COACHING IN A DIGITAL AGE:

CAN A WORKING ALLIANCE FORM BETWEEN COACHEE AND COACHING APP?

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Abstract

The field of coaching could be seen as a late entrant in appreciating the potential that technology can help to play in the delivery of successful outcomes for individuals seeking support. The advent of new digital communication modalities, alongside the development of artificial intelligence, particularly the advancement of natural language processing algorithms, provides the opportunity for technologists to work in partnership with the coaching field to develop new methods of delivering coaching services. The aim of this study was to investigate whether a working alliance can develop between coachee and an artificial agent, and through this agency deliver positive outcomes.

Research to date suggests that a good working alliance is a predictor of positive coaching outcomes. One coaching outcome which seems to be the focus of corporations at present is that of helping employees build self-resilience, which is seen as having a positive impact on an employee's ability to handle stressful situations. This research seeks to consider whether a working alliance can develop between an artificial agent employing coaching tools and a coachee. The 48 volunteers participated and were given access to WYSA, an AI-based mental well-being chatbot app ("coaching app") over an eight-week period. Participants' self-resilience and working alliance was tested, using known Working Alliance Inventory (WAI) (Horvath and Greenberg, 1989) and Self-Resilience (SR) (Naswall et al., 2015) measures, before and after the quasi-experiment, providing the quantitative data. Semi-structured qualitative interviews explored how the user's engaged with the app and also examined the concept of working alliance with the technology and whether they believed their self-resilience improved.

The results from the quantitative analysis, Wilcoxon signed rank test, showed that despite no statistical change in working alliance with the coaching app during the testing period, the majority (80%) of participants' self-resilience improved, with a large effect size ($r=.61$). In the results from the qualitative

thematic analysis of post quasi-experiment, expressions of hope, positivity and motivation were more frequently observed. The results from the convergence of quantitative and qualitative findings provided elements of coherence: that working alliance did not develop, yet without this agency, self-resilience did improve in the majority of participants.

The study suggests that digital technologies can provide specific support through coaching techniques and have the potential to democratise coaching. However, these forms of technology, using artificial intelligence, lack sufficient contextual responses to widely engage users, but arguably do provide an opportunity for coachees to experience specific skills coaching. In addition it could be an opportunity for coaches, through adoption of such technologies, to augment their coaching practices.

Keywords: Working alliance, coaching relationship, digital coaching, self-resilience, artificial intelligence, chatbots, mental health.

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Foreword

"**In the coming years** our relationships with robots will become ever more complex. But already a recurring pattern is emerging. No matter what your current job or your salary, you will progress through these Seven Stages of Robot Replacement, again and again:

- 1. A robot/computer cannot possibly do the tasks I do. ….. [Later.]
- 2. OK, it can do a lot of them, but it can't do everything I do. …..[Later.]
- 3. OK, it can do everything I do, except it needs me when it breaks down, which is often. …..[Later.]
- 4. OK, it operates flawlessly on routine stuff, but I need to train it for new tasks. ….. [Later.]
- 5. OK, it can have my old boring job, because it's obvious that was not a job that humans were meant to do. …..[Later.]
- 6. Wow, now that robots are doing my old job, my new job is much more fun and pays more! …..[Later.]
- 7. I am so glad a robot/computer cannot possibly do what I do now. **Repeat**

This is not a race against the machines. If we race against them, we lose. This is a race *with* the machines. You'll be paid in the future based on how well you work with robots. Ninety percent of your co-workers will be unseen machines. Most of what you do will not be possible without them. And there will be a blurry line between what you do and what they do. You might no longer think of it as a job, at least at first, because anything that seems like drudgery will be done by robots…They will let us focus on becoming more human than we were. Let the robots take the jobs and let them help us dream up new work that matters."

Kevin Kelly (kk.org) is editor of *Wired* and the author, most recently, of *What Technology Wants*

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Chapter 1 Introduction

1.1 Background

The notion that a robot can coach a human was, only until relatively recently, confined to the realms of futurologists and writers of science fiction. However, the dawning of the fourth Industrial Revolution is transforming the capacity of machines to influence, alter and direct human behaviours. Schwab (2016) considers that the technological revolution will be of such a profound nature that humankind will need to respond across all aspects of society.

Technology is an ever-advancing field, providing opportunities for computer scientists to design programs to alter human behaviour through sophisticated interventions. For example, Chatbots, powered by Artificial Intelligence, can be accessed via mobile smartphones, enabling users to experience a seemingly human conversation with an 'agent'.

Artificial intelligence (AI) has become synonymous for a wide variety of computer software innovations. Perhaps in part due to its evocative name and motivations of commercial enterprises to conjure a sense of increased capabilities of products. Further, according to Nascimento and Bellini (2018), public perception of AI is that it is a beneficial futuristic emerging technology, able to assimilate into multiple facets of human engagement. The use of natural language processing where a computer synthesises and analyses speech, has been adopted by customer service organisations in the form of chatbots, as a natural extension of the service offering.

This thesis will begin to explore whether machines have the ability to deliver coaching by "unlocking people's potential to maximise their performance [through] helping them to learn rather than teaching them" (Whitmore, 2002, p. 8) through digital machines. (Pelham, 2016) considers that the relationship between coach and coachee is at the heart of the coaching process and takes great pains in providing evidence to support his contention. However, he fails

to consider whether a number of coaching processes could be automated through AI mechanisms.

The definition of coaching continues to be debated. Passmore et al. (2013) attribute this lack of common definition to both the immaturity of the coaching field and the lack of a unifying professional body. Academics and practitioners do, however, appear to agree around the need to form a relationship between a coach and a coachee. Peltier (2010, p. xxxi) defined coaching as "the application of skills and methods used in a one-on-one relationship to help someone become a more effective manager". Hicks (2017, p. 206) stated that "coaching is a collaborative and egalitarian relationship between the coach and the coachee. Unlike an authoritative relationship, e.g. teacher and student, the coach and coachee are considered to be equal, but have different roles." Kilburg (2000) provided an alternate organisational perspective on coaching, yet he clearly stated the need for a relationship to improve the effectiveness of the client's organisation within a formal coaching agreement. The tone and extent of the bond formed between a client and a coach is debated in the literature and will be explored in this thesis.

Some suggest that an almost intuitive, human 'personal process' develops, where openness is important to the relationship (Whitworth et al., 1998), while others suggest a more structured analytical interaction where the coaching process is grounded in established therapeutic theories (Grant and Palmer, 2015), or a formulaic approach where the coaching process should be in the form of a contract between a professional coach and a management-level client (Lee, 2003).

Self-resilience can be viewed as a key defence mechanism to a stressful corporate life (Neenan, 2018; Davydov et al., 2010) and can be a preventative learned skill that can aid an individual's ability to confront life's challenges (Kottler, 2011). Self-resilience is a developable skill that can be considered as an individual's ability to bounce back from adversity (Turner, 2001). It is a

personal attribute that is developable through behavioural therapy (King and Rothstein, 2010).

Advancements in technology, applying human-to-human relationship theories are emerging as driving innovation in chatbot design. Coaching is widely considered to require the formation of a personalised relationship between a coach and a coachee (Bluckert, 2005; Ghods, 2009; Ole Michael et al., 2016; Walton, 2014; Alvey and Barclay, 2007). There appear to be no proponents that suggest that the relationship should be one that is on an algorithmic transactional basis or deemed as remote. A universal model of the coaching relationship has been suggested and given the term of Coaching Alliance (O'Broin and Palmer, 2010) and is arguably interchangeable with the term Working Alliance. Gessnitzer and Kauffeld (2015) researched working alliance in coaching relationships with thirty-one video-taped coaching dyads and found that client-initiated agreement on goals and tasks provided more successful outcomes. In particular, the concept of a working alliance (WA) is explored in this study as a related measurable determinate of positive coaching outcomes, where results support that engaged coachees, co-creating aspects of task and goal, appear to be integral to the coaching process. The notion of a working alliance is founded in psychotherapy and consists of three aspects, namely goals, tasks and bonds (Bordin, 1979). The current designs of chatbot coaching apps have been designed to mirror these three concepts with the majority of software programs establishing goals and tasks with their users on platforms that seek to create a bond with the technology; it would therefore be logical to examine the new technology through these conceptual lenses.

The coaching field has adopted technology as a casual bystander rather than an enthusiastic adopter. Berry et al. (2011) found that there was no research on the effect of distant digital communication modes on coaching and referred to the neighbouring field of psychotherapy for reference points. In addition to this finding, there have been a number of studies on the use of media and communication platforms, exploring the perceived impact on the bond

between a client and a coach (Averweg, 2010; Beun et al., 2017; Geissler et al., 2014; Rossett and Marino, 2005). The coaching field's apparently unenthusiastic approach to technology continues today. The literature review undertaken for this thesis revealed so few studies on coaching services delivered by technological methods, that it was deemed necessary to examine research papers in other professional disciplines.

Given the apparent benefits of the adoption, augmentation and delivery of coaching services through technological means, it is likely that the discipline will follow in the same path as that of the digitisation of behavioural health medicine. Arigo et al. (2019) argued that technology can be further leveraged to advance interventions to promote healthy behaviours and suggested that this would be best achieved through industry and academic partnerships. The authors suggested that there was a risk to the wider behavioural science community if it failed to keep pace with fast-paced emerging technological advances, and highlighted areas where some much-needed research was required. This thesis seeks to explore the role of this emerging technology and the place it could play in the field of coaching, specifically investigating whether computer-coaching software employing Artificial Intelligence and delivered via smartphones can further support and build junior managers' self-resilience (SR) in a corporate environment.

Despite the advent of artificial coaching agents being developed by technologists there appears very little empirical research on their efficacy or underlying coaching processes 'in play'. This thesis will address this issue with the aim to explore whether a working alliance, a key relationship component and predictor of positive outcomes, can develop between a coaching and artificial agent, and deliver successful outcomes.

