with the experience of this inquiry, that SEIPS 2.0 offers no “comprehensive instructional guide in how to conduct a configuration analysis” (p 6).

6.10.5 *New Zealand context*

Only nine papers, reporting on six unique settings, were identified in the published literature examining THVCS in New Zealand with the period of publication spanning sixteen years (Al-Qirim, 2003, 2005, 2007; Day & Kerr, 2012a, 2012b; Kerr & Norris, 2004; Oakley et al., 2000; Oakley & Rennie, 2004; Wright, 2016). Just two of these presented the research with a theoretical lens. Thus, this inquiry makes a theoretical contribution to the understanding of THVCS in the New Zealand context. Adding to the knowledge base for New Zealand is a valuable contribution as the nature of the New Zealand healthcare system differs from most other countries and research situated in a foreign context does not always apply in New Zealand. In particular, the partnership, participation, and protection elements through commitment to the Treaty of Waitangi

(1840) that underpin our legislative framework. The United States of America context, from where the telehealth research dominates (Şenel & Demir, 2015), is a prominent example as the licensure, insurance, and litigious environment of their healthcare system is in contrast to that of New Zealand. Moreover, the practical contributions discussed in section 6.9 can be applied in the New Zealand context, enhancing THVCS for key stakeholders in New Zealand.

6.11 Methodological contributions

The current inquiry contributes to methodology in THVCS studies in three main ways: addition of a qualitative approach, use of a theoretical framework to inform methods, and the nature of participants. These are elaborated on in the next paragraphs.

Qualitative methodology is used in the telehealth field but as the literature search for this inquiry determined, quantitative methodology dominates. Ekeland et al. (2012), in a review of reviews for methodologies to assess telehealth, found that 60% had used only quantitative studies and they concluded that formative assessments engaging with stakeholders including patients were recommended. Thus, the qualitative methods in this inquiry contribute to the qualitative research base of THVCS.

Drawing on STS theory and the SEIPS 2.0 framework (as discussed in 6.10.2) for THVCS research is novel and also makes a methodological contribution. This theoretical approach influenced the design of this inquiry, including using two stages of data collection and involving participants representing different levels of the system. In addition, the design of the interview schedules was influenced by STS theory and the sociotechnical work system. SEIPS 2.0 was used as a theoretical touchstone in the analysis of the data and helped inform organisation and visualisation of emergent concepts.

The semi-structured interview and contextual observational methods used in this inquiry are commonly used in healthcare and HFE research (Carayon, Kianfar, et al., 2015; Valdez et al., 2017). However, the type of interview participants in the inquiry offer two further methodological contributions, involving an expert group and engaging participants who preferred not to use THVCS. First, the Phase I participants were a population of experts who represented core, direct and indirect stakeholders.

Interviewing a key informant group in telehealth research is not unique: Jennett et al. (2003) interviewed healthcare professionals active in telehealth; Finch et al. (2012) collected data from academic experts and health professionals in telehealth implementation to develop a readiness framework; Gagnon et al. (2005) interviewed administrators and doctors; and Singh, Mathiassen, and Mishra (2015) interviewed administrators, managers, physicians, nurses, and IT specialists associated with the telehealth initiative. However, the participants in the current inquiry represented multiple levels of the system including, uniquely, government, regulatory, professional bodies, and a consumer representative. Additionally, key informants in the existing research tend to be from one organisation or case study whereas the Phase I participants were from a wide range of organisations. Utilising the expertise of a group such as the Telehealth Forum was an efficient way to collect a rich data set across the levels of the work system and from a variety of perspectives. Drawing on the participation of the expert group had secondary benefits of accessing a network of people involved in the field which was invaluable for recruitment of Phase II participants. Seeking such key informant groups as part of a methodological strategy is recommended for future THVCS research.

Second, this inquiry recruited a novel participant group of 'decliners', those who had been offered THVCS but had chosen to continue with in-person care. This group represented a unique perspective on THVCS use. No other studies in the published literature specific to THVCS were identified as including this group. While not THVCS, Bentley et al. (2018) studied a group of non-users of a telecare initiative. They defined a subset of the non-users as 'known refusers' to mean individuals who had been offered the service but decided not to use it, similar to a 'decliner' in the current inquiry. Unfortunately, they had similar difficulties as this inquiry in recruitment of these participants, recruiting only one known refuser. However, they also recognised the value of this group's perspective. Thus, including the group of decliners offers a contribution to methodology and one which would be advantageous to explore further in subsequent research.

6.12 Summary

This inquiry has explored how the impacts of THVCS on work systems are perceived by key stakeholders in New Zealand, and the preceding chapter has discussed the culmination of findings and explained the practical, theoretical, and methodological contributions that this thesis makes to knowledge.

