A ROLE FOR IS IN MENTAL HEALTH: AN INVESTIGATION OF THE BENEFIT OF USING IS IN THE CONTEXT OF UNIVERSITY STUDENTS WITH ADHD

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

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Every great work of culture, be it a scientific breakthrough or a literary masterpiece, was achieved by a person who, at minimum, was able to pay attention.

— Jessa Gamble 2016
DECLARATION

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; and, any editorial work, paid or unpaid, carried out by a third party is acknowledged, and ethics procedures and guidelines have been followed.

May 2017

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Bader Binhadyan
ABSTRACT

Information systems (IS) can support intervention and treatment of many different mental illnesses and there appears to be great potential for IS in the context of university students with mental disorders such as Attention Deficit Hyperactivity Disorder (ADHD). ADHD is a neurodevelopmental disorder that is characterised by inappropriate levels of inattention, hyperactivity and impulsivity. Globally, ADHD prevalence rates are estimated at 3.4% in people over the age of 18, which includes university students, and often these students exhibit impairments in executive functions (EF) in the brain. These impairments can impact academic performance, study skills, and social life; hence, fewer university students with ADHD complete their degrees in comparison with their peers.

The treatment recommended by The Royal Australian College of Physicians is a multimodal approach, which consists of four components: medication, therapy, coaching, and education. This research investigated psychologists’ perceptions of the use of IS in the non-pharmaceutical components of the multimodal framework: coaching, therapy and education. This investigation adopted a multiple case study approach.

Data was obtained by employing in-depth interviews of psychologists. Each psychologist was allocated to a case based on their declared treatment preference and each case used a slightly different interview protocol. The interviews sought deep knowledge of both the psychologists’ perceptions of the aspects of ADHD in university students and of their practice that relates to their potential use of IS tools. The interviews revealed the following:

1. There is a set of behavioural and neurodevelopmental attributes of university students with ADHD that are seen as relevant to the use of IS tools;
2. Clinicians have perceptions of the nature of the Tools of Care Process (TCP), which includes the tools and approach used by participants in the treatment and diagnosis of ADHD;

3. Clinicians see a separate set of attributes of IS tools when considered as part of the Care Intervention Process;

4. There are attributes of Clinicians that influence IS acceptance;

5. Clinicians identify specific attributes of the university student ADHD patient that determine the relevance of IS tools for each individual; &

6. There are a number of ’external factors’ (outside the Clinician-patient relationship) that determine the effectiveness of IS tools.

These emergent themes have been used to develop a theory. The theory is an extension of the multimodal framework, called the e-multimodal framework, which includes the key attributes that need to be addressed for the successful use of IS in the treatment of university students with ADHD.
This poster [excluding themes and outcome section] won the Delegates most Favourite at the Higher Education Conference 2015 Poster Exhibition.
I sincerely acknowledge the valuable time, patience, support of my supervisory team Dr Davey, Dr Bruno, and Dr Peszynski, whom I called the "the three musketeers", and for making this journey enjoyable. I have learned important steps, and styles in conducting research, as well as how to smile when it gets rough. Special thanks to my senior supervisor, Dr Davey for his patience, enthusiasm and insightfulness.

My sincere thanks to Prof. Wickramasinghe, Nilmmin, my former senior supervisor, for her supervision, support, knowledge, and valuable feedbacks that assisted in developing the foundation of this research. I would not be able to publish that many publications without her motivations. To the memory of Dr Stas Lukaitis, my deceased supervisor, here I am, I made it. To all supervisors, current or former, I could not have thought of any better advisors and mentors for my Ph.D study.

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Beyari, Mohammad Jan "Not Jaan as I always write it", Hilal Ali, and Zyad Almotawa, Ahmad Bash, Ahmad Subahe, Ayman Al Harbi for making this journey fun. Thanks, Geo, and Sari for being there when I needed, they have been like a second family to me. Special Thanks for Covey, who offered unconditional and complete support throughout is all, and for representing my working memory . . . ‘yes, I slept last night, and I’ve had my lunch’.
Some of the research leading to this thesis has appeared previously in the following publications.

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GLOSSARIES

ADHDer An individual with ADHD whether she/he is an adult or a university student. xvii, xviii, 84, 85, 87–98, 100–111, 116–132, 136–143, 145, 146, 148, 150–152, 155–158, 160–164, 166, 168–171

AduADHD describes ADHD symptoms and issues persisting in Adults. 84, 87–89, 94–97, 100, 103, 104, 106, 107, 110, 113, 138–143, 145, 149–151, 166

AT Assistive Technologies are tools used by participants to enhance treatment of ADHD and support participants’s self-management approach. xv, xvii, xviii, 85, 86, 104, 105, 107, 109, 110, 116–118, 120, 121, 123, 124, 126, 128–131, 138, 142, 143, 150–152, 155–158, 161, 163, 164, 168, 169, 171

CBT Cognitive Behavioural Therapy is a short-term, goal-oriented psychotherapy treatment that takes a hands-on, practical approach to problem-solving. 7, 10, 26, 38, 39, 43, 44, 52, 63–68, 71, 85, 100, 101, 119, 120, 124, 129, 138, 153, 154, 173

CDP Care Development Process contains the views of the majority of participants about the diagnostic process of the disorder. 87, 95–98, 103, 112, 115, 136, 137, 140, 146, 147, 149, 153, 163, 167, 168

CIP Care Intervention Process contains of the views of the majority of participants about the intervention process to target issues related to ADHD. 87, 95, 101, 103, 104, 111, 113, 118, 127, 129, 136, 138, 140, 145, 146, 154, 155, 163, 166, 168
CIT Care Intervention Tools contains the treatment tools used by clinicians in ADHDer treatment, as perceived by the participants. 84, 96, 115–120, 125, 126, 147

CPT Continuous Performance Task is any type of neuropsychological assessment that measures an individual’s sustained and selective attention. 99, 137, 138, 140

DBC DSM-Based Criteria is sub-process of CDP which is the initial step in screening for ADHD employed by participants. 95–97, 112–114, 137, 146–149, 163, 167

DSM Diagnostic and Statistical Manual for Mental Disorders is a manual developed by the American Psychiatric Association, which offers a common meaning and standard criteria of classification of mental disorders. 36, 85, 88, 95, 113, 137, 146, 148, 149, 168

EEG An electroencephalogram is an examination that detects electrical activity in the brain using small, flat metal discs (electrodes) attached to the ADHDer’s scalp. 113, 153, 154

EF Executive functions are a set of cognitive processes – including attentional control, inhibitory control, working memory, and cognitive flexibility, as well as reasoning, problem solving, and planning – that are necessary for the cognitive control of behaviour. xiii, xviii, 6, 28, 30–32, 34, 36, 41, 45, 84, 87, 88, 90–92, 94–96, 99, 104, 105, 113, 118, 120–124, 126, 128, 130–132, 137, 138, 140–143, 146, 147, 150, 151, 155–157, 159, 161–163, 168–172, 174
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<td>Education for a Supportive Environment includes a range of approaches to increase the opportunity for ADHDer to experience better mental health. 85, 86, 104, 107</td>
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<td>IQ</td>
<td>An intelligence quotient is a total score derived from one of several standardized tests designed to assess human intelligence. 99, 137</td>
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<td>KidADHD</td>
<td>Describes ADHD symptoms and issues persisting in children. 88, 94, 153</td>
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<td>MA</td>
<td>Medication Adherence is perceived by some participants to be employed to improve medication intake. 104, 106, 107, 158, 168</td>
</tr>
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<td>NBT</td>
<td>Neuropsychological-Based Testing is sub-process of CDP use by participant for further examination to evaluate other associated issues with ADHD. 95, 96, 98, 99, 112–116, 137, 146–148, 153–155, 163, 167</td>
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<td>Neurofeedback</td>
<td>Neurofeedback therapy is a behaviour technique based on brain-imaging studies, quantitative electroencephalography (qEEG), to facilitate brain activity self-regulation. 8, 10, 39, 40, 43, 44, 52, 63–65, 67, 68, 71, 85, 100–102, 107, 115, 116, 137, 138, 150, 153–155, 169, 173</td>
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<td>PET</td>
<td>A Positron Emission Tomography scan is an imaging test that allows a doctor to check for diseases in the body. 99</td>
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<td>PFC</td>
<td>Prefrontal Cortex of the Brain is the cerebral cortex which covers the front part of the frontal lobe. 28, 113, 162</td>
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**qEEG**
Quantitative EEG is the analysis of the digitized EEG, which is an extension of the analysis of the visual EEG interpretation, which may assist and even augment the understanding of the EEG and brain function. 39, 40, 85, 99, 113–115, 137, 138, 153–155, 169, 173

**SPECT**
A type of nuclear imaging test, which means it uses a radioactive substance and a special camera to create 3-D pictures. 85, 99, 100, 114, 115, 137

**TCP**
Tools of Care Process employed by clinicians. 84, 109–112, 136, 145, 161, 165, 166

**T.O.V.A**
The Test Of Variables of Attention is a neuropsychological assessment that measures a person’s attention while screening for attention deficit hyperactivity disorder. 99, 115, 137, 138, 153, 155, 173

**UniADHD**
University Students’ ADHD; describes ADHD symptoms and issues persisting in University Students. xviii, 7, 83, 86, 141

**WM**
Working memory, a core executive function, is a cognitive system with a limited capacity that is responsible for the transient holding, processing, and manipulation of information. Working memory is a central intellectual faculty, linked to IQ, ageing, and mental health. 6, 31, 41

**WM-f**
describes ADHDer attributes of Working Memory impairment of EF abilities, as perceived by participants. 88, 90, 93, 95, 120, 123, 124, 168
WMT  Working memory training is intended to improve a person’s working memory.  8, 10, 41, 43, 44, 52, 63–65, 67, 71, 72, 85, 100, 102, 138, 154, 173
Part I

GETTING STARTED

Let me introduce my research and give you the background into the current issues regarding the use of IS in mental health and in the treatment of university students with ADHD.
INTRODUCTION

This research sought to explore psychologists’ perceptions of the use of Information System in the current treatment and management of university students with Attention Deficit Hyperactivity Disorder (ADHD) in Australia. These perceptions have offered a key set of themes, which provided a general view of ADHD approaches, tools and elements used in diagnosis, and treatment processes. These emergent themes have been employed to develop a theory, which consists of attributes that need to be addressed for the successful use of IS in the treatment of university students with ADHD. This chapter will provide insight into IS in mental health, ADHD, research aims and questions. It will also introduce the method that was adopted and how this thesis is structured.

1.1 IS IN MENTAL HEALTH

IS in healthcare has the potential to assist developed and developing countries to solve many issues they are facing (Wickramasinghe, Geisler, & Schaffer, 2006), such as easy access to information and services, coping with changing population health patterns, and satisfaction and safety of stakeholders. E-health refers to the use of IS to easily connect and educate healthcare stakeholders, to boost innovation in care delivery and health system management, and to facilitate the healthcare system, as well as to eliminate geographical and financial barriers to healthcare provision (World Health Organization, 2013). Eysenbach (2001), Wickramasinghe, Fadlalla, Geisler, and Schaffer (2005) claim e-health covers a broad area in healthcare, including e-Mental Health (eMH).

The use of IS in mental health, often called eMH (Binhadyan, Davey, & Wickramasinghe, 2015), provides treatment, intervention, and sup-
port to people with different mental disorders (depression and anxiety, for example) through sensible technologies such as Short Message Service (SMS), email, website, Chat/Instant Messaging (IM) tools, social media, video/audio over the internet, as well as through smartphones and tablets (Anthony, Nagel, & Goss, 2010; Christensen & Petrie, 2013b; Proudfoot et al., 2014; Whittaker et al., 2012). eMH has the ability to improve accessibility, reduce cost, provide treatment flexibility, and offer better consumer interactivity and engagement (Anthony et al., 2010). eMH also has the ability to overcome issues that already exist in current mental health service delivery, including:

- Improving lack of access due to location, time or financial difficulties (Booth et al., 2004);
- Reducing stigma incurred by seeing a therapist (Burns, Davenport, Durkin, Luscombe, & Hickie, 2010; Christensen & Hickie, 2010a);
- Improving the therapist’s time and efficiency (Jorm, Morgan, & Malhi, 2013; Jorm, Wright, & Morgan, 2007).

However, Anthony et al. (2010) present arguments to emphasize that there are a number of disadvantages of eMH that might affect the development of eMH programs, which include:

- Lack of quality control on eMH services;
- Access to eMH being limited to people with only low to moderate mental illnesses;
- Only being suitable for people who are familiar with using technology;
- Confidentiality, data security, privacy, funding and maintenance concerns.

The Australian Government is investing heavily in eMH services because technology can assist in overcoming existing barriers that are preventing young people from seeking mental health providers and
treatment (Australian Government, 2012). There are five types of eMH services in Australia (Australian Government, 2012; Proudfoot et al., 2014):

- Health promotion, wellness promotion and psycho-education
- Prevention and early intervention
- Crisis intervention and suicide prevention
- Treatment
- Recovery and mutual peer support

Between 2006 and 2012 the Australian Government invested $70.4 million in developing and funding eMH services and telephone crisis assistance, and planned to invest a further $110.4 million during the four years to 2016 (Australian Government, 2012). This investment is targeting young people in Australia using internet technologies. Between 2012 and 2013 it was estimated that 96.5% of 15- to 24-year olds used the internet in Australia (Australian Bureau of Statistics, 2016b). Although there appears to be great potential for eMH in the context of young adults with mental disorders (Burns et al., 2010; Wilens et al., 1999) such as Attention Deficit Hyperactivity Disorder (ADHD), the majority of eMH programs are targeting illnesses related to depression, anxiety and suicidal thoughts (Australian Government, 2012). This is despite the fact that one every 20 between five of Australian adults suffer from ADHD (The Royal Australian College of Physicians, 2009).

1.2 ADHD

ADHD has been defined as a childhood neurodevelopmental condition, which is characterised by inappropriate levels of inattention, hyperactivity and impulsivity (Barkley, Fischer, Edelbrock, & Smallish, 1990; Heiligenstein, Greta Guenther Msn, Levy, Savino, & Fulwiler, 1999; Quinn, 2001). However, more than half of such children will carry the symptoms into adulthood (Fischer, Barkley, Edelbrock, &
Smallish, 1990). Globally, estimates of ADHD prevalence average 5% in children and 3.4% in adults (Fayyad et al., 2007). Numerous follow-up studies have confirmed the existence of ADHD symptoms in adulthood (Lauesen & Younessi, 1998; Wender, Wolf, & Wasserstein, 2006; Meaux, Green, & Broussard, 2009; Swanson et al., 1998). Parker and Banerjee (2007), Parker, Hoffman, Sawilowsky, and Rolands (2011), Barkley (2012b) also claimed that ADHD is often related to impairments in Executive Functions (EF).

EF are described as a set of cognitive processes that connect, prioritise, and integrate cognitive functions that include Working Memory (WM), planning, task flexibility, inhibition, organisation, and attention (Brown, 2006; Parker et al., 2011; Oosterman, Derksen, van Wijck, Kessels, & Veldhuijzen, 2012; Pennington & Ozonoff, 1996; Ramsay & Rostain, 2007). ADHD often co-occurs with learning disabilities (LD) such as difficulty in organising time, poor reading, writing or spelling skills, or difficulty with completing tasks (Richardson, 2015; McGillivray & Baker, 2009; LaCount, Hartung, Shelton, & Stevens, 2015).

Globally, between 4% and 11% of university students have symptoms of ADHD (Wender et al., 2006). These symptoms can impact student academic performance, study skills and various aspects of social life (Bak, Nguyen, Risgaard, & Stage, 2008; Westerberg et al., 2007; Quinn, 2001; Prevatt, Lampropoulos, Bowles, & Garrett, 2011). Hence, fewer such students complete their studies in comparison with non-ADHD students (Murphy, Barkley, & Bush, 2002; Barkley et al., 2006). Other critical factors are listed in Table 1.1.

This underachievement is because university students with ADHD are often or lower functioning on a number of academic variables compared to their peers (Heiligenstein et al., 1999). These variables include study skills, such as note-taking, summarising, organising, and completing assignments on time; (Javorsky & Gussin, 1994; Lambrecht, 2003; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1998; Zwart & Kallemeyn, 2001). Issues with impairment of EF are strongly related to less productivity and poor academic performance (Gropper & Tannock, 2009). University students with ADHD usually have some com-
Table 1.1: Critical UniADHD factors affecting university students

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<th>Factor</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher rates of subject failure</td>
<td>(Grenwald-Mayes, 2001; Lamberg, 2003; Meaux, Green, &amp; Broussard, 2009)</td>
</tr>
<tr>
<td>Lower Grade Point Averages</td>
<td>(DuPaul, Weyandt, O’Dell, &amp; Varejao, 2009; Bass &amp; John, 2000; Young &amp; Sedgwick, 2015; Cheung et al., 2015)</td>
</tr>
<tr>
<td>Class attendance</td>
<td>(Ramsay, 2012; Rucklidge &amp; Tennock, 2002)</td>
</tr>
</tbody>
</table>

Common academic behaviour patterns, as shown in Table 1.1 above. These issues associated with the core symptoms of ADHD assist in diagnosing the disorder. A more detailed account of diagnosing ADHD is given in Chapter 2. The following is a brief introduction to treatment of ADHD.

1.2.1 Treatment of ADHD

Generally, the recognised treatment of ADHD is based on a multimodal framework, which includes four components: medication, education, therapy, and coaching (Beier & Vaughan, 2003; The National Institute for Health and Clinical Excellence, 2008; The Royal Australian College of Physicians, 2009), as illustrated in Figure 1.1. Stimulant medications are commonly used for ADHD (Wilens et al., 2002), as is therapy – also known as psychotherapy – which is the use of psychological approaches by mental health providers to assist university students with ADHD and associated mental issues to change and overcome issues in their lives.

Previous studies have suggested that tools used in therapy to treat ADHD include:

- Cognitive Behaviour Therapy (CBT) (Knouse, 2015; Gerald, 2015);
• Neurofeedback Therapy (Millings & Carnelley, 2015; Gevensleben et al., 2009; Lansbergen, van Dongen-Boomsma, Buitelaar, & Slaats-Willemsen, 2011; Irani, 2010);

• Working Memory Training (WMT) (Beck, Hanson, Puffenberger, Benninger, & Benninger, 2010; Westerberg et al., 2007; Irani, 2010; Westerberg et al., 2007).

ADHD coaching is delivered as "executive" and "life skill" coaching, which involves time management, organisation, and problem solving, to help students to change their behaviour and improve social and academic skills (Parker et al., 2011; Swartz, Prevatt, & Proctor, 2005; Zwart & Kallemeyn, 2001). Education is offered to university students with ADHD to help them gain control of their own issues, and to the people who regularly interact with these students to provide support and better living situations (Beier & Vaughan, 2003; Wiebe, 2000). The multimodal framework was adopted to assist in this research investigation. The research objectives are discussed in the following section.

1.3 RESEARCH OBJECTIVES

This research examined psychologists’ perceptions of the role of IS in the treatment of ADHD in university students in Australia. The emphasis of this research is on the non-pharmaceutical components of the multimodal framework: therapy, coaching, and education. The
role for IS in each of these components was examined with the view to introduce IS into the traditional treatment context (Figure 1.2). I excluded the medication component because it seemed an area where IS was less useful, although IS can be used to facilitate medication adherence, which falls under the coaching or education component of the multimodal framework (The National Institute for Health and Clinical Excellence, 2008).

![Figure 1.2: e-Multimodal Framework](image)

### 1.4 RESEARCH QUESTIONS

As indicated previously there is potential to incorporate IS in the treatment of people with mental illness such as depression and anxiety (Anthony et al., 2010; Christensen & Hickie, 2010a; Whittaker et al., 2012). However, to date there has not been a study conducted on the role of IS in the treatment of university students with ADHD in Australia, nor globally. Therefore, this research aimed to address the following research question:

1. What are clinicians’ perceptions of IS in regard to the treatment and support of university students with ADHD?

This question allowed a closer view of how psychologists perceive the use of IS in the treatment of ADHD in adults, which included university students, and examined factors that enable or inhibit the use of IS as part of their treatment regime. To answer this question, the
following subsidiary research questions were developed to facilitate the research process:

1.1 What are the elements of treatment of ADHD?

1.2 How do clinicians perceive the applicability of currently available IS-based tools?

1.3 How could IS better support treatment of ADHD?

1.4 What are the barrier and enabler factors influencing the adoption of IS?

The research question and subsidiary research questions have been answered, based on a theory that emerged from the data obtained from the participating psychologists.

1.5 RESEARCH METHODOLOGY

To explore psychologists’ perception of the use of IS in ADHD treatment, a case study developed by Eisenhardt (1989) was adopted as the methodology for this research. The methodology is described in Chapter 3.

This study sought to obtain data from psychologists in the form of semi-structured interviews and analysed the data using grounded theory as a lens for multiple cases. Four cases were therefore chosen to represent the key treatment components, which are presented in Table 1.2. The role for IS in each of these cases was examined. These selected case studies are introduced in detail in Section 3.4.3.

<table>
<thead>
<tr>
<th>Case</th>
<th>Multimodal Component</th>
<th>Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Therapy</td>
<td>CBT</td>
</tr>
<tr>
<td>2</td>
<td>Therapy</td>
<td>Neurofeedback Therapy</td>
</tr>
<tr>
<td>3</td>
<td>Therapy</td>
<td>WMT</td>
</tr>
<tr>
<td>4</td>
<td>Coaching &amp; Education</td>
<td>Coaching &amp; Education</td>
</tr>
</tbody>
</table>

The transcripts of these interviews were analysed using grounded theory as a lens, which was developed by Gerlach and Kuo (1991),
and supported by IS-based analysis tools such as NVivo (QSR International, 2013), MS Excel, and MS Visio.

The resulting group of coded references formed an initial set of 237 categories and over 700 coded references using NVivo. The final grouping led to 30 broad concepts, which were then examined and regrouped into six emerging themes. These themes, which consist of related concepts and categories, assist in the development of the theory that is employed when answering the research question and subsidiary research questions as discussed in Chapter 6. This theory was examined alongside current literature on the topic for the purpose of comparing and contrasting it.

1.6 THESIS STRUCTURE

The overall structure of this research takes the form of seven chapters, including this introductory chapter.

CHAPTER 2 introduces the literature review, which includes different types of eMH services delivered in Australia, detailed findings regarding ADHD and its symptoms, and different types of treatment. It also presents a few of the issues associated with ADHD.

CHAPTER 3 outlines the methodology and research design as well as the four selected case studies. It also presents the data collection and analysis methods and techniques.

CHAPTER 4 describes the findings of the research, based on the analysis of the four case studies and the psychologists’ interview scripts. It introduces the findings, which consist of open coding themes and related concepts. These themes describe the overall perceptions of ADHD definitions, diagnosis and treatment, and use of IS-based tools.
CHAPTER 5 presents a further analysis of the emergent themes and their interrelationships, where the themes assist in the theory development that answers the research questions.

CHAPTER 6 presents the outcome of the data analysis that answers the research questions. It outlines the essence of the research and summarises the emergent themes that assist in the development of the theory.

CHAPTER 7 discusses the emergent themes and compares the outcome with the current literature.

CHAPTER 8 outlines the implications of the theory, the limitations of this research, and possible further areas of study that could be undertaken to extend this thesis.
BACKGROUND

This chapter reviews the literature that emphasises the theory generated by this research within its scope. It provides the basis for comparison that lays the foundation for enfolding the theory that emerges from the findings in Chapter 4, which are then analysed in Chapter 5, used to answer the research questions in Chapter 6, and are discussed and compared with the literature in Chapter 7.

This chapter is divided into three main sections, the contents of which together informed the research initially in the development of the interview questions, and enabled the researcher to be informed about IS in mental health and concepts of ADHD in university students. The three sections are as follows:

• Section 2.1 gives a brief overview of mental health and the prevalence of mental health disorders in Australia, with statics obtained from a variety of sources. It also outlines the barriers to treatment, especially for university students with a mental illness.

• Section 2.2 begins with a brief introduction to e-health and its aims. Furthermore, the literature analysis examines the tools and services that have been used in the delivery of eMH, particularly in Australia. This is followed by an overview of mental health services in Australia and the barriers affecting eMH in Australia.

• Section 2.3 starts with an overview of ADHD symptoms, specifically in young adults, and the characteristics that have been found in university students with ADHD. This is followed by the recommended treatments and the Assistive Technologies (AT) found in the current treatment delivery for ADHD.
2.1 MENTAL HEALTH

This section will introduce mental health, provide statistics concerning the prevalence of mental health disorders in Australia, discuss barriers to accessing treatment and look at internet use in Australia. This will be followed by an overview of e-health and a detailed discussion of most aspects of eMH, such as the benefits and limitations of using eMH, and the type of eMH services in Australia.

2.1.1 Mental Health in Australia

Mental health is defined as a "state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community" (World Health Organization, 2014). The prevalence of mental health disorders in Australia varies. Approximately one in five (20%) Australians aged 16-85 years old will experience mental illness during a given 12 month period (Proudfoot et al., 2014). This figure is higher in young adults aged 18-25 years old with 26% of young Australians experiencing commonly reported disorders such as anxiety (14%), depression (6%), and substance abuse (5%) (Australian Bureau of Statistics, 2007). The same report showed that across gender, depression in women (17%) is higher than in men (10%). There is no indication of ADHD in this report. What is known, is that globally the prevalence of ADHD is estimated to be between 2% to 5% in individuals across all ages (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007; Baer, Greist, & Marks, 2007).

The second section of this chapter, Section 2.1.2, will discuss why not all of these people will have access to treatment (Proudfoot et al., 2014). This is because of stigma, geographical location, financial situation, or mental health provider capabilities (Anthony et al., 2010; Christensen & Hickie, 2010a; Jorm et al., 2013).
2.1.2 Barriers to accessing treatment

The literature review indicates that among university students, the most significant barriers to accessing mental health services or seeking help are financial situation or stigma (Hunt & Eisenberg, 2010; Givens & Tjia, 2002; Eisenberg, Golberstein, & Gollust, 2007; Kellison, Bussing, Bell, & Garvan, 2010).

Financial Situation

The cost of mental health care; for example, psychological services, may not be affordable for many students (Australian Psychological Society, 2015b), or perhaps the bulk billing option is limited (Australian Psychological Society, 2015a). Furthermore, university students are more likely to have low income, especially those who are dependent on government support (Australian Bureau of Statistics, 2012; Australian Government, 2013). In the case of international students, the Overseas Student Health Cover (OSHC) is insurance to assist international students with meeting the cost of medical and hospital care and services, and is a compulsory insurance that has to be obtained by international students who are studying in Australia (Australian Government, 2013); however, psychiatric conditions have limited cover (Australian Government, 2013).

Stigma

The literature review shows that one out of four people with mental health disorders have experienced stigma, which makes it one of the most significant barriers to accessing mental health treatment (Burns, Durkin, & Nicholas, 2009; Canu, Newman, Morrow, & Pope, 2008; Corrigan, 2004; Corrigan & Matthews, 2003). Stigma is usually the result of three components: stereotyping, prejudice, and/or discrimination (Corrigan, 2004; Corrigan & Watson, 2002). The literature shows that stigma is not only based on a person with a mental disorder who avoids being labelled as mentally ill by society, it is also how society stigmatises mentally ill individuals (Canu, Newman, Morrow, & Pope, 2007; Corrigan, 2004). In addition, the stigmatisation process
robs people with mental disorders of the opportunities of a good life (Corrigan & Watson, 2002). In the case of ADHD, according to Kellison et al. (2010) university students with ADHD express self-stigma because they do not want to be judged and labelled by friends, which leads to low self-esteem and increases self-blame.

To overcome these barriers and to facilitate mental health service delivery, countries such as Australia have started combining advances in IS with mental health services (Australian Government, 2012). This is because IS has the capability to deliver mental health care for different age groups with different mental illnesses (Ben-Zeev, Davis, Kaiser, Krzosos, & Drake, 2012; Proudfoot et al., 2010; Whittaker et al., 2012), as well as the ability to diminish barriers to mental health treatment, such as financial issues (Australian Government, 2012; Booth et al., 2004; Burns et al., 2010; Christensen & Hickie, 2010a; Proudfoot et al., 2014; Jorm et al., 2013; Anthony et al., 2010). Furthermore, IS advances, such as the internet and other technologies, have the potential to improve efficiency, accessibility and the opportunities for early intervention and treatment for young adults (Anthony et al., 2010, 2010).

2.1.3 Internet use in Australia

According to statistics from 2013, 83% of the population in Australia were using the internet at that time. This number increased to 86% in the year 2014-2015 (Australian Bureau of Statistics, 2015). Recent research on internet use in Australia has found that there are 13.3 million internet users who spend approximately 10 hours a week on the internet for personal use. Users over the age of 65 years spend around 7 hours a week on the internet (Australian Bureau of Statistics, 2016a). Of households with children under the age of 15 years, 97% have access to the internet, which drops to 82% for households without children under the age of 15. The households located in major cities are more likely to use the internet (88%), in comparison to rural households (79%) (Australian Bureau of Statistics, 2015).
According to the report from the Australian Bureau of Statistics in (2015), 1.3 million households (14%) were found without the use of the internet. The significant reasons for not having an internet connection at home include: no need of the internet (65%); lack of knowledge to use internet (22%); and the high cost of having and using the internet (16%). When looking at internet use by age group, of young people between the age of 15 and 17, 99% are regular internet users. This is the highest percentage of any age group. The lowest percentage of users are those aged 65 and over, with only 51% of this age group using the internet (Australian Bureau of Statistics, 2015). The following section outlines E-mental health and starts with a short overview of e-health.

2.2 WHAT IS E-HEALTH?

The use of IS in health care, in the form of e-health, is thought to be the most important revolution in the healthcare industry since the discovery of modern medicine or vaccine (Silber, 2003). The term “e-health” has been used since early in the twenty-first century. E-health describes the use of IS and data with a focus on the delivery of services and medical information rather than on the functions of the technology, which is known as clinical informatics. Oh, Rizo, Enkin, and Jadad (2005) identified 51 definitions related to e-health.

Despite the challenge in finding an agreement on a field-specific definition, e-health is a broad term that includes numerous activities, related to the practice of various e-business technology advances and infrastructure, to improve healthcare service delivery (Wickramasinghe et al., 2005). Mountzoglou (2011) describes e-health as a method that greatly improves the transfer, sharing and processing of information between healthcare stakeholders. These definitions are from a technical perspective. Eysenbach (2001) introduced a wider definition of e-health that covers technical and non-technical concepts.

E-health is an emerging field in the intersection of medical informatics, public health and business. It refers to health services and
information delivered or enhanced through the internet and related technologies. In a broader sense, the term characterises not only a technical development, but also a state of mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology (Eysenbach, 2001).

Quite often people think the "e" before any e-service stands for "electronic" only; however, in e-health, it refers to other "e’s" that explain the role of e-health (Eysenbach, 2001). The "e" in e-health primarily characterises what e-health is about. Namely, efficiency in healthcare; enhancing quality of care; evidence-based empowerment of consumers and patients; encouragement of a new relationship between the patient and the health professional; education of healthcare stakeholders; enabling information exchange and communication; extending the scope of health care beyond its usual boundaries; as well as ethics and equity. The Australian Primary Health Care Research Institute has outlined five models of e-health services (cited in Christensen & Hickie, 2010a). These are:

1. Stand-alone systems offering self-help, self-care and prevention via websites;
2. Patient-assisted care, which offers early intervention through peer support;
3. Virtual Clinics providing treatment and early intervention by using assisted professional care via several technological tools, such as the web, email or phone;
4. General practice models, where clinicians provide e-treatment;
5. Stepped care, which offers a set of integrated services ranging from prevention to self-help and self-care.