1.2 The objectives

1. To critically review the literature relating to the use of automated behavioural change app technologies, in business coaching and

neighbouring fields, specifically in relation to the development of a working alliance and the achievement of a positive outcome, namely self-resilience in individuals

2. To analyse outcomes and perceptions of junior managers coached by an Artificial Intelligence coaching app exploring their:
    - relationship toward the coaching app through the prism of working alliance.
    - ability to enhance self-resilience through using this technology
3. To contribute to knowledge and understanding of app technology and its interaction with humans
    - In particular, whether an artificial social actor can influence and enhance a developable human behavioural capability.
    - Specifically relating to how an app interacts with a coachee, and in particular whether it can develop a working alliance with them.
    - In addition whether through that working alliance, the coachee can enhance their self-resilience within a corporate setting

It is hoped that this thesis will help stimulate further research on this emerging technology within the coaching field.

1.3 Broad statement of the inquiry

The context of self-help technologies provides an important backdrop to this study, where coaching apps appear well-suited. The computerised coaching models created by the app industry vary considerably in terms of theoretical underpinning in their digital architecture, but an initial overview of the available software identifies that a number do employ concepts and theoretical coaching models. However, according to Otte et al. (2014, p. 2) “there are too few theoretical models and published studies about computer-based coaching to derive general conclusions”. Similarly, in the neighbouring discipline of general health care and the use of smartphone apps, a study by Reynoldson et al. (2014) identified that the technology was of varying quality and that there was lack of healthcare professional input in their design. It could be argued that

entrepreneurs are merely fulfilling a consumer demand for technologies that help deliver personal change to their users, and in an attempt to satisfy the market, the technologists have developed the interfaces, computing codes and algorithms from varied sources. There are numerous websites and apps purporting to offer support, remote coaching and motivational statements, few though, can demonstrate the underlying academic mechanisms deployed. The need for the 'froth and hyperbole' to be removed from the marketing hype of the software products is clearly evident.

There are several psychological theories that will be referred to in this research in order to understand the basis on which the coaching relationships are formed and the relationships which may be supported by computerised technology. An influential study on addiction by Prochaska et al. (1992) led to the Transtheoretical Model (TTM). These researchers observed that people exhibited five progressive stages: pre-contemplation, contemplation, preparation, action and maintenance. These findings have been widely adopted by designers of computer-based cognitive behavioural therapy (Stieger et al., 2018; Provoost et al., 2017; Klein et al., 2013; Beun et al., 2017). Similarly, a process for planned behavioural changes is seen as an essential ingredient to the coaching contract between a facilitator and a participant.

The technological interfaces through which users receive and are given feedback will also be studied. Smartphones have become the hub of our daily lives. According to Ofcom (2018), 78% of the UK adults now have them in their pockets, an increase from 39% in 2012. Apps (software code) are available for a wide variety of purposes, ranging from games to life skills and from weather to personal health management. The choice in coaching and mentoring apps is narrow, but apps that have behavioural theory at their core is even narrower. The market provides a degree of assistance to those seeking life-coaching, with a bias to health and physical well-being, but for those wishing to have support in their business or career, the choice appears to be

minimal. If one seeks a business app that is theoretically based, the choice is even less.

The apps that do exist can be divided into two distinct classes: one being a simple portal where the user (coachee) connects with a coach, e.g. CoachMe and TCA; these apps have a number of podcasts and marketing pitches for additional offline services. The second type has greater functionality offering the user a degree of feedback, goal-setting and motivational messages triggered by user reports. The available apps for the latter are fewer in the market; WYSA is promoted as “an AI Life Coach that seeks to help individual’s build emotional resilience”; Remente is marketed as a life-coach app with some elements of coaching theory supporting its functionality. The vast majority of apps are simplistic in their construction and approach. There are, however, a number of apps being developed in the healthy lifestyle arena, such as Emate, which requires user interaction and response using validated psychological theories. Moreover, there are apps, such as Moodnotes, which have been developed to help employees’ mental well-being.

This inquiry has adopted a single app as the trial vehicle to allow a common user experience for the participants, allowing the study to focus on whether a working alliance between a coachee and coaching app develops. In addition, it seeks to understand whether there are parallels between the user and the app, when compared to a co-created relationship between a human coach and a coachee.

1.4 Problem formulation

A key motivation for formulating the study into coaching apps, is that the researcher hopes this thesis will be of interest to the worlds of commerce and academia. The study acknowledges that quantitative data is received with greater legitimacy than qualitative research within the field of business (Cassell *et al.*, 2006). Notwithstanding the researcher’s wish to address the two different epistemological continents (those alternative worldviews of

constructivist and positivistic) found in human behavioural and technological fields, the methodology chosen was the most appropriate to answer the study's research question. The researcher, being a pragmatist, is conscious that creating knowledge is central to the objective of research. Furthermore, it is hoped that the construction of the research method using dual-languages of mixed methods can help to highlight the opportunity for the coaching field to co-create with commercial app developers these forms of technology. That said, the qualitative aspect of the study will have equal prominence because of the use of a concurrent triangulation design (Creswell 2017, p392). The study also recognised that both research methods need to talk to each other. Belgrave et al. (2002) suggested an approach that explicitly ties methodological strategies to research goals and results, providing a thesis that should appeal to different audiences.

1.5 Research Setting

Positioning this thesis in the kaleidoscope of coaching applications is necessary in order to provide a narrower exploration ground of these self-help technologies. Some consider that the field of coaching is without boundaries and practised by those from a multitude of backgrounds (Grant and Zackon, 2004; Seligman, 2007). This, coupled with digital coaching being in its infancy, is arguably creating a new and potentially unregulated branch of the sector. The emerging technology of artificial intelligence is now being offered to the coaching market by entrepreneurs keen to sell products to corporate businesses that wish to support their employees. Recent advances in natural language processing, whereby computer programs process and analyse human language, have created platforms that enable interaction with artificial entities that can inform, persuade and develop individuals.

Coaching within the workplace has been defined as "a solution-focused, result orientated systematic process in which coach facilitates the enhancement of work performance and self-directed learning and personal growth of the coachee" (Grant, 2001, p. 8). In order to narrow the investigation from a broad

spectrum where coaching is applied in business, the study sought to look at pressing dilemmas faced by businesses.

Presently, a particular area of concern to employers is employee mental health. The Chartered Institute of Personnel and Development's (CIPD) yearly Absence Management report in 2016 identified stress as the second most common short-term reason for illness at work. The number of working days lost due to work-related stress, depression or anxiety in the UK 2017/2018 was 15.4 million (Executive, 2017). Not diminishing the human and social cost of this emotional condition, the expense to the economy is significant. There is clearly a commercial imperative that is motivating employers and software designers to develop solutions to help individuals. Pemberton (2015) suggested that building a client's resources through the creation of new narratives may provide self-supporting sustainable tools for stressful situations. Resilience is a personal developable skill, defined as a 'positive bounce-back reaction to either an adverse or a stressful event' (Luthans, 2002, p. 203). The researcher's literature review has found little to distinguish theoretical constructs between the workplace and everyday resilience. A meta-analysis using 42 independent samples across 37 studies found that resilience-building courses in the workplace provided mixed results (Vanhove *et al.*, 2016). It found that the approaches used at the workplace were similar to the interventions found in general well-being programmes.

This backdrop of heightened awareness by corporates for their employees' well-being has stimulated substantial investment by software developers in creating apps that attempt to deliver coaching outcomes. Significant challenges exist for developers as they strive to create an experience similar to the nuanced relationship between a coach and a coachee, attempting to ape the working alliance. Nonetheless, the prize of an affordable development tool that coaches users, helping them to build self-resilience is a captivating prospect for many organisations, including large corporates.

1.6 Definitions and description of terms used

This study focuses on interventions into human behavioural changes in the field of coaching through technology. As this is an emerging field, definitions and explanations of phrases, idioms and terms are being developed, crafted and re-crafted by the academia and the industry continuously. Furthermore, there appears to be no agreement among the coaching fraternity about the nomenclature of the core design elements, processes or idioms of the digital aspects of the coaching discipline. The following schedule is not intended to be exhaustive but gives a reference point for the reader for the principal terms used in this thesis.

1.6.1 E-coaching:

As the technology has advanced, so has the scope covered by the term e-coaching. Early definitions appear to originate from the concepts of email and electronic media of communication. Rossett and Marino (2005) considered e-coaches as practitioners who use digital platforms to connect with their coaches, conducting sessions through alternate communication media and using online resources to create flexible coaching programmes.

Clutterbuck (2010) considered e-coaching as part of the developmental relationship mediated through email and supplemented by varying digital platforms and media. This term is also used interchangeably with virtual coaching, distance coaching, online coaching and text coaching. Presently, e-coaching is presented as a medium through which virtual human-to-human coaching occurs using platforms such as Skype and Zoom as well as libraries of tools and techniques available for a coach and his/her coachees to access. Geissler *et al.* (2014) considered e-coaching to be a human-to-human coaching process mediated through modern media that replaces face-to-face communication by using a number of alternative technological modalities. They provided the taxonomy of four media: (1) audio communication (telephone), (2) video communication, (3) synchronous text-based communication and (4) asynchronous text-based communication. These communication modalities can be enriched with e-coaching tools such as text-based tools, pre-prepared pictures, videos and audio-documents, and virtual

reality platforms. However, this definition appears to be outdated as it relates to a human-to-human coaching process and neglects the possibility of either a triadic relationship, where a computer augments a human coach or AI replacing a human coach. In an attempt to future-proof a definition, the author proposes the following definition:

E-coaching is a human developmental process that uses technologies that augment a human coach or stimulate self-directed learning of the coachee solely through computerised methods.

1.6.2 E-coaching systems:

Kamphorst (2017) suggested that a definition should explicitly state the level of design these systems contain: 'E-coaching systems are a set of computerised components that constitutes an artificial entity that can observe, reason about, learn from and predict a user's behaviours, in context and over time, and that engages proactively in an on-going collaborative conversation with the user in order to aid planning and to promote effective goal striving through the use of persuasive techniques.' (p. 629). A shorter but more generalizable definition was proposed by Beun *et al.* (2017) who advocated that an e-coaching system consists of a digital agent that supports automated self-help therapies. This definition, however, could be considered too broad a description, as it fails to mention the collaborative conversational nature of coaching, although it is broad enough to assimilate future technological developments such as electroencephalography (an electrophysiological monitoring method to record electrical activity of the brain) or 'mind-reading' machines. The specificity and the broadness of the above-mentioned definitions can be considered to be too explicit to be future-proof or too general as to be vague. Therefore, the author proposes the following definition as a middle ground:

E-coaching systems are a framework of software architecture including AI tools that interact with users to help them achieve their goals by using the established behavioural change techniques.