THVCS impact across the levels of the work system in seven main concepts that were evidenced from the Phase I and Phase II data of this inquiry and illustrated in Figure 6.1. Combining these key findings, this thesis argues that, for THVCS to be a sustained practice in New Zealand, the impacts the services have on the work system need to e recognised and managed. This offers a practical contribution (6.9) for the design of the THVCS system by considering the significant factors across the work system and supporting new ways of working, leading change, providing choice for human connection, recognising and addressing inequity, focussing on what is best for patients and balancing cost and consequences. This requires close attention to ensuring 'fit' across the system and collaborative, co-design approaches (Figure 6.5).

The model developed in Figure 2.2 contributes to the conceptualisation of the extant literature, and through its grounding in STS theory, this inquiry contributes to the theoretical basis of telehealth that is typically atheoretical. Moreover, this thesis adds to the theory and practice of SEIPS 2.0. By exploring the perspectives of participants across work systems and the health system in a multi-level systems analysis, the current inquiry contributes to the theoretical base of THVCS. Significantly, this thesis augments the THVCS research in the New Zealand context which provides opportunities for enhancing THVCS for key stakeholders in New Zealand. Methodologically, this thesis contributes by drawing on a qualitative approach, using a theoretical framework to inform methods, and through the unique nature of the participant groups.

The thesis is concluded in the next chapter with an overview of key findings, consideration of the limitations of the inquiry, suggestions for future research, and concluding remarks.

CHAPTER 7 Conclusions

7.1 Overview of key findings

This inquiry explored how the impacts of THVCS on work systems are perceived by key stakeholders in New Zealand. Taking a qualitative approach, with an STS theoretical foundation, the inquiry interviewed a total of forty participants across the levels of the system to address the following research questions:

1. What are the current characteristics of THVCS in use in New Zealand?
2. How do THVCS impact key stakeholders in the work system?
3. What are the facilitators and barriers to THVCS for key stakeholders in New Zealand?
4. How can the work system adapt for THVCS to be sustained practice in healthcare in New Zealand?

The robust methodology of this inquiry produced a rich data set which contributes to knowledge, research, and practice in the telehealth field. The findings show that in 2017, with services provided over a wide range of disciplines there was still a relatively low uptake of THVCS. Few services were embedded as usual practice and there was evidence of services that had not been sustained. Additionally, there was variation of THVCS availability in different areas of the country with a hub-and-spoke model the primary form of THVCS.

From the perspectives of an expert group, providers, and patients and families, THVCS have an impact across the work system, with facilitators and barriers at all levels interacting for resultant outcomes. Predominantly, THVCS impact on the work of providers and patients with the introduction of technology requiring adjustment of processes, relationships, and behaviour and the interactions of these processes. A focus on patient-centric care offers advantages for patients while creating effort shift, and a balance is sought between costs and consequences. THVCS with technology as the enabler, requires a new way of working which in turn requires a change process, leadership, and support at all levels to effect this change. The interactions of people, tasks, technology, organisations and wider external environmental factors create barriers

and facilitators to THVCS. Healthcare as a context for technology introduction is complex and the embedded social identities of providers, patients and the importance placed on human connection creates challenges for THVCS.

The way in which the components of the work system fit determines the outcomes of THVCS, and any mismatch of fit may result in inequities or other unintended consequences. Adapting the work system for THVCS to be sustained practice in healthcare requires collaborative design across the work system to enable fit across the levels of the system.

7.2 Limitations

The extant literature in telehealth is large, and while the search strategy and literature review followed a robust process it is unlikely to be exhaustive and relevant literature may have been overlooked. Efforts to minimise this were made throughout the timeline of this project to stay abreast of the literature however this remains a limitation.

Qualitative methods, though appropriate to the exploratory nature of this inquiry, limit the generalisability of the findings. However, in comparison to other qualitative THVCS research, which is often conducted in one organisation or examines one THVCS programme, the research presented here drew on the perspectives of a wide range of participants across a large number of organisations, health disciplines and roles. While the findings reflect the participants' perspective and may not be able to be generalised in all contexts, they have enabled the synthesis of general principles for the design of THVCS which are likely to be relevant in other settings.

The participant sample presents two limitations. The members of the New Zealand Telehealth Forum had, by nature of their membership a strong interest in THVCS which may have influenced their perspective of THVCS to be more positive. The design of the inquiry tried to mitigate this through Phase II data collection with participants more at the 'front line' of THVCS. This group included those who preferred not to use THVCS. This 'decliners' group was just three participants and were receiving healthcare within the same speciality, also a limitation. Nonetheless, the perspectives of this group provided a valuable contribution to the data.

The participant recruitment method in Phase II required willing participants to contact the researcher directly. This was an ethical requirement to protect patients from feeling coerced by providers to participate. As this relied on the enthusiasm of people to make contact it limited the number of participants and prolonged the data collection of Phase II. Nevertheless, the resultant sample represented a range of people, across the health sectors, regions, and genders.

7.3 Suggestions for future research

The journey of the current inquiry has highlighted worthy areas for further research that broadly fall into three areas: participants, theoretical, and research design. These are suggested in the following paragraphs.