E-health has both benefits and disadvantages, which are discussed in the following sections.
2.2.1 *E-health Advantages*

As mentioned earlier, e-health has the ability to assist in improving issues that the healthcare sector is currently facing. Wickramasinghe et al. (2005) point out that cost, availability, access to treatment, and locations for either treatment or stakeholders are the main issues that affect the delivery of healthcare in developed and developing countries. The advantages that e-health can offer to improve many of these issues include:

- enabling more informed decision making and enhanced quality of care;
- saving lives through remote consultations, whether urgent or diagnostic;
- creating more efficient, convenient and potentially more cost effective delivery of care;
- facilitating earlier - and more accurate - diagnoses;
- providing greater, and faster, access to patients, medical history, reducing the risk of negative drug interactions or poor response to a course of treatment;
- improving administrative efficiency and coordination;
- allowing rural residents to receive expert diagnosis and treatment from distant medical centres;
- increasing timeliness of treatment and decreases transfer rates while reducing medical costs through video technology;
- supporting real-time treatment by first responders through the use of wireless devices;
- enhancing senior wellness and preventative care through telemedicine and remote in-home monitoring.

The literature analysis of e-health shows that it is important for healthcare providers or decision makers to carefully recognise and under-
stand these goals to successfully adapt and implement e-health. However, there are barriers that impact on E-health use, which are investigated next.

2.2.2 The Barriers and Limitations of E-health

Although e-health has the potential to provide solutions and opportunities to facilitate healthcare delivery and increase stakeholder satisfaction, there are three factors that can hinder and limit the adaptation and implementation of e-health. Previous studies have classified these factors into three groups; human, technological, (Wickramasinghe & Schaffer, 2010) and organisational (Ammenwerth, Iller, & Mahler, 2006; Yusof, Kuljis, Papazafeiropoulou, & Stergioulas, 2008).

Human barriers

One of the main obstacles to successful adoption of e-health concerns the human factor. Attributes such as lack of IT knowledge; lack of motivation to use; little belief and acceptance (Yusof et al., 2008); and questions around the privacy and security (Wickramasinghe & Schaffer, 2010) of e-health can result in health professionals being very reluctant to implement e-health services. According to Xu, Gao, Sorwar, and Croll (2013), privacy and confidentiality of patient information, and physical security of the data are among the top challenges or limitations of e-health.

Technological barriers

Previous studies outline technological attributes that can hinder the adoption of e-health. These include stability and usability of e-health services (Ammenwerth et al., 2006) and compatibility of e-health with other existing systems (Wickramasinghe & Schaffer, 2010). Most of the technological concerns are centred around the effectiveness, usability, accessibility, and capability of e-health services. The high cost of adopting e-health technology is reported to also be one of the greatest barriers to it being implemented (Scott, 2007).
Organisational barriers

One of the major challenges to adopting e-health is the lack of management support and policy, and the lack of guidance in making the organisational changes necessary (Noblin, Shettian, Cortelyou-Ward, & Schack Dugre, 2016). National policies and regulations that have been developed are also vague, and overlapping standards make the adoption of e-health very complex. Adopting e-health on a national basis would require the formation of government policies to cover various areas and allow better understanding of the infrastructure issues and priorities of the health care settings (Xu et al., 2013).

Having defined what is meant by e-health, which provides various services in the field of healthcare, mental health services is an area which could greatly benefit from implementing such technologies. The following section discusses the use of IS in mental health in the form of eMH.

2.2.3 What is E-Mental Health (eMH)?

One of the fastest growing fields in mental health research is eMH (Schmidt & Wykes, 2012), and the ability of eMH to improve traditional mental health services delivery has been recognised by previous studies (Christensen, Griffiths, & Evans, 2002; Lal & Adair, 2014; Musiat & Tarrier, 2014). However, the role of IS in eMH remains in its early stages (Binhadyan, Troshani, & Wickramasinghe, 2014), and there is no agreement on an eMH definition (Lal & Adair, 2014). An early example of the definition of eMH, introduced by Christensen et al. (2002), refers to the mental health services and information delivered or facilitated by using the internet and related technologies. Another definition refers to eMH as a tool that enhances clinical work, patient management methods, and clinical guidelines as well as professional training and education channels (Proudfoot, 2013). Riper et al. (2010) define eMH as the use of digital technologies and social media to deliver mental health services such as screening, health pro-
motion, prevention, early intervention, or treatment. These previous studies defined eMH from psychology/mental health perspectives.

For the purposes of this thesis, eMH is defined as the use of IS to create an additional layer of services that provide enhanced and integrated versions of traditional mental health services with the intention of improving accessibility, efficiency, effectiveness and usability. The following section outlines the benefits of eMH.

2.2.4 The Role and Benefits of eMH

eMH has the potential to improve the traditional mental health system. The rapid development of innovative technologies, such as the internet and smart phones, has made impossible ideas become possible and introduced methods that provide enhanced treatment and early intervention for common mental health issues (Christensen & Petrie, 2013a). The literature on the role of eMH has highlighted a number of benefits, which include: 1) its capability to improve usability of services; 2) with lower cost and better quality; and 3) which can be accessed anytime and anywhere.

Improved usability

Previous studies show that improved access to information by patients about their care improves the care integration for these people and empowers them. eMH may empower patients by increasing their chances of mental health intervention and providing new options as to who can be involved (Proudfoot, 2013; Orman et al., 2014; Puszka, Dingwall, Sweet, & Nagel, 2016). eMH also has the ability to enable information exchanges between health care providers in a standardised way. This involves using tools, such as smart phones, that can be connected with other devices and used as a “bio-sensor” to monitor behavioural activities and mood changes in real time, which traditional care finds challenging (Christensen & Petrie, 2013a). Although eMH promises to facilitate the accessibility of mental healthcare services, people with mental health issues or mental health professionals
who are unfamiliar with technology may limit their access to such services (Anthony et al., 2010).

*Reduced cost and enhanced quality*

E-mental health has the potential to increase efficiency in mental health treatment and reduce costs. Previous studies show the delivery of eMH is both cost-effective and cheaper in comparison to traditional mental health delivery (Proudfoot et al., 2014; Anthony et al., 2010). In comparison with traditional delivery of mental health services, eMH is believed to be more cost-effective for providers, and some interventions or treatments can be delivered over the internet at no or very low cost (Proudfoot et al., 2014). Efficiency and low-cost delivery are achieved through the use of a screening mechanism and the employment of mental health workers who offer low intensity psychological services (Christensen et al., 2009). Eysenbach (2001) argues that increasing efficiency does not involve reducing the service cost, but also increasing the service quality. This can be seen as providing best quality tools for intervention or treatment (Anthony et al., 2010).

In addition, eMH interventions should be evidence-based, which means these interventions should be validated by scientific evaluations (Wickramasinghe et al., 2005). In Australia, a web portal has been introduced to recommend evidence-based interventions for many mental disorders to improve service quality (Anthony et al., 2010). Not only does eMH facilitate better integration of mental health services into the community sector, but it also facilitates the development of partnerships between consumers and mental health providers (Musiat & Tarrier, 2014).

*Better Accessibility*

By extending the scope for delivery of eMH services beyond its conventional boundaries, some of the advantages of using the internet include; improving access for consumers, automating data collection and processing, and removing geographical limitations to treatment. eMH services have successfully been used in therapeutic situations,
which means enabling users to access therapy and support in real-time, where and when they need them (Proudfoot, 2013). eMH provides online sources for training and professional development of mental health professionals and delivers psych-education for people in need, to ensure the latest developments in mental health are available at any time (Burns et al., 2010).

As mentioned, e-mental health services offer specific efficiencies and advantages in the delivery of eMH. These capabilities can make a positive impact by reducing the barriers to traditional mental health services. "Traditional clinic-based service delivery systems remain inaccessible to many Australians with mental health problems. If we are to substantially reduce the burden of mental illness, we need to develop more accessible, empowering and sustainable models of mental health care" (Christensen & Hickie, 2010b). E-Mental health in Australia is introduced in the following section.

2.2.5 eMH in Australia

The Australian government is currently investing heavily in e-mental health services, as technology can assist in overcoming issues that are both preventing young people from accessing mental health services/providers, and creating barriers to treatment (Proudfoot et al., 2014). These include lack of access to mental health services due to location, time or financial circumstances (Booth et al., 2004); stigma incurred due to seeing a therapist (Burns et al., 2010; Christensen & Hickie, 2010a), and therapist time and efficacy (Jorm et al., 2013; Jorm et al., 2007). Reynolds, Griffiths, and Christensen (2011) argue that there are two types of e-mental health programs in Australia:

1. Information, support and assessment sites, including informative websites, diagnostics tools and screening methods;

2. Symptom prevention and management programs designed to treat or manage specific mental illness such as depression and anxiety.
There are five types of eMH services; promotion, prevention and early intervention, crisis intervention and suicide prevention, treatment, and recovery and support, as shown in Figure 2.1.

**Promotion**

The literature indicates that providing health promotion and psycho-education programmes for people with mental health issues can be effective in improving symptoms (Griffiths, Christensen, Jorm, Evans, & Groves, 2004). Successful adoption and implementation of promotional programmes that provide training and information in the education sectors, are related to enhancements in students’ behaviours and academic performance (Dix, Slee, Lawson, & Keeves, 2011). These online programmes can also improve the referral process or improve the numbers of those seeking help, especially among young adults who have not previously accessed health services (Burns et al., 2010).

**Prevention and early intervention**

eMH based prevention and early intervention tools have enabled young adults to better cope with their mental health (Jorm et al., 2013). eMH services that provide different tools to deliver counselling and referrals, such as email and/or chat, can be effective in reducing dis-
tress, connecting consumers to treatment and improving motivation to act (Anthony et al., 2010). Previous research has found that websites can be used to target young adults with depression and can be used as a prevention tool to reduce substance abuse among students (Proudfoot et al., 2014; Newton, Teesson, Vogl, & Andrews, 2010).

*Crisis intervention and suicide prevention*

It has been found that online interventions targeting suicide ideation can reduce suicidal thoughts (van Spijker, Majo, Smit, van Straten, & Kerkhof, 2012). Online crisis support chat services in Australia have reported that one in every three people who contacted the crisis services reported feeling suicidal, with the majority of them experiencing decreased distress and improved mental mood afterwards (Proudfoot et al., 2014).

*Treatment*

Mental health treatment, such as internet-based CBT targeting young adults with depression and anxiety, have been found effective in reducing these conditions (Andersson & Cuijpers, 2009; Proudfoot et al., 2014; Kalthenthaler et al., 2006).

*Recovery and support*

There is evidence that enabled participation in an online support group can decrease symptoms of depression and increase openness and self-esteem for people with mental illness (Anthony et al., 2010; Boniel-Nissim, 2010; Ortiz & Clancy, 2003). Proudfoot (2013) argues that IS technologies, such as smart-phones and tablets, have the ability to provide health services and information better than ever before due to their capacity to access health information, monitor progress, collect valid data, and implement self-management interventions when and where they are needed.

Between 2006 and 2012, the Australian Government invested $70.4 million in developing and funding e-mental health services and telephone crisis assistance, and planned to invest a further $110.4 million...
During the four years to 2016. (Australian Government, 2012). This investment is designed to target young people in Australia using internet technologies. Between 2014 and 2015 it was approximately estimated that 97.5% of 15- to 24-year olds used the internet in Australia (Australian Bureau of Statistics, 2016b). By reviewing the list of online or telephone services that were provided for in the E-Mental Health Strategy of Australia (Australian Government, 2012), the majority of e-mental health programs are targeting depression, anxiety and suicidal thoughts, (see Appendix B). This is despite the fact that between 5% and 10% of Australian young adults suffer from ADHD (The Royal Australian College of Physicians, 2009).

2.2.6 Section Summary

In summary, this section discussed that healthcare is being technology driven and IS has the ability to overcome issues that the healthcare sector is facing. E-health is an IS which covers a wide range of services, including eMH. eMH has the capability to provide better accessibility to treatment, along with lower cost and higher quality treatment. It can also remove current barriers to traditional mental health services delivery. This section showed that the Australian Government has invested heavily in eMH, and also presented the barriers to implementing eMH in Australia.

The following section is the second part of this chapter, and presents the definition of ADHD and its symptoms and characteristics in adults, and in university students in particular. It also outlines the literature analysis concerning the relationship between ADHD, executive functions and academic performance. The final section of this chapter also discusses the recommended methods for treatment of ADHD.

2.3 University Students with ADHD

In this section, characteristics of ADHD in adults and issues associated with it are introduced. This is followed by the diagnosis and
recommended treatment for university students with ADHD. The literature in this section provides me with an insight and assists me to explore how psychologists perceive the use of IS in this disorder.

As was mentioned in the previous chapter, ADHD in adults is the continuation of the common neurodevelopmental disorder of childhood, which is characterised by inappropriate levels of inattention, hyperactivity and impulsivity (Fischer et al., 1990; Heiligenstein et al., 1999; Quinn, 2001). Quite often university students with ADHD exhibit impairment of executive functions (EF) in the prefrontal cortex (PFC) of the brain, as shown in 2.2 (Barkley et al., 2006).

![Figure 2.2: Frontal lobes of the brain showing the location of EF (MYBRAINTEST, 2016)](image)

The core symptoms of ADHD are hyperactivity/impulsivity, inattention, and a combination of the two behaviour types. Inattention symptoms involve difficulty in sustaining concentration, failure to follow through and complete tasks, excessive forgetfulness, and high levels of distractibility (Barkley, 1997). Hyperactivity includes restlessness, excessive movements or talking, and fidgetiness. Impulsivity can be seen as difficulty in controlling thoughts or actions, which may result in interrupting or intruding on others (Heinonen et al., 2010). The combined disorder is the existence of both symptoms in one person (Barkley, 1997; Heinonen et al., 2010).

Although it has been thought that ADHD is a childhood disorder (Barkley, Murphy, & Fischer, 2010; Lamberg, 2003; Myers & Avison, 2002; Roy-Byrne et al., 1997), it is now known that the majority of
these children will carry the symptoms into adulthood (Barkley et al., 2010; Ebejer et al., 2012; Fischer et al., 1990; Okie, 2006; Young & Bramham, 2006). Furthermore, ADHD symptoms in children look different to how they present in adults.

2.3.1 Attributes of ADHD in Adults

There is a similarity of symptoms between children and university students with ADHD, and it has been found among university students with ADHD that many have obtained less formal education and/or performed at a lower level while in high school (Mannuzza et al., 1998). However, the implications are greater for university students, as they have also been found to have higher unemployment rates, show antisocial behaviour, and experience alcohol and drug abuse (Pope, 2010). The behaviour and experiences of university students with ADHD are likely to include the following:

*Impulsivity*

The literature reviews indicate that to be impulsive and have difficulties in self-control results in acting impulsively without any regard for the consequences (Barkley, 2012a; Mannuzza et al., 1998). In addition, university students with ADHD experience adverse family functioning, other psychiatric illnesses, substance abuse, and trouble with the law (Barkley et al., 1990; Fischer et al., 1990). Pope (2010) argues that university students with ADHD have a tendency toward addictive and/or antisocial behaviour.

*Hyperactivity*

Hyperactivity symptoms in adults are more refined than in childhood, presenting as restlessness, racing thoughts, doing an unreasonable amount of talking, or trying to do many things at once (Barkley et al., 2010; Myers & Avison, 2002; Murphy et al., 2002). Lamberg (2003) argues that individuals with ADHD frequently search for high stimulation and have an intolerance of boredom.
Inattention

Inattention is related to issues with concentration. University students with ADHD often display a lower attention span than what is expected for their everyday routine and find it difficult to remain focused, concentrate, or stay on task (Barkley et al., 2010; Lamberg, 2003; Prevatt et al., 2011). They also appear to make mistakes due to lack of attention to detail, or due to the inability to follow directions or remember what the requirements of the tasks were (Barkley et al., 2010). Starting and finishing tasks or projects can be very challenging, as they often underestimate the time required or suffer from a lack of management and organisation skills (DuPaul, Weyandt, O’Dell, & Varejao, 2009; Rabiner, Anastopoulous, Costello, Hoyle, & Swartzwelder, 2008; Weyandt & DuPaul, 2006).

Previous studies note that there is a relationship between EF and the presentation of ADHD symptoms (Westerberg et al., 2007; Brown, 2006, 2008; Parker et al., 2011; Ramsay & Rostain, 2007; Young & Bramham, 2012).

2.3.2 EF Abilities

EF represent complex and global abilities that supervise, control, organize, maintain, and integrate cognitive functions in order to initiate goal-oriented behaviour (Lezak, 2004). There is still no formally agreed-upon definition of executive functions and there is little consensus about the components included. However, EF has often been used to describe a variety of specific functions that deal with abstract thinking, inhibition, novelty, control, problem-solving, planning, and mental flexibility. Sometimes attention is subordinated to executive functions (Purdy, 2011) and has been considered to underlie and maintain the activity of cognitive functions (Lezak, 2004). The relationship between attention and cognitive functions is further specified in what follows.

EF is characterised by a set of central control processes of the brain that connect, prioritise, supervise, manage, and integrate cognitive
functions; namely WM, planning, task flexibility, inhibition, organisation, and attention (Brown, 2006, 2008; Oosterman et al., 2012; Pennington & Ozonoff, 1996; Ramsay & Rostain, 2007).

The International Neuropsychological Society dictionary of neuropsychology has defined EF as the “cognitive abilities necessary for complex goal-directed behaviour and adaptation to a range of environmental changes and demands. Executive function includes the ability to plan and anticipate outcomes (cognitive flexibility) and to direct attentional resources to meet the demands of non-routine events” (Loring & Meador, 1999).

Since large numbers of studies refer to ADHD as the executive function, there is a conflicting view about this claim. The term ‘executive functions’ is associated with the wide range of cognitive functions that play a significant role in the life of humans. Cognitive functioning is associated with many functions of day-to-day life (Rommelse et al., 2008).

Six clusters of cognitive functioning are included in executive function impairment; activation of information, focus, effort, emotions, memory and action. However, different definitions of EF are still evolving. Many studies consider that executive functions manage the cognitive functioning of the brain and provides the brain with the work of ‘self-regulation’.

In addition, EF is to be separated from Cognitive Functions, which are divided into different classes, consist of many different abilities, and which select and integrate information; store and retrieve information; organise/reorganise information; and act upon this information.

Accordingly, they express multiple domains of mental abilities that are essential for human thinking, reasoning, learning, and remembering. Each of the classes is comprised of more specific abilities; for example, object recognition, concept formation, short-term memory or speed of information processing. These abilities can be distinguished conceptually but their classification is not straightforward since the different abilities overlap and interact with each other (Lezak, 2004). Together, they are often described as an intellectual process and the
fundamental core of intelligence (Sternberg, 2009). This thesis refers to all of these as cognitive functions, the umbrella term for specific components of intellectual abilities, which when deficient result in specific functional impairment.

However, the development of EF can be affected by traumatic injury, ageing, and mental disorders such as ADHD (Brown, 2006). ‘Executive dysfunction is increasingly associated with differences in the structure and function of the ADHD brain. These differences in neurobiological structure and functioning in the ADHD brain, in turn, seem to be the result of genetic predispositions’ (Ramsay & Rostain, 2007, p. 18).

Barkley (2012b) divided the executive functions into four areas, also known as Barkley’s model, as follows:

1. Pre-Executive
2. Instrumental–Self-Directed
3. Methodical–Self-Reliant
4. Tactical–Reciprocal
5. Strategic–Cooperative
6. Extended Utilitarian

Barkley explains the EF model illustrated in Figure 2.3:

"Two different ways of illustrating the extended EF phenotype as it occurs at the Extended Utilitarian level. The concentric rings at the left indicate the outwardly radiating nature of the phenotype at this final stage of development (Pre-Executive, Instrumental–Self-Directed, Methodical–Self-Reliant, Tactical–Reciprocal, Strategic–Cooperative, Principled Mutualistic), as does the leftward-pointing arrow in the diagram. The final sunburst edging of this diagram reflects the extended consequences or utility of employing EF across these levels and one’s lifetime. The stacked boxes at the right indicate the hierarchical arrangement of
these six phenotypic levels and the ultimate utility (effects-at-a-distance) of using them. The bidirectional arrows to the right of each box are intended to convey the bidirectional flow of information between the levels. Information from the lower levels flows upward to the higher levels, while management of the lower levels may be exerted downward by the next higher level.” (Brown, 2006, p. 170).

Brown (2006) has introduced a more clinical-based executive functions model (Figure 2.4). He has categorised the executive functions into six clusters as follows:

1. Activation: Organising, prioritising and activating to work.
2. Focus: Focusing, sustaining, and shifting attention to tasks.
3. Effort: Regulating alertness, sustaining effort, and processing speed.
4. Emotion: Managing frustration and regulating emotions.
5. Memory: Utilising working memory and accessing recall.
Until we know much more about underlying neural processes, any descriptive model is likely to be a bit arbitrary. But regardless of how the clusters are arranged, these executive functions tend to operate in an integrated way. Most persons diagnosed with ADHD report significant chronic difficulties in at least some aspect of each of these six clusters. Impairments in these clusters of cognitive functions tend to show up together; they appear clinically to be related.

When an individual with ADD is treated with appropriate medication and shows significant improvement in one of these six clusters, some significant improvement is usually seen in aspects of the other five clusters as well.

Since these clusters of symptoms often appear together in persons diagnosed with ADD and often respond together to treatment, it seems reasonable to think of these symptoms of impairment as a “syndrome.” Because this syndrome consists primarily, though not exclusively, of symptoms associated with the disorder currently classified as attention-deficit hyperactivity disorder, I refer to it as “ADD syndrome.” Taken together, the six clusters in this model describe my understanding of the executive functions of the brain.

**Figure 2.4: Brown’s model of EF (Brown, 2006)**

Brown’s model of EF is developed based on outlines connecting impaired EF with ADHD, which is a more suitable for the purposes of this thesis. As indicated earlier, ADHD affects the development of EF in the brain that are required in the managing of many sub-processes to achieve a specific goal or behaviour, such as academic performance. Therefore, the next section will point out the lower functioning academic variables that have been found among university students with ADHD, and will then allocate these variables to Brown’s executive functions model.

### 2.3.3 Impaired EF and ADHD

For many years, researchers have been studying the relationship between impaired EF and ADHD symptoms and how this affects academic achievement. In order to study the effect of ADHD symptoms on the academic performance of students with ADHD, Heiligenstein et al. (1999) compared university students with ADHD (n=26) with students without ADHD (n=28). Students with ADHD reported lower functioning than the non-ADHD group on numerous academic variables (Heiligenstein et al., 1999). Thomas Brown (2008) has identified EF that are associated with ADHD, and these attributes appear in Brown’s model, illustrated in Figure 2.4. These include:
Activation

This cluster is related to functions such as organising, prioritising and activating to work. It has been found that university students with ADHD find it difficult to concentrate, to be motivated, are more anxious, and less organised (Gorry & Morton, 1971), and they frequently have problems with study strategies, test-taking, and summarising (Javorsky & Gussin, 1994).

Focus

University with ADHD reported difficulty in focusing, sustaining focus, or maintaining attention to tasks, which affected their ability to complete tasks on time or at all (Lamberg, 2003).

Effort

It has been found that students with ADHD usually favour the easy work, and have shown a lack of enjoyment of learning because of the lack of effort (Wallace, Winsler, & NeSmith, 1999).

Emotion

This cluster covers managing frustration and regulating emotions, and university students who have ADHD show lower levels of adjustment, social skills and self-esteem compared to their peers (Shaw-Zirt, Popali-Lehane, Chaplin, & Bergman, 2005).

Memory

The lack of ability to access working memory and utilise recall affects university students’ study skills, such as note-taking, summarising, and test-taking skills (Zwart & Kallemeyn, 2001). Current research suggests that both ADHD and LD may share common risk factors in cognitive processes, such as core deficits in processing speed and executive functions, especially working memory (Gropper, Gotlieb, Kronitz, & Tannock, 2014).
36 BACKGROUND

Action

Often university students with ADHD lack monitoring and self-regulating skills, which can increase their difficulties by limiting their campus involvement and quick response to an immediate task compared with their peers (Mannuzza et al., 1998). In addition, they face trouble coping with the new environments because of the high level of self-responsibility and independence required (Meaux et al., 2009).

2.3.4 Diagnostic Tools

ADHD diagnosis requires a comprehensive assessment to screen, diagnose, and evaluate ADHD core symptoms and associated issues (Barkley et al., 2010; The National Institute for Health and Clinical Excellence, 2008; Okie, 2006; Young & Bramham, 2006). This assessment includes implementing a number of different tools, the first of which is screening for behavioural criteria listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM) (American Psychiatric Association, 1994, 2013).

Table 2.1: Tools to screen and evaluate ADHD in adults

<table>
<thead>
<tr>
<th>Tools</th>
<th>Name</th>
<th>Target</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>BADD</td>
<td>Brown Attention-Deficit Disorder Rating Scale for Adults</td>
<td>Target core symptoms of ADHD</td>
<td>(Sandra Kooij et al., 2008)</td>
</tr>
<tr>
<td>CAARS</td>
<td>Conners’ Adult ADHD Rating Scale</td>
<td>To test severity of ADHD symptoms</td>
<td>(Strauss, Sherman, &amp; Spreen, 2006)</td>
</tr>
<tr>
<td>BRIEF</td>
<td>Behavior Rating Inventory of Executive Function</td>
<td>EF</td>
<td>(Strauss, Sherman, &amp; Spreen, 2006)</td>
</tr>
<tr>
<td>WCST</td>
<td>Wisconsin Card Sorting Test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Several tools have been developed based on this approach, including the Adult ADHD Self-Report Scale (ASRS-V1.1) Symptom Check-
list (Adler et al., 2006), which has been developed and validated to use adult behaviour to identify the symptoms of the disorder (Weinstein, Staffelbach, & Biaggio, 2000).

In addition, ASRS-V1.1 contains the six symptoms of ADHD that are the most predictive of the disorder. Studies on the validation of ASRS-V1.1 have shown a positive predictive value between 57-93% (Kessler et al., 2005). The World Health Organisation (WHO) holds the copyright of these checklists, which are available to the public at no cost (Adler et al., 2006). Previous studies have outlined a number of tools that are used in ADHD diagnosis, as listed above in Table 2.1.

2.3.5 Treatment - The Multimodal Framework

The most effective method to treat ADHD is the one that incorporates multiple approaches (Australian Psychological Society, 2014; Barkley, 2006; Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA), 2011; Wender, 1998). Generally, experts believe that the best form of treatment is the multimodal framework, which contains four components; therapy, education, coaching, and medication (Australian Psychological Society, 2014; Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA), 2011).

Therapy

Therapy —also known as psychotherapy, talk therapy, or counselling—is the use of psychological approaches by mental health providers to treat mental health issues. Its emphasis is to assist patients to change and overcome issues in their lives. In addition, therapy is treatment based on a range of approaches used in psychology, including biological, behavioural, cognitive, and integrative approaches.

Psychotherapy is also referred to as psychosocial treatment. Psychotherapy is treatment that involves the formation of a therapeutic relationship between the therapist and patient. It is a type of counselling or talk therapy, which can also be offered in combination with other therapies, such as medication, or behavioural therapy. The focus of this therapy is on the healing of the mind, as it is believed that
only the mind is sick and only the mind requires healing. This therapy is used to treat the patients of ADHD, as it has resulted in greater reduction of the negative symptoms and provided active control and educational support (Conway, 2012).

**Cognitive Behavioural Therapy (CBT)**

CBT is a type of psychotherapy that focuses on the thoughts, images and feelings that influence behaviour, and allows ADHD university students to understand such thoughts (Beck, 1979). Before modifying their thoughts, CBT first encourages patients to recognise and understand their current feelings and thoughts (Ramsay & Rostain, 2007). CBT was designed to treat depression, but later it was found to be suitable for many other mental disorders including ADHD (Kaltenthaler et al., 2006; Lindstedt & Umb-Carlsson, 2013; Ramsay & Rostain, 2007; Wilens et al., 1999; Young & Bramham, 2012).

CBT is the psychosocial treatment of ADHD university students. Since ADHD causes significant impairment in many activities or domains of daily life, CBT can be used as a very beneficial therapy that can be combined with pharmacotherapy (Ramsay, 2012). This is a talking therapy that can help patients to change their way of thinking and behaving, and is commonly used for the treatment of many mental disorders. In ADHD patients, this therapy helps to control the symptoms. This therapy is the combination of cognitive therapy and behavioural therapy.

Research has shown that ADHD patients receiving this therapy have displayed improvement in neurocognitive skills, problem-solving skills, social skills, emotional control and critical reasoning (Antshel et al., 2011). Although CBT is a highly-structured approach, it has limitations as shown in Figure 2.5. CBT may not be effective for the people, who are suffering with more complex types of mental health problems. This therapy also ignores the personal and family history of the patient.

The conventional idea is that the negative activating event leads straight to unhappiness on the part of the individual who experiences it. However, in CBT it is not the activation event that is the cause
of the unwanted feelings but the person’s beliefs as a result of the activating event (Ramsay & Rostain, 2007; Meyer, 2001). Therefore, if a person learns how to change their beliefs about activating events, the consequences can also change (Young & Bramham, 2012).

It has been found that CBT can be effective in treating individuals with ADHD in order to: 1) assist these individuals to overcome issues with their executive functions that are interfering with the important abilities of managing time and organisation (Baer et al., 2007; Lindstedt & Umb-Carlsson, 2013; Ramsay & Rostain, 2007; Wilens et al., 1999); and 2) focus on improving emotional self-regulation, impulse control, and stress management (Heiligenstein & Keeling, 1995; Pettersson, Söderström, Edlund-Söderström, & Nilsson, 2014; Ramsay & Rostain, 2007; Meyer, 2001; Young & Bramham, 2012).

NEUROFEEDBACK THERAPY: Neurofeedback therapy is a behaviour technique based on brain imaging studies, quantitative electroencephalography (QEEG), to facilitate brain activity self-regulation (Kropotov, 2009). This technique is not new, in fact Arns, Heinrich, and Strehl (2014) state that the use of Neurofeedback was first reported in the early 1930s, and the use of Neurofeedback therapy to treat ADHD has been dated back to 1976.

Neurofeedback can be defined as biofeedback for the brain (Steffert & Steffert, 2010). The therapist attaches electrodes to the ADHDer’s scalp, which are held in place by a water-based gel. These electrodes
conduct the signals from the brain to a qEEG device, which transmits this information into a computer that displays the raw qEEG signals. This is then split into frequency bands: slow – up to 7 Hz; medium – 8–12 Hz; fast – 13–21 Hz (Steffert & Steffert, 2010).

![Figure 2.6: EEG frequency bands (Bedard et al., 2010)](image)

With Neurofeedback, ADHD individuals can learn how to regulate and train their brain activity by getting real-time feedback from their qEEG. For instance, using only their brain signals, an university student with ADHD may play a video game on a computer that only can be controlled or played if the ADHD individual is focused and the brain produces the qEEG frequencies that meet the criteria set by the therapist (Millings & Carnelley, 2015; Steffert & Steffert, 2010). Neurofeedback applications analyse qEEG signals coming from the brain and turn them into audio-visual feedback on a computer screen, to allow the individual to control their brain activity (Irani, 2010). However, the success of this treatment is based on the motivation of the client and the skills of the therapist (Masterpasqua & Healey, 2003). Steffert and Steffert (2010) argue that because Neurofeedback is a learning process, it takes time and multiple training sessions for it to work.

Neurofeedback therapy is considered a non-pharmacological treatment and is mainly used for the treatment of ADHD in children. According to the neuro-psychological concept, ADHD disorders include neurobiological dysfunction. The advantage of Neurofeedback treatment is that it is more beneficial than medication in real-world situations and provides active control over the symptoms (Mayer, Wyckoff, Fallgatter, Ehlis, & Strehl, 2015). No specific disadvantages of this therapy have been found.
Working Memory Training (WMT)  
WMT has been introduced to improve an individual’s working memory (Gropper et al., 2014). It has been found that working memory training sessions are effective in enhancing intelligence and cognitive functioning in both children and adults. WMT can also be used to treat and improve mental disorders, including ADHD (Beck et al., 2010; Gropper et al., 2014; Westerberg et al., 2007).

Using WMT to help university students with ADHD is a relatively new development. WM is considered as the system for temporary storage and manipulation of information, which is significantly important for a wide range of EF. The advantage of this training is that it helps in improving attention control and enhancing problem-solving skills. The limitation of the training is that it is not easy to identify whether the WMT is impacting on the WM.