1.6.3 Artificial Intelligence

According to Bughin et al. (2017) AI "covers a broad range of technologies and applications, some of which are merely extensions of earlier techniques and others that are wholly new. Also, there is no generally accepted theory of "intelligence," and the definition of machine "intelligence" changes as people become accustomed to previous advances." (p. 8).

The particular computational processes employed in coaching apps will be further discussed in chapter two; suffice to say at this juncture the sub-sets of AI employed are;

- **natural language processing,** the process of discourse between human user and artificial agent;
- **machine-learning** an algorithm (a set of computer instructions) which provides a prediction of responses that would be appropriate to users conversations;
- **deep learning** is a process where the architecture of a neural network creates a framework enabling the software to mine the raw data as the principal input and then establishing alternate methods for it to perform a required task.

1.6.4 Chatbot

Similarly, as with other terminology relating to developing technology, the language and definitions used are evolving, seemingly ever-changing as the machines advance in functionality. However, industry and academia consistently describe a chatbot as having a conversational component. Accordingly, the following definition is used:

A chatbot is a computer program designed to simulate conversation with human users, particularly over the Internet. (Oxford English Dictionary, 2019)

1.6.5 Algorithm

An algorithm is defined as a set of mathematical instructions or rules that, particularly if given to a computer, will help to calculate an answer to a problem. (Oxford English Dictionary, 2019)

1.6.6 Data mining

Data Mining is defined as the process of sorting through large datasets to identify patterns and establish relationships to solve problems through data analyses. Data mining tools allow enterprises to predict future trends and, in the case of coaching apps, provide responses to coachees. Data mining, and particularly text data mining, which uses natural language processing (NLP) algorithms, provides the technological advancement that can transform a conversational chatbot (Benedito Saura, 2018).

1.6.7 Application (App)

App is an abbreviation for application: A computer program or piece of software designed for a particular purpose and that can be downloaded onto a mobile phone or other mobile device. (Oxford English Dictionary, 2019)

1.7 Research, Design and Methodology

The section on research design and methodology debates the most apposite research methodology to investigate the coachees' experience of using the coaching apps. It adopted a mixed-methods approach synthesising quantitative and qualitative data in the prescribed method of convergence.

It considers paradigms to understand the coachees' view of the real and constructed worlds, arguing that a middle ground is appropriate to best answer the research questions. As Tashakkori and Teddlie (2009) rejected the paradigm debates, this thesis adopts a pragmatism paradigm focused "on what works as the truth"(p. 7). The chosen methodology for this study was mixed methods, using measured surveys together with the contextual understanding, through semi-structured interviews, provided a richness to the data, allowing for interpretation, contextualisation and measured outcomes. The subsequent convergence, while possibly problematic, enhanced the credibility of the results (Morgan, 2014).

To increase the reliability of the research, the coaching app was studied within a specific population, with similar education profiles and career progressions. The gatekeeper company operates in the banking sector. A sample for the quantitative data collection was stratified by age, gender and nationality. The total number of participants recruited for the study was 51.

Participants used an app over an eight-week period, after undergoing the initial acclimatisation with the technology in week -1. The research design consisted of two distinct elements. Firstly, a validated questionnaire to all the participants, testing the individuals' self-resilience and working alliance with the technology, administered at T1 (one week after the start) and at T2 (eight weeks later, i.e., one week after the finish). Secondly, in-depth interviews were undertaken with a number of junior managers, randomly selected from the study population, at T1 and T2.

The questionnaire design used a known scale to measure the impact of coaching on self-resilience (Naswall et al., 2015), and the working alliance formed with the coaching app (Horvath and Greenberg, 1989). The in-depth interviews were semi-structured and conducted either in person or remotely via a web video platform.

The analysis of the qualitative data adopted a six-phase approach as advocated and demonstrated through work by Braun et al. (2018). A Statistical Package for Social Sciences (SPSS) was used to aid the analysis. The final data analysis was the convergence of the quantitative and qualitative findings, following the tenets of Datta (2001).

1.8 General discussion of the literature

A desktop search for articles specifically on the use of technology in the coaching process provided few articles related to this study. Perhaps unsurprisingly, little research has been undertaken in this emergent field of digital coaching with human intervention. Web-based search engines, such as

Google Scholar, IEEE and Web of Science, were used, and the keywords searched included ‘coaching’, ‘relationship’, ‘technology’, ‘engagement’, ‘attitudes’ and ‘digital’. Phrases were constructed therefrom by combining, truncating and expanding these keywords. The words of ‘technology’ and ‘coaching relationship’ in the search phrase proved to be the trigger for improved matched results. A number of papers have been written on the adoption of technology in coaching but, to date, no article has been found that addresses the phenomenon of the experience of using a coaching app that uses the elements of AI.

The characteristics and the formation of a relationship between a coach and a coachee is also an area that has been under-researched (Baron and Morin, 2009). The exact term ‘coach / coachee relationship’, excluding medical publications, provided merely 36 positive results with the first recorded article published in 2013. Baron and Morin (2009), on finding little literature on the relationship between a coach and a coachee, decided to study evidence from the field of therapy. In contrast to the coaching field, the client-therapist working alliance has been subject to research over many decades through multiple treatment modalities (Bachelor, 2013). The lack of literature on digital coaching is therefore not surprising when the concept of the dyad relationship between a human coach and coachee, has yet to generate a comprehensive body of work and is overlaid onto the dynamic world of computer software applications.

The literature was explored using a number of lenses. Initially, the review explored the dyad between a coach and a coachee to determine the principal ingredients of the working relationship. A number of theoretical models were referred to in the examination of the bond between a client and a coach. To give further depth to the study, research from a neighbouring profession of psychoanalysis was reviewed with respect to the theory of the therapeutic alliance, also known as the working alliance. Bordin (1979) was studied, as it provided a conceptualised model of the therapeutic working alliance. His notion suggests that there are three elements of the relationship in a

psychotherapy dyad: tasks, goals and bonds. The nature of a bond is explored to afford measurable aspects of the relationship and further reviewed to explore suitable constructs in the study's research design.

The developable attribute of self-resilience will be explored. This section provides a context of self-resilience in the landscape of positive coaching outcomes, whilst appreciating that one the objectives was to explore the coaching app's ability to enhance the psychological skill of self-resilience. The literature will explore Self-Resilience as a developable attribute in the workplace, along with earlier studies into child development as the beginning of a theoretical construct.

Technology development in the field of the science of human intervention is fast-paced, and academics are continually challenged to provide evidence supporting innovations. It was found necessary to continually refer to the neighbouring fields of science and technology to find investigations into the phenomenon of a human-to-robot dyad. The literature review expanded its scope to include papers exploring the formation of human interactions and relationships with robots in areas of therapy, counselling, digital mental care and behavioural invention technologies.

It has been advocated that the working alliance or relationship found in therapy could be adapted and applied to the field of coaching (Joo, 2005). As a direct comparison, the working relationship between a therapist and a client is considered a prerequisite to eliciting trust (Bordin, 1979). The field of psychological therapy has invested heavily into computer-guided cognitive behavioural therapy (CCBT), where therapist and client contact is minimal, or none. The evidence that a good relationship between therapist and client improves outcomes is matched by the *impersonal* benefits of using CCBT. Consequently, the literature review also considered articles on motivation and behavioural change in the field of psychotherapy, particularly focusing on the relationship between a therapist and a client.

Finally, the literature was explored for developments in the science of human interactions with computers, and in particular, the issues of trust and how humans create bonds with technology were examined. The study revealed two notions of AI. One notion deals with strong AI, where designers consider it possible to duplicate a brain through a set of mechanistic formulaic instructions and in doing so, reveal the workings of the human mind. Key characteristics of this mimicking of the human brain include the capacity to make judgments, learn skills and knowledge, and even react appropriately to human emotions. In contrast, the proponents of weak AI consider that computer scientists will only achieve an illusory version of human intelligence. Duffy (2003) considered that weak AI is constructed on the illusion of computer intelligence being projected onto machines by users. This concept of anthropomorphism was explored in the context of how app developers use personification as a means of humanising computer-generated characters to help secure concepts of trust and other emotional connections.

1.9 Thesis Structure

1.9.1 Map of thesis

Figure 1.1provides a map to navigate this thesis, then a brief summary of each chapter is explained.