An identified limitation in designing THVCS to be a sustained service is that patients may refuse to engage with it (Rixon et al., 2013). Understanding why patients choose not to use THVCS is important if a service is to be successful. The decliners in the current inquiry provided interesting insight into this area and further efforts to explore the perspectives of this group across a range of THVCS models of care, services and geographical locations would be valuable.

Exploration of equity in THVCS deserves more attention both as it currently exists and to identify if it is an emergent property of the THVCS system. Identifying any inequities could lead to interventional studies to address the problem, for example, to examine the idea of a 'tech prescription.' Further investigation is also warranted on the impact of THVCS on Māori, and other ethnic minority and disadvantaged groups within New Zealand.

To the researcher's knowledge, this inquiry was the first time that SEIPS 2.0 has been used as a theoretical model in THVCS. Therefore, more work could be done with the model in the THVCS environment. Using it at a more micro-level of a specific THVCS system in an organisation may be useful for examining the internal environment more closely along with observations and task analysis and outcomes of THVCS could be examined quantitatively with the SEIPS 2.0 as a framework. Moreover, section 6.8 presented a SEIPS 2.0 based configural diagram to illustrate the interactions of the work system and what most strongly shapes the outcomes. The example given from the current

inquiry focussed on the perspective of a patient. It would be interesting to compare configural diagrams from the perspectives of providers or another level of analysis, for example an organisation, to explore differences or similarities that might provide insight into mismatch or 'fit' between elements of stakeholder work systems. This may also contribute to the development of a 'configurations' guide (Werner, Rutkowski, et al., 2020) to augment the SEIPS 2.0 model.

Finally, a longitudinal research design would enhance the understanding of the impacts of THVCS in a dynamic environment. This would be particularly useful to analyse the emergent properties of the system and identify adaptations taking place in the system over time and what may be required to balance the system to achieve the goals of key stakeholders. The COVID-19 pandemic reached New Zealand in the first quarter of 2020, resulting in rapid change in the THVCS environment and highlighting the importance of further evaluation. The changes in THVCS that have already been observed are reflected on in the final concluding remarks.

7.4 Concluding remarks and a COVID-19 post-script

THVCS offers a model of healthcare which has potential benefits for patients and families directly and indirectly, though to date this has not been part of routine care or sustained in a meaningful way in New Zealand. This inquiry has taken a broad, systems approach to shed light on the complexities of THVCS for key stakeholders. The integration of impacts, barriers and facilitators has provided insights into the important aspects of designing THVCS. It is hoped that this lens may help THVCS to be designed, implemented, and sustained in a way that provides optimal care and outcomes for New Zealand patients and their families, healthcare providers, organisations, and wider New Zealand society.

The COVID-19 pandemic has provided a large impetus for THVCS and there is now an enormous opportunity to put theory into practice. The data collection for this project was completed in December 2019, prior to emergence of COVID-19. The changes that have happened since this time in the THVCS field in New Zealand have been swift. Several identified barriers to THVCS have been removed, or at least suspended. THVCS funding for specific services by ACC was approved and limitations on prescribing using remote consultation relaxed. The barrier of lack of familiarity of THVCS or VC in

general was removed. Telehealth was encouraged by the Prime Minister and was at the forefront of the safe provision of healthcare, while 'Zoom' became part of the general public's vernacular. This has increased the awareness of the uses of VC and has been the impetus for skill development. Alongside this, vendors and Government policy have played a part with negotiations for the removal of data charges for access to health applications (Daly, 2020), demonstrating that other structural barriers to telehealth can be removed. Concurrently, support for THVCS has increased with the demand, evidenced by the rapid development of guidelines for THVCS in New Zealand and overseas (New Zealand Telehealth Forum and Resource Centre, 2020a; Wherton, Shaw, Papoutsi, Seuren, & Greenhalgh, 2020). Interestingly, telephone was the primary media used for consultations. It would be useful to explore the reasons for this. It is likely that providers were unprepared to use THVCS and it would be beneficial to learn if there is motivation to now become prepared and what the remaining barriers are. The cost and consequence assessment for THVCS weighed heavily towards the benefits when the importance of infection control could be understood.

The COVID-19 pandemic resulted in rapid adoption of THVCS in New Zealand and around the world, and concepts expressed in this thesis are now being played out in real-time. The question remains if the changes enacted apace will be sustained in the medium to long term and the outcomes will be observed with interest.

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APPENDICES

APPENDIX A: Phase I participant information sheet

Exploration of expert stakeholders' perceptions of telehealth video-conferencing services in NZ

INFORMATION SHEET

My name is Nicola Green; I am a PhD student at Massey University researching telehealth video-conferencing services (THVCS) in NZ and the impact on the people providing and receiving them.

An invitation
As a Member of the NZ Telehealth Forum leadership group, I hope that you will be able to help me. I would like to interview you to ask your thoughts on the impact that telehealth video-conferencing services in NZ has on health professionals, patients and their families. This study is the first phase of my PhD. Subsequent phases will examine the perspective of others.