Coaching

Coaching is a simple therapy, which helps people with ADHD to carry out their daily life activities. Medication might help only in improving focus and impulsivity, but coaching can significantly help in self-management, organisation, improving self-esteem and carrying out goal-oriented activities. There are no disadvantages of coaching.

ADHD coaching incorporates executive coaching and life skill coaching, which addresses time management, organisation, and problem solving to help the students to change their behaviour and improve social and academic skills (Quinn, 2001).

In Swartz et al. (2005), a study conducted at the on-campus assessment centre of a large, south-eastern university, the participant was a 21-year-old female student with ADHD who received eight weeks of coaching services. The schedule included initial meetings between the coach and the participant, planning long-term goals, setting weekly objectives, and rewards and consequences. After comparing her pre-academic records and post-academic records, indicators were that good improvement was found. Swartz et al. (2005) mentions that there is not enough research on coaching university students with ADHD and this approach requires further studies.
**Education**

Education, also known as psychoeducation, is a unique treatment method that provides information about the disorder and its treatment (Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA), 2011). In education, it helps university students with ADHD to understand how such a disorder can affect multiple areas of their lives, which results in reducing symptoms, improving functioning and preventing negative consequences of ADHD (Wender et al., 2006). It has been argued that education must be the first intervention because the more educated ADHD individuals are, the better their response to treatment (Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA), 2011). Education also can be can improve the level of support, management and occupational/educational accommodation for ADHD individuals (The Royal Australian College of Physicians, 2009).

Psychoeducation is the education that is offered to the individual suffering with mental health issues and to their families, in order to empower them to deal with the symptoms and conditions of the illness. People who are educated about their condition and illness are more likely to participate in the self-management of the disease (Bramham et al., 2009). Education also improves self-esteem and self-efficacy. The apparent disadvantage of psychoeducation is that it is implemented in a number of formats; however, no studies have formally explained the disadvantages of this therapy.

As mentioned earlier, IS can support intervention and treatment with many different mental illnesses; however, there appears to be great potential for IS in the context of young adults with mental disorders such as ADHD. Difference in education and coaching is tabulated in Table 2.2

The above treatments can help in improving problems with executive functioning and can reduce the symptoms of ADHD. They each focus on different functions and areas of psychological, emotional and educational functioning. The symptoms of ADHD will be reduced by bringing improvement in the executive functions.
2.3 UNIVERSITY STUDENTS WITH ADHD

### Table 2.2: Difference in Psycho education and Coaching

<table>
<thead>
<tr>
<th>Education</th>
<th>Coaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helps in handling personal conditions.</td>
<td>Helps in motivating people to enhance self-esteem.</td>
</tr>
<tr>
<td>Carried out by professional therapist in a group setting.</td>
<td>Carried out by ADHD coach in an individual setting.</td>
</tr>
<tr>
<td>Therapist helps the patient, their families and their relatives to learn strategies of managing ADHD.</td>
<td>ADHD coach helps the patient to develop skills and strategies for managing daily life activities.</td>
</tr>
</tbody>
</table>

**Technologies in ADHD Treatment**

The technologies that can be used in the coaching of ADHD individuals include the use of digital alarms for helping them to understand time management, reminders of treatment sessions being sent via SMS and email, and online coaching sessions can also be offered (Prevatt et al., 2011). Education can be offered through interactive websites and social media applications. Different kinds of therapy sessions, such as Neurofeedback therapy, CBT and WMT, can be offered through interactive programs in emails and by providing video call sessions. Some of the tools that have been found in the literature and previous studies are listed in Table 2.3

### 2.3.6 Section Summary

This section has attempted to provide a brief summary of the literature relating to ADHD university students. It has given an overview of ADHD symptoms, specifically in young adults, and the characteristics that have been found in university students with ADHD. The treatment and different types of treatments methods have also been introduced. Finally, it has outlined the technological tools found in the current treatment delivery of ADHD.
Table 2.3: Tools used in the multimodal framework

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Tools</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coaching</td>
<td>Smartphone or SMS reminder</td>
<td>(Prevatt, Lampropoulos, Bowles, &amp; Garrett, 2011)</td>
</tr>
<tr>
<td></td>
<td>Alarm and computerised reminders (online calendars, email notification)</td>
<td>(Young &amp; Bramham, 2006)</td>
</tr>
<tr>
<td></td>
<td>Email coaching and Time management</td>
<td>(Swartz, Prevatt, &amp; Proctor, 2005)</td>
</tr>
<tr>
<td></td>
<td>CBT/Internet-based CBT (Via emails and by providing video call sessions)</td>
<td>(Pettersson, Söderström, Edlund-Söderström, &amp; Nilsson, 2014; Wilens et al., 1999; Young &amp; Bramham, 2012)</td>
</tr>
<tr>
<td></td>
<td>WMT</td>
<td>Beck, Hanson, Puffenberger, Benninger, and Benninger, 2010; Klingberg et al., 2005; Westerberg et al., 2007</td>
</tr>
<tr>
<td>Education</td>
<td>Informative Website for intervention and Social media</td>
<td>(Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CAD-DRA), 2011)</td>
</tr>
</tbody>
</table>

2.4 CHAPTER SUMMARY

For over two decades the use of IS in healthcare in the form of e-health has been both comprehensive and varied, with strong research evidence of it making substantial contributions. These contributions can be found in providing solutions that overcome challenges for healthcare services, providers, and patients. These challenges, such as location of service providers or patients, cost of access, and stigma, are found to hinder delivery of healthcare services; mental health services in particular.

Such contributions can be adversely impacted by three different factors; human, technological and organisational, which can be overcome if the process is outlined prior to the adoption. However, the use of IS in eMH is not yet well-researched and not widely explored. What I found in the literature is that there is significant potential for eMH to provide better access to services and opportunities by offer-
ing cost affective, easy-to-access, and real-time services that provide intervention and treatment to those with different mental disorders, such as depression and anxiety. These services include promotion, prevention, crisis support, and treatment and recovery, which can be delivered by using a variety of technological advances such as smart phones, or the internet. These services also seem to be useful for university students with ADHD.

University students with ADHD are found to have significant issues that impact their social, emotional, and academic life. This disorder is reported in the literature to be the cause of impairment in the EF, which is the part of the brain responsible for attention, time management, decision making, personality and behaviour. Previous studies have indicated that this disorder can be treated by using a multimodal framework involving multiple components, including medication, therapy, coaching and education. By outlining aspects from the fields of eMH and ADHD, I have been able to investigate how psychologists perceive the use of IS in ADHD treatment.

Although previous studies have focused on the use of eMH for different mental disorders, such as depression and anxiety, to date none have considered the potential nor the issues in the use of IS (eMH) by university students with ADHD. This study is exploratory in nature and aims to develop a theory.

In the next chapter I will describe the procedures and methods used in this investigation to develop the research theory that addresses the research questions. I will discuss the reasons why these methods were chosen and I will present the process and tools through which the data was collected, analysed, and assisted in developing the theory.
Part II

CRAFTING INSTRUMENTS AND PROTOCOLS

This part will introduce the methods and tools used to gather and analyse the qualitative data that addresses the research questions and assist developing the theory.
This chapter outlines the research design and methodology employed in addressing the research questions. It describes in detail the processes and activities through which they were selected, implemented, and completed, to emphasise the rigour and validity of this research. The reasons and justifications for the research approach, the chosen methods, data collection and analysis are also provided. Overall, this chapter explains the research journey and the path taken to generate the theory that answers the research questions.

This chapter is structured into three sections as follows:

1. Section 3.1 introduces an overview of the research paradigm and the justification of the chosen method.

2. Section 3.2 discusses both the case study and grounded theory methodologies used in this research.

3. Section 3.3 discusses in detail the steps and process, which includes the journey of this research from developing the research question to developing the theory, that answered the research question.

3.1 THE RESEARCH PARADIGM AND METHOD

This section outlines the research paradigm and the reasons that justify the choice of research method. This research is exploratory and, as such, a qualitative study has been selected as it is a process of in-depth investigation of organisational and social characteristics, and human behaviours and their meanings (Lapan, Quartaroli, & Riemer, 2011). This method of research in IS is "aimed at producing an understanding of the context of the information system, and the process..."
whereby the information system influences and is influenced by the context” (Walsham, 1993, p. 4).

As mentioned in (chapter 1), this research is guided by one main question and four subsidiary questions. The main question is:

1. What are clinicians’ perceptions of IS in regard to the treatment and support of university students with ADHD?

The subsidiary research questions that were developed to address the main question are:

1.1 What are the elements of treatment of ADHD?

1.2 How do clinicians perceive the applicability of current available IS-based tools?

1.3 How could IS better support treatment of ADHD?

1.4 What are the barrier and enabler factors influencing the adoption of IS?

These questions have impacted on the choice of research paradigm and methodology. In the following section the justifications behind this choice, and the research design for this research, will be presented.

3.1.1 Research Paradigms

The nature of the research questions influences the decision regarding the choice of research paradigm and the methodology adopted to answer them (Creswell, 2007). The research question and subsidiary research questions investigate and explore the role of IS in the treatment of ADHD in university students. This research is not to test existing theories but to develop a new theory and seek to explain the complexity of the role of IS in the treatment of ADHD in the context of university students. This study, therefore, uses an interpretive research paradigm as this is the most suitable to answer the research questions. Both case study research and grounded methodologies are
suited to this approach (Creswell, 2007; Klein & Myers, 1999; Rowlands, 2005).

The interpretive paradigm used in this research is based on seven principles for interpretive field studies developed by Klein and Myers (1999) specifically for the IS research field. These seven principles are as follows:

1. **Hermeneutic Circle** which focuses on the meaning of the text. According to (Klein & Myers, 1999), the Hermeneutic Circle assists the researcher in understanding the text as a whole, and in the interpretation of each part and the whole that they form. Hermeneutic Circle case studies towards theory building (Eisenhardt, 1989) and grounded theory (Strauss & Corbin, 1990) methodologies, which are used in this research, are highly iterative and tightly linked to text. Both methodologies are continuously investigating and comparing thoughts and ideas, at low and high levels of conception.

2. **Contextualisation** requires critical reflection of the social and historical background of the research setting, so that it is clear how the conditions under investigation emerged. The conclusion (Chapter 7) offers a discussion that shows the findings of the analysis and relates them to the e-mental health context for the mental health sector, research and education.

3. **Researchers and Subjects Interaction** involves critical reflection on how the data was collected through the interaction between the researchers and the participants. The researcher needs to be mindful of his/her potential biases when performing interviews. The researcher is also required to reflect on the memos created during data collection and emergent themes. Memos are considered a common part of grounded theory, which will be discussed in Section 3.4.4.

4. **Abstraction and Generalisation** explains how themes are revealed through the interpretation of data. Detailed descriptions of emergent themes and how the theory has been developed will be dis-
cussed in three chapters: Chapter 4 which will relate the findings; chapter 5, which will conduct an analysis; and (Chapter 7), where the themes and theory will be discussed.

5. *Dialogical Reasoning* to possible contradictions between the theoretical preconceptions guiding the research design and the actual findings of the research. The case study and grounded theory share the same principle, which is that the theory emerges from the interview data and is not impacted by preconception of previous theories. The methodologies adopted in this research allow the theory to emerge from, and be highly linked to, the interview data. Chapter 7 offers sensitivity to the current literature and supports the findings of this research.

6. *Multiple Interpretations* involves sensitivity to possible differences in interpretations amongst the participants, who are expert psychologists in adult ADHD, and their perception of the use IS in the treatment of ADHD in university students. Allocating participants to one of the cases (ADHD treatment components found in the literature) (Chapter 2), has allowed each participant to provide their own experience and knowledge. This research obtained different interpretations and perceptions of IS use in the treatment of university students with ADHD.

7. *Suspicion* requires sensitivity to possible biases and distortions in the transcripts collected from the participants. The design and the style of the semi-structured interviews presented in Section 3.4.3 r) reduced the possibility of bias, as the participants were asked about other treatment methods and their advantages and disadvantages. For example, the participants who use CBT were asked about Neurofeedback Therapy, WMT, coaching and education.

3.2 **QUALITATIVE METHOD**

This section will introduce the justification for adopting the qualitative method that assisted in investigating the psychologists’ percep-
tion of the use of IS in ADHD treatment. The aim of qualitative research, as described by Wilens et al. (1999), is to understand issues or particular situations by investigating the perspectives and behaviour of the people in these situations and the context within which they act. Within the IS discipline, qualitative methods have been used in health informatics studies to effectively generate an understanding of the role of IS in healthcare and the impact this has on patients (Wickramasinghe et al., 2005), especially in areas that have not been easily described or examined by quantitative approaches (Cummings & Borycki, 2011). The field of eMH is relatively new and many recent studies have adopted qualitative methods to gain more insight into e-mental health strengths, weaknesses and potentials, as well as into how the role of IS processes has impacted on patients (Hilty et al., 2013; Lal & Adair, 2014).

In addition, there has been very little previous research on the use of IS in the treatment of ADHD in university students, and there is no previous theory to test. This approach will assist in introducing a new dimension of understanding about the role of IS, in the form of e-mental health, in the treatment of ADHD in university students. This process is supported by the nature of the research question, and will help to provide an understanding of the purpose and/or the experience of humans in the specific context of using IS in the treatment of university students with ADHD. Nápoles-Springer and Stewart (2006) claim that Qualitative research has the ability to benefit studies that focus on certain populations.

The aim of this research is to generate a theory that identifies and offers insight into how psychologists perceive the use of IS in the treatment of ADHD in university students. To do this, qualitative research was chosen to be the most suitable method using case studies and grounded theory methodologies. Those two methodologies are introduced in the next section.
3.3 Methodology

This section introduces the methodologies that were employed to assist in answering the research questions; case studies by (Eisenhardt, 1989) and grounded theory as described by (Strauss & Corbin, 1990). The second methodology was used as the analytical process to assist in generating a theory as described by grounded theory. The case study methodology was treated as the backbone of the research methodologies, which have eight clear steps to follow in order to generate a theory from case studies. These steps will be introduced in Section 3.4.1. In the case of grounded theory, it will be employed as a lens of analysis in Section 3.4.2.

Case Study

Case study research is described as a tool of investigation and evaluation in which the researcher develops an in-depth analysis of a case (Creswell, 2007). The case study approach is designed to investigate and explore new events or processes that are little understood (Meyer, 2001). As mentioned earlier in this chapter, the field of eMH—the use of IS in mental health—is relatively new. This research was limited to a specific population; Australian university students from the perspective of psychologists. While the case study approach is not strictly planned, it gives the researcher the chance to develop a customised research design with specific steps for data collection and analysis (Fidel, 1984). This also allows the research to be guided by the data rather than be constrained to a particular type of outcome. In addition, data can be collected using a variety of data collection methods, including interviews (Eisenhardt, 1989; Meyer, 2001).

According to Stake (1995) there are three types of case study research; intrinsic, instrumental, and collective. To gain more insight and knowledge into the research topic, and because the most effective treatment of ADHD as recommend by (The Royal Australian College of Physicians, 2009) consists of multiple components and different
approaches, collective case (multiple case) studies are the most appropriate to use when adopting those approaches.

Multiple case studies assisted this research by providing an in-depth study of several cases and enabling the comparison of these cases (Yin, 2009). Multiple cases offer a strong framework for data collection, and increase the methodological rigour of the research by strengthening the precision, the validity and stability of the findings (Miles & Huberman, 1994). The evidence found in multiple cases is also perceived as more convincing (Yin, 1994). In addition, Yin (2003) mentions that when multiple cases are adopted in research, each case should be treated as a single case and then each case's conclusions can be then used as data contribution to the whole study. (Eisenhardt, 1989; Lapan et al., 2011) claim that all the case studies used in the research should share common characteristics.

The four cases chosen for this research involve the four main non-pharmaceutical treatments of ADHD in university students, and included psychologists who use one or more of the e-multimodal framework components in Figure 3.4. This process will be discussed in the crafting the instruments and protocols (Section 3.4.3), and the data collection method developed for each case is explained in detail in 3.4.4

Although case study approaches offer flexibility, they can also provide a less structured approach. To reduce this risk, a well-structured case study approach developed by Eisenhardt (1989) was used. This approach involves the following eight steps:

1. Getting started. At this stage, the research questions are developed and the related literature is articulated. This step provides the researcher with a good background to the current issues, which will help in developing the research question and also later making comparisons with the data analysis outcome to identify similar or contrasting findings.

2. Selecting the case study is the phase when suitable cases are found to assist the researcher to understand the process or the event. Four case studies were chosen based on psychologists.
who used one or more of the e-multimodal components (Figure 1.2) in their ADHD treatment delivery. This process will be discussed in detail in section 3.4.2.

3. Crafting the Instrument and Protocols describes the methods of collecting the data. For this research, semi-structured interviews were the main method adopted to collect data. This section is discussed in detail in Section 3.4.2.

4. Entering the field includes data gathering and analysing data, which is a key step for building a theory. "Overlapping data analysis with data collection not only gives the researcher a head start in analysis but, more importantly, allows researchers to take advantage of flexible data collection." (Eisenhardt, 1989, p. 539). The case study approach allows the researcher to move back and forth from the data collection and analysis, and this
will continue until the main theory starts to develop (Section 3.4.3).

5. Analysing data is an essential step where the data collected is inspected for common characteristics that represent categories, concepts and themes (Boyatzis, 1998). The data collected was divided into categories (open coding), that later generated a group of sub-categories after more in-depth analysis had occurred. Within case and cross-case analysis were chosen as the analysis tools. Grounded theory was used in this process, which allowed me to go back and forth between entering the field, analysing data and shaping hypotheses steps using the selected analysis tools. Tools such as NVivo, Microsoft Excel, and Microsoft Visio were used during this stage of the research to explore relationships and identify differences in the cases.

6. Shaping Hypotheses is the sharpening of constructs, which involves two processes; 1) refining the definition of the construct; and 2) building evidence that measures the construct in each case (Eisenhardt, 1989). In this step, the relationship between the themes and related concepts and categories were validated and the core themes were refined. This process was conducted in accordance with (Strauss & Corbin, 1990) analysis of axial and selective coding. At this stage, all findings were considered and the overall theory was shaped and tested. The relationships and findings will be verified among the unique and specific constructs and aspects identified. The emerging themes from the data will be introduced (Chapter 4 & 5) and discussed later in the thesis (chapter 7).

7. Enfolding Literature is an important step of theory building, and entails comparing the findings with similar and conflicting literature. (Strauss & Corbin, 1998) argue that bringing the literature into the writing demonstrates scholarliness and allows for extending, validating and refining knowledge in the field. This will be introduced in chapter 7.
8. Reaching Closure is the final process. The outcomes of the data analysis, findings and the literature will be discussed and a recommendation proposed (chapter 7 & 8). This process is usually reached when theoretical saturation has occurred through the iterative process.

*Grounded Theory*

This research serves to investigate the possibilities for incorporating IS into the treatment of ADHD in university students. It also makes a significant contribution towards shaping the fundamental role of IS in mental health, by exploring the area of IS (eMH form) in mental health, especially in the treatment of ADHD in university students. EMH is an emerging area, where little is known about how IS might be effectively used for the treatment of ADHD in university students. The outcomes of this thesis will contribute to the development of eMH services in Australia, as well as the theory regarding e-mental health.

Figure 3.2: *Grounded Theory analytical processes (Eisenhardt, 1989)*

Qualitative methods usually produce large amounts of data that are not in a standard format and are not easily measured, analysed and reduced (Yin, 2009). Grounded Theory contains structured analytical processes that allow the researcher to organise the data, find relationships between the obtained data and then provide answers
to research questions. Grounded Theory was adopted as the analysis lens. In addition, Cummings and Borycki (2011) claim that Grounded Theory has been seen as a powerful tool when it comes to the development of a health informatic framework and/or application.

This research will follow the systematic design (Figure 3.2) of Grounded Theory, which uses the data by following analysis methods as described in detail in Section 3.4.4 This design includes three coding processes; open coding, axial coding and selective coding. It also includes the use of memos.

1. Open Coding, also known as initial coding, is the first step of data analysis and identifies potential categories of meaning in the data collected. It then labels each as a code representing that category. Open coding is a process of reducing the data to a small set of themes that appear to describe the phenomenon under investigation (Strauss, 1987);

2. Axial Coding facilitates building connections within categories. According to Corbin and Strauss (1990), this coding refers to "a set of procedures whereby data are put back together in new ways after open coding, by making connections between categories. This is done by utilizing a coding paradigm involving conditions, context, action/interactional strategies and consequences" (p. 96).

3. Selective Coding is the process of selecting and identifying the core themes and systematically relating them to other concepts and categories. Strauss and Corbin (1998) describe the process as "an integrative process that starts with the selection of a central category from the data and then integrates the existing categories in relation to the theory as a girt approximation of theory generation" (p. 149).

4. Memos are written records of thoughts and ideas that arise during the process of undertaking grounded theory studies; they differ in intensity, coherence, subject, theoretical content and usefulness to the finished product. Strauss (1987) describes
memos as “writing in which the researcher puts down theoretical questions, hypothesis, summary of codes, etc—a method of keeping track of coding results and stimulating further coding, and also a major means for integrating the theory” (Strauss, 1987, p. 22). According to Glaser and Strauss (1967), visualisation of the data can be incorporated with the data analysis process, to display data and visualise themes and relationships between concepts and categories, described in details in 3.4.4.

### Table 3.1: Memos involvement and development during the analytical process

<table>
<thead>
<tr>
<th>Coding</th>
<th>Purpose of Memos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>In this process, memos contain thoughts, impressions and directions to oneself. ‘Initial categories’ notes. Early concepts that pertain to categories and some dimensions and properties.</td>
</tr>
<tr>
<td>Axial</td>
<td>The memos during this stage relate to categories and resume developing them based on their dimensions and properties.</td>
</tr>
<tr>
<td>Selective</td>
<td>The memos throughout this process are theoretical and operational notes that relate to filling in themes and refining the theory.</td>
</tr>
</tbody>
</table>

In the next section, the research journey and all the steps that were taken in the research will be discussed.

#### 3.4 THE RESEARCH JOURNEY (RESEARCH DESIGN)

This section discusses the key elements of the steps taken in this research. It provides the key steps taken to facilitate the research plan and to deliver rigorous and valid research findings. According to Yin (1994), the research journey (design) is "an action plan for getting from here to there, where here may be defined as the initial set of questions to be answered, and there is some set of conclusions (answers) about these questions" (p. 19).

The research journey includes four steps as illustrated in Figure 3.3. A number of the eight steps of case study developed by Eisenhardt (1989) and described in section 3.3 were combined into one process
for ease of integration and for the implementation of the grounded theory analytical process. This included combining Step One – Getting Started with Step Two – Selecting Case studies, and Step Four – Entering the Field with Steps Five – Analysing the Data and Six – Shaping Hypotheses (Figure 3.1). These steps are discussed in section 3.4.4.

3.4.1 Literature Review (Step A)

This process is the very first step of the research journey and ends when the findings and analysis are enfolded with the literature to compare and contrast the outcomes. This assists in developing a theory that answers the research questions, as shown in Figure 3.3 Step (A). Both Eisenhardt (1989), Strauss and Corbin (1990) argue that the researcher is required to have prior knowledge before collecting data.
This process allows the researcher to get a better view and understanding of what has or has not already been explored, and to point out topic-related resources that have previously been used by other studies. This process will assist in providing evidence that might be employed to support the findings and analysis of the interviewed data.

3.4.2 Getting Started (Step 1)

This is the first combined step of Eisenhardt (1989) case study methodology in this research; Step (1) as shown in Figure 3.3. This step consists of two processes; the literature analysis and the case study selection process, which can be run simultaneously and can be revisited anytime during the process.

Literature Analysis

One of the key elements of employing the case study methodology introduced by Eisenhardt (1989) is that the sub-process is an outcome of the literature review process—Step (A) in Figure 3.3 and discussed in Section 3.6.1. The result of this process is articulated in the literature review (Chapter 2), which directly assisted in defining the research questions.

Case Study selection

The process of selecting the case studies takes the form of theoretical sampling in Grounded Theory (Eisenhardt, 1989). In grounded theory, "theoretical sampling simply means that cases are selected because they are particularly suitable for illuminating and extending relationships and logic among constructs (Eisenhardt & Graebner, 2007, p. 27).

The literature analysis in Chapter 2 shows that the recommended treatment for ADHD is the multimodal framework, which contains four components; medication, therapy, coaching, and education (previously described in section 2.3.4). Three components of the multi-
The research journey (research design)

A multimodal framework were adopted; therapy, coaching and education. Medication was excluded as IS was perceived to be less useful in this component. The therapy component covers a wide range of tools and approaches. CBT, Neurofeedback Therapy and WMT are different types of therapy tools that treat ADHD and are found in the literature (Chapter 2). Coaching and Education were combined into one category because they share similar concepts.

![Diagram of IS and E-multimodal Framework]

To be able to answer the research question and to gain insight of the topic and the current research issues, four case studies were selected and categorised. The cases chosen were based on psychologists who use: 1) CBT; 2) Neurofeedback Therapy; 3) Coaching/Education; or 4) WMT as mainstream treatment for ADHD in adults. Each of these categories represents one or more of the e-multimodal framework components, as shown in Figure 3.4 to treat ADHD in adults; university students in particular.

Case protocols and psychologists were each labelled with a code consisting of a letter and a number. As the protocols were represented by a "P", the psychologists were represented by "C". The codes were then matched up to produce a unique code that represented both the protocol and the psychologist who adopted it; for instance, with P1 as the code for the CBT protocol and C1 as the code for the first clinician in this protocol group, the code for this case study became P1-C1, as shown in Figure 3.5. The code for each case study protocol was as follows:

Figure 3.4: Case Study Selection Process
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- \( P_1 = \text{CBT} = C \)
- \( P_2 = \text{Neurofeedback} = N \)
- \( P_3 = \text{Coaching & Education} = C&E \)
- \( P_4 = \text{WMT} = W \)

![Diagram](image)

**Figure 3.5: Coding the case studies group and participants**

3.4.3  *Crafting Instruments and Protocols (Step 2)*

This step included choosing the data collection method, which was to interview individual psychologists using semi-structured interviews. There are a number of data collection methods for qualitative research, such as interviews, participant observation and using documents (Eisenhardt, 1989; Myers & Avison, 2002). Johanson, Williamson, and Kennan (2013) claim that interviews are widely used in the field of IS. This method is "permitting us to see that which is not ordinarily on view and examine that which is looked at but seldom seen" (Rubin & Rubin, 2005, p. vii).

*Semi-Structured Interview and Sample Size*

The aim of this research was to investigate how much the use of IS in the treatment of university students with ADHD was influenced by psychologists’ perception of IS. This research faced some difficulties in recruiting a psychologist who specialised in university students with ADHD. Approximately 13% (excluding the tweets) of the total number of interview requests sent out to targeted psychologists were accepted. This issue is discussed in the data gathering and coding
step (Session 3.4.4). For this research, 12 psychologists were recruited based on three criteria:

- Must have a minimum of ten years’ experience in the field
- Must specialise in treating adults with ADHD
- Must offer at least one IS tool to deliver services; eg, Skype, email, SMS

They were then allocated to a case study and interviewed individually based on their preferred treatment approach (Neurofeedback, CBT, WMT, or Coaching and Education). To assist in finding eligible psychologists, multiple resources were used. These included not-for-profit organisations, ADHD support groups, and psychology boards and associations. All of these resources are available online, and included:

1. The Australian Clinical Psychology Association (ACPA), which is the only Australian organisation exclusively representing clinical psychologists (The Australian Clinical Psychology Association, 2012). They offer a clinical psychologist directory service that allows ACPA members to be listed in their directory. The information about their members is available to the public.

2. The Institute of Private Practising Psychologists (IPPP), which also represents practising psychologists. They provide a searchable database that contains details of psychologists who are located in South Australia only (The Institute of Private Practising Psychologists, 2016).

3. The Australian Psychological Society (APS), which represents over 2200 members, and claims to be the largest professional association for psychologists in Australia (Australian Psychological Society, 2017). They also offer a "find a psychologist" service nationally.

au, who were contacted directly to find any potential participants.

5. Headspace National Youth Mental Health Foundation, 

6. Personal contact and social media groups.

After deciding on the criteria that the psychologists would have to meet before approaching them, requests were then sent via email or postal mail requesting their participation in the research. In addition, a brief introduction to the purpose of the research, as well as its scope and objectives, was enclosed (See Consent Form in Appendix D and Plain Language Statement in Appendix v.

Interview Protocols

The individual semi-structured interview protocol was then developed, which focused on obtaining the selected psychologists’ (hereon in referred to as "participants") perspective on non-medication treatment and the use of IS in the treatment of ADHD in university students, based on the Multimodal framework (Figure 1.1). The interview schedule included the participants’ qualifications, years of experience, their experience using IS technologies in their treatment of ADHD, and their opinion of the other case study categories. See Appendix B) for a complete list of these questions.

Protocol 1: Case of Therapy [Treatment] Using Traditional Method of CBT This protocol focused on using CBT as a mainstream therapy to treat ADHD in adults. Participants in this group were questioned about their perceptions of using CBT techniques in their treatment of ADHD in adults, and university students in particular. They were also asked how they define ADHD, what they perceived to be the best way to treat this disorder, and if they have used any technological tools to assist their treatment. The last part of the interview sought their vision of how technology could improve their favoured treatment method. Participants dealing with this protocol were also questioned about their perception of the advantages
and disadvantages of using the other three methods to treat ADHD; that is, Neurofeedback Therapy, Coaching and Education, and WMT.

**Protocol 2: Case of Therapy [Treatment] Using Neurofeedback Therapy**  This protocol focused on using Neurofeedback therapy as a mainstream treatment for ADHD in adults. Participants in this group were questioned about their perception of using Neurofeedback therapy in their treatment of ADHD in adults, and university student in particular. They were also asked how they define ADHD, what they perceived to be the best way to treat this disorder, and if they have used any technological tools to assist their treatment. The last part of the interview asked their opinion on how technology could improve the delivery of their favoured method. Participants in this protocol were also questioned about their perception of the advantages and disadvantages of using the other methods to treat ADHD; that is, CBT, Coaching and Education, and WMT.

**Protocol 3: Case of Therapy [Treatment] Using Coaching and Education Approach**  This protocol focused on using the Coaching and Education approach as a mainstream therapy to treat ADHD in adults. Participants in this group were questioned about their perception of using Coaching and Education in their treatment of ADHD in adults, and university student in particular. They were also asked how they define ADHD, what they perceived to be the best way to treat this disorder, and if they have used any technological tools to assist with their treatment. The last part of the interview asked their opinion on how technology could improve the Coaching and Education method. Participants in this protocol were also questioned about their perception of the benefits and drawbacks of treating ADHD with CBT, Neurofeedback therapy, and WMT.

**Protocol 4: Case of Therapy [Treatment] Using WMT**  This protocol focused on using WMT as a mainstream therapy to treat ADHD in adults. Participants in this group were questioned about their perception of using WMT in their treatment of ADHD
in adults, and university student in particular. They were also asked how they define ADHD, what they perceived to be the best way to treat this disorder, and if they have used any technological tools to assist with their treatment. In the last part of the interview, the participants were questioned about their perception of the benefits and drawbacks of treating ADHD with CBT, Neurofeedback Therapy, and Coaching and Education.

Protocols structure

These protocols were developed to gather opinions regarding all four types of treatment for ADHD from participants who favoured one of the four treatments. Each of the protocols was divided objectively into three parts, a top, middle and bottom set of questions. All four protocols shared the same top set of questions, which were mainly about the participant’s professional background, their definition of ADHD, the way they diagnose it, whether they use IS tools in their diagnostic process, and their perception of the ADHD treatment they use. This part provided data about the various perceptions concerning diagnosis and treatment of ADHD, which allowed me to compare participants’ perceptions within and across the protocols.

The middle set of questions was related to a mainstream treatment tool and each participant was questioned about the tool they use to treat ADHD in adults. This part of the protocol also contained questions about the participant’s perception of the tool they use and what they see as the issues and benefits that university students with ADHD face using this tool. This allowed me to see how each participant views their treatment tool and provided insight into why this was their choice of treatment method.