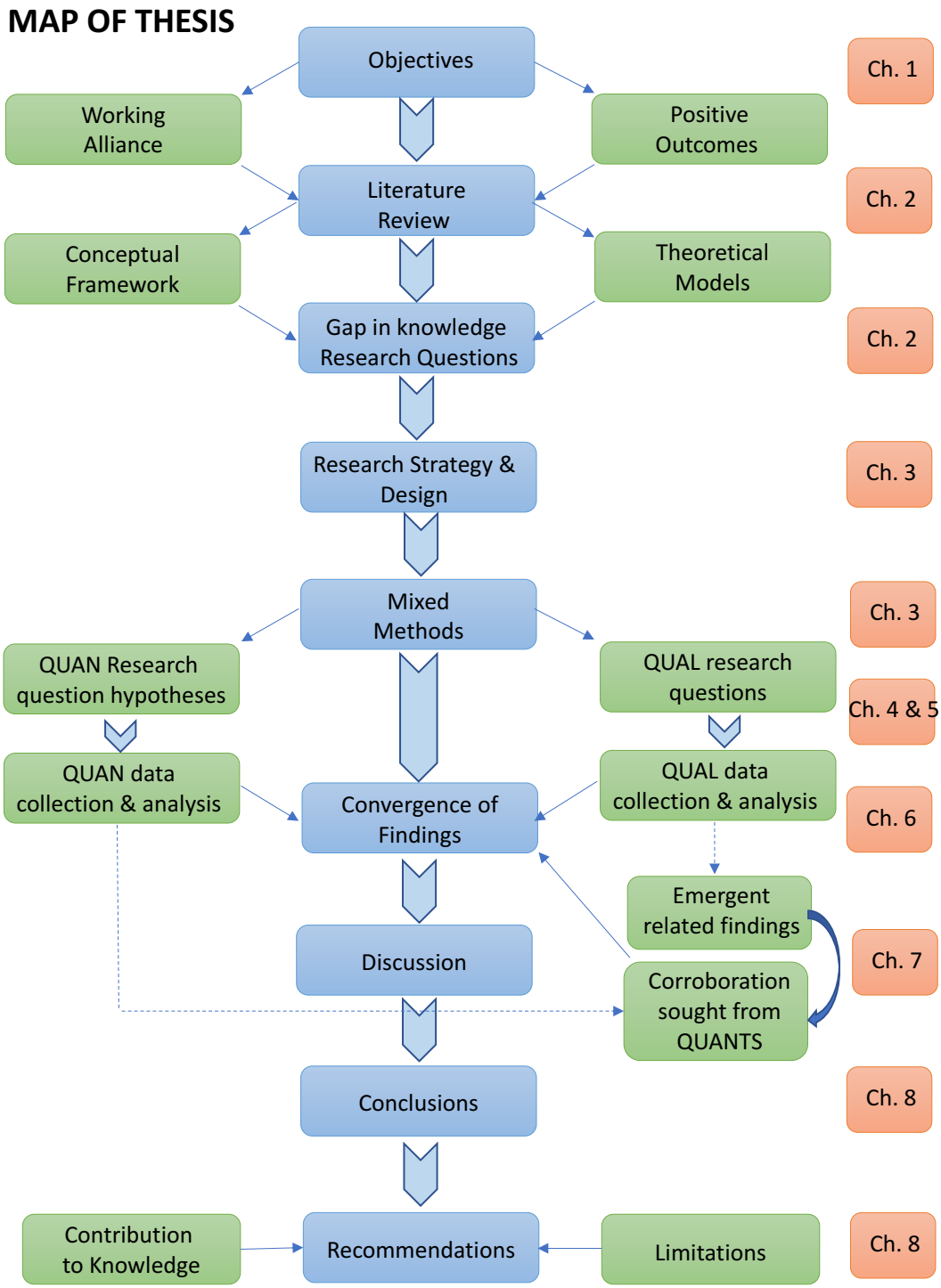

Figure 1.1Map of Thesis

1.9.2 Literature review

The limited number of studies using coaching apps required a lateral approach to the literature review exploring neighbouring disciplines and studies on the relationship that a human forms with technology. Chapter two discusses the phenomena through a number of lenses and brings in the concept of a measurable personal capability of self-resilience to gauge the effectiveness of the technology. The chapter will conclude by setting out the research questions created to answer the objectives of this study, as well as suggesting a conceptual framework for the phenomenon to be analysed through.

1.9.3 Methodology

Chapter three initially informs the reader of the author's world-view to give transparency to the conscious and unconscious bias that the research may contain. It outlines the methodological approach adopted by the researcher to answer the research questions and articulates why a pragmatic approach to the exploration was deemed the most appropriate. It continues by presenting the research strategy of mixed methods, using a convergent technique from parallel quantitative and qualitative studies, and discusses the pros and cons over alternative research strategies. It operationalises the research questions into quantitative hypotheses and parallel qualitative research questions. The chapter concludes by outlining the details of data collection, data analysis, and an assessment of the study's reliability as well as highlighting inconsistencies that are inherent with the mixed-methods approach.

1.9.4 Data analysis and findings

Chapters four and five focus on how data was collected and analysed, covering quantitative and qualitative research areas. The process of data collection is discussed, along with the challenges faced by the researcher in coordinating over 50 participants. A number of technical issues in using the app are highlighted along with how these were addressed.

The data two distinct data sets are explored separately, and results established prior to convergence. Various statistical tools are employed on the quantitative data while a thematic approach to the qualitative data is adopted. Dominant themes were revealed, however, unique personal encounters of using the app were also captured to illustrate the wide spectrum of data captured. The analysis of the longitudinal data from a quantitative survey and a qualitative semi-structured interview process is described, and observations are made. The results from this preparatory stage are then converged.

1.9.5 Convergence of quantitative and qualitative findings

The use of the mixed-methods research design with a convergent technique provides the emergent themes. The results from the two independent methods are merged to provide deeper insights and corroboration of the findings. The reader is asked to reflect on the study's discoveries from the viewpoint of rapid technological changes. Chapter six sets out the integration process where the results from qualitative and quantitative are converged. Confirmatory themes are revealed, and also contradictory findings are explored. Principal and supporting sub-themes are presented, followed by a detailed discussion of the findings at different levels.

1.9.6 Discussion

In chapter seven the reader will then be invited to consider the study's findings in context with other academic research from neighbouring disciplines.

1.9.7 Conclusions and Recommendations

Main conclusions are presented in chapter eight, along with their limitations. Recommendations are made from a number of perspectives and provide suggestions to coaches, coachees, and technologists on the challenges and opportunities of the technology. Recommendations for further research explored and finally a section on reflexivity from the research of his research journey.

Chapter 2 Literature Review

2.1 Introduction

2.1.1 Contextual setting

This chapter opens with a contextual setting to this study as it was felt necessary to position the literature review between the two fields of business coaching and human-to-computer technology. An electronic literature search in Sept 2018 using Google Scholar database with keywords “Artificial Intelligence”, “coach” and “coachee” but excluding “sports” revealed 59 references. An updated electronic literature search in March 2020 using the same database and terms, provided 102 matches, suggesting there is still a reticence of the coaching community to engage with this developing technology. Nevertheless, the practise of coaching has not been immune to the impact of technology and in some regards, it has embraced the flexibility of alternative digitally-assisted environments. There have been studies into the automation, digitalisation and communication within the field of coaching through electronically-mediated platforms and these investigations have broadly found that the technology supports the coaching process with its employment bordering on being ubiquitous within the coaching arena (Frazee, 2008; Wang and Wentling, 2001; Berry et al., 2011). However, in a study of coaches (Otte et al., 2014) (N = 161) found that overall practitioners were neutral towards digital platforms as a means of delivering a coaching process. Clients of coaching services are now being offered different solutions for learning and development in the form of chatbots, and apps supported by AI, but these platforms have received little attention by researchers. Neighbouring disciplines of counselling and therapy have experimented with AI for over ten years (Fogg, 2002; Andersson and Cuijpers, 2009; Marks and Cavanagh, 2009). A number of research papers have been published that explore the potential of computerised intelligent coaching solutions in the field of Cognitive Behavioural Therapy (CBT). It is acknowledged that “coaches have a lot to learn from the vast literature on the therapeutic relationship” (Bernard and David, 2018, p. 105).

2.1.2 Chapter Structure

One objective of this study is to critically review the literature in respect to the use of automated behavioural change app technologies, therefore central to this review is the automation of behavioural change techniques and processes employed in the coaching field. The review will begin by examining the dyadic relationship between coach and coachee. If automation of the coaching process is to occur, then arguably it should either augment the traditional Working Alliance between coach and coachee, or replicate some elements of coaching methods, using digital tools and processes. The introduction of digitisation into the coaching process should be beneficial, clearly it should not have an adverse effect on the relationship. The conceptual frameworks around the coach and coachee relationship, Working Alliance, will be explored, as it is widely considered a critical aspect of the dynamic between individuals and research suggests that it is a predictor of positive outcomes. Next, Self-Resilience will be explored, as this personal developable skill will be used as the measure of the app's effectiveness in coaching the users. The chapter will continue to explore other critical determinants to positive outcomes, namely: coaching approaches; human-to-computer relationship; digital coaching modalities and neighbouring disciplines. The chapter will outline the research questions and finally will suggest a conceptual framework for the phenomenon to be analysed through.

2.2 Working Alliance between Coachee and Coach.

The following section will explore how the formation and functioning of the relationship between coach and coachee is an active ingredient to successful coaching outcomes. It will do this by reviewing the importance of the dyadic relationship and highlighting those active, quality and constituent parts that are considered predictors of positive coaching outcomes. The section will conclude by considering the theoretical foundations of the alliance between coach and coachee.

Academics and practitioners appear universally in agreement that the formation of a working relationship between coach and coachee is a fundamental component to the coaching process (Bluckert, 2005; Baron and Morin, 2009; O'Broin and Palmer, 2010). From this point of consensus writers, practitioners, and academics provide a plethora of varying beliefs on the qualities and key components that dyads should contain in order to achieve a successful outcome for the coachee. The tone and extent of the bond formed between coach and coachee are widely debated in the literature. Stober (2006) states the need for a collaborative and egalitarian relationship between coach and coachee, while Kilburg (2000) provides an alternate organisational perspective on coaching, where he clearly states the need for a relationship to improve the effectiveness of the client's organisation within a formal coaching agreement.

Some suggest that an almost intuitive, human-personal process develops, where openness and spaciousness are important to the relationship, (Whitworth, 2007), whilst Grant et al. (2010) suggest a more structured analytical interaction where the coaching process is grounded in established therapeutic theories. Yet others suggest a formulaic approach where the coaching process should be in the form of contract between a professional coach and a management level client (Lee, 2003). There appear to be no proponents that suggest a relationship should be one that is based on an algorithmic transactional basis or is deemed as remote. It is surprising, therefore, that literature on the formation of the bond, and its characteristics, between coach and coachee is sparse. However, one limited study using semi-structured interviews with six pairs of coaches and coachees found three aspects emerged using the analysis; "bond and engagement, coach attitudes and characteristics, and collaboration" (O'Broin and Palmer, 2010).

Despite its centrality to the coaching process, the relationship between the parties and how it is formed and nurtured is comparatively under-researched. In comparison, methodologies, techniques and theories are well publicised, yet the barren landscape of detailed research into the bond between coach

and coachee is stark (Sun et al., 2013). This may be in part due to the fact that the interactions between the parties are generally of a private nature and confidentiality is seen as an important principle. Baron and Morin (2009) on finding little literature on the relationship between coach and coachee decided to study evidence in the adjacent field of therapy. They were not disappointed; the relationship between therapist and client has long been studied. This will be further reviewed in later sections of this review.

The quest for determining the “active ingredients” in a coaching relationship was explored by O'Broin (2016). Her paper contended that definitions and measurements are a necessary precursor to gain further understanding of the key characteristics of a dyadic relationship between coach and coachee. She further states the importance of learning from functional similarities and differences between supportive relationships. An earlier publication by Bluckert (2005) explored “the coaching relationship as a critical success factor in determining outcomes” (p. 336), and also considered rapport, trust, support, and challenge as important social skills that coaches should possess. He further advocates that coach training should emphasise this aspect of its curriculum.