How were you chosen for this invitation?
I obtained your name from the Ministry of Health's website which lists the Forum members. This study aims to interview all Members of the Telehealth Forum leadership group and as part of this group it would be great if you could help.

What will happen in this research?
Participants will be interviewed by me. It is anticipated that the interviews will take between 30 to 60 minutes. They can be conducted via video-conferencing, telephone or in person at your place of work. I would like to record the interviews for later transcription. I will also be asking for any documentation that you may have related to THVCS in NZ.

What will happen to the information after you participate?
The interviews will be transcribed and the content of these and any documentation will be analysed. The information collected will be used to inform further phases of the research and help the broader inquiry into telehealth work systems. All data collected will be treated confidentially and you will not be identified at any time by name. A summary of the project findings will be emailed to the Forum. Interview recordings and transcripts will be kept in password protected files and only accessible by me and my supervisors. The files will be deleted at the completion of my PhD.

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- Ask any questions about the study at any time during participation
- Be given access to a summary of the project findings when it is concluded
- Provide information on the understanding that your name will not be used unless you give permission to the researcher
- Ask for the recorder to be turned off at any time during the interview
- Decline to answer any particular question
- Withdraw from the study at any time before data collection is completed (end of March 2018)

Who can you contact for further information about this research?

Role	*Name*	*Email*	*Telephone*
Researcher	**Nicola Green**	N.J.Green@massey.ac.nz	[redacted]
Project Supervisor	**Dr. David Tappin**	**D.C.Tappin@massey.ac.nz**	**09 414 0800 ext 43384**
Project Supervisor	**Prof. Tim Bentley**	**T.A.Bentley@massey.ac.nz**	**09 414 0800 ext 43392**

Ethics review
This project has been evaluated by peer review and judged to be low risk (ethics notification numbe 4000018237). Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research. If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s)

APPENDIX B: Phase I informed consent form

Exploration of expert stakeholders' perceptions of telehealth video-conferencing services in NZ

PARTICIPANT CONSENT FORM - INDIVIDUAL

I have read the Information Sheet and have had the details of the study explained to me.

My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree/do not agree to the interview being sound recorded.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature: ..... **Date:** .....

Full Name - printed .....

APPENDIX C: Letter of approval from Massey University Human Ethics Committee- Phase I

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Date: 02 August 2017

Dear Nicola Green

Re: Ethics Notification - **4000018237** - **Exploration of expert stakeholders' perceptions of telehealth video-conferencing services in NZ**

Thank you for your notification which you have assessed as Low Risk.

Your project has been recorded in our system which is reported in the Annual Report of the Massey University Human Ethics Committee.

The low risk notification for this project is valid for a maximum of three years.

If situations subsequently occur which cause you to reconsider your ethical analysis, please go to http://rims.massey.ac.nz and register the changes in order that they be assessed as safe to proceed.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

A reminder to include the following statement on all public documents:
"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named in this document are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you want to raise with someone other than the researcher(s), please contact Dr Brian Finch, Director - Ethics, telephone 06 3569099 ext 86015, email humanethics@massey.ac.nz. "

Please note, if a sponsoring organisation, funding authority or a journal in which you wish to publish requires evidence of committee approval (with an approval number), you will have to complete the application form again, answering "yes" to the publication question to provide more information for one of the University's Human Ethics Committees. You should also note that such an approval can only be provided prior to the commencement of the research.

Yours sincerely

Dr Brian Finch
Chair, Human Ethics Chairs' Committee and Director (Research Ethics)

Research Ethics Office, Research and Enterprise
Massey University, Private Bag 11 222, Palmerston North, 4442, New Zealand **T** 06 350 5573; 06 350 5575 **F** 06 355 7973
E humanethics@massey.ac.nz **W** http://humanethics.massey.ac.nz

APPENDIX D: Letter of approval from Massey University Human Ethics Committee- Phase II

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Date: 01 March 2019

Dear Nicola Green

Re: Ethics Notification - **SOA 19/02 - Exploring the telehealth system-receivers' and providers' perspective: Phase II**

Thank you for the above application that was considered by the Massey University Human Ethics Committee: **Human Ethics Southern A Committee** at their meeting held on **Friday, 1 March, 2019**.

Approval is for three years. If this project has not been completed within three years from the date of this letter, reapproval must be requested.

If the nature, content, location, procedures or personnel of your approved application change, please advise the Secretary of the Committee.