The bottom set of questions was focused on how a participant who favoured one particular treatment tool perceived the other three treatment methods. This provided data on the level of resistance to or acceptance of alternative methods of treatment by those not currently using them. It also enabled a comparison of the perceptions of a particular treatment by those participants using the treatment, with those who are not.
3.4.4 Data Gathering and Coding (Step 3)

This step combined two main processes; entering the field and coding. Data gathering represents entering the field (Eisenhardt, 1989), Step 4 in Figure 3.1. Coding represents analysing data (Eisenhardt, 1989), Step 5 in Figure 3.1, and grounded theory analytical process, Step B in Figure 3.3. Both case study and grounded theory allow the researcher to go back and forth between collecting the data and analysing it until the initial theory is developed. This similarity allows the researcher to combine two steps and so ease the implementation of the grounded theory analysis process. The first process of Step 3 in this research was entering the field, also known as data gathering.

Entering the Field

This process involved recruiting and interviewing participants and transcribing the interviews. It required me to ensure that devices and software needed to record and store the collected data were ready to be used (Fernández, 2004). This included audio recording devices, a Skype account, a word processor, and NVivo.

Participant Recruitment The main data sources needed for this research were psychologists who would shared their perceptions of various IS treatment methods in treating ADHD in university students. After identifying the target group of data sources as mentioned earlier, 90 requests were sent out using email, snail mail, referral (snow ball) and physical site visits, and 1260 impressions [people who received and viewed a tweet] using social media (Hadyan, 2014b, 2014a). Twelve psychologists agreed to participate in this research (Table 3.2).

Psychologists Statics According to the The Psychology Board of Australia (2014), there are approximately 31,306 registered psychology practitioners in Australia; however, this is a count of licences held rather than of individuals. This mean a psychologist can
<table>
<thead>
<tr>
<th>Tools</th>
<th>Number</th>
<th>Recruited</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-mail</td>
<td>56</td>
<td>9</td>
</tr>
<tr>
<td>Snail Mail</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Referral</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Site visit</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Social Media</td>
<td>1260 impressions</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1242</strong></td>
<td><strong>12</strong></td>
</tr>
</tbody>
</table>

be counted more than once if they have more than one licence (endorsement).

This research used the APS and ACPA websites as a tool to target ADHD adult specialised psychologists, as outlined in the previous section (3.4.3). Although the ACPA website shows that there are 92 clinical ADHD adult psychologists in Australia, only 45 records were not duplicated. I was able to find 110 specialised psychologists’ records that were not duplicated in both websites.

In addition, mental health foundations, such as Headspace National Youth Mental Health Foundation, and some Melbourne-based University mental health clinics were also contacted, but declined to participate due to lack of ADHD adult specialists. Table 3.3 illustrates the number of psychology practitioners by state or territory in Australia.

<table>
<thead>
<tr>
<th>Type</th>
<th>ACT</th>
<th>NSW</th>
<th>NT</th>
<th>QLD</th>
<th>SA</th>
<th>TAS</th>
<th>VAC</th>
<th>WA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychology Practitioners</td>
<td>832</td>
<td>8905</td>
<td>194</td>
<td>4544</td>
<td>1320</td>
<td>443</td>
<td>7076</td>
<td>2733</td>
<td>31306</td>
</tr>
<tr>
<td>Specialised ADHD</td>
<td>3</td>
<td>36</td>
<td>1</td>
<td>12</td>
<td>2</td>
<td>0</td>
<td>48</td>
<td>8</td>
<td>110</td>
</tr>
<tr>
<td>Recruited Psychologists</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>1</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

**Individual Interviews**

Individual face-to-face interviews were the primary tool of data collection. The secondary tool was using online video conferencing; for example, Skype. Other data collection tools, such as email or
phone interviews, were employed if necessary. This process will be explained in detail in the next section.

Of the twelve participants who provided their consent to be interviewed, eight agreed to individual face-to-face interviews, two were interviewed using Skype because of their location and one preferred to use Skype rather than another method. One participant was interviewed over the phone due to being located outside of Melbourne and not having Skype available. Each interview lasted 45 minutes on average. All data collection tool options are outlined in Table 3.4.

The twelve interviews generated 237 initial categories and over 700 coded references using NVivo. Additional interviews were conducted with some of the participants for clarification purposes and to deepen understanding of the data collected. The twelve participants were later classified into groups based on their mainstream treatment tools as previously discussed; however, I was unable to find a WMT specialist for university students with ADHD.

The participants’ anonymity was respected, based on the research procedures and ethics used to conduct this research, as described in Section 3.4.3 (Figure 3.5). These were followed according to the RMIT University ethics policy. Ethical approval was granted by Human Research Ethics Committee (HREC)/College Human Ethics Advisory Network (CHEAN)- RMIT University to interview participants for this research.

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Code</th>
<th>Gender</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBT</td>
<td>P1-C</td>
<td>F=2 M=1</td>
<td>3</td>
</tr>
<tr>
<td>Neurofeedback</td>
<td>P2-N</td>
<td>F=1 M=3</td>
<td>4</td>
</tr>
<tr>
<td>Coaching &amp; Education</td>
<td>P3C&amp;E</td>
<td>F=4 M=1</td>
<td>5</td>
</tr>
<tr>
<td>WMT</td>
<td>P4W</td>
<td>F=0 M=0</td>
<td>0</td>
</tr>
</tbody>
</table>

| Gender Total      |       | F=7 M=5| 12    |

All of the interviews were recorded (audio only) and later transcribed. Transcriptions were completed by a third party using freelancer.com. To ensure the transcriptions were correct, I compared the
text to the recorded interviews, which also enabled me to become more engaged with the data.

Table 3.5: Participants Attributes

<table>
<thead>
<tr>
<th>No.</th>
<th>Participants</th>
<th>Profession</th>
<th>Education</th>
<th>Experiences/years</th>
<th>Interviewed</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P1-C1</td>
<td>CP</td>
<td>Masters</td>
<td>20 to 29</td>
<td>FaF</td>
<td>Melbourne</td>
</tr>
<tr>
<td>2</td>
<td>P1-C2</td>
<td>P</td>
<td>PhD</td>
<td>10 to 14</td>
<td>FaF</td>
<td>Melbourne</td>
</tr>
<tr>
<td>3</td>
<td>P1-C3</td>
<td>CP</td>
<td>PhD</td>
<td>5 to 9</td>
<td>FaF</td>
<td>Melbourne</td>
</tr>
<tr>
<td>4</td>
<td>P2-N1</td>
<td>CP</td>
<td>Masters</td>
<td>10 to 14</td>
<td>Phone</td>
<td>Sydney</td>
</tr>
<tr>
<td>5</td>
<td>P2-N2</td>
<td>CP</td>
<td>PhD</td>
<td>15 to 19</td>
<td>Skype</td>
<td>Melbourne</td>
</tr>
<tr>
<td>6</td>
<td>P2-N3</td>
<td>CP</td>
<td>Masters</td>
<td>30 and Up</td>
<td>Skype</td>
<td>Canberra</td>
</tr>
<tr>
<td>7</td>
<td>P2-N4</td>
<td>CP</td>
<td>PhD</td>
<td>30 and Up</td>
<td>FaF</td>
<td>Melbourne</td>
</tr>
<tr>
<td>8</td>
<td>P3-C&amp;E1</td>
<td>P</td>
<td>PGD</td>
<td>15 to 19</td>
<td>FaF</td>
<td>Melbourne</td>
</tr>
<tr>
<td>9</td>
<td>P3-C&amp;E2</td>
<td>CP</td>
<td>Bachelor</td>
<td>10 to 14</td>
<td>FaF</td>
<td>Melbourne</td>
</tr>
<tr>
<td>10</td>
<td>P3-C&amp;E3</td>
<td>P</td>
<td>PhD</td>
<td>20 to 29</td>
<td>Skype</td>
<td>Perth</td>
</tr>
<tr>
<td>11</td>
<td>P3-C&amp;E4</td>
<td>CP</td>
<td>PhD</td>
<td>30 and Up</td>
<td>FaF</td>
<td>Melbourne</td>
</tr>
<tr>
<td>12</td>
<td>P3-C&amp;E5</td>
<td>P</td>
<td>PGD</td>
<td>5 to 9</td>
<td>FaF</td>
<td>Melbourne</td>
</tr>
</tbody>
</table>

* P = Psychologist, CP = Clinical Psychologist, PGD = Post Graduate Diploma, PhD = Doctor of Philosophy

Table 3.4 gives information regarding the genders of the participants in each case study protocol and shows that there were seven females and five males in total. It also shows that there were no participants from the WMT protocol. The lack of WMT participants is considered one of the limitations of this research and is discussed in section 8.3. Gender did not appear to have any influence on the use of IS in ADHD treatment.

Table 3.5 shows the participants’ profession, education and years of experience, as well as how the interview was conducted and the location of the participants. The process of data collection and analysis will be explained in detail in the next section.

Coding

The Grounded Theory analytical process consists of three sub-coding processes: open coding, axial coding and selective coding (Strauss & Corbin, 1990). During this process, coded references were labelled or given a name that carefully described the selected words, sentences or paragraphs. This labelling process assisted in identifying relationships between categories, concepts and themes (Table 3.6. "The greatest tools researchers have to work with are their minds and intuition. The best approach to coding is to relax and let your mind and intuition work for you" (Corbin & Strauss, 2008, p. 160).
The first step in integration is to decide upon a core category. The core category represents the main theme of the research and is the concept that all the other concepts will be related to ((Corbin & Strauss, 2008; Strauss & Corbin, 1990). Furthermore, the other categories/themes are integrated around the central category to form a cohesive theory.

The integration process assisted in breaking large amounts of data into smaller categories and concepts, then relating them to each other based on conceptual similarity. This later assisted in refining the core theme and generating the e-multimodal framework theory.

Table 3.6: Three categorisations in analytical process

<table>
<thead>
<tr>
<th>Integration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>The labelling that is attached to words, sentences or paragraphs that identify specific participants’ perceptions [data].</td>
</tr>
<tr>
<td>Concept</td>
<td>Grouped similar categories. A grouping executed on the categories that share similar aspects or characteristics.</td>
</tr>
<tr>
<td>Theme</td>
<td>A group of related concepts. The theme is a higher level of this integration, which identifies a majority perception that describes the grouped concepts and categories. Group of themes create foundations of a developing theory (Corbin &amp; Strauss, 1990).</td>
</tr>
</tbody>
</table>

Open Coding

Open coding is the first process to "make sense" of the gathered data, and the first stage of the grounded theory analytical process. The research starts by carefully examining words and phrases of each sentence to identify categories from the data, without any early perception of concepts. This means setting aside any preconceived ideas about what the researcher expects to find and letting the data and interpretation guide the analysis (Corbin & Strauss, 2008). During this process, the data was broken into discrete parts and closely examined for both differences and similarities, which enabled precise discrimination and differentiation amongst the categories (Strauss & Corbin,
Events, objects, and action/interaction that were found to be conceptually similar in nature or related in meaning were grouped under more abstract concepts termed "categories" (Strauss & Corbin, 1998, p.102).

Corbin and Strauss (2008) argue that categories can range from lower-level categories to higher-level categories. Higher-level concepts are called themes and themes tell us what a group of lower-level categories are pointing to or are indicating. All concepts, regardless of level, arise out of data (Corbin & Strauss, 2008). In later analytic steps, such as axial and selective coding, data is reassembled through statements about the nature of relationships between the various categories and their subcategories. However, in this research lower-levels were called categories, which were a set of similar data that characterised the category feature. Categories that shared the same characteristics were grouped together to form concepts. Related concepts were grouped into higher-level concepts, which were called themes.

**Axial Coding**

The aim of the axial coding process is to start shaping higher-level concepts (core categories/themes) from the open coding process, and to explore the relationship between initial concepts. In addition, "the purpose of axial coding is to begin the process of reassembling data that were fractured during open coding. In axial coding, categories are related to their subcategories to form more precise and complete explanations about phenomena" (Strauss & Corbin, 1998, p.124). Technically, axial coding is done by relating categories to subcategories along the lines of their properties and dimensions, and it looks at how categories crosscut and link.

**Selective coding**

The aim of selective coding is to integrate and refine the themes/categories into a theory that justifies the phenomenon being investigated. "Concepts that reach the status of a category are abstractions. They represent the stories of many persons or groups reduced into . . . highly conceptual terms" (Corbin & Strauss, 2008, p. 198).
Data Gathering and Coding Tools

Computer software has the ability to assist in the data gathering and analysis process. It provides assistance to the researcher in answering the research questions from the data (Bazeley, 2007). A number of software tools were used to handle the vast amount of data gathered from the interviews. These tools included NVivo 10, and Microsoft Visio 2010. The two software applications greatly facilitated the analysis methods.

Within this methodological analysis there were various methods available to aid in sifting through the data collected. These techniques, as described by various authors such as (Eisenhardt, 1989; Strauss & Corbin, 1990, 1998), included:

- Within-case analysis tools that assisted in examining each interview individually and identifying concepts for the open coding. Within case analysis also involved analysing a set of interviews that fell into one category and finding interesting concepts to be coded.

- Cross-case analysis, which enabled comparisons across each individual interview, and later allowed comparisons across each categorised interview. During this process, differences and similarities between each of the case studies was closely examined.

Memos

Writing memos is an essential part of doing grounded theory (Birks & Mills, 2011). Memos can include the products of analysis or directions for the analyst. Glaser (1978) refers to memos as "the theorising write-up of ideas about codes and their relationships as they strike the analyst while coding" (p. 83). Memos are intended to be conceptual and analytical, not descriptive, as they assist the researcher to be aware of his own potential effects on the data (Strauss & Corbin, 1990).

Writing memos continuously during the analysis process allows the researcher to investigate, explicate and theorise the emergent
themes. Memos start in parallel with open coding and are produced continuously in grounded theory from the start of the analysis process until reaching closure (Fernández, 2004). Memos contain the actual products of the grounded theory analytical coding processes (open, axial and selective), or theoretical notes, which may conclude the analysis or keep the analyst’s thoughts and ideas about theoretical sampling and other issues (Strauss & Corbin, 1998).

Memos were considered the vehicle for creativity during this research journey and were viewed as the centre of ideas and thoughts for the development of the emergent theory. During different stages of the analysis process, memos developed and grew and they remain significant documents for this research. This is because they store my ideas, thoughts, feelings and hints about this research as it developed. Strauss and Corbin (1998) mention that the risk of failing to remodel the details of the research without memos is high, as indicated early in section 3.3. Table 3.2 outlined memos development and the task at each coding step of the grounded theory analytical process (Strauss & Corbin, 1998).

Visualization approaches allowed me to visualise the theme that covered most of the concepts and categories, and was often mentioned by participants. Different tools and methods, such as graphs, diagrams, matrixes, and tables, can be used in the analytics process to allow the researcher to get an overview picture of the whole integration process and the related data of perception Martin and Gynnild (2011). Martin and Gynnild (2011) argue that this approach is powerful when used to map concepts and outline conceptual relationships between themes. "Still others suggest new concepts and roles in conceptualization, just because the researcher is able to stare at and be stimulated by a diagram, a matrix, a table of items. These all help our thinking about comparisons and theoretical samples" (Strauss, 1987, p. 143).

The visualisation approaches employed in this research were not used to force themes to emerge. They were used to thoughtfully and visually examine the themes and their connections to the data and participants’ perceptions. This use followed the recommendations of
Martin and Gynnild (2011) to create visualisations that "must not muscle the grounded theory researcher. The tool must be used critically and thoughtfully and its affordances acknowledged and its role in research acknowledged (p. 140).

For this research, tools, including NVivo, Microsoft Excel and Microsoft Visual Studio, were used to assist in the visualising. A table was created using colour to highlight which themes were mentioned by which participant and how many quotes were found in each case where a theme was mentioned. This table was created using "matrix query" in NVivo and based on the initial 30 concepts. The themes were basically the result of open coding, and the result of the matrix query process was exported to Excel in order to highlight where themes were found across the case studies or mentioned by participants. Three different colours were used for each column (concept), which were then totalled by colour in the rows underneath. Figure 3.6 illustrates this process.

Both within-case and cross-case analysis were primarily done using Microsoft Excel, after the 30 initial concepts were coded and weighted. Starting with the most coded and mentioned by participants, each concept was analysed and the data was recategorised using Excel. This resulted in a matrix table of categories and participants. This enabled me to easily visually explore the axial codes' properties and dimensions within and across cases. Figure 3.7 shows a sample of
the matrix table produced by Excel. The yellow rectangle outlines the name of the case study groups, the red lines illustrate how the data for each case was analysed, and the green lines show how the data was analysed across cases.

3.4.5 Enfolding the Literature and Reaching Closure

Once the findings from the research within the core themes emerged and theoretical saturation was reached, I was able to examine and compare these themes with existing literature to confirm or disprove them. This process was assisted by Step A of the research design, illustrated in Figure 3.3, which allowed me to acquire sensitivity and knowledge on core themes that emerged. The literature review in this process was used as a source of further data to be compared or contrasted with emerged themes. This research reached theoretical saturation when the main objectives of the research were met and further data gathering and analysis did not add any significant new knowledge to the emerging theory.

3.5 Chapter Summary

This chapter outlined the methodological steps and approach taken in this research. It presented a detailed discussion of the processes and activities that were performed to generate the theory that answered
the research questions (Chapter 6). This chapter also offered justification for the research methodologies used in this research, specifically case studies by Eisenhardt (1989) and grounded theory described by Strauss and Corbin (1998). This chapter described the method chosen and explored the process by which the data was collected, analysed and formulated to reach the findings. Ultimately, this chapter described the research journey and justified the path taken to generate the theory that answered the research question.

This research carried out an in-depth investigation of the use of IS in the treatment of university students with ADHD. To assist in the investigation, a qualitative study was employed that involved four case studies and the interviewing of twelve psychologists who adopt different methods to treat ADHD in adults. The interviews were transcribed and analysed using the grounded theory analytical process. The process of finding concepts and themes from the gathered data generated the theory of the e-multimodal framework.

The development of the e-multimodal framework theory is presented over the next two chapters (Chapter 4 and Chapter 5). Chapter 4 will introduce the findings of this research in terms of open coding themes and related concepts. These themes outlined the overall perceptions of the participants regarding the definition of ADHD, diagnosis and treatments. These themes and related concepts were further analysed to find evidence of relationships between them (Chapter 5). The outcomes of both chapters assisted in developing the theory and answering the research questions (Chapter 6), and in comparing and discussing the findings in Chapter 7.
Part III

DATA GATHERING AND CODING

In this next part I introduce the three themes that emerged from the data in Chapter 4, and then present further analysis of the relationship between the themes and the participants’ perceived use of IS, which assisted in generating a further set of three themes (Chapter 5).
FINDINGS OF PARTICIPANTS' PERCEPTION OF ADHDER

As indicated in the previous chapter, this research took a qualitative approach, and the data was obtained through semi-structured interviews that explored how psychologists perceive the use of IS in the treatment and management of university student ADHD (UniADHD). It demonstrated that both the research question and subsidiary questions can be addressed and answered by an extension of the multimodal framework, which I have named the "e-multimodal framework". This new framework was constructed from themes that emerged out of the interviews with the twelve psychologists.

In this Chapter I report the findings of the interview data, which primarily consisted of open coding categories/concepts and related themes, and supporting statements made by participants. The outcome of this Chapter will provide the basis upon which the core thematic analysis was theorised, including the "e-multimodal framework" (Chapter 4 & Chapter 5), the interrelationships between the themes (Chapter 5), how this assisted in answering the research question and subsidiary questions (Chapter 6), and conclude with a discussion of the outcome of this research compared to current literature (Chapter 7).

The data analysis started by identifying categories, which were a collection of similar data [participants’ perceptions] that identified and defined features (Section 3.4.4). Categories that shared common features were then grouped to create concepts. Related concepts were grouped into themes. NVivo was used to assist in the coding process. This included a set of 237 categories and over 700 coded references. The final grouping allowed 30 broad concepts. As part of the memos process in grounded theory, I performed matrix coding in NVivo and exported the result to MS Excel. This assisted in visualising the rela-
tionship between the concepts, and identifying which of the concepts were strongly perceived by participants across the case study protocols. A more detailed account of the visualisation process is discussed in Chapter 3.

The following sections start with an overview of the participants’ attributes, their care development, and their approach to interventions, and describe the tools and approaches that each participant uses in treatment delivery. This is followed by an examination of the key themes that emerged from the open coding analysis; AduADHD attributes, Tools of Care Process (TCP) employed by participants and Care Intervention Tools (CIT) used for ADHDers.

4.1 CLINICIANS’ ATTRIBUTES

This section presents the attributes of the participants that were found in the data from the participants’ profiles. The themes needed to be interpreted in terms of each type of participant. This was determined by interviewing them, which produced different answers depending on whether the participant had a behavioural or clinical focus. For example, when asking a participant how they defined ADHD, I was asked the following question in reply:

\[ P1-C1: \text{"OK, are you asking from a diagnosis or clinical psych point of view, or talking about behavioural meaning?"} \]

This showed me that there were two important attributes to be considered when interpreting the themes. These attributes were care development and the interventions approach. Care development attributes include:

- a diagnostic approach;

- using neurological test assessments that examine other issues such as EF abilities; and

- incorporating other health professionals into the process.

Care intervention attributes include:
• using Assistive Technologies (AT) with their ADHDer; and

• communicating and working with university administrators to implement the treatment.

4.1.1 Care Development

Care development is the process employed by clinicians to diagnose ADHD and examine other issues related to the disorder. Two standard guidelines are used in the diagnostic process; the (DSM) and neuropsychological test instruments, both of which are discussed in Section 4.2.2.

The diagnostic process is only performed by clinical psychologists, as shown in Table 3.4. Although the sample included four participants who were not clinical psychologists, they collaborate with other authorised mental health professionals for the diagnosis.

P3-C&E5: "I use a structured interview called the DIVA [DSM based tool] to make the diagnosis. . . it needs to be diagnosed on clinical grounds. There are a number of tests which are potentially suggested, but they’re not always conclusive. Of those tests, I would say SPECT blood flow scan is the best one. Second best is probably QEEG."

4.1.2 Intervention approach

The intervention approach is the delivery of treatment based on the multimodal framework components described in Chapter Chapter 2.

The findings show that the tools used in the intervention approach fall into two categories: 1) Tools that are used by clinicians to treat or improve ADHDer attributes, including CBT, Neurofeedback and WMT; and 2) Tools that are provided by clinicians to assist ADHDers with self-management, including the use of (AT).

Table 4.1 tabulates the care interventions for participants with respect to the diagnoses made. It illustrates that the education and support (ESA) pattern was found across several case study groups,
Table 4.1: Participants’ care process of diagnosis and intervention of UniADHD

<table>
<thead>
<tr>
<th>Participants</th>
<th>D*</th>
<th>D- Others*</th>
<th>Assessment</th>
<th>A- Others*</th>
<th>AT</th>
<th>ESA</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1-C1</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>P1-C2</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>P1-C3</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>P2-N1</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>P2-N2</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>P2-N3</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>P2-N4</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>P3-C&amp;E1</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>P3-C&amp;E2</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>P3-C&amp;E3</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>P3-C&amp;E4</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>P3-C&amp;E5</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

* D= Diagnose, D-Other = Diagnose with Others, A-Others = Assessment with Others, AT = Assistive Technologies, ESA= Education and Support

showing that different protocols perceive ESA in the same way. These attributes were found in the data when participants were asked about their intervention approaches and how to improve the implementation of these approaches.

*P3-C&E2: “Obviously, we’ve got an actual diagnosis at this point, so I may be writing a letter of support just to say that they [UniADHDer] are finding study difficult and will need extra support and possibly need different times for submitting assignments.”*

4.2 KEY THEMES

This section presents the themes that emerged from the open coding of the interview data.

Figure 4.1, below, illustrates these themes and related concepts. It delivers a visual guide to the description that follows and shows the overall outcome of the open coding analysis of this Chapter. This diagram will also be used in the analysis Chapter to show the relationship between these themes and their relationship with IS.
4.2 KEY THEMES

Figure 4.1: The three key themes I have used to group and present the related concepts

The dark blue rectangle represents the AduADHD attributes theme, which includes two concepts; behavioural presentations and neurobehavioural impairment of EF abilities. The light green rectangle consists of the tools found in the care process: Care Development Process (CDP) and Care Intervention Process (CIP). The pale yellow box indicates the factors that provide the additional information used in the CDP, and are provided in the CIP to educate and manage outcomes. The circles illustrate participants’ perceptions of the use of each of the processes in their practice. The different colours indicate the categories to which each process is related; a process being any event or task that is used in the care process. Further details are described in Appendix A.

4.2.1 Theme 1: AduADHD Attributes

The essence of this theme is that AduADHD attributes consist of related concepts that label participants’ views of ADHDer behaviours and neurobehavioural impairment of EF abilities. This theme and re-
lated concepts are represented by the dark blue rectangle in Figure 4.1. ADHDer behaviour includes two categories; behavioural presentation and behavioural gender differences. Neurobehavioural impairment of EF abilities often affects the behaviour, mood, and functioning of an ADHDer, as perceived by the majority of interviewed participants.

The findings show that there is a relationship between impairment of EF and the AduADHD behavioural presentation. This concept includes five categories: 1) Planning and Management (PM), 2) Attention (ATT), 3) Emotional Control (EC), 4) Working Memory (WM-f), and 5) Self-Regulation and Motivation (SRM).

**Concept 1.1: ADHDer Behaviours**

The essence of this concept is that ADHD presentation varies according to gender and age. ADHD is a collection of behavioural presentations that includes inattention, hyperactivity and impulsivity, as defined by interviewed participants. The findings show that common behavioural aspects vary from ADHDer to ADHDer and the presentation of these behaviours changes with age. Some of participants believe that the prevalence of ADHD differs between genders, and there are also different behavioural attributes.

**Category 1.1.1: Behavioural Presentations** The focal point of this category is that the core presentation of ADHD is perceived by participants to consist of specific behavioural presentations. These behavioural presentations include inattention, hyperactivity and impulsivity, which are perceived by most of the participants to define ADHD according to DSM criteria.

_P3-C&E2: “Basically, we would define it according to the DSM, so it’s the whole distractibility and hyperactivity, tendency to space out, difficulties with the social side of things.”_

Hyperactivity presentations can be verbal, physical and/or internal activities. The form of these presentations varies from one ADHDer to another. Some participants perceive that hyperactivity presentations can be re-formed and change with age. Hyperactivity can present as physical activity in children with ADHD (KidADHD), whereas
in AduADHD hyperactivity can manifest itself as inner feelings of restlessness and racing thoughts.

\[ \text{P1-C1: “The core characteristics are inattention, hyperactivity, and impulsivity.”} \]

\[ \text{P3-C&E: “They can be verbally quite hyperactive rather than physically, although they will maintain fidgeting behaviour often.”} \]

ADHDers with impulsivity issues are believed to be outspoken, and perform actions or react to events without paying attention to the consequences of their actions, as they have difficulty with self-control, either verbally or behaviourally. They are believed to act or react without thinking or being conscious of the possible repercussions of their actions.

\[ \text{P2-N4: “You know, you also get people [ADHDers] who are impulsive, who blurt things out, who—just their mind gets distracted by a million things.”} \]

\[ \text{P1-C3: “Adults [ADHDers] do or say things they wish they had not. They are sort of. . . do not have the brake [self-control] to tell themselves ’Think before you act’ some of the time.”} \]

Inattention presentations are perceived as distractibility, unsustainability, and lack of attention span by participants, and an ADHDer can easily lose track of different objects or belongings. Participants believe that issues related to inattention can impact on treatment, due to the difficulties with focusing, concentrating, and recalling information. An ADHDer with this type of presentation also seems to have issues with communication skills, such as following instructions or holding conversations.

\[ \text{P2-N1: “Some of the primary symptoms [are] concentration problems, difficulty starting a task, or starting a task then getting distracted, then moving on and starting another task and not completing the first task, without being conscious of it and doing that repeatedly.”} \]

\[ \text{P3-C&E3: “You have to be really mindful that your client could agree to all sorts of things in your office, and five minutes after the session, he or she has forgotten everything that you’ve discussed.”} \]
Category 1.1.2: Behavioural Gender Differences

The central part of this category is that some participants believe there are prevalence and behavioural differences between male and female ADHDers. The gender ratio of males to females in children and adolescents with ADHD is four-to-one (male-to-female); however, the gender ratio in adults is one-to-one. Females focus more on self-improvement and self-care, and they have better social skills in comparison with males with ADHD. Male ADHDers tend to prefer interaction methods, such as email or group therapy. Female ADHDers can be misdiagnosed because of their ability to hide their ADHD presentations, as well as the fact that the diagnostic criteria are based on the male presentations of ADHD symptoms.

P3-C&E1: “Clinically we know that the, well, research says basically it’s probably four-to-one in children and adolescents, male-to-female. Clinically we know it’s one-to-one in adulthood. . . females are socially genderised into being more social creatures.”

P1-C1: “Males do really like groups if we can get them into them. So if there is real life interaction involved in it, for example you know, a telephone call or feedback email or somebody at the other end, they do that really well.”

Concept 1.2: Neurobehavioral Impairment of EF Abilities

This concept consists of the participants’ views of neurobehavioural EF impairment and its relationship to the behaviour presentation of ADHDers.

These impairments are characterised by difficulties with five EF abilities: 1) Planning and Management (PM), 2) Attention (ATT), 3) Emotional Control (EC), 4) Working Memory (WM-f), and 5) Self Regulation and Motivation (SRM). Each of these impaired abilities results in behavioural symptoms that are associated with the presentation of ADHD symptoms. In addition, these perceived EF difficulties contributed to assisting me in analysing the relationship between IS use and ADHDers.
4.2 KEY THEMES

**CATEGORY 1.2.1: PM**  The core element of this category is that PM issues related to EF-impaired ADHD behaviour are seen to present as a lack of organisation and planning, a lack of self-initiation and poor sense of time skills. Most participants see ADHDers as having difficulty with both their organisation skills and their ability to break big tasks into smaller steps. Participants believe that ADHDers leave working on any task until the last minute.

*P2-N2:* "They usually have problems organising themselves."

*P3-C&E:* "They have no concept of time. They have no idea how long things are going to take them so they underestimate."

The data shows that ADHDers are perceived by the participants to exhibit high levels of procrastination and delay in initiating tasks. This is not due to a lack of motivation, but rather is seen by the majority of participants as a difficulty in initiating tasks. Furthermore, the data shows that ADHDers have a poor sense of time, which affects their organisational skill, time management, and their ability to complete a given task on time.

*P3-C&E:* "It’s not lack of motivation; it’s lack of the ability to initiate tasks."

*P2-N2:* "Their [ADHDer] problem is they can’t seem to get started."

**CATEGORY 1.2.2: ATT**  The core of this category consists of participants’ perception that EF-impaired ADHDers often have difficulties with ATT. Participants see these ATT difficulties to include the inability to initiate, sustain, and not be distracted throughout a given task. ADHDers have issues with stimulating the effort required to initiate attention, maintain alertness and resist distractions, which is believed to affect the level of ADHDer productivity and performance. The data shows that sustained attention, which enables people to maintain their focus and complete a task, is lacking in ADHDers.

*P2-N4:* "When people [ADHDers] have trouble focusing—adults—what they’ll often find is that they can get the work done, but they’re not very efficient at it."
Difficulties focusing and concentrating are believed to be the most critical ADHD behaviour connected to impaired executive functions. Participants believe that ADHD can increase the difficulties of completing tasks or functions. In addition, there are typical symptoms and impairments found among ADHDers.

**Category 1.2.3: EC** This category describes the participants’ perception of the association between EC issues and ADHDers. Some participants believe that these issues are found more often in behavioural impulsivity presentation types of ADHDer, which can be seen in difficulties managing frustration and controlling emotions. These issues are seen to impact ADHDers’ thoughts and actions related to tasks, information or social situations. Emotional control issues are seen to be associated with being highly sensitive and impulsive. Being unable to control emotion in a social situation is seen to negatively influence an ADHDer’s social skills and communication. The data shows that issues related to EC impact on ADHDers’ social skills, which in turn impact on their social networks. Issues related to EC are found to be correlated with other impaired abilities of EF.