A qualitative study undertaken by O'Broin and Palmer (2010), on a small sample group of 12 participants, concluded that the interpersonal interactions between coach and coachee seemed important in the formation of a coaching relationship. It also concluded that the co-creation of the relationship was a mutual responsibility between the dyad, however, it emphasised that the onus was on the coach to enact the process. It further found that trust was an essential aspect of the relationship. A subsequent study, by Bozer et al. (2015), also explored the nature of the coaching relationship, through a survey of 68 coaching pairs from 4 Israel-based firms. They found that coach-coachee matching had a minimal effect on measurable outcomes. Whilst gender or other perceived similarities were not a predictor of results, they did reveal that gender similarity had a marked correlation with a change in coachees self-awareness, except when it was a male executive coachee being coached by

a female. Nonetheless, the report concluded that buyers of coaching services need not be concerned regarding the coach-coachee pairing and hypothesised that this was due to the highly structured goal-focused approach process. However, the balance of evidence suggests that the importance of a good collaborative platform is important.

Another paper by Gan and Chong (2015) attempts to fill the gap in the literature by focusing on the fostering of a quality coaching relationship. It considers that attainment of the agreed coaching objective, a strong rapport between coach and coachee is needed as well as full commitment and engagement from the coachee. Surprisingly, in this large quantitative study (*N = 172*) findings were limited as it only considered the relationship from four pre-positioned factors, and consequently it called for further research to confirm the linkage and dynamics supporting the dyad. An outcome study, by Wasylyshyn (2003), looked from a coachee perspective, into factors influencing the choice of an executive coach, and determined that 86% of respondents believed that the coach should form a strong connection. “Strong” defined as having empathy, warmth, listening skills and an ability to build trust. What is interesting is that while there are a number of articles about the personal qualities that a coach should possess, and how the characteristics of the relationship are key success elements, there is comparatively little research focussed on how this relationship is formed and sustained. The use of the adjective “strong” in both unconnected studies by Gan and Chong (2015) and Wasylyshyn (2003), conveys that a deep, stable and resilient relationship needs to exist, however, importantly from this study’s perspective, it could be argued that this is from a client-centred approach to coaching, rather than a process orientated methodology. This is important for this thesis as it seeks to determine whether coaching outcomes can be obtained through interaction with a digital agent through a process-oriented methodology.

A core competency that coaches should adopt, according to the International Coaching Federation (ICF), is a style that “continuously demonstrates personal integrity, honesty and sincerity” (Federation, 2019). The European

Mentoring Coaching Council (EMCC) similarly suggest that coaches need to ensure that a "requisite level of trust has been established for effective mentoring/ coaching" (EMCC, 2015). The dynamics in the relationship between coach and coachee has been extensively explored and are deemed to be a critical success factor in positive coaching outcomes. (Rekalde et al., 2015; Bernard and David, 2018; Jones, 2006; Alvey and Barclay, 2007).

Interest in a working alliance between coach and coachee has continued to develop, and alternative concepts have been proposed in a bid to explore the phenomenon from a coaching perspective. This has led to the term 'coaching alliance' being created. O'Broin and Palmer (2009) consider how a coaching alliance can be developed and maintained within a context of cognitive behavioural coaching assignments. However, these considerations are not explicit in the differences when comparing components and characteristics between working alliance and coaching alliance. They further suggest "that the explicit discussion, agreement and renegotiation over time, of the goals, tasks and bonds of the coaching alliance can help create the clarity and transparency vital for trust" (p. 189). The reader is left considering that the terms are interchangeable and that their applicability is one of application rather than substance.

In a bid to understand where there are valid nuances between the terms coaching alliance and working alliance, an earlier paper by Dryden and Reeves (2008) may be helpful. They suggest a fourth component be added, seemingly variable in design, to the three proposed by Bordin (1979) in the context of a therapeutic relationship between counsellor and client. However, through the examination of this suggested additional aspect to a relationship, it would appear that it is a negotiated outcome of discussions prior to the therapeutic services commencing, encompassing topics such as; agreement on preparatory areas of focus which is adjusted to take account of points of view between the parties and through these interactions a creation of a shared vision of the challenge ahead. Nonetheless, it could be argued that these types of discussion prior to appointment are vital for human development

behavioural sessions as they provide a shared conceptualisation of the client's problem prior to any work starting. It therefore stands that for the purposes of this study, a narrow, arguably more focused, understanding of the working alliance be adopted in line with Bordin's original conceptual model, as shown in Figure.

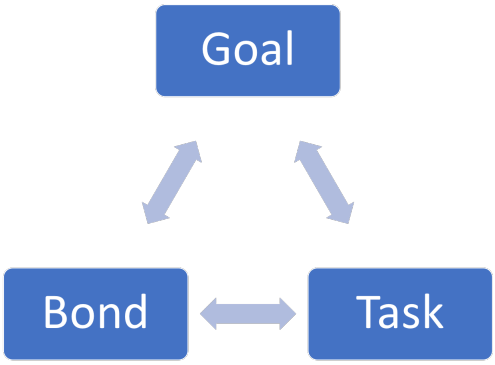

Figure 2.1: Working Alliance Theoretical Model

However, the concept of working alliance has received a degree of criticism since its "conception". Early in its conceptualisation, Brenner (1979) suggested that the concept was a substitution for analytical rigour of clients symptoms. He argued "I am not convinced by all the available evidence that concepts of therapeutic alliance and working alliance are either valid or useful" (p. 149). A more relevant criticism of the Working Alliance concept, in terms of this thesis, was whether the complexity of the relationship is measurable. Wallerstein (2003) objects to the notion of a bounded measurable concept that "can be better or worse, stronger or weaker, and that therefore some metric can be established to assess this entity in its fluctuations over time. I conceive the alliance rather as a subtle and complex process, not easily reducible to some linear metric" (p. 397). Notwithstanding the foregoing criticism of working alliance construct, the concept has gained acceptance in the therapeutic community, and attention has evolved to the testing of predictive outcomes of the construct (Martin et al., 2000).

Some have sought to measure the nuances of a relationship between client and practitioner. A large-scale study into executive coaching was undertaken by de Haan et al. (2016). The international research team undertook a study

of 366 coaching pairs across 34 countries, exploring coaching effectiveness and coachee-rated strength of the working alliance. The results from the quantitative data suggest a positive working alliance significantly influences a coachee's perception of positive outcomes of the work with their coaches.
To conclude this section, the above literature discussion clearly points to an understanding that the relationship between coach and coachee is a central component to successful coaching outcomes. Professional coaching bodies consider an ability to foster good working relations with clients as a core competency.

The next section will review the literature surrounding self-resilience, as this personal developable skill will be used as the measure of the app's effectiveness in coaching the users.

2.3 Positive Outcomes: Self-resilience

According to Jones et al. (2016), little consensus is found in the literature regarding the valuation of coaching efficacy. In their meta-analysis of the effectiveness of workplace coaching, because of the lack of common approach in measurement, the study used techniques from training literature to evaluate effectiveness of workplace coaching. Notwithstanding the necessity of an acquired criterion framework, the analysis of studies ($k=17$) comprising of $n=2267$ individuals coaching had positive effects.

A review of the literature also found a similar lack of consistency regarding the measurement of coaching outcomes. In order that this study anchors a measurable positive outcome to examine the moderating effect of the working alliance between coaching and coaching app, self-resilience was chosen. The rationale is further explained in the 'Focus of the Research' section later in this chapter.

The importance of Self-Resilience as a developable attribute in the workplace will be explored in this section. The following paragraphs will attempt to frame

the construct of resilience firstly through studying definitions, applications in the coaching field, and concluding with the importance of Self-Resilience in the workplace and how it may be developed.

The origins of conceptual models surrounding resilience evolved from studies of young children (Garmezy et al., 1974; Werner, 1984). Garmezy's study followed individuals at a school and highlighted four central characteristics in children: a tendency to regard challenges positively; an active approach to problem resolution; an ability to gain positive support from others; and overall a positive paradigm. These temperament capabilities created a protective emotional layer, providing individuals with coping abilities to confront life's challenges. The concept of a personal shield to protect one from the mental strain was also explored by Rutter (1987), he later considers resilience as dynamic and a developable skill through "steeling" effects when individuals confront adversity (Rutter, 2012). This notion of sensitizing to events, creating protection, will be examined later in this section as it is fundamental to this study.

Kumpfer (2002) provides a framework of the key characteristics of self-resilience, as shown in Figure 2.2. He considers that resiliency can be viewed as an interaction between a person and their environment that can be mediated through conscious or subconscious processes, modifying their perceptions. This is arguably most important for this thesis, as he considers that purposeful design interventions could hold the promise of enhancing an individual's self-resilience. The Kumpfer (2002) framework utilised the 'four worlds' native American conceptual understanding of the emanation of life, adding a further cluster variable of social/behaviour competencies, as a consequence of the literature supporting this. The five internal competencies are considered core to resilient skills, namely; Spiritual or Motivational Characteristics, Cognitive Competencies, Behavioural/Social Competencies, Emotional Stability and Emotional Management, Physical Well-Being and Physical Competencies.