Yours sincerely

Professor Craig Johnson
Chair, Human Ethics Chairs' Committee and Director (Research Ethics)

Research Ethics Office, Research and Enterprise
Massey University, Private Bag 11 222, Palmerston North, 4442, New Zealand **T** 06 350 5573; 06 350 5575 **F** 06 355 7973
E humanethics@massey.ac.nz **W** http://humanethics.massey.ac.nz

APPENDIX E: Phase II participant information sheets-providers, receivers, decliners, other personnel, and family

Exploration of providers' perceptions of telehealth video-conferencing services in NZ

INFORMATION SHEET

Providers of telehealth video-conferencing services

My name is Nicola Green; I am a PhD student at Massey University researching telehealth video-conferencing services (THVCS) in NZ and the impact on the people providing and receiving them.

An invitation
As someone who provides healthcare using video-conferencing, I hope that you will be able to help me. I would like to interview you to ask your thoughts on the impact that telehealth video-conferencing services have had on you and your work.

How were you chosen for this invitation?
I got your name through contacts I have made through the Telehealth Forum or at the HiNZ conferences. This part of the study aims to interview several providers of THVCS and it would be great if you could help.

What will happen in this research?
Participants will be interviewed by me. It is anticipated that the interviews will take between 30 to 60 minutes. They can be conducted via video-conferencing, telephone or in person at your place of work. I would like to record the interviews for later transcription. If the interviews are at your place of work the THVCS process and environment may be observed and field notes taken.

What will happen to the information after you participate?
The interviews will be transcribed and the content of these will be analysed. The information collected will be used to help the broader inquiry into telehealth work systems. All data collected will be treated confidentially and you will not be identified at any time by name. A summary of the project findings will be emailed to you if you would like them. Interview recordings and transcripts will be kept in password protected files and only accessible by me and my supervisors. The files will be deleted at the completion of my PhD.

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- Ask any questions about the study at any time during participation
- Withdraw from the study at any time before data collection is completed (2 weeks after the interview takes place)
- Provide information on the understanding that your name will not be used unless you give permission to the researcher
- Ask for the recorder to be turned off at any time during the interview
- Decline to answer any question
- Be given access to a summary of the project findings when it is concluded
- Read and edit the transcript

Who can you contact for further information about this research?

Role	*Name*	*Email*	*Telephone*
Researcher	**Nicola Green**	N.J.Green@massey.ac.nz	[redacted]
Project Supervisor	**A/P. David Tappin**	**D.C.Tappin@massey.ac.nz**	**09 414 0800 ext 43384**
Project Supervisor	**Prof. Tim Bentley**	**T.A.Bentley@massey.ac.nz**	**09 414 0800 ext 43392**

Ethics review
This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern A, Application 19/02. If you have any concerns about the conduct of this research, please contact Dr Lesley Batten, Chair, Massey University Human Ethics Committee: Southern A, telephone + 646 356 9099 x 85094, email humanethicsoutha@massey.ac.nz.

Exploration of receivers' perceptions of telehealth video-conferencing services in NZ

INFORMATION SHEET

Receivers of telehealth video-conferencing services

My name is Nicola Green; I am a PhD student at Massey University researching telehealth video-conferencing services (THVCS) in NZ and the impact on the people providing and receiving them.

An invitation
As someone who receives healthcare using video-conferencing, I hope that you will be able to help me. I would like to interview you to ask your thoughts on the impact that telehealth video-conferencing services have had on you and your family.

How were you chosen for this invitation?
The health service area where you receive telehealth video-conferencing services provided you with this information sheet. This part of the study aims to interview people who use this service. As part of this group it would be great if you could help. Please text or call me on 021 750 020 or email N.J.Green@massey.ac.nz if you can.

What will happen in this research?
Participants will be interviewed by me. It is anticipated that the interviews will take between 30 to 60 minutes. They can be conducted via video-conferencing, telephone or in person at your home or convenient location. I would like to record the interviews for later transcription. A $20 petrol voucher will be given in thanks for your time.

What will happen to the information after you participate?
The interviews will be transcribed and the content of these will be analysed. The information collected will be used to help the broader inquiry into telehealth work systems. All data collected will be treated confidentially and you will not be identified at any time by name. A summary of the project findings will be emailed or mailed to you if you would like them. Interview recordings and transcripts will be kept in password protected files and only accessible by me and my supervisors. The files will be deleted at the completion of my PhD.

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- Ask any questions about the study at any time during participation
- Withdraw from the study at any time before data collection is completed (2 weeks after the interview takes place)
- Provide information on the understanding that your name will not be used unless you give permission to the researcher
- Ask for the recorder to be turned off at any time during the interview
- Decline to answer any question
- Be given access to a summary of the project findings when it is concluded
- Read and edit the transcript

Who can you contact for further information about this research?

Role	*Name*	*Email*	*Telephone*
Researcher	**Nicola Green**	N.J.Green@massey.ac.nz	[redacted]
Project Supervisor	**A/P. David Tappin**	**D.C.Tappin@massey.ac.nz**	**09 414 0800 ext 43384**
Project Supervisor	**Prof. Tim Bentley**	**T.A.Bentley@massey.ac.nz**	**09 414 0800 ext 43392**

Ethics review
This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern A, Application 19/02. If you have any concerns about the conduct of this research, please contact Dr Lesley Batten, Chair, Massey University Human Ethics Committee: Southern A, telephone + 646 356 9099 x 85094, email humanethicsoutha@massey.ac.nz.