*P2-N4:* "They're [ADHDer] just frustrated because they can't get the stuff done. So often we'll say, 'Okay, overload and losing the track can cause these emotional disruptions and you know you can get into a spin and stop doing anything' and that's a common problem."

*P3-C&E2:* "They're always highly sensitive, which means they're highly reactive."

Social difficulty issues include social adjustment, social skills, and self-esteem. Participants believe that ADHDers in university are unable to successfully interact with others, are not aware of social rules or don’t know how to build a social network. Some participants believe that ADHDers have issues with being independent and responsible for self-behaviour. ADHDers acting improperly is also seen to create issues with their environment (education for example), which can impact on their performance.
P1-C1: “They [ADHDer] don’t know what some of those social rules are, or even how to build up some of the social networks they need.”

P3-C& E3: “I think it’s one of the biggest problems because they don’t have the skills that allow you to be independent, no matter how responsible they try to be.”

P2-N4: “So we’re talking about a student who goes to university and can’t cope and fails. This is the hyperactivity and inattention. . . It’s an image that you mask through being the class clown.”

**Category 1.2.4: WM-F**  The essence of this category is that ADHDers are seen to have an issue with working memory, which is related to the process of holding and recalling information needed to complete a task or activity. The data shows that ADHDers are constantly losing their belongings or recent information. With this practical issue, participants argue that ADHDers with working memory issues should use notes and reminders, a technique which is found to be used more with the inattention presentation of ADHD. The issues with WM-f can impact the holding of information or the retrieval of it, which is seen by some participants to impact on the communication skills of ADHDers, and is the reason why ADHDers interrupt conversations and act impulsively when communicating.

P2-N1: “Often there are memory problems and forgetfulness, like losing things, or you keep forgetting things constantly.”

P1-C1: “Other behaviour, that includes jumping in. . . almost like impulsivity. . . they say things or they do things quickly because of their inattentive quality. Because they are scared they are going to lose that idea, or they are going to forget to follow.”

**Category 1.2.5: SRM**  The central point of this category is that SRM associated with ADHDers refers to a lack of motivation, self-regulation and self-monitoring. Participants believe that levels of motivation are related to the amount of mental effort required for a task. The more mental effort ADHDers have to make, the less motivated they are about doing the task.
P2-N2: "Well, there is poor motivation, but the reason behind the poor motivation is the fact that they perceive that the work they’re meant to do requires a lot of mental effort, and it’s just too hard and they avoid it."

The findings show that issues with SRM ability are seen to be related to ADHDer difficulties with self-monitoring and self-evaluation. ADHDers with SRM issues have difficulties in sustaining effort to perform and complete tasks, and this can impact on other EF abilities such as PM and the ability to prioritise.

P3-C&E3: "It’s about not being able to do what they [ADHDer] know they should do at the point of performance. For example, if you were to sit them down and say, ‘What are the steps you have to go through to get to work on time?’, they may well be able to tell you, but the following morning when they wake up, in their point of performance where they’ve got to decide between following the steps they need to get ready or sitting down and having a quick game on the computer, they’ll sit down at the computer."

Another issue with SRM difficulties is that they are seen to affect attending class, and submitting or completing assignments. Participants believe that ADHDers are not lacking intelligence, but rather their behavioural issues impact on their coping mechanism and learning skills. As an example, P1-C2 argues that ADHDers need guidance and support to assist them with SRM difficulties, just as KidADHDs receive parental guidance.

P1-C2: “I think if you’ve got a neurological condition like ADHD...at that age in your life [university student], mum and dad are less present. You do need someone to guide you. You need someone to talk to about how to manage situations and problems you’re having.”

Theme 1 Summary

In summary, this theme outlines the participants’ perception of ADHD attributes, which includes ADHDer behaviour presentations, the differences between males and females with ADHD, and neurobehavioural impairment of EF abilities. Participants see the core be-
havioural presentations consisting of hyperactivity, impulsivity, and inattention. Some participants felt that the number of male ADHDers is higher than the number of female ADHDers, and AduADHD presentations are different in females than males. The data shows that some participants believe male presentations are more obvious than female, which leads to ADHD misdiagnoses in females. Some participants see female ADHDers as having a higher level of self-control and selfmotivation than AduADHD males as they can initiate task performance, whereas males find this difficult. There appears to be relationships between Neurobehavioural issues and the behavioural presentation of AduADHD, which relate to five EF abilities. These are; PM, ATT, EC, WM-f, and SRM. Participants believe impairment of these EF abilities impacts on the ADHDer.

4.2.2 Theme 2: Tools of Care Process (TCP) employed by clinicians

This theme consists of related concepts and categories that describe participants’ views of tools that are employed by clinicians in their care process of AduADHD. The care process contains all available diagnostic, assessment and treatment processes and tools that participants implement in ADHDer treatment delivery.

The data shows that the AduADHD care process includes two approaches; the Care Development Process (CDP) and the Care Intervention Process (CIP), as seen in Figure 4.1. The concepts of this theme assist in analysing participants’ perception of IS acceptance (Section 5.1.1).

The CDP contains the views of the majority of participants about the diagnostic process of the disorder. These views describe this process as a complex one that requires employing tools to gather and interpret information from different resources. This process involves using two different methods: 1) DSM-Based Criteria (DBC), and 2) Neuropsychological-Based Testing (NBT), which includes the tools listed in Table 4.2. However, some participants expressed concern in regards to the types of tools that influence the CDP results. These concerns are based on participants’ perceptions of clinical ethical
practise, gender, the age of the ADHDer and the capability of NBT’s IS-based tools.

<table>
<thead>
<tr>
<th>Care Process</th>
<th>IS-based Tools</th>
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</thead>
<tbody>
<tr>
<td>Care development Process (CDP)</td>
<td>CPT</td>
</tr>
<tr>
<td></td>
<td>QEEG/EEG</td>
</tr>
<tr>
<td></td>
<td>PET</td>
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<td></td>
<td>SPECT</td>
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<tr>
<td>Care Intervention Process (CIP)</td>
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<td>WMT</td>
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<td></td>
<td>AT</td>
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</tbody>
</table>

Participants develop treatment plans based on the information obtained in the CDP. The data shows that treatment plans are methods and approaches employed as Care Intervention Tools (CIT) to improve AduADHD issues. The CIT listed in Table 4.2 are the treatment tools used by clinicians in ADHDer treatment, as perceived by the participants. The perception of the use of these tools varies among participants, but the overall view is that these tools are not able to target the core symptoms of AduADHD, they are only effective as an aid to improving EF ability.

P3-C&E3: “ADHD is not diagnosable by any IS-based tool.”

Concept 2.1: CDP

The core element of this concept is that AduADHD is a complex disorder and requires a comprehensive diagnostic process to be carried out in order to make an informed diagnosis. The data shows that CDP consists of two sub-processes; DBC and NBT. It also outlines that AduADHD is only diagnosed based on DBC—a subjective process—which is perceived by most participants to be either inaccurate or open to misinterpretation. The majority of participants argued that relying solely on DBC to make a diagnostic decision is an issue due to its limitations in providing enough data for accurate diagnosis. Further examination using NBT to evaluate other associated issues with
the disorder is necessary to facilitate a more accurate diagnosis, and this is the procedure the participants indicated they follow.

These CDP tools (Table 4.2) are perceived by the majority of participants to evaluate the strengths and weaknesses of an ADHDer’s cognitive skills, and to investigate the possibility of comorbidity such as depression or anxiety. Some participants argue that these tools are not sufficient to diagnose AduADHD.

**Category 2.1.1: DBC** The foundation of this category is that participants employ DBC as the initial step in screening for the disorder. This screening relies on the participants and ADHDers objectivity in uncovering the behavioural presentation of ADHD.

Some participants expressed how easy it is to use the tools and make a diagnosis. However, some participants argued that relying solely on these tools is not enough to make an effective diagnosis. Using only an ADHD screening test to diagnose ADHD in individuals is considered a ‘dereliction of duty’, as pointed out by participant P1-C. The perceptions of the sole use of DBC was one of concern, as these criteria have never acknowledged ADHD to persist into adulthood and they are gender insensitive. Females with ADHD can remain hidden or be misdiagnosed because the diagnostic criteria is based on male presentations of ADHD symptoms.

\[P1-C3: \text{“I certainly wouldn’t make a diagnosis based just on that. I have been told that there are some people that do, but I think that’s a bit of a dereliction of duty.”}\]

\[P3-C&E1: \text{“As we get further into adulthood, it’s easier for the females to hide. . . The diagnostic criteria are based on little boys—the presentation of little boys.”}\]

**Concept 2.1: CDP**

The root of this concept is that participants expressed the importance of further data gathering and the involvement of people found in the direct environment of the patient in order to make an accurate ADHD diagnosis.
In CDP, the majority of participants obtain further information from an external resource, such as a family member, other clinicians, or a close individual found in the direct environment of the patient to assist the diagnostic decision, as shown in Table 4.2. The data shows that some participants may employ different channels of input to gather more data for verification from third parties. They may organise interviews with the individual’s close family members, friends and possibly teachers if the person is a child or adolescent. These other parties will be questioned on how the individual behaves or acts in different settings. Participants use school reports or inquire about academic performance to evaluate and screen the areas impacted by the disorder.

\[P1-C3: \text{"I've come across talks about clinical interview, verification with third parties, you know spouse, parents, friends, and history—what evidence is there from childhood, and as much as possible I try to get source material like school reports rather than, you know, when you were a kid, what were you like."} \]

\[P3-C&E2: \text{"They take—this is the key aspect of it—there has to be in-depth developmental and familial history taken."} \]

Other information, as perceived by participants, relates to medication. This medication can be either prescribed or recreational drugs. The data shows that ADHDers are often diagnosed with a comorbid disorder and are on other medications treating other mental disorders. Some participants argue that for better CDP, clinicians require to know the medication history in order to identify issues that might affect any interventions.

\[P2-N4: \text{"If medication was not able to manage their ADHD, you’d want to know which medications they had tried."} \]

category 2.1.3: NBT The core of this category is that participants employ different tools to assist them in further examination and information gathering. This is in order to obtain a better understanding of other issues that are often found to be related to the ADHDer. The data shows that NBT tools are used to identify the level of severity of ADHD presentation, to examine for any other comor-
bidities, such as depression or anxiety, and to identify any neurobehavioural impairment of EF abilities. Tools used to screen for these issues include brain-mapping devices such as QEEG, SPECT, and PET (as shown in Table 4.1), Intelligence Quotient IQ tests to measure cognition and intelligence, and tests for educational achievement and memory. Many of the participants commented on this part of the process.

\[ P_1-C_1: \text{"So the process of knowing what's really going on for this individual is very important—do they have anxiety, do they have depression, do they have moodiness or irritability. Do they have any obsessive compulsive type traits, do they have perfectionism, and do they have any other of these things?"} \]

\[ P_3-C_&E_2: \text{"In the clinic, the whole process includes an IQ test and basic educational achievement and memory tests."} \]

The data shows that continuous performance tests, such as Conner’s CPT and T.O.V.A., are used to provide specific information related to the ADHD. This information can be used to identify the degree of ADHD via inattention or impulsivity. Half of the participants raised some concern about the capability of these NBT tools; however, most of the participants agree that these tools can assist in determining whether inattention or impulsivity are related to ADHD or caused by other mental disorders.

\[ P_1-C_3: \text{"Oh yeah, the Conner’s continuous performance test [Conner’s CPT] is so that they can help with specific areas. . . . and it’s the same with some of the neuropsych [neuropsychological] tests, if there’s a specific area you want to check up a bit more and add extra data."} \]

\[ P_4-C_2: \text{"We also use the T.O.V.A., which is a technology that measures impulsivity and things like that and it basically prints out whether someone’s impulsive or whether they make errors because they’re too slow at responding and things like that."} \]

**CATEGORY 2.1.3: PERCEPTION OF IS-BASED NBT CAPABILITY**

The foundation of this category is that some participants perceived NBT as an IS-based assessment tool used to quantify data and present patterns that might be considered as being present in ADHD.
Some participants who employed these tools argued that the use of these tools assists the diagnosis and facilitates their diagnostic decision-making. The perception of these tools’ capabilities is further analysed in Section 5.1, where the aspects affecting the use of these tools by participants is outlined. Although the perception of the practical use of these tools varies from one participant to another, all participants believe that these devices do not have the ability to diagnose ADHD.

\[P3-C&E3: \text{"I believe that there are some doctors who are talking up SPECT scans and saying that these are a diagnostic tool. I know for a fact that they’re not. They show differences in the brain, but they don’t pinpoint ADHD."}\]

Concept 2.2: CIP

The core aspect of this concept is that CIPs are developed to be used by participants to target issues related to ADHD. They include CBT, Neurofeedback and WMT, which are also types of therapy tools in the e-multimodal framework discussed in Chapter 2 Table 2.3.

CBT is believed to assist individuals with ADHD to identify the relationship between thoughts and emotions. Some participants argue that these tools do not target the core symptoms of ADHD and the complexity of these tools can limit the benefits. Neurofeedback and WMT are perceived by participants to involve computer-based training, which allows real-time feedback regarding the attention levels of ADHDers.

**Category 2.2.1: Perception of using CBT** The core point of this category is that CBT is perceived by the majority of participants as a tool that is effective for issues associated with AduADHD.

Participants see the use of CBT as effective in issues associated with ADHD and it is believed to improve the quality of life for ADHDers. However, the majority of participants see CBT as not being effective in addressing the core symptoms of ADHD, as CBT is seen to be behaviour-oriented and does not have the ability to improve the productivity level of ADHDers. CBT is useful in reducing symptoms of
other disorders, such as anxiety; a view that was expressed by many of the participants.

\[\text{P1-C2: "Yeah, we would do CBT for that and behaviour—how to help them address aspects of their lives."}\]

\[\text{P1-C1: "The difficulties that I hear from individuals and groups is if you’re only going to do the emotional awareness CBT, then it doesn’t help them to become productive."}\]

\[\text{P2-N4: "That’s what CBT really translates into for me...anxiety reduction—the skill, teaching people how to do that."}\]

One of the downsides of CBT is the amount of reading and writing required, which is not suitable for ADHDers. Furthermore, CBT could enable clinicians to take control of the ADHDer’s interpretation of their thoughts, as it limits the self-regulation of emotion and thought, and increases the ADHDer’s dependency on the psychologist to assist them to interpret their thoughts. CBT can only benefit cognition and behaviour aspects; it cannot necessarily work with emotive aspects. One participant in case study P2-N noted that because of these issues with CBT, treatment relying on this approach might result in failure.

\[\text{P1-C3: "The disadvantage of CBT tends to be that it sets the coach or counsellor as the authority on whether it is reasonable to interpret things this way or not. And that can come across as patronising and isn’t actually getting into where the client is at."}\]

\[\text{P3-C&E1: "CBT is quite beneficial in the sense that it deals with the cognition and the behaviour, but it doesn’t necessarily deal with the emotive aspect, per se."}\]

\[\text{P2-N3: "CBT has disadvantages to me, because if it’s ineffective that can lead to a treatment failure even though it may seem like a great idea."}\]

**CATEGORY 2.2.2: PERCEPTION OF USING NEUROFEEDBACK**

The core concern of this category is the views of participants about IS-based tools used by clinicians in the CIP process. Neurofeedback therapy is a computerised version of mindfulness, but it is not an on-
going approach to sustaining the improvement of ADHD symptoms as it does not have a permanent effect on any of the three core areas.

Neurofeedback has the potential to improve short-term working memory in the view of some participants. Some participants (P1-N) believe that there is no set of rules concerning how many sessions are needed for each individual but, on average, 30 sessions of Neurofeedback treatment is the minimum number of sessions. Many comments similar to those quoted here were made by the participants.

\textit{P1-C1}: "Neurofeedback therapy has not been shown to be effective to the core three areas—hyperactivity, impulsivity, and inattention."

\textit{P2-N4}: "I'd say thirty to forty [sessions] is probably what you’re looking at for a person who simply has inattention. I’d say that’s probably where you’re going to end up."

\textbf{Category 2.2.3: Perception of using WMT} WMT is a useful tool that can improve difficulties resulting from ADHD core symptoms. These difficulties include low confidence, distractibility, and the inability to retain information. The WMT approach is not effective in treating the core symptoms of ADHD in adults, although participants felt ADHDers might gain some improvement in their working memory. The negative impact of using WMT is that it can overload the working memory with unnecessary information or tasks, and it has been known to create fatigue by consuming energy. The evidence that supports WMT is weak and participants perceive it cannot be effective on its own.

\textit{P1-C1}: "It will help them to feel confident, and it may help them to pick up some of their distractibility, but is it going to change their core inattention?"

\textit{P3-C&E5}: "So we know that cognitive tasks can be relatively fatiguing and they can lead to the depletion of energy in some circumstances."

\textit{P3-C&E3}: "That’s exactly what I believe, and I know for a fact that those working memory programs are not supported sufficiently by research."
4.2.4: Perception of Medication as a Solo Intervention

Medication is not suitable for all ADHDers and it does not target all areas affected in the brain. It can only be prescribed by psychiatrists or paediatricians; however, psychologists can refer their ADHDer to a psychiatrist or paediatrician if they decide there is a need to take medication. A participant from P3-N argued that there is an issue with the process of medication prescription by psychiatrists or paediatricians, as these clinicians treat ADHD in adults as a simple disorder that can be managed solely with medication without taking into consideration other attributes and issues associated with ADHD.

P3-C&E: "We work in conjunction with the psychiatrist because he does the medication side of things."

P2-N: "So if a person actually wants to figure out how to work with a problem with attention and focus, they’re better off investigating a little further, but most paediatricians or psychiatrists only use that. They have no interest in any other sort of information, and then they go straight to treatment, usually with medication."

The positive impact of medication on ADHD symptoms is questioned and sometimes an opposite result is reported. ADHD medications have unpleasant side effects. Participants believe that sometimes ADHDers develop depression as a side effect of medication because they are more aware of events that happen to them, whereas before these events were not noticed. These side effects might force ADHDers to discontinue taking medication.

P3-C&E: "If they don’t want to take medication, sometimes I spend awhile asking why, what’s the problem, and what have they had and have they had side effects, and have they tried it."

Theme 2 Summary

In summary, this theme outlines the participants’ perception of ADHD and the diagnostic process used to screen for AduADHD. The findings show that the AduADHD care process that is used by clinicians consists of two processes: CDP and CIP. The CDP is found in the
data to include tools that can diagnose ADHD core presentation and measure other issues impaired by AduADHD. The CIP consists of tools that are developed to be used by clinicians to treat AduADHD. However, the capability of these tools raised some concerns. The relationship between this theme and the perception of the use of IS to identify aspects that influence IS acceptance is outlined in Chapter 5.

This theme and related concepts and categories were mentioned by the majority of participants, and found across the different case studies. This seems to be an indication of a strong theme as it was discussed by all case studies.

4.2.3 Theme 3: Tools of CIP used for ADHDer

The essence of this theme is that participants use different approaches in the CIP for ADHDers. This includes providing AT, helping with medication adherence (MA) if needed, and providing education for a supportive environment (ESA), as shown in the dark green rectangle in Figure 4.1.

The majority of participants believe that interventions focus on improving impaired EF issues in AduADHD, which leads to an improved quality of life. The data shows that participants develop their interventions on improving issues with EF abilities. Therefore, AT is used in this type of intervention as it helps to support ADHDers in their everyday life. MA is perceived by some participants to be employed to improve medication intake, which is seen to be related to improved performance by ADHDers on given tasks. Medication is found in the data to be the only treatment component that targets the core symptoms of ADHD. Improving mental health literacy in individuals with AduADHD is perceived to improve their living situation and offer them support.

Concept 3.1: AT to Aid EF abilities impairments

The core root of this concept is that participants adopt AT to support their self-management approach. The AT tools include smart-phones, the internet, and cloud-based applications, which are used to enhance
treatment of ADHD. Participants believe that AT are beneficial and can improve EF abilities. The data regarding tools that aid EF abilities, and attributes influencing their use, will be further analysed in Chapter 5.

Issues with an ADHDer’s ability to plan or manage time are perceived to be supported by multiple AT by most of the participants. The participants believe that these technological tools are exciting, animated, and engaging for ADHDers to work with. Electronic maps that can show an ADHDer’s current location are used as a technological tool that helps to improve the ADHDer’s time management skills and their commitment ability.

P1-C2: “You increase the size of working memory by having IT.”

The use of smartphone features, such as reminders, is found to be useful for mobile applications with multiple alarms and are used to assist the ADHDer’s commitment. Timers and cloud storage services are also helpful in improving the management and organisation skills of ADHDers. Comments on all of these AT tools were made by participants.

P1-C1: “I talk to people about how to get their world into a more ordered state—like I said, they’re all over the darn place—so we scan stuff and we put it up to a cloud.”

AT that have multiple methods to present or store content can increase the potential successful use of technology in the treatment of ADHD. This includes text, or visuals, or other multimedia methods that can enhance intervention outcomes. Some participants argue that providing ADHDers with these tools, which gives them the option of being interactive and socially connected, will empower ADHDers to use these tools effectively.

P1-C3: “Modular, but very small modules, and ideally with different ways of accessing content. . . everything’s all blocks of text, or we’re going to do five minute videos, or we’re going to present information with choice.”
Concept 3.2: Medication adherence (MA)

The essence of this category is that participants work to improve ADHDers’ MA. The data shows that medication in AduADHD treatment is seen to have an immediate outcome with a short-lasting effect. The data shows that medication is believed by the majority of participants to be the only method that targets core symptoms of ADHD. Medication is perceived to be useful to facilitate the strategies for improving issues associated with ADHD, such as management and organisation skills.

P2-N3: "...I’m not so worried about the side effects or the scary stuff around meds [Medication]. It is a helpful intervention for short-term improvement."

The data shows that the information that supports the use of medication in ADHDer intervention is based on evidence-based research that has been conducted over long periods of time. Participants will strongly dismiss any information that is based on weak evidence or unusual claims. However, medication, as found in the data, is a temporary solution and the results are not permanent. Therefore, an ADHDer needs to keep taking them to obtain ongoing benefits. The data shows that some participants believe that this temporary solution can be used to improve the use of other ADHD treatment methods, and to train the individual with ADHD to get into a new treatment routine. Medication is also seen as a method to improve the use of care interventions effectively.

P1-C3: "I was going to say hundreds of hours—probably thousands of hours, going through all the various literature. Although there’s odd studies here and there that claim banana juice or whatever is the new thing, there’s nothing else that has such a strong consistent evidence base as medication."

P2-N2: "If you do it remotely, you’re relying on the student to organise themselves. . . but generally speaking, they [ADHDers] need a kick in the bum to get going, unfortunately. So what we usually recommend is that they [ADHDers] go in the short term on stimulant medication, which will help them get going
and they can do Neurofeedback [remotely] while on stimulant medication.

Concept 3.3: Education for supportive environment (ESA)

The essence of this concept is that the majority of participants offer health education, which includes a range of approaches to increase the opportunity for ADHDers to experience better mental health. The approaches include providing ADHD-related education and information to the ADHDer, as well as to those in living situations and environments that support the ADHDer, in order to encourage them to adopt and maintain supportive lifestyles. This can help to improve the ADHDer’s living and study or work situations. The data shows that some participants measure the literacy of the ADHDer in order to develop a suitable education approach.

P3-C&E1: “First and foremost, I ask them what they know about it, so I judge their knowledge basis.”

P1-C1: “So that’s one thing, make people aware that this person’s got these things going on for them and get support.”

ADHD education is believed to improve ADHD literacy and reduce the stigma of ADHDers. ESA can improve the level of support for ADHD by providing ADHD health education to inform individuals and communities of the real issues of ADHD and explain how it affects the quality of living for an ADHDer. Improving the quality of living is related to increasing the level of acceptance shown by individuals found in the ADHDer’s environment.

P3-C&E1: “So the awareness and the acceptance of the fact that these kids are trying—these young adults are trying more than what the university realises.”

Theme 3 Summary

This theme outlined the participants’ perception of intervention approaches offered to those with AduADHD. These approaches include: AT to support issues associated with ADHD; support with MA if
needed; and improvements to the ADHDer’s living situation by providing education to people in the ADHDer’s direct environment. This theme and concepts are further analysed in Chapter 5, which outlines the participants’ perceptions of ADHDer attributes impacting on the use of IS. This theme, and related concepts and categories, were mentioned by the majority of participants, and were discussed by all case studies, indicating it was a strong theme.

4.2.4 Chapter Summary

In this Chapter I outlined the clinicians’ attributes, and the three themes that emerged from the analysis that assist in developing the theory that answers the questions of this research. This set of themes and their interrelationships will be further analysed in the next chapter (Chapter 5), where the themes will be regrouped into interrelated concepts and categories. The relationships and contrasts have been matched against the participants’ perceived use of IS in each concept.
In the previous Chapter, I presented three sets of themes derived from the data that assisted in the development of the e-multimodal framework. In this Chapter, I present additional themes that arose from the analysis of the interaction of the three themes and the relationships between them. I performed a further analysis based on the participants’ and ADHDers’ attributes described in Chapter 4, and comparing them to the participants’ perceived use of IS. The outcome of this analysis assisted in answering the research question and subsidiary questions (Chapter 6) and contributed to the discussion in Chapter 7, where I compared the outcome with the current literature.

In this chapter, I present a new set of three themes that emerged from further analysis, which includes: 1) Clinicians’ attributes influencing IS acceptance; 2) ADHDers’ attributes influencing IS acceptance; and 3) External Factors to the ADHDer-IS relationship influencing the use of IS.

These themes consist of the participants’ views of the use of IS in the care process of an ADHDer. The analysis shows that there are different systems’ attributes that form factors that influence the use of IS. These factors include: 1) Clinicians’ attributes of practical experience and perceived effectiveness and efficiency of the use of IS-based TCP; and 2) ADHDer attributes impacting on AT usability. The analysis also shows that there are external factors that impact the ADHDer use of IS. These external factors are human and nonhuman actors found in the direct environment of the ADHDer that can impact on the use of IS.

I have illustrated the IS attributes in Figure 5.1, and these themes and their relationships are displayed using MS Visio, as in the previous Chapter. The new shapes and colours representing the IS are
described in Appendix A. The complete illustration of the six themes and their relationships will be introduced in Chapter 6. In the following sections, the second set of the three themes will be introduced.

5.1 Key themes

In this section, I introduce IS attributes that were found in the data to be impacted by clinicians’ and ADHDers’ attributes. The analysis of the interview data shows that acceptance relies on perceived accessibility, usability, capability, cost and trust of IS-based tools, as shown in the dotted red rectangle in Figure 5.1.

Participants recognise the capability of IS-based tools, regardless of whether the tools are being used to diagnose or treat ADHD, and whether or not the objectives are achieved. Capability refers to participants’ clinical expertise (dark-yellow box in Figure 5.1) regarding what services these tools offer and what they are used for—this focuses on the functionality of the tools. Figure 5.1 below shows how participants perceive the use of IS in the care process. IS attributes (dotted red rectangle) lie between the care process tools (TCP) (light-green rectangle) and the process used by clinicians (dotted black rectangle), or for ADHDers (dotted light-blue rectangle). The figure illustrates the impact of clinical expertise (dark-orange rectangle), ADuADHD attributes (dark blue rectangle), and external factors (pale-yellow box) on IS attributes.

Usability is perceived by participants as how AT is used by ADHHDers, and is impacted on by ADHDers’ attributes. Accessibility, as found in the data, is seen to describe the way the IS is accessed and obtained by ADHDers. Trust attributes seem to consist of efficiency of IS-based diagnoses or treatment; effectiveness in the use of IS-based TCP; perception of diagnostic accuracy; and the evidence-based research of assessment devices. Cost was found in the data to be related to the participants’ perception of cost and quality of the use of these tools, and whether the benefits of using these tools can justify the financial cost.
As outlined, a further three themes emerged from the analysis of the interview data. This section presents the themes and related concepts and categories, as follows:

Theme 4: Clinicians’ attributes influencing IS acceptance

Theme 5: ADHDers’ attributes influencing IS acceptance

Theme 6: External Factors to ADHDer-IS relationship influencing the use of IS

5.1.1 Theme 4: Clinicians’ attributes influencing IS acceptance

The essence of this theme consists of concepts and categories that label participants’ perceptions of clinicians’ attributes influencing acceptance of IS in TCP, as shown in the dotted red rectangle in Figure 5.2. This figure is an extension of Figure 5.1, which shows how IS attributes are perceived to fit within a process.

Participants who have practical experience and have used CIP IS-based tools, believe that the use of these tools during the neuropsych-
chological assessment of CDP can gather a greater quantity of more specific data, which may increase the quality of diagnosis of ADHD and assist their decision regarding ADHD treatment. Other participants who do not have practical experience and have not employed these tools believe that they are used to diagnose ADHD core symptoms as DBC tools do, but that they do not have the capability to determine a diagnosis and cannot be used solely as diagnostic tools.

**Concept 4.1: Clinician expertise impact on perceived capabilities of NBT**

The essence of this concept is that the perception of IS capability is impacted by the participants’ experience with IS-based TCP. Using capability attributes to investigate the participants’ perception within and across case studies has resulted in two new categories being generated from the analysis of this concept. I have called these categories the Expert Group, and the Non-Expert Group. The Expert Group includes the perceptions of participants who implement and practice NBT in their care process. The Non-Expert Group is a group of par-
participants who are aware of these tools, but do not have practical experience in using them for diagnosis and treatment.

**Category 4.1.1: View of Expert Group of the Practical Use of NBT**

The core element of this category is that the Expert Group views NBT as tools that can explore, gather and evaluate further data about other issues associated with ADHD, which can potentially highlight patterns and events that might be evident in the behavioural presentation of ADHD in individuals. The relationship analysis shows that NBT tools are used to examine neurodevelopmental impairment of EF abilities. These participants see this examination as a way to facilitate the development of better CIP. The capability of NBT, as described by the Expert Group, is not seen as a diagnostic assessment, but rather as a specific predictive assessment. The functionality of this tool is to measure brain patterns, but it does not have the ability to point out any behavioural presentations of ADHD. qEEG is believed to measure and compare results to what has been called a 'normative database' to assist in predicting the underlying brain patterns associated with ADHD behavioural issues.

*P2-N2: "We have been using quantitative EEG [QEEG], which is the statistical evaluation of the EEG compared to a normative database, to tease out what are the underlying brain patterns that are responsible for what we call ADHD."

*P1-C2: "We also use brain maps, which are quantitative EEGs [QEEG] here, which can tell us if there are problems with the prefrontal cortex [PFC]."

qEEG capability is explained by this group as different to DBC, which is based on behavioural presentations of AduADHD listed on the DSM criteria. DBC is viewed as a general tool, which relies on behavioural presentation of the AduADHD, whilst qEEG is seen as objective, focusing on the biological part of ADHD.

*P2-N4: "The diagnostic is only by the manual [DSM]. If you want to look at the qEEG equivalencies of the symptoms, then it’s a very different investigation, but you don’t do that in order to diagnose the disorder."
P3-C&E5: “It [ADHD] needs to be diagnosed on the clinical grounds [symptoms-based diagnostic assessment]. There are a number of tests [NBT tools] which are potentially suggested, but they’re not always conclusive. Of those tests, I would say SPECT blood flow scan is the best one. Second best is probably QEEG.”

Furthermore, NBT is employed to assist with the treatment decision, which allows these participants to measure the severity of ADHD symptoms. The outcome of these tests is believed to facilitate the development of a suitable treatment and management plan, and to determine the type of treatment and the specific issues that need to be treated first.

P1-N2: "It turns out that there’s a range of those patterns and each one of them responds better to a particular treatment."

P1-N4: "That [QEEG test] will help me figure out the severity of it [ADHD issue of attention], it’ll help me figure out how I’m going to train the brain to shift that [to improve the ADHD symptoms]."

**Category 4.1.2: View of Non-Expert Group of the Use of NBT Tools** The core of this category is that the perceptions of the Non-Expert Group of NBT are that it is used to diagnose the behavioural presentation of ADHD. The perception of these participants is based on the fact that they have never used these tools in their practice. The analysis shows that the view of this group is that these tools are used to determine a diagnosis, as does DBC. These participants believe that other clinicians employ NBT devices to determine whether a person has ADHD symptoms. They also perceive these devices are used to substitute DBC.