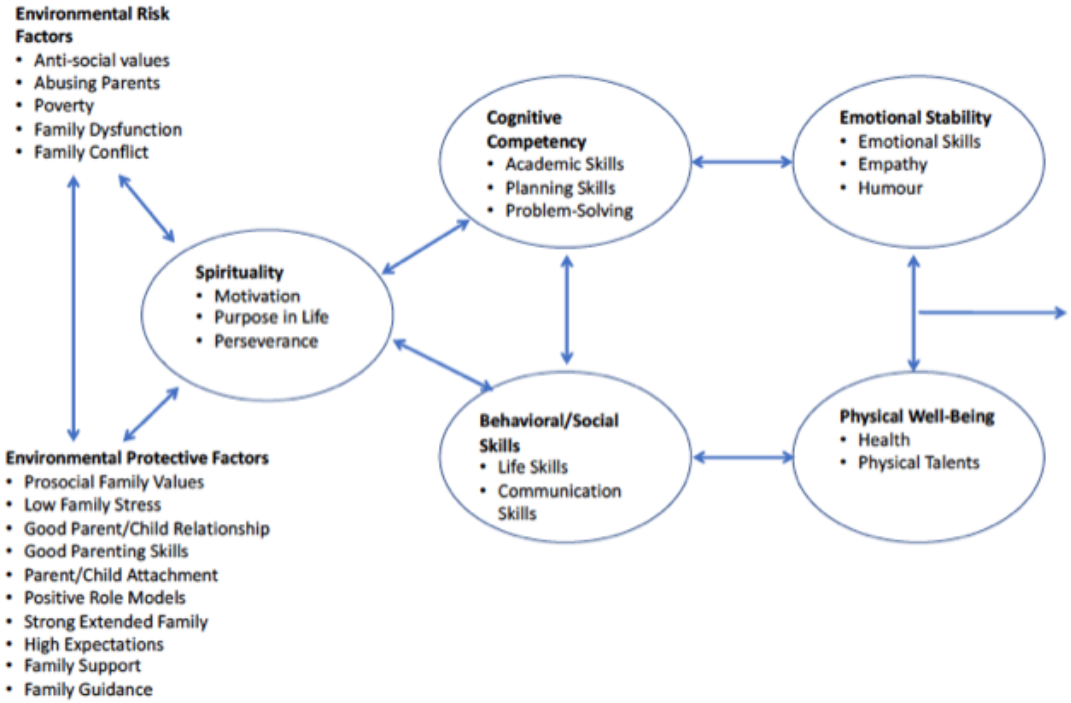

Figure 2.2: Kumpfer's Model of Self-Resilience Characteristics

Spiritual or Motivational resiliency characteristics are proposed as deep-rooted belief systems providing the individual with a direction and capacity to consider alternative futures for themselves. This characteristic can have a religious reference point where individuals have the ability to endure adversity with a degree of positivity, believing that there is a higher purpose to their present circumstance. This thought-process further provides individuals with a purpose in life-giving cognitive styles of determination and perseverance. The model presents the spiritual cluster with variables that include perseverance, proposed by Bandura (2006), who also suggested that resilient individuals possess planning abilities. This particular insight, and how a coaching app can aid this cognitive process will be further explored.

The cluster of characteristics under the component of cognitive competencies has pertinence to this study as they comprise variables that are developable in the workplace setting. Kumpfer (2002) suggests a link between individuals' intellectual and academic abilities with their capacity to recover from situations. Later in the methodology chapter, the choice of a suitable instrument to measure workplace self-resilience shall be outlined. A

correlation between developing employees' cognitive abilities with their self-resilience capability is an important concept for this study to highlight. In addition, the behavioural/social competencies within a workplace setting should be considered equally cogent as they encompass elements of communication skills and problem-solving abilities. The characteristics of behavioural skills and emotion stability are thought to include softer skills such as humour and communication abilities. Kumpfer's model proposes that individuals who demonstrate these characteristics also display empathetic skills. An employee's ability to inject humour into stressful work situations was explored by Plester (2009) in a 3-year study of an organisation. Her findings suggest that humour is used at work as a coping strategy to help teams manage stressful situations.

The final characteristic of Physical Well-being is not considered in this study, as these forms of coaching app technology are cognitively centric. However, it is worth stating that even a brief intervention into employees' physical well-being can build additional mental defences to stressful situations (Hartfiel et al., 2011). Kumpfer's model has been adapted across multiple environment situations, and their core characteristics have been evident. Nonetheless, some argue that the concept of coping with stress, and the resilient qualities within the Kumpfer's model, are distinct constructs and should be considered separately (Fletcher and Sarkar, 2013).

The construct of resilience as a conceptual model has been appropriated across disciplines generating multiple perspectives. According to King et al. (2016), two notions of resilience have emerged. Firstly, they suggest that some consider resilience as a dispositional construct where individuals recall resources allowing them to recover from a stressful event. Secondly, they cite others who believe that resilience is fluid in nature where individuals with greater resilience adapt, learn and overcome traumatic events. The emphasis on the latter construct is one of an ability to learn from experiences and create protective factors and resilient states. It could be argued that this attempt at categorization is unhelpful as no real meaningful difference exists as a

dispositional construct still provides the opportunity to build additional resources. Previous studies are critical of the work in developing resilience constructs, damning of both proponents and advocates, suggesting both need evidence-based arguments in addressing each other's concerns and calling for rigour in validating their claims (Luthar et al., 2000; Atkinson et al., 2009). While it can be seen much research has been undertaken in an attempt to unify the conceptualization of resilience, the landscape remains confused.

Windle (2011) frames the personal capabilities of self-resilience by drawing on three working models, systematic, conceptualization, and consultative. She suggests that the nature of resilience is:

> "the process of effectively negotiating, adapting to, or managing significant sources of stress or trauma. Assets and resources within the individual, their life and environment facilitate this capacity for adaptation and 'bouncing back' in the face of adversity. Across the life course, the experience of resilience will vary." (p. 163).

She emphasises the importance of three factors that need to be present; an adverse event, tools to deal with the event, and flexibility of thought to present a positive outcome. A more generalised stand is suggested by Neenan (2018) and introduces the notion of learning through adversity "marshalling your resources (e.g. psychological, spiritual, social) to cope adaptively with tough times, however long they last, and emerging from them sometimes stronger, wiser and more capable person." (p. 5). However, in a qualitative study by Greene et al. (2004) interviewing eighteen psychologists, it was found that only 38% suggested that resilience is a developmental process. The research adopted a loose methodology as it explored conceptualisations of resilience theory within the field of social work, seeking support of its findings from other studies into mental wellness. One of its more interesting suggestions was that more research needs to be undertaken on the dynamic of internal and external factors in developing a client's resilience.

As has been discussed earlier, it can be expected that as new technologies are constantly adopted, the nature of the work environment and the increasingly turbulent times that now beset organisations will continue. The result will be increasing uncertainty for individuals, manifesting in heightened levels of anxiety and workplace stress. King et al. (2016) argue for research into new theory development for workplace self-resilience. They further state that developing employee's self-resilience is vital as a defence mechanism for those facing ever-changing work environments. Earlier studies suggest that it is a personal capability sought by employers in the labour market even before the onset of the gig-economy[1] (Grotberg, 2003; Coutu, 2002). The contention is made that self-resilience is both a skill that employers are seeking and a characteristic that workers should enhance, in order to navigate the turbulence of modern working environments.

Earlier on in this section, the work of Rutter (2012) and Windle (2011) identified the dynamic nature of resilience. It follows that coaching practice is well-suited to helping individuals navigate a path to greater self-resilience through the re-framing of reactions to past events and establishing an inventory of resources to retrieve on future occasions when trauma occurs. A conceptual model for the workplace, developed by King and Rothstein (2010), considered the individual's personal characteristics as well as available external support in the event of a significant set-back. It identifies the dynamic process following a traumatic event and how the individual's reaction disrupts their equilibrium. Their resultant reaction is a product of the resources and protective factors they can muster. The model emphasises the self-regulatory process, blending effective, behavioural and cognitive strategies. These self-regulating adaptive strategies can be linked to flexible thinking - allowing individuals to reframe their thoughts and the promotion of sustainable and desirable belief systems in themselves. The comparison to desirable coaching outcomes is clear:

[1] Gig-economy is a labour market dominated by short-term contracts.

> "Coaching can be seen as a human development process that involves structured, focused interaction and the use of appropriate strategies, tools and techniques to promote desirable and sustained change for the benefit of the coachee and potentially other stakeholder" (Cox et al., 2018, p. 1).

Developing a coachee's self-resilience in the workplace, when considering the high stress levels experienced by employees, makes the use of coaching techniques to enhance protective barriers particularly apt.

The advent of enquiries into self-resilience in the workplace can arguably be traced to a paper by Spreitzer et al. (2005) on 'thriving at work'. The paper introduces a theoretical model defining thriving at work as "the psychological state in which individuals experience the sense of vitality and the sense of learning at work"(p. 538). Importantly it differentiates self-resilience as a construct that needs environmental adversity and a personal capacity to bounce back. Nonetheless, a link is made to an individual's resources to adapt and create positive learning experiences. The suggestion that resilience and thriving at work are related provides the much-needed impetus for research into workplace self-resilience.

According to Tonkin et al. (2018), the construct of employee self-resilience is different in three ways to other ecological perspectives. First, the working environment challenges the employees' frame of mind, thus influencing behaviours and reactions to events. Second, the employer may have resources and tools that the employee can call upon in times of adversity (King and Rothstein, 2010). Finally, an employee's resilience can be developed and tested in real or false environments to heighten protective barriers. The notion that there is an ecologically different resilience construct is somewhat supported by the research of the Tonkin et al. (2018) study where the findings suggest personal and employee resilience are related. Their study of n=209 participants from two occasions who undertook a well-being intervention and were tested for personal and employee self-resilience suggested that

outcomes were similar but required other interventions to influence the different groups. The authors posit that organisations should seek to develop a culture that helps build employees appreciating a contextual nature to enhancing self-resilience. Employers should first understand the nature of the components of the developable skill.

Naswall et al. (2015) consider the measurement of employee self-resilience is in its infancy and put forward a scale that uses constructs from organisational perspectives as well as a developable human capacity. A supportive learning employee environment is an underlying premise where past experiences are seen as learning opportunities, allowing individuals to reflect on their ability to deal with situations. These moments of learning are channelled and harnessed into positive experiences. Unlike other scales, such as Hystad et al. (2010), that seek to measure self-resilience by focusing on individual's innate dispositions, Naswall et al. (2015) consider workplace environmental factors that influence employees' behaviour. The components it seeks to measure are behaviourally centric, namely: self-belief, problem-solving, adaptability and positivity. Whether an organisation's culture can help its employees through a period of significant adversity was studied in the wake of the earthquake disaster in New Zealand in 2010 by Seville (2018). Her findings suggest that an organisation's culture and its leaders' qualities can enhance or undermine employees self-resilience.

The next section will investigate genres of coaching between skills and performance coaching and that of transformational coaching. The rationale for exploring this line of enquiry will manifest itself more fully in the later sections of the literature review, suffice to say that digital coaching technologies, using algorithms are a boundary of knowledge in the field of computer science. As such, an appreciation of the importance of relationship across the various types of coaching will help further to frame the conceptual model for the research.