Please contact Nicola [redacted] or email N.J.Green@massey.ac.nz if you would like to take part.

Exploration of perceptions of telehealth video-conferencing services in NZ

INFORMATION SHEET

Prefer not to receive telehealth video-conferencing services

My name is Nicola Green; I am a PhD student at Massey University researching telehealth video-conferencing services (THVCS) in NZ and the impact on the people providing and receiving them.

An invitation
As someone who did not wish to receive healthcare using video-conferencing, I hope that you will be able to help me. I would like to interview you to ask your thoughts on telehealth video-conferencing services to receive health care.

How were you chosen for this invitation?
The area where you receive health care provided you with this information sheet if you were offered telehealth but preferred not to receive care by video-conference. This part of the study aims to interview people who prefer their health care provided in person and not through video. As part of this group it would be great if you could help. Please text me on 021 750 020 or email N.J.Green@massey.ac.nz if you can.

What will happen in this research?
Participants will be interviewed by me. It is anticipated that the interviews will take between 30 to 60 minutes. They can be conducted in person at your home or other convenient place or by telephone. I would like to record the interviews for later transcription. A $20 petrol voucher will be given in thanks for your time.

What will happen to the information after you participate?
The interviews will be transcribed and the content of these will be analysed. The information collected will be used to help the broader inquiry into telehealth work systems. All data collected will be treated confidentially and you will not be identified at any time by name. A summary of the project findings will be emailed or mailed to you if you would like them. Interview recordings and transcripts will be kept in password protected files and only accessible by me and my supervisors. The files will be deleted at the completion of my PhD.

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- Ask any questions about the study at any time during participation
- Withdraw from the study at any time before data collection is completed (2 weeks after the interview takes place)
- Provide information on the understanding that your name will not be used unless you give permission to the researcher
- Ask for the recorder to be turned off at any time during the interview
- Decline to answer any question
- Be given access to a summary of the project findings when it is concluded
- Read and edit the transcript.

Who can you contact for further information about this research?

Role	*Name*	*Email*	*Telephone*
Researcher	**Nicola Green**	N.J.Green@massey.ac.nz	[redacted]
Project Supervisor	**A/P David Tappin**	**D.C.Tappin@massey.ac.nz**	**09 414 0800 ext 43384**
Project Supervisor	**Prof. Tim Bentley**	**T.A.Bentley@massey.ac.nz**	**09 414 0800 ext 43392**

Ethics review
This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern A, Application 19/02. If you have any concerns about the conduct of this research, please contact Dr Lesley Batten, Chair, Massey University Human Ethics Committee: Southern A, telephone + 646 356 9099 x 85094, email humanethicsoutha@massey.ac.nz.

Please contact Nicola [redacted] or email N.J.Green@massey.ac.nz if you would like to take part.

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Exploration of perceptions of telehealth video-conferencing services (THVCS) in NZ

INFORMATION SHEET

For other personnel involved in THVCS process

My name is Nicola Green; I am a PhD student at Massey University researching telehealth video-conferencing services (THVCS) in NZ and the impact on the people providing and receiving them.

An invitation
As someone who is involved in providing healthcare using video-conferencing, I hope that you will be able to help me. I would like to observe the telehealth video-conferencing services that you are providing.

How were you chosen for this invitation?
You are involved in the THVCS process. This part of the study aims to observe THVCS occurring, so I am familiar with the process.

What will happen in this research?
The THVCS process and environment will be observed and field notes taken.

What will happen to the information after you participate?
The information collected will be used to help the broader inquiry into telehealth work systems. All data collected will be treated confidentially and you will not be identified at any time by name. A summary of the project findings will be emailed to you if you would like them. The files will be deleted at the completion of my PhD.

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- Ask any questions about the study at any time during participation
- Withdraw from the study at any time before data collection is completed (2 weeks after the observation takes place)
- Decline to answer any question
- Be given access to a summary of the project findings when it is concluded
- Provide information on the understanding that your name will not be used unless you give permission to the researcher

Who can you contact for further information about this research?

Role	***Name***	***Email***	***Telephone***
Researcher	**Nicola Green**	N.J.Green@massey.ac.nz	[redacted]
Project Supervisor	**A/P. David Tappin**	**D.C.Tappin@massey.ac.nz**	**09 414 0800 ext 43384**
Project Supervisor	**Prof. Tim Bentley**	**T.A.Bentley@massey.ac.nz**	**09 414 0800 ext 43392**

Ethics review
This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern A, Application 19/02. If you have any concerns about the conduct of this research, please contact Dr Lesley Batten, Chair, Massey University Human Ethics Committee: Southern A, telephone + 646 356 9099 x 85094, email humanethicsoutha@massey.ac.nz.