P3-C&E3: “I believe that there are some doctors who are talking up SPECT scans and that these are a diagnostic tool. I know for a fact that they’re not. ADHD is diagnosed through clinical interviews [DBC], same way as depression and anxiety.”

P1-C3: "We haven’t got blood tests, brain scans, computerised reaction tests that will conclusively demonstrate that this person has ADHD."
Concept 4.2: IS Attributes of Trust and Cost and clinicians’ acceptance

The essence of this concept is that the perception of the use of IS-based tools in CDP and CIT is impacted by trust and cost. The majority of participants believe that NBT tools are not reliable and do not have enough research-based evidence supporting their use. The data shows that the cost and benefits of using IS-based tools are issues influencing the acceptance of IS.

Category 4.2.1: Trust

The foundation of this category consists of the majority of the participants’ perceptions of the role of trust in acceptance of IS-based tools. The analysis shows that trust attributes are perceived to be based on the efficiency, effectiveness and ethical considerations of the use of IS-based tools found in CDP and CIT. Most of participants expressed concerns about the efficiency and effectiveness of using these tools, and the lack of evidence-based research to support their use. Efficiency and effectiveness can impact the perceived acceptance of NBT, which relies on the current brain status of a person with ADHD. This issue with accuracy affects the perception of the reliability of QEEG. As an example of this, P3C&E5 argued that ADHD symptoms are ‘intermittent’, and that a qEEG test would not be able to show abnormal brain activities if the person with ADHD was in a normal brain status.

P3-C&E5: "Both of those [SPECT and QEEG] can be wrong if you catch it [ADHD] on a good day because symptoms are intermittent."

Both tools found in NBT (QEEG and T.O.V.A.) and CIT (Neurofeedback) were found in the interview data; however, both lack evidence-based research support, which therefore impacts the participants’ perception of the use and acceptance of IS. As an example of this, P1-C3 claims that the validity of SPECT in ADHD practice is not supported by evidence-based research.

P1-C3: "His [Dr Daniel Amen, American psychiatrist] approach [SPECT] is not validated by research... some of the stuff [SPECT/QEEG] that he promotes is not supported by the research evidence."
"That’s exactly what I believe, and I know for a fact that those working memory programs are not supported sufficiently by research."

There is no strong evidence supported by academic research that indicates CIT are effective on the core symptoms of ADHD, yet this tool is believed to be useful for other comorbid mental disorders, as perceived by most participants. Moreover, the perceived effectiveness of CIT is influenced by the limitation of only being able to target the minority of ADHDers. Most of the participants, except participants of P2-N, report that clinicians cannot rely on Neurofeedback because it does not work with the majority of ADHDers.

"Neurofeedback [type of CIT] therapy has not been shown to be effective to the core three areas—hyperactivity, impulsivity, and inattention."

Ethical considerations related to most of the participants’ perceptions of the use of CIT (AT for example), were found in the data to be based on concerns about crossing professional boundaries and breaches of privacy between clinicians and ADHDers. As an example, P3-C&E2 argues that using SMS in treatment delivery is not possible because she believes that SMS is only used for private and personal matters.

"I don’t use SMS with my clients because I’m not handing out my own phone number."

**Category 4.2.2: Cost** The core root of this category is that cost is seen by most participants to impact on the use of IS-based tools in the care process. This view relies on whether the benefits of using these tools can justify the cost. Some participants see the use of NBT and CIT as unnecessary and expensive for the individual with ADHD. The data shows that IS-based NBT costs the same as years of traditional treatment and is therefore not justifiable in the absence of evidence of effectiveness.

"It [NBT] can be done, but I think that this thing’s expensive and unnecessary."

"They [ADHDer] could spend that five thousand dollars that it would cost for a scan [NBT]—well that’s years of therapy if..."
they needed it, years of medication if they needed it, so it’s the cost-benefit ratio, there’s huge cost with minimal benefit.”

The lack of co-payments by health insurers in Australia that would subsidise the cost of providing treatment via CIT; for example, AT, is perceived as an issue that impacts the use of such tools by clinicians. As an example, P2-N2 argues that Medicare does not support therapy delivered via video conferencing, preferring and supporting face-to-face treatment only. P2-N2 mentions that he would feel encouraged to adopt video conferencing tools in the future if a new policy was developed that included these tools as a type of treatment delivery.

P2-N2: “The trouble is that Medicare will not pay for consultations over Skype [AT]. With Medicare to do that—if we can change Medicare on that issue that would be great.”

Theme 4 Summary

In summary, the analysis shows that the capability, trust, and cost attributes of IS-based tools can impact on clinicians’ acceptance of their use. The perception of these attributes is influenced by the clinician’s level of expertise, and the effectiveness and efficiency of the tools. A low level of expertise is characterised by less time spent in clinical practice and little knowledge of the use of these tools. High cost and a lack of research-based evidence impacts on the perceived effectiveness and efficiency of IS tools, and influences whether participants trust the use of them in their practice delivery. This theme has been found across the case studies and mentioned by most of the participants. In the next section, patients’ attributes, which are found in the data to impact on the successful use of CIT, will be introduced.

5.1.2 Theme 5: ADHDers’ attributes influencing IS acceptance

The data shows that ADHDers’ characteristics can impact the use of CIT (AT for example). This is because the successful use of these technologies relies on both the adequate cognitive skills and personality of the ADHDers. Analysis of the data shows that there is a re-
lation ship between these attributes, EF abilities, AT usability, and ADHDers’ use of CIT. These attributes are classified into two groups, which include EF ability and ADHDer personal attributes. The analysis shows that impaired EF ability influences the use of these tools by ADHDers, as illustrated in Figure 5.3.

ADHDer personal attributes are perceived to be those of gender, age, and behaviour. Participants believe that these attributes have the ability to influence the use of IS by ADHDers in the CIP.

**Concept 5.1: ADHDer Behaviour and IS**

The essence of this concept is that ADHDer characteristics, such as gender, age, and behaviour, as discussed in Section 4.2.1, can impact the use of IS-based treatments. Participants believe that adult females with ADHD have different attitudes towards using some of the treatments than males. Female ADHDers are more focused on self-improvement and will self-initiate. Some options of CIP, such as gamification, are perceived to only be useful for young adults up to
the age of 21. Participants believe that ADHDers have issues such as being reliant and seeking support from others for performance tasks; therefore, treatments that were developed to target children with ADHD may not be suitable for adults. This is because of the absence of the supervision and support element that these children receive.

**CATEGORY 5.1.1: ADHDER GENDER AND AGE DIFFERENCES**

The data shows that female ADHDers are more self-initiative, and focus more on self-improvement than male ADHDers. Online self-treatment is likely to be used by females with ADHD. Some participants believe that because females focus more on self-improvement and self-health they are more committed to self-treatment than males with ADHD. Male ADHDers are likely to engage more with interactive types of CIT, such as online or face-to-face group therapy, email, or other methods that involve interaction with others.

\[P1-C1: \text{“For online CBT... I also think you will probably get the females and not the males. Females tend to be more, just, they initiate more for self-improvement; they initiate more for self-health.”}\]

\[P1-C1: \text{“Males do really like groups if we can get them into them. So, if there is real life interaction involved in it. So, for example, a telephone call or feedback email or somebody at the other end, they do that really well.”}\]

Participants perceive that ADHDers are seen as dependent and they seek help and support from other people to perform tasks. ADHDers need more time to mature in all aspects of life. Some participants believe that treatments developed to target ADHD children may not be useful for university students with ADHD, as often the students are independent and not able to rely on others for help with performing or completing a task.

\[P3-C&E: \text{“The strategies that are around for kids don’t work for adults, because there is going to be a classroom teacher making sure the kids apply stuff. The adults have to do it on their own. . . without depending on other people.”}\]
Concept 5.2: EF ability attributes

This concept consists of participants’ views of EF ability attributes impacting the use of IS. The perceived EF ability attributes found in the data refer to the cognitive skills that an ADHDer requires to:
1) start, plan, organise;
2) sustain and retain attention;
3) maintain mood and emotions;
4) regulate and monitor behaviour in regards to the task;
5) recall and remember task-related information; and
6) regulate and monitor performance for successful execution of a given task. All of these attributes are perceived by participants to influence the use of CIT. Table refTbl5.1 lists the EF and related AT.

<table>
<thead>
<tr>
<th>EF Ability</th>
<th>AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM</td>
<td>online calendar or to-do-lists, clock-time, time management personal cloud storage service</td>
</tr>
<tr>
<td>ATT</td>
<td>Time alarms, Multiple alarm</td>
</tr>
<tr>
<td>EC</td>
<td>CBT</td>
</tr>
<tr>
<td>WM-f</td>
<td>Multiple alarm, cloud-based applications</td>
</tr>
<tr>
<td>SRM</td>
<td>Support and interaction with External Factors</td>
</tr>
</tbody>
</table>

Category 5.2.1: PM The core element of this category contains participants’ views of the use of AT to assist ADHDers with planning and management issues related to impaired EF, which includes poor organisational skills and difficulty prioritising and activating. Most of the participants perceive the role of AT to imitate the EF ability by providing a visualisation of time and information. The representation of time is made by using clock time pacing and a backward planning approach, which includes measuring the progress of tasks by using the predictable passage of clock time. For example, participants request their clients to calculate the travel time between places, or to make the starting time of any task earlier than the actual starting time.
P1-C2: “Maybe we have to help them put in, instead of aiming to get there at one thirty when they’re supposed to be, maybe we say to them, ‘Aim to get there at one fifteen’, because inevitably—they run late all the time.”

P1-C2: “It’ll say it takes you thirty-seven minutes approximately to get from home to uni [university], so then that information can be added into their schedule and we work backwards.”

P2-N3: “The other thing is that pacing is probably the most important tool. Where is the saturation point for learning, how long can you attend, is it seven minutes? Is it seventeen minutes? Is it twenty-seven minutes?”

The majority of participants believe that management and organisation issues relating to impaired EF ability can be assisted by using tools to externalise management skills, and visualising time to promote better organisation. These tools include To-Do lists, cloud-based file management systems, and attaching reminders to locations. Cloud storage services are helpful in improving management and organisation skills, as reported by the participants.

P1-C1: “Then there’s apps, like, to-do lists, and there’s ones that have avatars... and you get points for doing the things that you need to do.”

P1-C1: “I talk to people about how to get their world into more order,—like I said, they’re all over the darn place—so we scan stuff and we put it up to a cloud.”

P3-C&E3: “There are excellent task lists. I encourage them to use their smart phones really smartly to use reminders attached to locations.”

However, the analysis shows that the issues correlated with impairment of EF ability are perceived by participants to influence the use of AT by ADHDers. Some participants believe that because university students with ADHD are unable to organise tasks and have issues deciding which tasks or projects are more important, adopting AT is not going to be useful. The majority of ADHDers have difficulties with converting or breaking down processes into smaller tasks.

P1-C1: “You cannot kind of go ‘You are having trouble with planning so let’s teach you how to make a to-do-list’. It does not work, it
is not that easy because individuals with ADHD have trouble even prioritising what to put on a to-do list.”

**P3-C&E3:** “Nine times out of ten organisation, time management, and breaking jobs down into steps. Once they learn to plan on a piece of paper they learn to plan a time—I’ll encourage them to find a calendar.”

### CATEGORY 5.2.2: ATT

The central component of this category is that attention and focus issues related to ADHD can be helped by using AT. This includes providing a visual, physical and audible representation of time by using clocks, alarm systems, smart-phone reminders, and introducing multiple SMS. However, the use of tools is seen by some participants to be impacted on by the level of EF impairment affecting the ability to focus, sustain and retain attention.

This representation of time is seen by most participants to be useful in improving ADHDers’ issues with attention. Most of the participants believe that using tools that represent time visually or aurally; for example, multiple alarms, provides the opportunity for ADHDers to improve issues related to shifting and sustaining attention, as they can shift their attention from one task to another in a managed fashion. One of the participants who mentioned this was **P1-C1**, who claims that having two alarm systems can improve ADHDers’ EF ability to switch between tasks.

**P1-C1:** “Sometimes we put on timers for forty-five minutes, so then we have a forty-five-fifteen kind of work aspect. . . .so there’s this ability to shift between tasks.”

**P1-C3:** “So I suppose there’s just a simple reminder, or an app, or there’s a trigger to remember to do the thing. So that’s the key concern—remembering to remember.”

**P3-C&E4:** “I encourage them to use their phones as reminders, with alarms.”

However, the issue of difficulties with attention in EF-impaired ADHDers is seen by participants to impact the use of AT. This level of distractibility is perceived by participants to result in less productive
use of these AT, which impacts ADHDer performance in completing tasks using these tools.

\[P_{3-C&E}: \text{"But you have to be careful with these guys [ADHDer] because they will actually find apps for themselves, try them, and then try and fiddle with them... And it [task] never gets done because they’re trying to make it [the app] work."}\]

**Category 5.2.3: EC** The core component of this category is that the analysis shows that university students with ADHD have EF-related issues with emotional control. This is seen by the majority of participants to impact on how ADHDers interact with AT. Issues with emotion indicate high levels of frustration, and difficulty in regulating emotions and mood. The fear of feeling overwhelmed is also seen by participants to affect the use of these technologies. Some participants believe that ADHDers will often try to find a number of small tricks and methods to try to adapt to a new technology successfully. However, this type of behaviour might increase the sense of being overwhelmed by the number of tools that are being used, or will be used, to complete a task.

\[P_{3-C&E}: \text{"The more intelligent these guys [ADHDer] are, the more they will go and find all these little bits and pieces to try and make it work, and get overwhelmed with all these bits and pieces."}\]

\[P_{3-C&E}: \text{"So they would be frightened that embarking on another journey of planning is just going to be something else to beat themselves up with."}\]

**Category 5.2.4: WM-f** The core element of this category is that ADHDers have difficulty in recalling and holding information. Participants use AT as a method to visualise the information to represent WM-f ability and to support the deficit in WM-f. AT such as smartphones, the internet, and cloud-based applications, which are used to enhance the treatment of ADHD, are believed by participants to be beneficial as they have the ability to improve issues with WM-f.
Participants believe that IS-based treatment tools that present their content using only text are not suitable for these ADHD individuals, as the effectiveness of the tools in assisting WM-f is significantly reduced. Participants believe that treatment tools that are text heavy present issues that reduce the treatments’ accessibility. Participant P1C3 claimed that MoodGYM, which is an online CBT tool, is heavily text based making it unsuitable for patients with ADHD.

\[ P1-C2: \text{"I think technology is very, very good for ADHDer because with working memory problems you increase the size of working memory by having IT."} \]

Participants believe that IS-based treatment tools that present their content using only text are not suitable for these ADHD individuals, as the effectiveness of the tools in assisting WM-f is significantly reduced. Participants believe that treatment tools that are text heavy present issues that reduce the treatments’ accessibility. Participant P1C3 claimed that MoodGYM, which is an online CBT tool, is heavily text based making it unsuitable for patients with ADHD.

\[ P1-C2: \text{"My whole PhD was on presenting information in a way that promotes the efficiency of learning, and the whole thing was geared around reducing the impact on working memory. If they’re [ADHDers’] confronted with a huge amount of writing to do, that might not be their thing."} \]

\[ P1-C3: \text{"Some of them, like "MoodGYM", are so text heavy, and for someone with ADHD it’s like—it’s great content there, but I don’t know anyone with ADHD that’s finished it. So back to that accessibility part again."} \]

**CATEGORY 5.2.5: SRM** The foundation of this category is that ADHDers have issues with motivation, self-regulation and self-monitoring, all of which are related to EF impairment. Some participants perceived that using AT that are able to provide feedback or reward options, as well as having the ability to be presented in the form of text, graphic or sound, can improve issues related to SRM. The data analysis shows that creating rewards and positive feedback using AT can work as an externalised source of motivation. Participants perceived that using IS tools such as mobile apps, which provide users with motivational words or visualise task performance progress, encourages ADHDers to stay motivated.

\[ P3-C&E1: \text{"... one of my clients showed it to me and it said, ‘Procrastinate later’, and then the little you know how it says accept or deny on the buttons usually? One says, ‘Okay, I’m motivated’. The other button said, ‘Stop yelling at me.’ Okay, so} \]
some clients have been finding that that’s been very, very useful for them.”

P1-C1: “Habit Role Play Games—RPG. Right? RPG, yeah, it’s “Habit RPG” and what it is, you put in the habits that you want to develop, and you have this little avatar and you get points for, you know, kind of doing the things that you need to do. So if the person gets up, has their shower, and gets on the bus on time, they go into their Habit RPG [Assistive technology mobile app] and they say, ‘Yes I did it, yes I did it, yes I did it,’ and their avatar gains strength and stuff.”

Participants believe that feedback on task performance is seen as a useful tool to improve the lack of motivation issues in those with ADHD. Setting up a feedback approach that allows both psychologists and ADHDers to exchange information regarding task progress can improve issues associated with self-regulation that is impaired by ADHD.

P3-C&E1: “You can say, ‘Yeah, you’re on the right track,’ or ‘You’re completely missing the point.’ That can then motivate the behaviour much more readily, because they’re getting the feedback that they need, because they can’t judge it themselves.”

P3-C&E4: “On a good day, I say, ‘Okay let’s look at why it didn’t work and how we can jiggle it and make it work more effectively’. . . Whenever I’m giving feedback, I’m like, you’ll go through and I say, ‘You missed on this, you were great on that’.”

Feedback also acts as a support system that assists ADHDers to choose the suitable CIT to suit their requirements. This feedback is seen to improve the level of interaction with technology by encouraging ADHDers to choose and try specific assessments.

P3-C&E2: “I encourage them, basically, to find there’s all sorts of apps that could be relevant. . . meeting regularly by phone or in person to check in on how the actions they have undertaken to do have worked and whether they’re staying on track.”

5.1 Key Themes

This theme and its related set of concepts were mentioned by the majority of participants across the different case studies. They sum-
marised the views of participants concerning patients’ attributes that impact IS usability. These attributes include ADHDers’ characteristics of EF abilities and personality. The analysis shows that successful use of AT in ADHD treatment relies on healthy cognitive skills and technology features that match the personality of the ADHDer. The next section will outline participants’ perceptions of external factors that impact on IS use.

5.1.3 Theme 6: External Factors to ADHDer-IS relationship influencing the use of IS

The essence of this theme is that external factors to the ADHDer-IS relationship are found to facilitate the use of IS in CIT for ADHDers. This relationship is illustrated in Figure 5.4. These factors include an individual’s skills or the effect of medication. The data shows that individual skills are found in direct environments (home or education facilities, or on the internet) of the ADHDer. Skills such as technology literacy, communication, and ADHD awareness are perceived by participants to influence the use of IS by the ADHDer. Medication effects are also perceived by participants to influence ADHDer performance of given tasks.

Figure 5.4: External Factors influencing AT use
Concept 6.1: External Factors of Individuals to ADHDer-IS relationship

The core idea of this concept is that an individual’s skills can influence the CIP. Individuals and their skill and environment are listed in Table 5.2. These factors enhance the ADHDer care process. These environments include home, clinic, education environment, and virtual/online environments; and actors include clinicians, family members, educators, and online users. The analysis shows that supervision and support, and the level of awareness of these, influence the use of IS-based treatments. Participants perceived that although tertiary education provides IS-based treatment tools for ADHDers attending university, education systems and structures can negatively influence the use of these by ADHDers.

<table>
<thead>
<tr>
<th>Individual</th>
<th>Skills</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family/Friend</td>
<td>Communication</td>
<td>Home</td>
</tr>
<tr>
<td>Educator</td>
<td>Awareness</td>
<td>Education</td>
</tr>
<tr>
<td>Online User</td>
<td>Communication</td>
<td>The Internet</td>
</tr>
</tbody>
</table>

**Table 5.2: External factors enhancing the use of IS for ADHDer**

**Category 6.1.1: Family members support** This category consists of how family members are viewed as an external factor that influences ADHDers’ use of IS. Family member support is perceived by participants to impact on the effectiveness of the use of IS-based treatment. Parental support is a key factor in the treatment of children and adolescents with ADHD, and the absence of this support can be an issue for ADHDers.

Ps-C1: "Like, if you’re targeting university students, then it’s going to need to be scaled… some individuals, some eighteen year olds, this is their first opportunity to be looking after themselves. They
really still are adolescents. It needs to be scaled down, because there’s a big difference for an eighteen-year-old who’s for the first time driving to university, because mum’s always driven them to school.”

P1-C2: “Yeah, I think what you’re saying about when the parents drop away—that’s really tricky because now it’s up to them to get their assignments in on time. It’s up to them to get to places on time. It’s up to them to turn up to a lecture after they’ve had a big night out. And some people can do that, but if you have ADHD, it’s a lot harder.”

Some participants believe the support provided by a member of the ADHDer’s family can facilitate the adoption of technology in the treatment of ADHD. As an example, participant P3-C&E4 claimed that having someone who has knowledge and understanding of the use of technology has facilitated the use of IS-based treatment by an ADHD patient.

P3-C&E4: “A couple of people I’m thinking of—they’ve got partners who are very IT savvy and they’ve set up other systems in the home that kind of help them stay organised.”

**CATEGORY 6.1.2: EDUCATORS INTERACTION AND AWARENESS**

The core notion of this concept is that other human external factors, such as educators and online users in the environment of ADHDer, can influence the use of AT. Educators in tertiary educations are useful aids for ADHD students. Participants perceive that a good quality educator can improve issues with EF, which is found in the analysis to have a positive influence on the use of AT. Technology literacy and the awareness of ADHD are seen to influence the level of support and acceptance of ADHD students.

P1-C1: “Really good tutors often are the saviour for a lot of these university people because they’ll help them break the tasks down, keep them on track, ask for a draft of, you know, the first part of an assignment.”

P3-C&E1: “So the awareness and the acceptance of the fact that these kids are trying—these young adults are trying more than what the university realises.”
Participants believe that IS-based tools improve the performance of these students and provide better human interaction between students and education providers. This interaction is able to improve the level of motivation and behaviour of ADHD students.

_P3-C&E_: “IT interaction between lecturers and tutors and ADDers [ADHDer], where they can say, ‘Yeah, you’re on the right track,’ or, ‘You’re completely missing the point.’ That can then motivate the behaviour much more readily because they’re getting the feedback that they need because they can’t judge it themselves.”

However, the unstructured style of tertiary education is believed to be a huge challenge for ADHDers. Some participants perceive that issues with the structure of education in Australia is positively related to decreased levels of motivation in ADHDers and reduces the effectiveness of the use of IS-based tools.

_P1-C1_: “So... the whole kind of lecture format doesn’t work for them. Then they choose not to attend. ‘Oh, I can just listen to it online, or whatever.’ And so then they avoid going to the actual physical lecture and they miss out on a really important information experience.”

**CATEGORY 6.1.3: ONLINE USER** The central notion of this concept is that participants believe that online users in virtual environments of the ADHDer can influence the use of IS in treatment. The data shows that online users can provide support and better communication to empower ADHDers to use tools found in the care process (CIP). These tools include AT and IS-based CBT. Connected AT in the socio-technical systems approach has the ability to enhance the appeal of, and encourage the ADHDer to use, these tools. Participants see this enhancement as diminishing the sense of isolation and increasing the level of motivation among these individuals. Other available assessments, such as online CBTs, which are not socially connected, can increase the sense of isolation of the ADHDer.

_P1-C1_: "For an online CBT, I think you’re going to have to go with something that has been done for groups because you’re targeting the masses. Part of the group thing, though, is the normalisation of it, whereas if it’s online, you’re still an individual."
You’re still isolated. Nobody else has this stuff going on for them in their head.”

P1-C1: “We can get them into groups, or we can get them into a network, a system. Then all the people [ADHD people] that are talking on that chat actually have the same issues as them. It normalises stuff. Then they don’t feel so isolated; they’re more likely to continue.”

P1-C1: “If you could make it socially connected, that would even be more awesome, because I’d reckon there’d be that sort of thing of like, they’re excited to do it.”

Concept 6.1: External factor of Medication

The essence of this concept is the effect of medication on EF abilities, which can improve ADHDers’ use of AT. Most of the participants believe that stimulant medication is the only approach to effectively target the core behavioural presentation of ADHD. As a result of the analysis of these perceptions, the findings show that medication can act as an external factor that influences the use of AT by the ADHDer. Although all participants are not authorised to prescribe medication, they can use coaching or education approaches, in the form of medication adherence, to improve medication intake and management for ADHDers. Some education to improve medication adherence is in regard to its effect, how long it lasts and when is the best time for it to be taken. Most of the participants argue that medication has short-term effects and for the patient to be able to benefit from it, they should know when to take that medication.

P3-C&E: “She’s [a female ADHDer] finding it really good [getting her medication on time] because it’s helping her with her daily goal setting.”

The effect of medication is also believed to improve issues with EF abilities and improve ADHDer performance in given intervention tasks. The effect can also improve and facilitate the self-regulation of ADHDers and their interaction with tools; for example, AT. Some participants believe that improving medication adherence can help to improve the ADHDers’ ability to manage their time and to improve
attention. Issues with SRM are also believed to be improved with medication—some participants argue that some of their ADHDers report improved self-control and find themselves motivated.

*P3-C&E3:* “So there’s just more cognizance of active periods of medication and making sure you make the best use of those times.”

*P3-C&E4:* “It gives them more chance to consciously control and monitor their activity.”

### Theme 6 Summary

In this theme, the analysis shows that there are individuals who are found in the direct environment of ADHDers, such as family members, educators, and online users, that can enhance IS usability and accessibility for ADHDers. Some participants argued that the effect of medication can be used to improve several aspects of ADHDer behaviour and assist their use of AT. This theme and related concepts were found across the case studies and mentioned by the majority of participants.

### 5.2 Chapter Summary

In summary, this chapter outlined the themes that were raised by the participants regarding attributes and factors that impact on the use of IS. These attributes include clinicians and patient attributes, as shown in Table 5.3. The analysis shows that the acceptance by participants of IS-based tools in the diagnosis and treatment of ADHD is impacted by their experience of the capabilities of these tools.

Other attributes affecting the use of IS include whether the tools are effective and efficient; whether they have evidence-based research supporting their use; and whether they provide reliable information to assist in the care process. The majority of participants believe that EF abilities and ADHDer personality can impact the use of AT. This means that improving a deficit in EF abilities (PM for example) in an ADHDer is related to the successful use of IS. Participants perceive that successful use of IS can be enhanced by external factors such as family members or online users.
<table>
<thead>
<tr>
<th>Factors</th>
<th>Perceived Attributes</th>
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<tbody>
<tr>
<td>Clinician</td>
<td>Effectiveness, efficiency, reliability</td>
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<td></td>
<td>Knowledge of evidence-based research.</td>
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<td>Experience with use.</td>
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<td>Medication</td>
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Part IV

ENFOLDING LITERATURE AND REACHING CLOSURE

Here I will present the findings that answered the research questions (Chapter 4) and contribute to the discussion and literature comparison in Chapter 7. The last chapter (8) of this part will conclude my research.
In this chapter I present the outcome of the analysis that answered the main research and subsidiary questions posed in Chapter 3, which guided my research into psychologists’ perceptions of the use of IS in the treatment of university students with ADHD. This chapter contributes to the discussion and to the current literature comparison that I outline in Chapter 7. I collected the data using semi-structured interviews and analysed it using Grounded Theory lens analysis (Chapters 4 & 5). The six set of themes that emerged from the data assisted me in addressing my research questions.

In this section I will present the answers to those questions, obtained from this research, which contribute to the development of the theory of the e-multimodal framework.

6.1 Research Questions

The first step in answering my research questions was to collect data by conducting in-depth interviews of 12 psychologists (participants). Due to the nature of the questions (found in Chapter 3), I followed a qualitative research approach and adopted multiple case studies, a method developed by (Eisenhardt, 1989). Each psychologist was assigned to four case studies, which reflected their treatment preference approach. Each case study used an interview protocol with few differences. The data was analysed using Grounded Theory. Six sets of themes emerged from the interview data and were used in developing the theory of the e-multimodal framework. This framework outlines attributes and factors that need to be addressed to enable mental health providers to successfully use IS, which will lead to enhanced treatment of ADHD in university students.
In this section I introduce the answers to my research questions in relation to the theory developed by this study that was summarised in the previous section. The study sought to answer the following main research question:

What are clinicians’ perceptions of IS in regard to the treatment and support of university students with ADHD?

Analysis of the data shows that attributes related to ADHDers, psychologists (the participants), and IS are all seen to be related to the successful use of IS in the TCP. These processes are themes and concepts that emerged from the data, discussed Section 4.2.2, which consist of the tools and approach employed by participants in CDP and CIP. Participants see IS-based treatment to have a particular set of attributes when used in CIP for ADHDers. The data shows that the practical experience and knowledge attributes of psychologists are seen to be relevant to IS acceptance in the care process. Participants point out a different group of attributes of an ADHDer that influence the successful use of IS. Furthermore, the data shows that there a number of external factors (outside the psychologist-patient relationship) that determine the effectiveness of IS tools. These outcomes have revealed participants’ perceptions of university students with ADHD and the applicability of TCP tools, and generated information that identifies enabler and hindrance factors that need to be addressed in order to make better use of IS, which would result in better treatment. In the following sections I will answer the first subsidiary question by discussing the findings relevant to the participants’ perceptions of the treatment elements of ADHD.

6.1.1 Answer to subsidiary research question: What are the elements of treatment perceived by psychologists?

The element of diagnosis is perceived by participants to consist of using different tools and approaches to measure, evaluate and diagnose all attributes of an ADHDer, in order to gather information that will inform their diagnostic decision. The data shows that the CDP out-
lines the core of this element, which is perceived by participants as the initial step of the care process of an ADHDer. CDP is found in the data to involve different tools and resources; tools based on DBC or NBT, resources that can include individuals related to the ADHDer, and any medication intake by the ADHDer. The use of these different tools in this process raised some concerns from some participants.

Element of Diagnosis

The data shows that ADHD cannot be diagnosed by any single tool, in the opinion of the participants. The tools found in DBC are seen as the only method to diagnose ADHD, and are based on the behavioural presentation of ADHD symptoms listed in the DSM criteria. This approach relies on the subjective assumption of the disorder by a patient, their family and clinicians. Some participants argue that this approach is not sufficient to make an informed diagnosis of the disorder, and further evaluation and assessment is required to facilitate this process. This includes gathering data from a third party, such as a family member, and employing the neuropsychological assessments process. NBT is seen to involve screening for comorbidity and impaired cognitive skills [EF]. As mentioned previously, ADHD is perceived by participants to co-exist with other mental disorders, such as depression or anxiety, and it is important for psychologists to check for these to allow them to have a clear understanding of any underlying issues other than ADHD.

Tools found in NBT are used to gather data related to the severity of issues associated with ADHD. These tools include comorbidity tools, brain-mapping devices, and cognitive and intelligence-based tools. Comorbidity screening is done using tools such as check-lists, which can be completed online. All the tools of brain-mapping devices are IS-based, including QEEG, SPECT, and PET. Cognitive/Intelligence-Based Performance tools include tests such as an IQ test, educational achievement and memory test, Rey Osterrieth Complex Figure, T.O.V.A, and CPT. The data shows T.O.V.A. to be an IS-based tool.

However, the participants’ perceptions of the use of these tools differ from one case study protocol to another. For example, Neurofeed-
back Therapy protocol group (P2-N) argue that qEEG and T.O.V.A. are important and are always used to help them with the diagnosis. CBT protocol group (P1-C) perceive the use of these tools as unnecessary and expensive. All groups agreed there are IS-based tools available that can help diagnose ADHD. CPT is found to be used across all the groups. Website and email are used to gather data from ADHDers’ parents, schools, or other health providers. Video conferencing over the internet is used in the diagnostic process, especially for clinical interviews. It is also used during treatment. The different perceptions of the applicability of these tools will be discussed in detail in Section 6.1.2.

**Element of Intervention**

The element of intervention is perceived by participants to consist of multiple approaches that focus on improving ADHDer attributes. The data reveals that participants see the use of this element as being to improve the skills ADHDers require to manage their behaviour and their ADHD symptoms. These approaches consist of a range of tools from the multimodal framework components; medication, therapy, and education and coaching, which are designed to help with symptoms management, medication adherence and knowledge. This element is addressed by the CIP of the care process outlined in Section 4.2.2.