2.4 Coaching approaches

This section sets out the perceived distinction between skills and performance coaching and that of transformational coaching. Considering the context of this study within a commercial enterprise, it will draw on insights from studies, and commentators from industry. It will further consider the degree of relationship necessary to present in different coaching approaches.

The coaching profession employs a wide range of techniques, methods and processes “in a one-on-one relationship order to help someone become a more effective manager or leader” (Peltier, 2010, p. xxxi). The theoretical frameworks that practitioners utilise vary considerably. Indeed, models and theories employed by coaches may be tailored using the coach’s personality, strengths, and experience (Lennard, 2010). Lennard (2010)suggests that coaches “develop or refine then apply their coaching models” (p. xi). These home-grown styles, reflecting the coach’s personality, will naturally have a determining factor in how the coach approaches his client and accordingly influence the dynamic of the relationship. It is evident that coaches will adopt a style best suited to their personality but whether this is the best fit for the coachee is less clear, suffice it to say that this style of approach will have the coach at ease and possibly ensure a more relaxed collaborative working arrangement.

Skills and performance coaching have been said to be the genesis of the coaching field. Cox et al. (2014) consider “Skills and performance coaching (SPC) is, perhaps, the original and most common genre of coaching: assisting someone to learn how to do something better.” Sir John Whitmore, an early populariser of applied coaching in the workplace, considers that coaching should focus on people’s potential, not their current performance. He considers that coaching is a mindset and anchors the process in terms of positive outcomes, emphasising the importance of the coachee in achieving goals and through those successes building self-belief (Whitmore, 2002). He further expands by stating that the coach builds inner qualities in the coachee through a “relentless focus on their potential and establishing patterns of

achieving goals"(p. 45) In an interview with The International Journal of Coaching in Organizations he stated that "business is very much about performance, so that's what they're [business] looking for." (Amura, 2003).

Table 2.1 illustrates the different emphasis that each genre of coaching places on personal growth and development. This qualitative meta-analysis by Hamlin et al. (2009) suggests a greater emphasis within the concept of business coaching of personal development than arguably the narrower goal of performance enhancement suggested by Whitmore. Nonetheless, when those definitions are compared and contrasted there remains a consistency that coaching in a business context includes the acquisition of skills and delivery of higher performance. Although it has been suggested that the process of obtaining newly acquired skills develops a lasting personal transformation in the coachee (Cox et al., 2014), to date, this has yet to be fully verified. However, in an earlier study of an entrepreneurs' development programme, delivered through a coaching programme, researchers identified successful personal transformation outcomes, where participants acquired new technical skills and also life-long learning abilities (Kutzhanova et al., 2009).

Categories/variants of Coaching	Derived Unified Perspectives /Composite Conceptualizations of Coaching
'Coaching'	…is a helping and facilitative process that enables individuals, groups/teams and organizations to acquire new skills, to improve existing skills, competence and performance, and to enhance their personal effectiveness or personal development or personal growth.
'Executive Coaching'	…is a process that primarily (but not exclusively) takes place within a one-to-one helping and facilitative relationship between a coach and an executive (or a manager) that enables the executive (or a manager) to achieve personal-, job- or organisational-related goals with an intention to improve organizational performance.
'Business Coaching'	…is a collaborative process that helps businesses, owner/managers and employees achieve their personal and business-related goals to ensure long-term success

'Life Coaching'	…is a helping and facilitative process-usually within a one-to-one relationship between a coach and a coachee-which brings about an enhancement in the quality of life and personal growth of the coachee, and possibly a life-changing experience.

Table 2.1: Synthesized Composite Conceptualizations of the Variants of Coaching
Hamlin et al. (2009, p. 18)

In contrast with skills development coaching, transformational coaching is a person-centred approach. According to Hawkins and Smith (2014), transformational coaching lies at the end of a continuum from a transactional transfer of knowledge within the skill coaching genre to a level of engagement with a coachee in transformational coaching that seeks to change perceptions and underlying behavioural issues. Along this suggested continuum sit performance and development coaching as shown in Figure 2.3. The illustration also overlays concepts of the types of coaching relationship that could be expected to occur along the continuum.

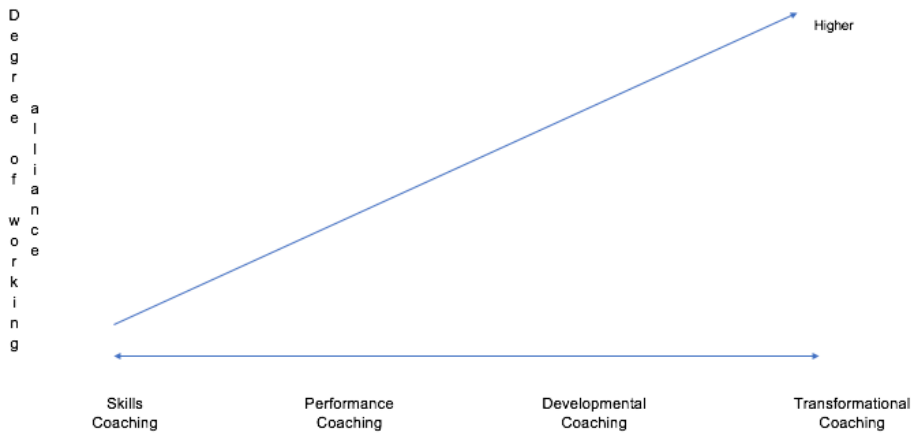

Figure 2.3 Coaching Relationships and Genres
Illustration of an amalgam of coaching continuum Hawkins and Smith (2014) and coaching relationship Sun et al. (2013)

There is a clear contrast between the levels of personal engagement required of coaches when confronted by different coaching assignments. Skills coaching requires less intrusion into the coachee's psychology and could be more of a didactic process. Whereas the transformational coaching

assignment requires a coach to explore underlying beliefs, attitudes, emotions and cognitive behaviours (thinking patterns). Arguably, the latter requires greater abilities in the coach and the need for higher investment in the relationship, where authenticity and co-working between coach and coachee, in determining goals and objectives come to the fore. It therefore follows that specific aims and objectives of coaching assignments should inform the coaching approach to be employed by the coach (Ives, 2008).

In what may be seen as a contentious paper, Ives (2008) attempts to construct frameworks to analyse various methods used in the field of coaching. Whilst the paper helps to develop a taxonomical approach to the debate on the applicability of the type of coaching, in doing so it posits a series of statements from popularising positions; for example therapeutic versus performance-driven, whereas others suggest that different assignments call for different levels of engagement (Sun et al., 2013). However, Ives' final statement does emphasise "it is important that the gap between these two trends in coaching does not widen, to retain the distinctive goal-focused character of coaching". The next section continues exploring the notion of relationships, but from a human to computer perspective.

2.5 Human-to-computer relationship

This section will review the journey of scientists as they seek to create a human-to-computer relationship shall now be investigated to attempt to comprehend the scale and potential impact this form of computer technology may have on the field of coaching, and also provide a context for this research into coaching Apps. It will reflect the pace of technological change and then consider the transference of human capabilities that individual's assign to technology. Finally, this section will conclude by highlighting the continuing developing landscape of AI applications.

The profound character of the fourth industrial revolution to our global society will be of greater significance than previous human endeavours (Makridakis,

2017; Schwab, 2016; Park, 2016). There is seemingly a wide acceptance from cultural anthropologists, theologians to computer scientists and industrialists that humanity is in the midst of fundamental change (Forsythe, 2001; Stone et al., 2016). According to Park (2016), the change will not only affect our physical work but also impact our understanding of ourselves. He further argues that digital technologies will impact every facet of society.

Computer systems entered the field of behavioural science in the early 1970s when computers were considered to influence human behaviours. However, the hardware at that time had insufficient capacity for software engineers to create programs that could fully ape a human-to-human conversation. A catalyst was needed to develop computer systems that were sufficiently powerful and had the capacity to handle the inherent complexity of human thought. The advent of the fourth industrial revolution has created more powerful computer resources that potentially provides the quantum leap. According to Makridakis (2017), in his analogy of previous and current technological inventions, AI is the profound catalyst and "is on target and that it would bring extensive changes that will also affect all aspects of our society and life" (p. 1). To add weight to his forecast, he refers to his previous paper (Makridakis, 1995) and considers his forecasts contained therein were generally predicted correctly, albeit, it could be argued that his belief that a competitive market spanning the entire globe has yet to be fully realised. He suggests that "the forthcoming technologies of the AI and their impact over the next twenty years will probably be many times the magnitude of those of the digital one from1995 to 2015" (Makridakis, 2017, p. 2). An early manifestation of coaching bots appeared in the 1960s. The invention of ELIZA by Joseph Weizenbaum[2] created a computer program using elementary Natural Language Processing, together with a database of mental health non-prescriptive responses. The artificial agent performed a basic person-centred form of counselling using a closed-loop feedback of standard responses.

[2] Joseph Weizenbaum (8 January 1923- March 2008) was a German-American computer scientist and Professor at Massachusetts Institute of Technology (MIT)

Fogg (2002) was an early investigator of the potential of machines to elicit change from their human users, exploring the social bond that individuals build with their computer products. He further proposed five indicators that suggest that human users are altering behaviour; physical, psychological, language, social dynamics, and social rules. It will be revealed later in the study that today's engineers are still seeking design solutions in machine architecture to provide language and psychological responses which are generalisable. In a more recent study by Hertz and Wiese (2018), they investigated whether artificial agents that were designed with variable degrees of human likeness were able to influence human behaviour. The results suggest that conformity of participants was higher when the automated agent possessed more 'human-like' qualities. They further suggested that designers of artificial actors should seek to maximise trust in human-machine relationships to enable greater degrees of conformity in humans. Nonetheless, the human ability of free-flowing conversational engagement has been questioned as a necessary precursor to coaching. Elliot (2020) explored human conversational skills that health coaches employ in their assignments against a chatbot (Wizard-of-OZ)[3]. In a small longitudinal study (*N=23*), human coaches were given the same script as the WOZ chatbot but were encouraged to embellish their conversation with coachees using their human qualities. Preliminary results suggest that participants were more likely to engage with the chatbot in a proactive manner than the human coach. Furthermore, whilst human coaches engaged participants in longer conversations response rates by the participants were similar to those with the WOZ chatbot. The authors suggest that further research is needed to fully explore the comparative efficacy between human coaches and artificial coaches.