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Exploration of receivers' perceptions of telehealth video-conferencing services (THVCS) in NZ

INFORMATION SHEET

For family / whanau / other support people involved in receiving THVCS

My name is Nicola Green; I am a PhD student at Massey University researching telehealth video-conferencing services (THVCS) in NZ and the impact on the people providing and receiving them.

An invitation
As someone who supports a person who receives healthcare using video-conferencing, I hope that you will be able to help me. I would like to interview people receiving the services to ask thoughts on the impact that telehealth video-conferencing services have.

How were you chosen for this invitation?
The person you support has asked that you be included in the interview. This part of the study aims to interview people who use this service. As part of this group it would be great if you could help.

What will happen in this research?
You and the person you support will be interviewed by me. It is anticipated that the interviews will take between 30 to 60 minutes. They can be conducted via video-conferencing, telephone or in person at your home or convenient location. I would like to record the interviews for later transcription.

What will happen to the information after you participate?
The interviews will be transcribed and the content of these will be analysed. The information collected will be used to help the broader inquiry into telehealth work systems. All data collected will be treated confidentially and you will not be identified at any time by name. A summary of the project findings will be emailed or mailed to you if you would like them. Interview recordings and transcripts will be kept in password protected files and only accessible by me and my supervisors. The files will be deleted at the completion of my PhD.

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- Ask any questions about the study at any time during participation
- Withdraw from the study at any time before data collection is completed (2 weeks after the interview takes place)
- Provide information on the understanding that your name will not be used unless you give permission to the researcher
- Ask for the recorder to be turned off at any time during the interview
- Decline to answer any question
- Be given access to a summary of the project findings when it is concluded
- Read and edit the transcript.

Who can you contact for further information about this research?

Role	*Name*	*Email*	*Telephone*
Researcher	**Nicola Green**	N.J.Green@massey.ac.nz	[redacted]
Project Supervisor	**A/P. David Tappin**	**D.C.Tappin@massey.ac.nz**	**09 414 0800 ext 43384**
Project Supervisor	**Prof. Tim Bentley**	**T.A.Bentley@massey.ac.nz**	**09 414 0800 ext 43392**

Ethics review
This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern A, Application 19/02. If you have any concerns about the conduct of this research, please contact Dr Lesley Batten, Chair, Massey University Human Ethics Committee: Southern A, telephone + 646 356 9099 x 85094, email humanethicsoutha@massey.ac.nz.

Please contact Nicola [redacted] or email N.J.Green@massey.ac.nz if you would like to take part.

APPENDIX F: Phase II informed consent forms – participants and other personnel

Exploration of perceptions of telehealth video-conferencing services in NZ

PARTICIPANT CONSENT FORM

I have read or been read the Information Sheet and have had the details of the study explained to me.

My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree to the interview being sound recorded.	Yes ☐	No ☐
I agree to my telehealth interaction being observed (if applicable)	Yes ☐	No ☐
Please send a copy of the interview transcript to read and amend.	Yes ☐	No ☐
Please send me a copy of the findings.	Yes ☐	No ☐

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature: _____ **Date:** _____

Full Name - printed _____

Address (email or physical) _____

Only if you want transcript or findings sent _____

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Exploration of perceptions of telehealth video-conferencing services (THVCS) in NZ

THVCS PERSONNEL PARTICIPANT CONSENT FORM

I have read or been read the Information Sheet and have had the details of the study explained to me.

My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree to my telehealth interaction being observed (if applicable) Yes ☐ No ☐

Please send me a copy of the findings. Yes ☐ No ☐

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature: _____ **Date:** _____

Full Name - printed _____

Address (email or physical) _____

Only if you want findings sent _____

APPENDIX G: Examples of participant recruitment advertisements

APPENDIX H: Phase I interview schedule

Expert Stakeholder (Telehealth Forum) Interview Schedule
A. To explore expert stakeholders' perceptions of current characteristics of THVCS in NZ
RQ: What is the expert's role in THVCS?
Introduction… **1. What is your involvement in telehealth?** - What about THVCS? - In what capacity?
2. In your experience what are organisations using THVCS for? - For direct contact between clinician's and patients? - -In which sector of care? Primary? Secondary? What is it used for? - Between whom? Spoke-hub, patient-Dr, Dr-Dr, nurse-patient, allied health-patient… - In which disciplines? - Are there other uses directly related to the delivery of health services?
RQ: What is the expert's experience of THVCS types and technology?
3. In your experience what technology is used to provide the patient care services? -What type of technology is used? - Fixed or mobile VC facilities?
RQ: What is the expert's experience of the governance structure of THVCS?
4. In your experience how do organisations manage THVCS? -strategies, policies..? -is there a governance group? Are there clinical telehealth leaders? THVC facilitators? Programme managers? -How is THVCS governed by (your) professional bodies? -Procedures? Standards (e.g. interoperability) **5. Have you experienced any difficulties with managing THVCS?**
RQ: What is the expert's experience of the funding structure of THVCS?
6. Can you tell me about how THVCS is funded? -what does the funding include? -Capital expense (eqpt), IT support? Training? Administrative support? -Who is responsible for approving THVCS funding? -if you want to utilise a service or extend it do you make a case for it? Are there restrictions?
RQ: What is the expert's perception of the extent of THVCS?
7. How do you feel THVCS have changed during your involvement? -In what way? -Expanded? -Contracted? -Have you had any experiences of THVCS been discontinued or reduced? -What were they? -Why do think this was?
RQ: What are the expert's perceptions of the facilitators and barriers to embedding THVCS in the health system?
8. In your opinion what *helps* THVCS become part of 'usual business' or part of the 'normal routine'? **9. In your opinion what *hinders* THVCS becoming part of 'usual business' or part of the 'normal' routine?**