The symptoms management approach is based on the therapy component of the e-multimodal framework, which targets the psychological impacts of AduADHD. Participants employ different IS-based tools targeting different ADHDer attributes; for example, AT, to support the neurobehavioural attributes. Some participants argue that tools such as CBT, WMT, and Neurofeedback are not capable of targeting the core symptoms of ADHD, and these tools are only useful for associated issues, such as improving issues related to EF abilities. Another element of intervention is medication adherence. The data shows that most of the participants believe that the only treatment that can target ADHD core symptoms and have an immediate effect is pharmacological (medication). It is seen as an important compo-
nent in improving self-control and monitoring issues associated with ADHD. The data also reveals that this approach is found to have the indirect impact of improving ADHDer use of IS treatment tools, which influenced my decision to redesign the e-multimodal framework. This impact is disused in Chapter 7.

**Education and Support**

The data shows that participants provide ADHD education and support to assist with the development of a new and supportive environment that can improve issues with AduADHD. This can be by improving the ADHDers’ personal skills and living situation, and improving the ADHD literacy of the people and community found in the direct environment of the ADHDer. Furthermore, the majority of participants believe that improving the diet of the ADHDer is related to improving ADHD symptoms.

In conclusion, the analysis shows that participants perceive three different elements in the treatment of ADHD: 1) The element of diagnosis, which is seen as a comprehensive process that employs different types of tools to screen for ADHDer attributes; 2) The element of intervention, which is based on the outcome of the diagnosis and involves developing a suitable intervention plan to improve ADHDer attributes; and 3) The element of education and support, which promotes a supportive environment to assist in implementing the intervention plan.

6.1.2 **Answer to subsidiary research question: How do clinicians perceive the applicability of currently available IS tools?**

The overall perception is that using IS as part of the treatment is beneficial for both clinician and ADHDer. The data shows that the currently available IS tools used in the treatment of AduADHD can be classified into two groups; diagnostic tools used by clinicians, and treatment tools that target the ADHDer. The data found that several tools are used by participants in the diagnostic process, including brain-mapping devices, and cognitive and intelligence-based tools.
The perception of the use of these tools varies across the case study groups. The practical acceptability of the role of these tools is influenced by their usefulness, which includes utility, and usability.

The data shows that participants who have never used brain-mapping devices perceive their use differently to participants who have. Care Process Tools (CPT) that target clinicians are found to be used either in the CDP or the CIP, and are adopted based on their perceived capability and usability. The perceptions of these two elements differed between the Expert Group (previous experience with devices) and Non-Expert Group (no previous experience with devices). The Expert Group believe the use of these tools is to assist with diagnosis and to improve treatment. The Non-Expert Group perceive they are used as a diagnostic tool to identify the core symptoms of AduADHD.

Another aspect of the practical acceptability of IS tools is the reliability of results and the cost of using them. Some participants argue that there is not enough evidence-based research to support the use of these tools, and the cost-benefit ratio of using them is unjustifiable. Most of the currently available IS tools that target the ADHDer are perceived by participants to be useful. They are used as assistive tools that externalise executive function, and include programs and devices such as online calendars, online management and planning tools, alarms, smart-phones and GPS. The participants believe that the functionality of such tools is able to improve issues in certain areas affected by ADHD. Multiple alarms, for instance, can be used to improve distraction issues and shifting attention. A calendar and online diary can be used to improve planning difficulties associated with ADHD.

However, participants believe that issues with EF can impact the effective use of these tools; for example, some participants argue that if an ADHDer has problems with planning and management, they will find it difficult to use time-management tools. This is because an ADHDer’s existing difficulties with converting or breaking down processes into smaller tasks will interfere with their ability to work
through the steps needed to implement IS-based time-management tools.

6.1.3 Answer to subsidiary research question: How could IS better support treatment of ADHD?

The data shows that to better support treatment of UniADHD the focus needs to be on the deficit of EF experienced by the ADHDer. The data shows that there are no tools that test EF. The literature shows that ADHD impacts on EF, and participants are required to measure this impact by observation, ADHDer history analysis or with neurological assessment tools. Observation is influenced by a psychologists’ experience, knowledge and cognitive skills. History-taking is lengthy and needs multiple parties to be involved. Neurological assessment tools that measure EF all are based on a clinical environment and can only be used in one place at a time. All these factors can impact on the treatment of ADHD.

The treatment of ADHD, whether IS is used or not, varies from one participant to another and from one ADHDer to another. Generally, the majority of participants agree that when it comes to the use of IS there is potential to improve the AduADHD attributes. Most of the tools are already available at low or no cost; however, finding these tools can be difficult and time consuming for clinicians, and overwhelming for the ADHDer.

Most of the participants say they usually ask their ADHDers to test different tools and provide them with feedback at the following visit, which they see as a waste of time and effort. As mentioned earlier, ADHDers have issues with commitment, motivation, following instruction, and completing a task. Without motivational factors the risk of this testing process failing is high. The time spent in choosing and evaluating tools makes this process a long and expensive one, and obtaining feedback at the following appointment adds extra cost to the actual treatment. Participants believe that face-to-face consultation time is better spent on improving the ADHDer’s issues with internal factors, rather than trying to find the best tools, a process
which relies on these factors. To address this issue, improving the levels of communication between clinicians and ADHDers, and providing better EF measurement tools that could be used in a variety of environments would definitely help. The results from the measurement tools would provide data showing the area of executive function that was affected the most and associated with the presentational issues of ADHD. Clinicians could then choose the best IS tool to support the treatment.

Some participants argue that choosing the appropriate IS-based treatment is based on the ADHDer attributes; however, none of the participants have a defined method of choosing the required ADHDer-related software. This is an issue as it can be time-consuming to explore and test different tools to fit the ADHDers’ requirements. To better support treatment using IS, clinicians should be provided with easy-to-access IS-based tools that can analyse the results of different data, such as ADHD presentation, EF, and ADHDer-related IS requirements. This would streamline the process of choosing and allocating the right AT tools to specific issues associated with ADHD.

Answer to subsidiary research question: What are the barrier and enabler factors influencing the adoption of IS?

6.1.4 Answer to subsidiary research question: What are the barrier and enabler factors influencing the adoption of IS?

The data shows that there are a number of barrier and enabler factors that influence the use of IS in the treatment of ADHD. As mentioned in Chapter 5, the findings show that there are two types of user profiles in the system, clinicians and ADHDers. Each of these profiles has factors that enable and hinder the use of IS in the treatment of ADHD. Improving clinical expertise and knowledge of the IS tools used in the treatment of ADHD were enablers included in the data. The introduction of a comprehensive healthcare policy that covered the use of IS as a treatment tool was also considered to be an enabling factor, as was the development of a guide to promote good practice and improve information exchange. According to the partic-
participants, the barriers that hinder their use of IS include the cost of IS treatment, the perceived capabilities of IS, and the perceived reliability and trust attached to the use of IS-based tools.

The enabling factors for ADHDers, as seen by the participants, would be to improve the impaired EF abilities required to undertake AT tasks, and to develop a systematic process to improve efficiency and effectiveness in choosing the correct technologies.

The data shows that factors inhibiting the use of IS by AduADHD are related to the inability to use such technologies due to impaired EF abilities.

6.2 CHAPTER SUMMARY

In this chapter I discussed the outcome of the data analysis, which addressed both the main research question and subsidiary questions. The data shows that there are three different sets of attributes; clinician, ADHDer, and IS attributes. These attributes need to be addressed to achieve the successful use of IS in ADHD treatment. I presented the findings that outlined the elements of treatment, which include diagnosis, intervention and creating a supportive environment. I described how knowledge and clinical experiences have an impact on how clinicians perceive the use of IS tools, and how AT is used to support ADHDer attributes. I also described how IS can improve ADHD treatment by reducing barrier factors such as impaired EF abilities of the ADHDer. In the next chapter, I will discuss my research outcomes and compare them with the current literature.
In Chapter 6, I described the outcomes of this research in terms of answers to both the research question and subsidiary questions. These questions were addressed and answered through the six themes that emerged from the interview data, which were presented in Figure 5.1. The themes were as follows:

**Theme 1**: AduADHD attributes, which consists of participants’ perceptions of the behavioural and neurodevelopmental attributes of university students with ADHD.

**Theme 2**: Tools of Care Process (TCP) employed by clinicians, which includes the tools and approaches used by participants in the diagnosis and treatment of ADHD.

**Theme 3**: Tools of CIP used for ADHDers, which outlines the tools Care Intervention and approaches used by participants in the treatment process of university students with ADHD.

**Theme 4**: Clinicians’ attributes influencing IS acceptance, which identifies the attributes of clinicians that can impact on IS acceptance, as perceived by the participants.

**Theme 5**: ADHDers’ attributes influencing IS acceptance, which describes the participants’ views of ADHD attributes that impact on IS usability.

**Theme 6**: External Factors to ADHDer-IS relationship influencing the use of IS, which includes factors outside of the ADHDer-IS relationship that can impact on the successful use of IS, as seen by the participants.

In this chapter, I will enfold the outcomes with the current literature, outline the significance of the findings, and put forward a number of
recommendations. For better readability, I have divided this chapter into five sections. In each section, I give a brief overview of the outcomes that emerged from the interview data and their relationship to the current literature, if any. These sections are as follows:

1. Clinicians’ perceptions of elements of treatment
2. Clinicians’ perceptions of IS applicability
3. Using IS for better support treatment of ADHD
4. External factors to ADHDer-IS relationship enabling and hindering the adoption of IS
5. The Inclusion of Medication in the “e-Multimodal Framework”

7.1 CLINICIANS’ PERCEPTION OF ELEMENTS OF TREATMENT

In this section I discuss the elements of ADHD treatment that have emerged from the analysis of the interview data and compare these to previous work in this area. The analysis of this research found that the elements of treatment for university students with ADHD, which I called the ‘Care Process’, consists of two processes that each group related concepts to form a theme: 1) The diagnostic process, which I labelled as ‘Care Development Process’ (CDP) in Section 4.2.2; and 2) Intervention/treatment, which I referred to as Care Intervention Process (CIP) in Section 4.2.2.

I discovered that the majority of participants seem to perceive CDP as an essential process that involves comprehensive evaluation and observation by the clinician concerned, and which generates data to facilitate their diagnostic decision regarding ADHD and issues associated with the disorder, such as impaired EF abilities. The outcome of this evaluation seems to contribute to the CIP. I found in my research that in order to generate quality data, clinicians employ different tools, which include: 1) diagnostic approaches and tools that are based on the ADHD behavioural presentation criteria listed in the DSM (DBC); 2) obtaining additional information from external factors to the clinician-ADHDer relationship; and 3) the use of NBT to
screen and examine other neurological conditions (Section 4.2.2). Although these tools were seen to be beneficial in diagnosing ADHD in adults, the findings also outlined some concerns with their use. These concerns included issues such as the reliability and validity of these tools.

Developing a care process for ADHD relies on a clinician’s knowledge of and experience with the use of technology in the diagnostics process, the depth of the evaluation process, the availability of third party input, DBC results, and the complexity of neuropsychological assessment (NBT).

These findings seem to echo what has been found in previous studies outlined in the literature review (Section 2.3.3).

7.1.1 Diagnosis as an element of treatment

This research found that the information used to make a diagnosis is generated by observation, which is a subjective measurement of the behavioural presentations of a patient with suspected ADHD, and by third parties who provide information concerning the history of the patient, which relies on the perceptions and memory capacity of the third parties. The data obtained from IS-based NBT relies on IS acceptance attributes. In this section I will discuss the findings related to the participants’ perceptions of DBC. Additional information on NBT is presented throughout Sections 7.2, 7.3, and 7.4.

The majority of participants believe that employing all the different tools found in DBC and NBT in the CDP (Section 4.2.2) is an essential step to collecting data that supports the effectiveness and efficiency of the diagnosis. These tools are used by clinicians to collect data that will help them to understand and examine the patients’ attributes of personality and EF ability. This assists in making an accurate diagnosis and assessment, and also provides clinicians with the appropriate tools and resources essential for developing a CIT. This was found to be consistent with the literature (Barkley et al., 2010; Okie, 2006; Young & Bramham, 2006) as discussed in Chapter 1.
The data revealed there are issues related to the use of DBC and NBT. The DBC-related issues are found to consist of views that question the capability of DSM to measure potential adult ADHD behavioural and gender-specific attributes in the DBC process. Some participants expressed the concerns that the DSM has never acknowledged that ADHD can persist into adulthood, and that the diagnostic criteria are based on childhood presentations of ADHD. These perceptions are found to be in contrast to the literature. Both DSM-IV and DSM-V indicate that ADHD can persist into adulthood yet do not allow for differences in the presentation, such as physical hyperactivity in children presenting as internal feelings of restlessness in adults (American Psychiatric Association, 1994, 2013).

The other issue related to DBC is its inability to diagnose ADHD in females, as DSM is based on male behavioural presentations of ADHD. This is outlined in Section 4.2.1. According to Stewart et al. (2006), female ADHDers are more likely to have the inattentive subtype ADHD where they display spacey and unorganised behaviour as opposed to the hyperactive behaviour shown by boys. This makes male ADHDers more likely to fit the DBC criteria than female ADHDers (Bruchmüller, Margraf, & Schneider, 2012).

However, there are no significant previous studies indicating these differences and issues concerning male and female ADHDer presentation and the DSM-IV (now DSM-V) criteria of diagnosis. The reason for the lack of strong fundamental evidence being found concerning the differences between female and male presentation of ADHD is that ADHD has been mostly studied in male adults.

"The lack of inclusion of the female gender in ADHD studies suggests that the potential for an under-diagnosis is great, as females have not been studied enough to determine the differences, if any, between genders within the disorder. It also illustrates a potential bias toward the male gender as males are more likely to be diagnosed and more likely to be studied." (Rizzo, 2016, p. 4)
The fact that DBC relies on the availability of an authorised, specialist AduADHD provider is an issue in the Australian healthcare system. The multimodal framework requires better accessibility and availability of clinicians to provide the best fit. Western Australia’s chief psychiatrist, Dr Rowan Davidson, argues that due to the lack of specialised clinicians’ availability and accessibility in his state, implementing the multimodal framework, which requires a multi-disciplinary approach, can be difficult (Buckmaster, 2004). In addition, this availability has impacted this research and limited the sample size of participants (discussed in Chapter 3).

Issues concerning the capability and reliability of DBC tools appear to be related to the availability of clinical practice guidelines, which should outline the use of these tools either online or in hard-copy. In general, clinical practice guidelines are important tools for employing clinical evidence in practice (May, Sibley, & Hunt, 2014).

The findings show that participants expressed concerns about the clinicians in Australia who make their diagnosis based solely on DBC, without exploring other attributes related to the patient or following the recommended process of diagnosis. In Australia, to date, there are no clinical practice guidelines regarding ADHD in adults. The absence of these guidelines is impacting negatively on the use of IS-based tools in the CDP. The only available clinical practice guidelines in Australia have been developed by the Australian National Health and Medical Research Council (National Health and Medical Research Council, 2012); Clinical Practice Points on the Diagnosis, Assessment and Management of ADHD in Children and Adolescents (CPP). There are a number of key points emphasising the issues with these guidelines that impact on their successful use by clinicians in the CDP. These points include:

1. CPP targets children and adolescents only (up to 18 years).

2. Although CPP is deemed valid for a period of five years from 3 September 2012, it may no longer reflect current evidence or best practice (DSM-V for example).
3. CPP dismisses alternative approaches, including Neurofeedback and dietary approaches.

7.2 CLINICIANS’ PERCEPTIONS OF IS APPLICABILITY

In this section, I will discuss the findings related to the applicability of currently available IS, and barriers and enablers that affect the use of IS. I will also compare these findings with the related literature. This research has shown that successful IS acceptance in the care process of ADHD is derived from the clinical expertise of participants (clinicians) in the use of currently available technology tools (listed in Table 4.2). There are a number of attributes, which facilitate IS acceptance, that need to be examined when considering how IS can be better used by ADHDers and clinicians. This will be discussed in the following section.

7.2.1 AT applicability in ADHDer use

This research has shown that the majority of participants perceive currently available AT to be beneficial. These tools are used to support the deficit in EF abilities associated with ADHD. These views are found to be consistent with previous literature outlined in Chapter 1.

As outlined in Section 4.2.1, the majority of participants believe that ADHDer attributes include ADHDer behaviours and neurobehavioural impairment of EF abilities. These attributes are symptoms of and related to the disorder as discussed in the literature review in Chapter 1. The behavioural presentations include hyperactivity, impulsivity and inattention. The impaired EF abilities associated with ADHD are also considered to be attributes of AduADHD. This is consistent with the literature. Both sets of attributes of ADHDer life are outlined in the literature review, Chapter 2.

The successful use of AT relies on improving ADHDer attributes associated with EF abilities. The participants’ perceptions of the applicability of AT is influenced by whether the AT is designed to improve
the specific EF impairment of the ADHDer. Other attributes of ADHD, such as age and gender, are perceived by participants to impact on the use of IS. The perceptions of the importance of matching AT to EF ability seem to match the framework of Task-Technology FIT (TTF), developed by (Goodhue & Thompson, 1995), who argue that for successful use of AT, the capabilities of AT must match the task that the user must perform.

ADHDer attributes related to the EF abilities of PM, AT and SRM seem to hinder the usability of AT. Some participants argue that the successful use of AT depends on the ADHDer possessing a high level of organisation skills and self-regulation aspects, and a low level of distractibility from technology tools. This is significant as ADHDers often have issues with organisation skills and have low levels of self-regulation, as outlined in Section 4.2.1. To give an example, the participants perceived that if ADHDers do not have the knowledge or the EF ability of planning and management to be able to prioritise and break down tasks into smaller processes, the AT usability that externalises these skills will not meet their purposes.

The intervention that is used by most participants to improve the use of IS, is to provide the cognitive-skill coaching and training needed to improve the impairment before introducing AT. This enabler factor action is often delivered on the basis of a face-to-face or paper-based delivery approach. Most participants argue that treating these issues associated with the impairment of EF abilities by using paper-based tools is related to the successful use of IS assessment, as discussed in Section 5.1.1.

These findings are consistent with the literature. Roper (2007) conducted a study on online learning and students’ skills, yet the mental health of these students was not indicated in the study. This study showed that the successful use of online learning in general is based on the students’ ability to organise themselves. However, university students with ADHD have lower self-regulation in regard to using learning technologies in comparison with students without disabilities (Parker & Banerjee, 2007).
Other factors that hinder the use of AT are the ADHDer attributes of age and gender. The findings show that male and female ADHDers tend to interact differently with AT. On one hand, female ADHDers are perceived by most participants to be more self-initiating and to take more responsibility for self-improvement and self-health, including the use of online-based treatment, than male ADHDers. On the other hand, male ADHDers prefer more interactive technology such as group therapy, SMS or email. This finding has not previously been described.

At the current time I have not been able to find any previous research or studies outlining the relationship between ADHDer personality and the use of IS or technology interaction. However, what is known is that for more than a decade, researchers did explore the influence of different personality and gender on IS interaction (Amichai-Hamburger, Wainapel, & Fox, 2002; Hamburger & Ben-Artzi, 2000; Özbek, Alnıaçık, Koc, Akkılıç, & Kaş, 2014). These studies indicate that individuals with emotion cluster dysfunction tend to use social media more. Hamburger and Ben-Artzi (2000) argue that females with this issue are more likely to use social media than men. In relation to ADHD, ADHDers with inattention presentation are associated with high levels of neuroticism (Knouse, Traeger, O’Cleirigh, & Safren, 2013; Valero et al., 2012). In contrast, there is no relationship between emotion cluster dysfunction and gender when it comes to the use of counselling services, either online based or traditional face-to-face, nor when using interactive methods (Tsan & Day, 2007).

Having just discussed AT applicability and its enablers and barriers in regard to ADHDers, I will now introduce IS applicability in regard to clinician use and the factors that enable and hinder this use.

7.2.2 IS applicability in clinician use

My research has found that clinicians’ attributes affect their use of IS-based tools. These attributes were found to be capability, cost of the tools, and trust. In this section I will introduce the findings in relationship to previous studies.
Clinicians’ knowledge and experiences of the practical accessibility of IS-based tools influence their use of these tools in the CDP. The majority of participants expressed concerns regarding the practical acceptability of the available IS-based NBT tools: QEEG, PET Scan, and T.O.V.A. Although these tools are perceived by participants as available technology tools that can be used in the diagnostic process, the perception of the practical accessibility of these tools differs between case study protocols and influences the use of IS.

For example, Neurofeedback participants argue that qEEG and T.O.V.A are important in aiding the diagnosis and are employed as a means of gathering more data to help them make an informed decision. This, in turn, assists them in developing a suitable treatment plan. On the other hand, the majority of CBT, and Coaching and Education participants perceive these tools to be unnecessary and expensive, and their only function is to be used in clinical examinations as diagnostic tools.

In the literature, the perceptions of the role of NBT tools is in contrast to what I found. Along with other sources of information, qEEG provides an objective measure that may help clinicians to distinguish between symptoms of ADHD, and assist in the diagnosis and development of the treatment (Cortese et al., 2016; Mazaheri et al., 2014). Previous studies show that there are changes in brainwaves when it comes to visual processing and motor planning. These changes can be used to identify the differences between ADHD subtypes; hyperactive/impulsive, inattentive, or combined in KidADHD. Lenartowicz and Loo (2014) argue that ADHD cannot be diagnosed by any available tools, nor do NBT tools have the ability to measure ADHD based on biological markers.

"As the past 75 years will show, finding a simple diagnostic measure for ADHD (i.e., behavioural, cognitive, etiological, neurophysiologic, or neurobiological) has not been possible and such a measure may not exist at all. Needless to say, we believe that EEG/ERP are not ready to serve as tools to diagnose, or aid in the diagnosis of, ADHD. Our caveat, based on review of current literature, is that this
conclusion is not specific to EEG/ERP but reflects a general problem of univariate measures or markers (biological or otherwise) being used to predict clinically heterogeneous disorders such as ADHD.’ (Lenartowicz & Loo, 2014, p. 1)

This research has shown that acceptance of CIP tools, such as CBT, WMT and Neurofeedback, is influenced by how clinicians’ perceive the usefulness and validity of these tools in targeting symptoms of ADHD. As an example, Neurofeedback is believed by P2-N participants to be beneficial in targeting the core ADHD symptoms; however, the other two groups (P1-C & P3-C&E) perceived that this tool is not useful, is not able to target the core symptoms of ADHD and does not change the structure of the brain as participants of P2-N contended.

The issue of these differing perceptions of the use of NBT would seem to be improved by better collaboration between clinicians in terms of the exchange of experience and knowledge. The data in this research supports this argument. As an example, participant P1-C2 has a different perception of qEEG tools to the other CBT participants, who all share similar perceptions. A possible explanation for this is that this participant works at a Neurofeedback clinic and often collaborates with Neurofeedback clinicians even though CBT is his/her mainstream approach.

These perceptions may be altered by improving technology literacy of the practical use of such tools, by improving access to information supported by evidence-based resources, or improving the level of communication and exchange of knowledge and experience between clinicians. This seems to be consistent with other research, which found that IS-based tools are seen as an essential element of translating research into practice, which in turn can promote clinicians communication, exchange of information and education to reduce the gap between issue and practice (Ortiz & Clancy, 2003).

The perceptions of the benefits of using Neurofeedback in ADHD treatment are in agreement with the literature already outlined in the literature review (Chapter 1). However, this study has been unable to
find controlled Neurofeedback studies other than studies conducted on children with ADHD. According to Cortese et al. (2016), the results of Neurofeedback studies targeting children cannot be applied to adults, as the measurement of qEEG in children, which is the basis for Neurofeedback, is different to that of adults due to the maturation development process.

Another issue found in the data to impact on IS acceptance is the high cost of using IS-based tools compared with the cost of face-to-face treatment. Using NBT during the care process of diagnosis (T.O.V.A., for example), or treatment (Skyping, for example), is costly in comparison with traditional practice, as discussed in Chapter 5. The issues seem to match the literature I have reviewed previously in Section 2.2.2, and can impact on the role of IS and the adoption of IS-based tools.

However, this situation would be improved by the introduction of health policy that encouraged the use of IS in ADHDer treatment. According to Leeuw, Clavier, and Breton (2014) health policy leads intervention development and implementation, clinical practice guidelines, and health cover policy. Developing a comprehensive health policy that subsidised the cost of IS-based tools (Medicare co-payments, for example), would improve technology accessibility for patients and clinicians (Ferri, 2015).

7.3 USING IS FOR BETTER SUPPORT TREATMENT OF ADHD

My research has found that the CIP approach for ADHDers focuses on their EF abilities and choosing the right AT that has the capability to represent one or more of these abilities. It is interesting to note that none of the participants use a systematic process to evaluate ADHDer personality and EF abilities to identify better AT choice.

The analysis shows that participants employ AT to aid the impaired EF abilities of the ADHDer. These types of tools provide multiple utility with low or no cost to the ADHDer or clinician, as discussed in Chapter 2. Surprisingly, this research found the issues seem not to be with AT usability or functionality, as was the case with impaired EF
abilities that I mentioned early in this chapter. Rather, the process of finding the most suitable AT that matches the ADHDer attributes and needs seems to be hindered by the fact that it’s very time consuming. In reviewing the literature, no study was found on the association between EF measurement and AT selection. A possible explanation for this might be that most of the available theories or models of EF seem to be outdated and inaccurate.

This possibility supports previous research, according to McCloskey and Perkins (2012). They argue that it is possible to learn about an individual’s temperament and personality through an assessment of EF. However, the majority of currently available EF assessments outlined in Table 2.3 do not measure the emotion control of EF. Furthermore, Barkley (2012b), McCloskey and Perkins (2012) argue that most EF assessment tools are missing the emotion, belief, and feeling aspect, and they are mainly focused on cueing and directing perception, cognition, and action. There is a need for new IS-based EF assessments that will overcome the issues and barriers of the current EF assessments tools. Furthermore, McCloskey and Perkins (2012) state that to ensure successful use of technology it is important to collect, evaluate and analyse data concerning user requirements, to enable clinicians to choose the most suitable AT that won’t be affected by an individual’s disability.

7.4 EXTERNAL FACTORS TO ADHDER-IS RELATIONSHIP ENABLING AND HINDERING THE ADOPTION OF IS

These research findings outline that the external factors (external factors to clinician, ADHDer, IS, and care process relationships) are human (individuals who provide support and who are found in the direct environment of the ADHDer) and stimulant medication. In this section, I will present and enfold these external factors.

These external factors can remove barriers to the use of IS, which can lead to successful use of IS in ADHDer treatment. The data shows that the existences of these factors is most likely to improve the use of IS by an ADHDer; however, their absence does not necessarily mean
there is a high-risk of the treatment failing. According to Maheu, Pulier, Wilhelm, McMenamin, and Brown-Connolly (2004), AT used in a clinical environment also lacks this outside encouragement. This finding seems to build on the successful adoption of IS in healthcare. Ammenwerth et al. (2006) argue that such external factors are also defined as facilitator or intervention approaches, which can promote the successful use of IS in healthcare. In the next section, the effect of these external factors will be discussed.

This research has shown that external factors include individuals who are found in the direct environment of the ADHDer. These individuals include family members, educators, online users and health providers. The data in this study supports the argument that these external factors can assist with issues the ADHDer may have with EF ability and improve the usability attributes of technology.

This research has shown that individuals found in the home environment who offer good support and have technology literacy can improve the use of IS in ADHDer treatment. A supportive individual in the home; for example, a partner or friend, who is well-informed about the use of modern technology tools, can provide practical training on how a specific IS-based treatment technology tool is to be installed and used at home. This support by external factors acts as an intervention that can enhance ADHDers’ attributes of technology literacy.

The quality of information provided by a third party; for example, a family member, during the data gathering step of the diagnosis care process relies on the level of communication of that third party. However, relying on such an individual as a source of information can affect the use of IS in ADHDer treatment. Young and Bramham (2006) argue that clinicians often have to trust the memories of these individuals, which can be inaccurate or inadequate, when collecting data to inform a diagnosis.

An educator’s influence can provide special academic considerations (extra time, or peer-to-peer support) and technology tools (online support) that can improve the opportunity for effective use of IS. An educator’s interpersonal skills of awareness and communication
are believed to improve the relationship between an ADHDer, the care process and AT in an educational environment. This interaction can be impacted by the level of awareness of ADHD. The process of online communication enables the ADHDer to consider and pay attention to what information or requests have to be sent, which will have a positive impact on self-awareness, awareness of others and will increase the sense of self-control (Høybe, Johansen, & Tjørnhøj-Thomsen, 2008).

Online social connection will empower an ADHDer to adapt and use IS successfully in their treatment. The data in this research supports the contention that an ADHDer who interacts with other online users or online communities (social media) that share common needs, knowledge and experience, will empower the ADHDer by reducing their sense of isolation, improving self-confidence and self-awareness, and promoting a sense of belonging.

This is consistent with the literature, where Pennebaker and Seagal (1999) argue that communication and virtual interaction between users provides a channel of emotional relief and improves issues of loneliness. This interaction empowers users to share their experience, encourage each other, build trust and reduce stigma (Boniel-Nissim, 2010). However, this option of interaction may negatively impact on people with low social skills or who are isolated. Kim, LaRose, and Peng (2009) argue that these people might develop strong compulsive behaviour towards the use of technology tools, which would negatively impact on their life outcome.

Medication is seen as an external factor that can improve the use of IS; however, the data shows that it is important to educate an ADHDer about when to take medication. To gain the most from IS treatment, MA is required and the ADHDer must be educated about when the medication is best taken prior to treatment. If these two steps are not taken, medication is only of temporary benefit and has a short-lasting effect. Without coaching and education, which can improve low-level medication adherence and literacy, medication will not be as effective (Young & Sedgwick, 2015). However, taken at the right time medication may result in a desirable outcome, as higher dosages
appear to improve attention (ATT) at the expense of the other EF, which effects performance and productivity (Ilieva, Hook, & Farah, 2015; Spencer, Devilbiss, & Berridge, 2015). This result has influenced me to redesign the e-multimodal framework and to include medication as an external factor impacting the use of IS, which will be discussed next.

7.5 The inclusion of medication in the e-multimodal framework

As I stated in previous chapters, I found that the research question was better addressed and answered by redeveloping and redesigning the ‘e-multimodal framework’ using the themes that emerged from my research, as illustrated below in Figure 7.2. In this section I will discuss and explain the reasons for the initial exclusion of medication, I will outline the themes leading to its inclusion, and I will introduce the literature and medication into the e-multimodal framework.

7.5.1 Reasons for initial exclusion of medication

During the early stages of investigating and developing an IS-based treatment and management framework for university students with ADHD, and after the reviewing the current literature, I decided to exclude the medication component for three main reasons. Firstly, I could not see any role for IS in the medication component. The benefit of using IS with medication is derived from a medication management approach, such as medication adherence, knowledge, and decision making. This approach is part of the coaching and education attributes, also known as medication management (“Self-management education: history, definition, outcomes, and mechanisms”, 2003; Zeng, Sun, Gary, Li, & Liu, 2014).

Secondly, the participants, who were psychologists, are not authorised to prescribe medication, as discussed in Chapter 4. Only authorised practitioners; for example, psychiatrists, neurologists, respi-
ratory and sleep physicians, and palliative care physicians who are authorised by the government health department in the state or territory where they practise, can prescribe psychostimulant medications for university students with ADHD.

Finally, I do not have the knowledge, the education, or the authority to explore, debate or investigate the medical benefits or the side-effects of medication. These fall outside of the research objectives.

7.5.2 Themes leading to the inclusion of medication in the e-multimodal framework

This research objective was to investigate the direct relationship between IS and each of the non-pharmacological therapies, and discover how IS can deliver, transform, or/and enhance these therapies. The reasons above explain my decision to exclude the medication component. I believed that IS was less useful in terms of the medication component of the multimodal framework (Binhadyan & Davey, 2016). Figure 7.1 illustrates the initial e-multimodal framework. However, in contrast to my view that there was no role for IS in the medication component, the themes that emerged from the research included the benefits of medication for ADHDer use of IS. The analysis of the relationship between concepts and categories, combined with the participants’ perception of the effect of medication on their treatment approaches, and examined in terms of the relationship between an
ADHDer, a given process and the use of AT (Figure 7.2), shows that medication can impact on the successful use of IS.

Figure 7.2: Themes and their relationships shown visually

7.5.3 Literature and medication in the e-multimodal framework

The effect of medications that can improve the core symptoms of ADHD, and improve other issues associated with ADHD, can be identified as an additional factor that has a direct impact on improving impaired EF abilities, as outlined in Chapters 4 and 5, and can influence the use of IS. As an example, some participants argue that medication can improve the issues of motivation or behaviour associated with ADHD. By improving issues, such as ATT or SRM, the usability of technology is improved. This is consistent with the literature,
which states that the only currently available treatment that targets core symptoms of ADHD is medication (Barkley, 2012b; Barkley & Benton, 2010). Barkley (2012b) argues that the only existing approach and treatment that has the potential to improve the core symptoms of ADHD is medication, which improves the neural substrates in the PFC that are associated with ADHD. Recent studies show a relationship between stimulant medications and EF enhancements in general adults, and better therapy in university students with ADHD (Cherkasova et al., 2016; Ilieva et al., 2015; Spencer et al., 2015; Volkow et al., 2010).

In two meta-analysis studies of clinical trials of stimulant medication, Ilieva et al. (2015), Spencer et al. (2015) indicated that small dosages of stimulant medication improved several EF such as memory (recalling and storing information), effort, and some aspects of attention (shifting and selective attention) in healthy people. The level of motivation and cognition in an ADHDer to perform a task was improved with the accurate dosage of medication intake (Bidwell, McClernon, & Kollins, 2011).

In conclusion, the multimodal framework and the correct use of medication can together facilitate the provision of better treatment for ADHDers. Using the coaching or educating component to improve ADHDer medication adherence and knowledge of outcomes of medication may improve the relationship between an ADHDer, a
7.6 Chapter Summary

In this Chapter, I discussed and enfolded my research outcome that answered the research questions. This chapter was divided into 5 sections, each of which addressed one or more of the emergent themes and subsidiary research questions.

In Section 7.1, I discussed the treatment elements perceived by participants. I pointed out the benefits of using the multiple diagnosis tools found in the CDP process (either paper-based or IS-based tools). This process includes the use of DBC, NBT, and the additional information that can be obtained from other individuals, who are beyond the clinician-patient relationship, that helps to inform the diagnostic decision. However, some participants expressed a number of concerns regarding the use of tools found in DBC and NBT. These concerns are related to clinicians’ attributes that affect their use of these tools, which were found to be perceived capability, cost of the tools and trust. The DBC concerns were found to be in contrast with the literature and the lack of Australian clinical practice guidelines were found to be linked to these concerns.

In Section 7.2, I showed the findings regarding the clinicians’ perceptions of the applicability of the available IS-based tools. The data shows that the perceptions of the use of IS-based tools by clinicians varied among the participants. The use of IS is impacted by a clinician’s attributes regarding knowledge of and experience with the use of such tools. In terms of AT use to aid an ADHDer with a deficit of EF abilities, the data shows that successful use of AT relies on improving these EF abilities. This finding has not previously been discussed in any literature.

In Section 7.3, I discussed the findings in regard to the CIP approach for ADHDers, which focuses on EF abilities. I showed how
participants view choosing appropriate AT that has the capability to represent one or more of these abilities. What I found is that none of the participants use a systematic process of evaluating ADHDer attributes in order to make a better AT choice. This also has not been found in previous studies.

In Section 7.4, I introduced the external factors to the ADHDer-IS relationship. It outlined how these external factors can influence this relationship and provide support, which can enable successful use of IS by a university student with ADHD. This outcome was consistent with previous studies.

In Section 7.5, I explained the new findings concerning the effect of medication in enhancing the use of IS by an ADHDer. It showed that improving medication adherence, and educating the ADHDer about the best time to take medication, can improve the effect of IS-based treatment on ADHDer attributes. This yields encouraging results for future studies.
This research sought to explore psychologists’ perceptions of the use of currently available IS for the treatment and management of university students with Attention Deficit Hyperactivity Disorder (ADHD) in Australia. I employed the multiple case study methodology developed by Eisenhardt (1989) and the data was obtained by employing in-depth interviews of psychologists.

Each psychologist was allocated to a case based on their declared treatment preference and each case used a slightly different interview protocol. The interviews sought extensive knowledge of the psychologists’ perceptions of the aspects of ADHD in adults, and of their practice, that relate to their potential use of IS tools.

Data was obtained from twelve psychologists in the form of semi-structured interviews. It was then analysed using the analytical process of Grounded Theory, which assisted in developing a set of six key themes as follows:

1. There is a set of behavioural and neurodevelopmental attributes of university students with ADHD that are seen as relevant to the use of IS tools;

2. Clinicians have perceptions of the nature of the Tools of Care Process (TCP), which includes the tools and approach used by participants in the treatment and diagnosis of ADHD;

3. Clinicians see a separate set of attributes of IS tools when considered as part of the Care Intervention Process;

4. There are attributes of Clinicians’ that influence IS acceptance;

5. Clinicians identify specific attributes of the adult ADHD patient that determine the relevance of IS tools for each individual; and
6. There are a number of external factors (outside the ADHDer-IS relationship) that determine the effectiveness of IS tools.

These emergent themes have been used to answer the research questions and for the development of a theory. The theory is an extension of the multimodal framework, called the e-multimodal framework, which includes the key attributes that need to be addressed for the successful use of IS in the treatment of university students with ADHD. In this section, I will provide the essence of this research, which is outlined by the six core themes that arose from the analysis of the data collected, and assists in answering the research questions. This will be followed by the implications and recommendations for practice and theory.

8.1 ESSENCE OF THE RESEARCH

The essence of this research is summarised in Figure 8.1 and described in the six main themes that emerged from the analysis of the interview data (Chapter 4 & Chapter 5). These themes encapsulate the views of participants about characteristics that define ADHDer neurobehavioural aspects and the elements of the care process of diagnosis and treatment. These themes include:

Theme 1: AduADHD attributes (number (1) in Figure 8.1)

Theme 2: Tools of Care Process (TCP) employed by clinicians (number (2) in Figure 8.1)

Theme 3: Tools of CIP used for ADHDers (number (3) in Figure 8.1)

Theme 4: Clinicians’ attributes influencing IS acceptance (number (4) in Figure 8.1)

Theme 5: ADHDers’ attributes influencing IS acceptance (number (5) in Figure 8.1)

Theme 6: External Factors to ADHDer-IS relationship influencing the use of IS (number (6) in Figure 8.1).
This set of themes, which form the basis of the theory developed by this research, offer answers to the main research question and its subsidiary questions. In the next section I present a summary of the main themes.

8.1.1 Main themes overview

The findings show that ADHD is a complex disorder that consists of two main sets of attributes; behavioural and neurobehavioural attributes, as shown by the dark-blue rectangle (1) in Figure 8.1. This disorder requires a multiple care processes that involves adopting different tools and processes to diagnosis and then treat. The diagnostic care process (CDP) that emerged from the data consists of two subprocess; DBC and NBT, both found in the light-blue rectangle (2a) in Figure 8.1.

The participants’ perceptions of the use of these tools indicate there are two types of tools that perform specific functions for two different
users—tools used by clinician, and tools used for the ADHDer. In Figure 8.1 the cyan rectangle at (3) shows that the tools in the CIP (2b) are used to assist the ADHDer. The black rectangle at (4) shows that the CDP (2a) contains tools that are used by the clinician. For the ADHDer profile, participants employ AT tools, encourage MA, and provide mental health education to improve everyday-life issues for the ADHDer; for example, impaired EF abilities as shown at (1b) in Figure 8.1. The data shows that impairment of an ADHDers’ EF impacts their behavioural, performance and interaction processes in daily life. The six themes that describe the participants’ perceptions will be briefly introduced next. These were discussed in Chapter 4 and Chapter 5.

Theme 1: ADHDer profiles are perceived by participants to consist of personality or neurological aspects, as outlined in Section 4.2.1. The data shows that participants believe ADHD presents differently between genders, and affects EF abilities. The analysis of these views shows that ADHDers display common neurobehavioural aspects of impaired issues with EF. EF abilities consist of PM, ATT, EC, WM-f, and SRM. This issue with EF abilities can impact on the affected individual’s ability to perform tasks and functions.

Theme 2: The data shows that ADHD can be diagnosed by subjective measurement of behaviour during the CDP, as discussed in Section 4.2.2. This theme therefore consists of participants’ views of the two main diagnostic processes that measure aspects of ADHDer attributes: 1) Evaluation and data gathering that relies on the ADHDer criteria listed in DSM, and information provided by a third party; for example, a family member, and 2) Neuropsychological assessments and examinations, employed by most participants, to investigate the underlying behaviour correlated with ADHD, such as EF impairment and other mental disorders. Tools that are used by clinicians to treat ADHD are believed by the majority of participants to impact on issues
associated with ADHD, but are not effective on the core symptoms of ADHD.

Theme 3: The essence of this theme is that ADHDers require multiple interventions that target the ADHDer profiles. These include providing AT to support and improve issues impacted by the disorder, and working to improve medication adherence, if needed, as most of the participants argue that medication can improve performance and boost the effects of intervention and treatment, as outlined in 4.2.3. This treatment approach is believed by participants to provide the ADHDer with the skills needed to manage their own symptoms—the self-management approach. The data shows that there are three different types of treatment; symptoms management, medication adherence strategies, and education and support.

Theme 4: This theme outlines the analysis outcomes in relation to how the attributes of clinicians influence the adoption of IS-based tools. These attributes include clinician expertise, IS capability, cost, and trust, as presented in Section 5.1.1. The data shows that clinician expertise is perceived to impact on the use of IS-based tools used in the care process. Participants who have practical experience with using IS-based tools; for example, qEEG or Neurofeedback, have different perceptions from participants who are aware of them, but do not have practical experience with using these tools in their process of diagnosis and treatment.

Theme 5: The data shows that successful use of IS-based tools; for example, AT, relies on the EF abilities of the ADHDer. The analysis shows that these abilities form attributes that are found to influence the use of AT by ADHD individuals. In order to improve this issue of usability, participants (clinicians) provide training and enhancement approaches to strengthen the specific EF impairment of these patients. More details are found in Section 5.1.2.
Theme 6: The findings show that external factors found in the different environments where ADHDers live and study have the ability to improve the use of IS in the treatment of ADHD. Individuals who are outside the relationship between the clinician and the ADHDer include family members with technology skills who live at home with the ADHDer, educators in the ADHDers university environment who are prepared to help with communication and offer support skills, and other online users. More detail are found in Section 5.1.3.

Having presented the essence of my research, I will introduce the research implications, which include my research contribution to theory and practice.

8.2 Research Implications

In the previous section, I summarised the six key themes that contributed to the development of the e-multimodal theory, which addressed the research question. In this section I will outline the contribution of my research to theory and practice. "The extended e-multimodal framework would guide research being conducted into EF assessment by including the themes 5.1.2 and 5.1.3 and their relationships that are new in the model."

8.2.1 Contribution to theory

My research has contributed to the theory and body of knowledge surrounding ADHD treatment by highlighting the importance of the use of IS in treating the mental health issues of university students with ADHD. More significantly, this research has assisted in developing the theory of the e-multimodal framework that would guide research being conducted into EF assessment by including Theme 5, ADHDers’ attributes influencing IS acceptance; and Theme 6, External Factors to ADHDer-IS relationship influencing the use of IS, which are new to the model. The emergent themes of this research
have identified two new, key aspects that have not been explored elsewhere regarding the use of IS in treating university students with ADHD. These are the impact of EF abilities on IS interaction, and the potentially positive effects of medication in improving this interaction.

In respect to mental health, my research reveals how a high level of deficit in the EF abilities of university students with ADHD can hinder the successful use of IS, and highlights the importance of addressing and improving these EF issues before implementing AT. I believe these findings are extremely important when exploring the relationship between the EF of individuals and successful use of IS, particularly as these concepts have not been explored using the new models of EF introduced by Barkley (2012b), Brown (2006), McCloskey and Perkins (2012). Current EF assessments are based on isolating a single aspect of EF abilities, which can be challenging, inaccurate and may dismiss or remove aspects of EF (Sparrow, 2008). My research has shown the importance of addressing the particular EF impairments that are hindering the successful use of IS in order to achieve improved outcomes for ADHD sufferers.

8.2.2 Contribution to practice

The outcomes of this research reveal aspects that need to be addressed in order to facilitate the successful use of IS in the mental health and education sectors. The findings show that the successful use of AT relies mainly on the adequate EF abilities of the ADHDer, not the usability or capability of IS. My research has gone a significant way towards enhancing our understanding of how psychologists perceive the use of IS in ADHD treatment. Their perception of its use is impacted by different attributes, such as health care policy, clinical practice guidelines, and their clinical experience of the use of IS. These attributes need to be considered by Australia e-mental health services targeting the ADHD population. I believe that the findings, supported with examples of the interviews, offer valuable information that should be examined. The emer-
gent themes, their related concepts and categories, and the theory subsequently developed provide a new perspective from which to examine the use of IS in ADHD treatment. By developing the e-multimodal framework, my research provides new insights into the mental health sector, for decision-makers in the healthcare sector and for business information systems.

I hope that my research will be instrumental in the process of removing the barriers that are preventing university students with ADHD from accessing better treatment. My findings make it clear that clinical practice in the area of ADHD treatment needs to be updated to include the current evidence-based practice. It should include a thorough understanding of the impact of impaired EF abilities on the effectiveness of IS-based treatment and also of the importance of medication adherence in this process. In addition, my research indicates the high level of importance attached to the development of health cover policies and clinical practice guidelines, which should cover a wide range of evidence-base supported tools, approaches and technological advances, by the relevant policy makers. I believe this will lead to an increase in the successful use of IS and the further development of its capabilities. A number of recommendations directed at policy makers have come from my research that would improve the use of IS in ADHD treatment. These include:

• Encouraging the adoption of IS that offers better opportunities for involvement by all individuals that have a direct interest in the ADHD care process;

• Developing and supporting information sharing opportunities between clinicians;

• Supporting further research into the development of e-mental health services; and

• Encouraging e-mental health service providers to target people with ADHD.
In turn, this should result in the provision of an improved and enhanced care process for ADHD individuals, and university students with ADHD in particular.

**8.3 Research Limitations**

My research involved exploring psychologists’ perceptions of the use of IS in the treatment of university student with ADHD in Australia. As I indicated earlier, there is a lack of ADHD mental health providers in Australia, a fact mentioned by some of the participants, which makes it difficult for those that exist to provide services for adults suffering from this disorder. As a consequence, it was extremely difficult to find participants willing to take part in this research. My original target was 15 or more participants, but I only managed to recruit 12, which in turn left me without a psychologist who provides (WMT) for university students with ADHD, either locally or nationally. This issue prevented me from exploring the use of IS from this treatment perceptive. However, the structure and the design of the case study protocols obtained a range of different views and provided a rich source of data regarding the general view of using IS with WMT.

The findings show that there are fundamental differences in the perceptions of using psychotherapy tools, both for the diagnosis and treatment of ADHD. These tools include T.O.V.A., QEEG, Neurofeedback theory, and CBT. These perceptions were presented as attributes impacting the use of IS. The benefits of using IS, and whether these tools deliver what is intended, is not within the scope of this research, nor do I possess the expertise or authorisation to evaluate the validity and utility of these tools. My research has focused on finding psychologists’ perceptions of the use of these tools. Nevertheless, this research may help to better identify the issues that will assist future researchers to provide clinicians with research-based evidence that may facilitate the successful use of IS.

This research did not explore the psychological mechanism of IS-based tools used by clinicians such as Neurofeedback, CBT, QEEG, and T.O.V.A. Neither did it explore nor investigate the psychology
perspectives [schools] that participants strongly believe in or follow; that is, Behaviourism, Biological, Cognitive or Integrated psychology. This limitation has not influenced the development of the theory nor the analysis of the data.

8.4 FUTURE RESEARCH

Based on the development of the e-multimodal framework, which outlines attributes that need to be addressed for the successful use of IS, a number of future research areas are suggested, including:

- Testing the theory through the development of a questionnaire to measure the attributes outlined in the e-multimodal framework and imposing it on a larger population of mental health providers.
- Deeper investigation of EF abilities, and IS usability and acceptance, from the perspective of clinicians and ADHD individuals.
- Further exploration of different perceptions of the use of IS in mental health, which can be done via the creation of focus group studies.

8.5 CONCLUSION

My research has explored how psychologists perceive the use of IS in the treatment of ADHD in university students. I followed a qualitative research approach and I adopted a multiple case study methodology. I collected data from psychologists in the form of semi-structured interviews, which were analysed using Grounded Theory. Six sets of themes emerged from the data, which contributed to the development of the e-multimodal framework. These themes reflected the perceptions of the psychologists regarding attributes that influence the current use of IS. These themes assisted in developing the theory of the e-multimodal framework, which outlines the attributes needed for the successful use of IS by university students with ADHD. My
research, as I indicated earlier, makes a number of contributions to the theory and practice of IS-based ADHD treatment for Adults, and recommends three areas for continued research.
Part V

APPENDIX
The blue rectangle represents the AdoADHD attributes, which includes Behavioural presentations and neurobehavioral impairment of EF abilities.

The light green rectangle consists of Tools found in the care process, CDP and CIP.

The light blue box represents CDP concepts which includes DBC and NBT which are outlined in orange colour.

grey rectangle includes illustrates CIP concepts and the related categories which are represented by smaller rounded rectangles that are outlined with different colour to indicate the relationship between the category and the process.

The dotted cyan rectangle outlines the CIT process used for ADHDer.

The dotted black rectangle outlines the TCP process employed by clinicians.

The dotted red rectangle represents the IS layer and its attributes.

The yellow dotted rounded box indicates the factors that provide the additional information used in the CDT process and provided in the CIP to educate and manage outcomes.

Circles illustrate participants’ perceptions of the use of each of the process in their practice. The different colours indicates which categories is the process Related.

The colours of the arrows do not indicate or represent any additional information, they are used to visualise the interaction and the relationships between the themes, concepts, categories and processes.

The red squire represents the IS attributes.
Protocol 1 of 4 – Therapy using Traditional method of Cognitive Behavioural Therapy (CBT)

Education, therapy, and coaching are methods to treat ADHD in adults. In this interview I would like to ask you about the use of CBT as a mainstream therapy to treat ADHD in adults. Therefore, the main theme questions will be focused on how you, as clinician, think ADHD in university students might be effectively treated CBT and where Information Technology is used or might be used to better the treatment.

1. Would you please introduce yourself with a brief summary of your professional background?
2. How do you define ADHD in adults, what is/are the common behaviour aspect/s adults with ADHD share?
3. How do you diagnose the disorder and do you use any technology devices to help you with the diagnoses, if yes– what? Please explain and if no– why not?
4. What is/are principle ADHD treatment/s that you use?
5. Have you used CBT in treating adults with ADHD?
   a. If yes, what are the common issues patients usually face with CBT?
   b. If no, what other techniques or methods have you used?
6. Have you treated university students with ADHD and assisted them throughout their studies, if yes, which approach did you use and if no, please explain?
7. Have you advised patients to use any technological tools (such as online calendar, SMS, email alarm), please explain?
8. What are the significant issues that adults (especially university students) with ADHD face?
9. If a person with ADHD who is unable to be treated with medication comes to your clinic, which approach would you take to manage his/her ADHD?
10. What impact do you think online CBT software/programmes would have in treating or managing ADHD?
11. Can you suggest any special features that such software should have?
12. Are you aware of any other IT programme(s) that are used for treating other mental disorders?
13. CBT is often a preferred method to treat and manage ADHD; however, can you please tell me about the benefits and disadvantages in your opinion of
   a. Neurofeedback Therapy?
   b. Working Memory training?
   c. Life coaching and education?
14. Do you see a role for IT in supporting life coaching and education?
Protocol 1 of 4 – Therapy using Traditional method of Cognitive Behavioural Therapy (CBT)

Education, therapy, and coaching are methods to treat ADHD in adults. In this interview I would like to ask you about the use of CBT as a mainstream therapy to treat ADHD in adults. Therefore, the main theme questions will be focused on how you, as clinician, think ADHD in university students might be effectively treated CBT and where Information Technology is used or might be used to better the treatment.

1. Would you please introduce yourself with a brief summary of your professional background?
2. How do you define ADHD in adults, what is/are the common behaviour aspect/s adults with ADHD share?
3. How do you diagnose the disorder and do you use any technology devices to help you with the diagnoses, if yes- what? Please explain and if no- why not?
4. What is/are principle ADHD treatment/s that you use?
5. Have you used CBT in treating adults with ADHD?
   a. If yes, what are the common issues patients usually face with CBT?
   b. If no, what other techniques or methods have you used?
6. Have you treated university students with ADHD and assisted them throughout their studies, if yes, which approach did you use and if no, please explain?
7. Have you advised patients to use any technological tools (such as online calendar, SMS, email alarm), please explain?
8. What are the significant issues that adults (especially university students) with ADHD face?
9. If a person with ADHD who is unable to be treated with medication comes to your clinic, which approach would you take to manage his/her ADHD?
10. What impact do you think online CBT software/programmes would have in treating or managing ADHD?
11. Can you suggest any special features that such software should have?
12. Are you aware of any other IT programme(s) that are used for treating other mental disorders?
13. CBT is often a preferred method to treat and manage ADHD; however, can you please tell me about the benefits and disadvantages in your opinion of
   a. Neurofeedback Therapy?
   b. Working Memory training?
   c. Life coaching and education?
14. Do you see a role for IT in supporting life coaching and education?
Protocol 2 of 4 – Therapy using Neurofeedback Therapy

Education, therapy and coaching are methods to treat ADHD in adults. In this interview I would like to ask you about the use of Neurofeedback therapy as a mainstream therapy to treat ADHD in adults. Therefore, the main theme questions will be focused on how you, as clinician, think ADHD in university student might be effectively treated using Neurofeedback and where Information Technology is used to better the treatment.

1. Would you please introduce yourself with a brief summary of your professional background?
2. How do you define ADHD in adults, what is/are the common behaviour aspect/s adults with ADHD share?
3. How do you diagnose the disorder and do you use any technology devices to help you with the diagnoses, if yes what please explain and if No why?
4. What is/are principle ADHD treatment/s that you use?
5. Have you used Neurofeedback Therapy in treating adults with ADHD?
   a. If yes, what is/are the common issue/s they usually face with Neurofeedback Therapy?
   i. What is/are the benefit/s of using Neurofeedback therapy?
   b. If no, what other technique or methods you have used?
6. Have you treated university students with ADHD and assisted them throughout their studies, if yes, please explain which approach did you use and if no, why?
7. Have you advised patients to use any technological tools (such as online calendar, SMS, email alarm), please explain?
8. What are the significant issues that adults (especially university students) with ADHD face?
9. If a person with ADHD who is unable to be treated with medication comes to your clinic, which approach will you take to manage his/her ADHD?
10. From my understanding of Neurofeedback Therapy devices are quite expensive and most of the treatment sessions are not covered by private healthcare insurance or the public healthcare system (Medicare). Do you think it is possible to replace these at a lower cost, for example developing a mobile app, please explain?
11. I realised that Neurofeedback Therapy is your preferred methods to treat and manage ADHD; however, can you please tell me about the benefits and disadvantages in your opinion of
   a. CBT?
   b. Working Memory training?
   c. Life coaching and education?
12. Do you see a role for IT in supporting Neurofeedback Therapy, and life coaching and education?
Protocol 3 of 4 – Therapy using Coaching and Education Technique

Education, therapy, and coaching are methods to treat ADHD in adults. In this interview I would like to ask you about the use of coaching and education technique therapy as a mainstream therapy to treat ADHD in adults. Therefore, the main theme questions will be focused on how you, as clinician, think ADHD in university student might be effectively treated using coaching and education and where Information Technology is used or might be used to better the treatment.

1. Would you please introduce yourself with a brief summary of your professional background?
2. How do you define ADHD in adults, what is/are the common behaviour aspect/s adults with ADHD share?
3. How do you diagnose the disorder and do you use any technology devices to help you with the diagnoses, if yes what please explain and if No why?
4. What is/are principle ADHD treatment/s that you use?
5. Have you used coaching or education technique/method in treating adults with ADHD?
   a. If yes, what is/are the common issue/s they usually face with coaching?
   b. If no, what other techniques or methods you have used?
6. Have you treated university students with ADHD and assisted them throughout their studies, if yes, please explain which approach did you use and if no, why?
7. Have you advised patients to use any technological tools (such as online calendar, SMS, email alarm), please explain?
8. What are the significant issues that adults (especially university students) with ADHD face?
9. If a person with ADHD who is unable to be treated with medication comes to your clinic, which approach will you take to manage his/her ADHD?
10. When you do coaching, which area you focus on to assist such students with their issues?
11. The more a person knows about her/his disorder the more their disorder can be managed, therefore
12. How do you keep your patients informed and educated by their mental illness?
13. How IT can facilitate or can be used in the delivery of this approach?
14. I realised that Coaching/Education is your preferred methods to treat and manage ADHD; however, can you please tell me about the benefits and disadvantages in your opinion of
   a. CBT?
   b. Working Memory training?
   c. Neurofeedback Therapy?
15. Do you see a role for IT in supporting CBT?
Education, therapy, and coaching are methods to treat ADHD in adults. In this interview I would like to ask you about the use of coaching and Working Memory training as a mainstream therapy to treat ADHD in adults. Therefore, the main theme questions will be focused on how you, as a clinician, think ADHD in university students might be effectively treated using Working Memory training and where Information Technology is used to better the treatment.

1. Would you please introduce yourself with a brief summary of your professional background?
2. How do you define ADHD in adults, what is/are the common behaviour aspect/s adults with ADHD share?
3. How do you diagnose the disorder and do you use any technology devices to help you with the diagnoses, if yes what please explain and if No why?
4. What is/are principle ADHD treatment/s that you use?
5. Have you used brain training such as working memory technique/method in treating adults with ADHD?
   a. If yes, what is/are the common issue/s they usually face with such a technique?
   b. If no, what other techniques or methods you have used?
6. Have you treated university students with ADHD and assisted them throughout their studies, if yes, please explain which approach did you use and if no, why?
7. Have you advised patients to use any technological tools (such as online calendar, SMS, email alarm), please explain?
8. What are the significant issues that adults (especially university students) with ADHD face?
9. If a person with ADHD who is unable to be treated with medication comes to your clinic, which approach will you take to manage his/her ADHD, please explain?
10. Will working memory training work in adults with ADHD, please explain?
11. I realised that brain training method is your preferred methods to treat and manage ADHD; however, can you please tell me about the benefits and disadvantages in your opinion of
   a. CBT?
   b. Neurofeedback Therapy?
   c. Life coaching and education?
12. Do you see a role for IT in supporting
   a. CBT;
   b. Life coaching and education?
PARTICIPANT INFORMATION STATEMENT – CLINICIANS

PARTICIPANT INFORMATION

Research Project Title: A Role for IT in mental health. An Investigation of the Benefit of Using IT in the Context of University Students with ADHD

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Dear ………,

You are invited to participate in a research project being conducted by RMIT University. Please read this sheet carefully and be confident that you understand its contents before deciding whether to participate. If you have any questions about the project, please ask one of the investigators.

Who is involved in this research project? Why is it being conducted?
PARTICIPANT INFORMATION STATEMENT
My name is Ben Hadyan, and I am a PhD candidate at RMIT University. My supervisors are Professor Nilmini Wickramasinghe, Dr Stasys Lukaitis, and Dr Bill Davey. I am currently preparing my PhD in the area of e-mental health, title as shown above.

Why have you been approached?

You have been chosen based because of your experience in treating and managing ADHD in adults.

What is the project about? What are the questions being addressed?

Technology has the capability to improve mental health services provided for students and other people with different mental illness. It has the potential to improve efficiency, accessibility and the opportunities for early intervention and treatment of for young adults, especially in treating young adults with ADHD. ADHD in young adults, especially university students, causes attention difficulties, and emotional instability which affects their life outcomes and results in underachievement. Treatment/managing ADHD symptoms in adults can include combinations of coaching/counselling, education, therapy, and medication.

The aim of this research is to investigate the use of IT in the treatment/management of university students with ADHD and also will seek the possibility to introduce IT into the traditional treatment context. Pharmaceutical treatment will not be examined or explored.

This research will not involve gathering information from patients; it will include collecting data from clinicians in the form of open ended questions in interviews.

If I agree to participate, what will I be required to do?

The interview will take about 45 minutes. You will be asked you about your professional background, your knowledge of ADHD and types of treatment used/practised in treating or managing ADHD in adults as well as your general experience these treatment. The benefits and the disadvantage in the use of technology in your current treatment method(s) will be explored.

What are the benefits associated with participation?

We do not expect there to be any direct benefit to you, if you take part. However, we hope the information we get from this project will help us to improve ADHD treatment/management delivery in the future. You do not have to answer any questions if you do not wish to do so. Please note no specific questions will be asked about individual patients.
What are the possible risks or disadvantages?

If you are unduly concerned about your responses to any of the questions items or if you find participation in the project distressing, you should contact Professor Nilmini Wickramasinghe as soon as convenient. Professor Wickramasinghe will discuss your concerns with you confidentially and suggest appropriate follow-up, if necessary. Her contact details are listed below.

What will happen to the information I provide?

Any information collected for this research project that can identify you will be treated as confidential. We can disclose the information only with your permission, except as required by law.

All information will be stored securely in the school of business information technology in RMIT University.

The following people may access information collected as part of this research project:

- The research team involved with this project
- The RMIT Human Research Ethics Committee

The information will be de-identified. This means that we will remove your name and give the information a special code number. Only the research team can match your name to your code number, if it is necessary to do so.

The information will be kept for 5 years. After this time, it will be securely destroyed.

What are my rights as a participant?

In accordance with the relevant Australian and/or Victorian privacy and other relevant laws, you have the right to access and correct the information we collect and store about you.

When we write or talk about the results of this project, information will be provided in such a way that you cannot be identified.

At the end of the project, we will send you a summary of the results upon written request. This will be of the whole group of participants.
Participation in this project is voluntary. You do not have to take part if you do not wish to. You can withdraw from the project at any time, without giving a reason. We will not use any of your information if you withdraw.

Whom should I contact if I have any questions?

We hope you will take part by completing the consent form and return the signed copy in the prepaid envelope provided. If you have any questions, or would like further information about this project, please feel free to contact any of the project team.

What other issues should I be aware of before deciding whether to participate?

There are no other issues you need to be aware of before deciding whether or not to participate.

Yours sincerely,

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CONSENT FORM FOR CLINICIANS

HREC Project Number:

Research Project Title: A Role for IT in mental health: An Investigation of the Benefit of Using IT in the Context of University Students with ADHD

Version Number: 1 Version Date: 02/05/2012

1. I have had the project explained to me, and I have read the information sheet
2. I agree to participate in the research project as described
3. I agree:
   a. to be interviewed
   b. that my voice will be audio recorded
4. I acknowledge that:
   a. I understand that my participation is voluntary and that I am free to withdraw from the project at any time and to withdraw any unprocessed data previously supplied (unless follow-up is needed for safety).
   b. The project is for the purpose of research. It may not be of direct benefit to me.
   c. The privacy of the personal information I provide will be safeguarded and only disclosed where I have consented to the disclosure or as required by law.
   d. The security of the research data will be protected during and after completion of the study. The data collected during the study may be published, and a report of the project outcomes will be provided to me upon written request. Any information which will identify me will not be used.
5. I understand I will receive a copy of Participant Information Letter and Consent Form.

Participant Name ___________________________ Participant Signature ___________________________ Date __________

I have supplied an Information Letter and Consent Form to the participant who has signed above, and believe that they understand the purpose, extent and possible risks of their involvement in this project.

Research Team Member Name ___________________________ Research Team Member Signature ___________________________ Date __________

Note: All parties signing the Consent Form must date their own signature.


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