-what makes it work well? -what puts you off? -what doesn't work? - a champion(s) - attitudes – Drs, nurses, managers, patients - organisational culture - management support - funding - clear cost-benefit -consumer demand - computer / technology literacy -technology -legislation -professional registration -government support -trust -privacy / security/ safety
B. To explore expert stakeholders' perceptions of the impact that THVCS have on health professionals, patients, and their families.
RQ: What is the expert's perception of the impact of THVCS on key stakeholders?
10. How do you think THVC impacts on (effects) the services that are provided in the wider health system? -effectiveness -efficiencies -safety -positives -negatives -unintended consequences /surprises -*clinical staff* -change in tasks, change in nature of work / roles -change in process -*support staff / administrators* -*patients, family, carers* -*THVCS impact on managers / governance* -other managers higher up in the organisation -policy / strategy - professional regulation and registration -the labour market
RQ: What is the expert's perception of the future regarding THVCS?
11. How do you see the future of THVCS? -what are your thoughts on how this will be achieved? -what would you like to see happen?
C. Conclusion
12. Do you have anything else to add?
D. Documents
13. Do you have any documentation relating to using and managing telehealth e.g. policy documents, strategies, guidelines etc.? -If so, please could I have a copy of them?
E. Follow up contacts
14. Do you think there are other people who it would be valuable for me to talk to? **15. Please can I contact you for the other phases of my project if necessary?**

APPENDIX I: Phase II interview schedule- providers, receivers, and decliners of THVCS

Interview Schedule for providers of THVCS
Introduction -Information sheet -Explanation -Questions -Consent form
Can you tell me about the services you use THVCS for?
What technology systems do you use?
How is the process / logistics managed / organised?
Have you experienced any difficulties with organising / managing THVCS?
What makes THVCS work well for you?
What doesn't work well for you with THVCS?
How do you think THVCS impact on (affect) the services that you provide? -effectiveness -efficiencies -safety -privacy / security -positives -negatives -change in tasks -change in nature of work / roles -job satisfaction/work-life balance -change in process -support staff / administrators -patients, family, carers
Has there been any unintended consequences or surprises with delivering care using THVC?
Conclusion
Do you have anything else to add? **Thank you!**

Interview Schedule for receivers of THVCS
Introduction -Information sheet -Explanation -Questions -Consent form
1. How did it come about that you started using THVCS? -provider initiated - consumer initiated
2. How are your appointments arranged/ set-up?
3. Have you experienced any difficulties with the THVCS arrangements / setting it up?
4. What makes THVCS work well for you?
5. What doesn't work well for you with THVCS?
6. How has using THVCS affected your experience of getting healthcare? -effectiveness (does it help to manage condition?) -efficiencies (time savings, less travel…) -impact on wider family / carers -engagement
7. How has using THVCS impacted on other aspects of your life? -cost savings -independence
8. Has there been any surprises with using THVCS? Things that you weren't expecting?
9. Do you want to continue to receive healthcare using THVCS? Why or why not?
Conclusion
10. Do you have anything else to add? **Thank you!**

Interview Schedule for decliners of THVCS
Introduction -Information sheet -Explanation -why people use TH and why they don't and what their experiences are? -Questions -Consent form
1. Were you offered telehealth for your appointments? **2. Can you tell me about why you prefer to go to the clinic for your healthcare appointments instead of using THVCS?** Are there things about… - access to internet / device - using technology – would you say that you are confident with computers? - no one to help with it - your beliefs or culture - security and privacy - cost - the social aspects of going to the clinic - lack of space to take a TH call - relationship with provider …that affect your decision?
1. What things would need to change for you to consider receiving health care using videoconferencing? **2. Would you consider using TH for another type of healthcare service?**
3. Do you use any kind of video (e.g. Skype, FaceTime) to talk to friends or family? - do you have any type of electronic device? - what type of device do you have? mobile phone, smart phone, computer, iPad? - do you have an internet connection at home? - where do you use your device? - how far is it to the clinic for you? - do you drive?
Conclusion
5. Do you have anything else to add?