[3] Wizard-of-oz is a form of experiment commonly found in the field of human-computer science where participants believe that are interacting with an autonomous artificial agent whereas the it is being operated by a human being following a script and rules to afford the illusion of computer.

Research also suggests that gender influences computer self-efficacy. In research by He and Freeman (2009) which studied 281 undergraduates, the majority being under 20 years old, they found that males and females have different self-beliefs as to their computer abilities. Males had greater self-confidence, and females presented reduced computer self-efficacy. Other studies support that gender is a determinant of technology acceptance and use model (Venkatesh and Morris, 2000; Padilla-MeléNdez et al., 2013; Faqih and Jaradat, 2015). However, in a more recent quantitative study, Otte et al. (2014) found no significant differences between male or female coachees "attitudes" in the employment of technology in coaching. Nonetheless, this study sought to investigate the use of a coaching app from a coachee's perspective and not an attitude toward coaching technology itself; therefore gender and technological efficacy were deemed as useful variables to be included in the conceptual framework.

It was revealed earlier that the relationship between coach and coachee is a foundation from which the coaching process should be undertaken. Furthermore, certain key characteristics of the relationship need to be present to influence successful outcomes. Aspects of trust are seen as being fundamental to the coaching process (O'Broin and Palmer, 2010), albeit this human-to-human axiom of reliability is seemingly replicable. A study by Posard and Gordon Rinderknecht (2015), found that players of computer games developed similar levels of trust as they did when playing against human participants. Despite exhibiting similar behaviours with these partners, participants believed that computers were more likely to share their interests during this game than humans. It has been known for some time that people are increasingly treating computers as social actors; a meta-analysis by Nass and Moon (2000) summarises that humans demonstrate politeness and reciprocity toward computers.

Empathy by the coach to a coachee was also considered a component in a successful coach-coachee relationship (Megginson and Clutterbuck, 2004). The perception of empathy by a machine is arguably dishonest, "If human

nature at its essence includes a deep appreciation for empathy, then I prefer that we remain human. Our inescapable need for authentic relationships without deceit is a part of our deepest selves" (Herzfeld, 2015, p. 37). However, the advent of AI deep learning capabilities is perhaps challenging our understanding of the most basic of human desires, that of a wish to be understood and of sharing common experiences with others. Computers that attempt to simulate empathetic responses are a practical manifestation of the AI and human-computer interaction that focuses on sensor fusion and human-computer interaction. The deployment of such technology can be widespread and solve everyday problems by understanding human states and feelings (Cai, 2006).

The challenges in creating a machine that delivers contextual awareness is seen as intrinsically complex. The computer architect needs to employ advanced deep learning, employing multi-layered neural networks. However, a "loosely coupled architecture" is proposed for E-coaching systems in order to reduce complexity whilst creating flexibility (Ochoa and Gutierrez, 2018). This innovative approach divides rules architecture[4], into three separate processes: decision rules (determine when to trigger), intervention rules (determine what to do), intervention mechanisms (determine how to do it). In doing so, it allows human technologists and human coaches to analyse each component individually, providing real-time corrective adaptions to the system. Nonetheless, some consider these rule-based response algorithms are inherently weak and brittle, working only in contextual-appropriate environments, and suggest that employing learning frameworks on existing deep neural platforms will better leverage wider knowledge (Yang et al., 2018). This development illustrates how designers are adapting their strategies to enhance the flexibility of the modelling on e-coaching systems, as they contend with arguably the weaknesses of AI, and the delay of achieving artificial general intelligence (AGI). AGI is the degree at which intelligence of

[4] Decision rules provide the response criteria that an AI social actor employs to provide contextual relevant instantiate replies to users' interactions.

a machine is at a level that can comprehend or learn any intellectual task that a human is capable of, or a point of singularity. Grace et al. (2018) undertook a survey of 352 published AI researchers (consisting of robotics, AI, and machine learning experts) asking their predictions when a computer would outperform humans on various work activities:

- Language translators 2024
- Lorry drivers 2027
- Retail worker 2031
- Bestselling novelist 2049
- Surgeon 2053

Regrettably, from the point of view of this study, the research team from Oxford and Yale Universities omitted from the questions they posed, the field of business coaching. Nonetheless, from this picture it is clear that whilst previous predictions of AGI were that it would be achieved much earlier[5], the inevitability of computers being capable of performing human tasks is clear. However, as the above table suggests there are many computer scientists that believe that the dawn of AGI is beyond the scope of foreseeable scientific knowledge.

The following section will seek to explore how digital technology is currently being employed in the coaching arena, seeking evidence of the degree to which digital assistance is influencing the dyadic relationship between coach and coachee.

2.6 Digital Coach Modalities

The digital revolution has already affected coaching and its neighbouring disciplines (Sharf, 1985; Poepsel, 2011; tha, 2016). Virtual coaching, employing ever more sophisticated technological mediums, is now common-place, as general working environments have been digitalised, and it would seem that remote coaching is already embedded in the discipline. The studies

[5] At a AI conference in 2009, 21 AI experts participating believe that AGI would occur around 2050, and plausibly sooner.

into the endorsement of remote coaching by the discipline, as one would expect, correlated with the adoption of technology in business. Early studies focus on the advent of the emergence of coaching via the modality of the telephone and its efficacy (Ghods, 2009; Berry et al., 2011). The continuation of practitioners adopting new methods of interaction with their clients was studied by McLaughlin (2013) in one-to-one interviews with six practising executive coaches. In her conclusion, she challenged coaches "to further their understanding of telephone coaching, both practically and theoretically, and communicate the possible strengths and complexities of the medium in the corporate world." (p. 9). Her paper explores the differences between face-to-face coaching and telephone coaching and suggests that it is "inherently different" (p. 10).

As the technology was adopted, alternate definitions of the modalities were employed and it is now commonplace for e-coaching to be an all-encompassing term that is used when referring to virtual coaching, remote coaching, online coaching and coaching through video software platforms (Skype, Zoom, Teams). Averweg (2010) recognises the challenges in defining E-coaching and further adds to the complexity by differentiating between the internet and intranet, this conflict is somewhat resolved by stating that "e-coaching should be seen as a developmental partnership, in which much of the learning dialogue can take place using email and can be augmented by the neighbouring role the Intranet" (p. 48). He concludes his paper suggesting that e-coaching via the internet could be seen as a change agent, enabling learning as well as helping to redefine coaching culture and helping to re-scope an existing organisation's coaching culture.

Dwyer (2004) sees the 'world wide web' (www) as an expansive repository that could help coaches facilitate the coaching process giving access to tools and resources. However, she still considers that such remote sessions for coachees are supplemental to face-to-face meetings. This opinion is echoed by Botz (2009), who suggests that e-coaching delivered to employee desktops

in an organisation is an excellent supplement to face-to-face coaching sessions.

The flexibility of the technology that allows remote coaching is explored by Pascal et al. (2015), where the authors see advantages and disadvantages to both coach and coachee in universally adopting the practice. The authors envisage many uses of digital platforms; coach selection, business management, resource compendium and evaluation, considering that "coaching clients are likely accustomed to virtual meeting, remote work relationships, and leveraging technology in lieu of face-to-face interaction" (p. 101). Nevertheless, they articulate concerns in their conclusion. Coaches should be mindful "whether effectiveness is being compromised for the sake of efficiency" (p. 106) when employing technology. The participants' IT self-efficacy should be considered ensuring that the modalities employed do not compromise feelings of presence and engagement. They also raise issues that coaches should be cognisant of when adopting technology including; legal, ethical, and contextual considerations. Technology allows for the collection, storage and analysis of the private expansive and confidential one-on-one discussions to be analysed by third parties creating ethical dilemmas for coaches. An appreciation of context is also an aspect to consider and the authors suggest that "virtual or technology-enabled coaching simply may not be appropriate for everyone" (p. 107).

The coach's ability and comfort with internet technology was explored by Otte et al. (2014), where, using an online survey of coaches *(N=116),* the research team from Switzerland tested two hypotheses relating to a coaches' attitude towards, and ability with, computer-based technology. The search for survey participants was conducted through the internet and 1,372 potential participants were emailed. Not overlooking the fact that all coaches who participated in the survey arguably had a bias toward the use of computers as they were employing them in their practice, the European team found that coaches with a higher internet self-efficacy preferred systematic methods and the use of computers in coaching. Their second hypothesis, that there was a

positive relationship between a systematic approach to coaching, and positive attitudes toward computers in the coaching process, was confirmed.

There are more extensive studies in executive coaching via the internet (e-coaching), and the wider role of technology in coaching. These studies still maintain the dyad between coach and coachee as the principal fulcrum of the individual's development. The investigations do, however, challenge the boundaries of what constitutes an effective relationship between coach and coachee. Berry et al. (2011) provided evidence that coaching via internet portals can deliver as effective coachee outcomes as in-person coaching assignments. The research team undertook a quantitative analysis of data collected through an online questionnaire from self-selected coaches (N=51) finding that face-to-face and distance coaching was comparable in achieving goal attainment. The recruitment of volunteers via digital means arguably provided individuals that possessed a degree of computer efficacy and a propensity for such modalities. Yet other studies support alternative conduits of engagement. Rossett and Marino (2005) researched into coaching carried out entirely through the mediums of email, and instant messaging, asserting that chat creates a useful record for coaches to review their client's progress. As technological innovations have impacted and changed coaching practice, the definition of E-coaching has evolved and widened to include other facets of its capability. Kamphorst (2017) proposes the following definition "E-Coaching System: An e-coaching system is a set of computerized components that constitutes an artificial entity that can observe, reason about, learn from and predict a user's behaviors, in context and over time, and that engages proactively in an ongoing collaborative conversation with the user in order to aid planning and promote effective goal striving through the use of persuasive techniques." (p. 629).

It is unclear from the literature whether these innovations, in conducting coaching via different technological modalities, are as a result of clients demanding flexibility, cost pressures, or the coaches' wish to use platforms that enhance client experience. It is, however, according to Otte et al. (2014)

that “the use of computer-based technology in coaching will most likely increase in the near future” (p. 50). There are few studies into the impact of employing coaching apps through a coach or coachee’s perspective (Larson, 2018; Tawadros T., 2018; Lentferink A., 2018).

This direction of travel will now be considered from neighbouring disciplines.

2.7 Neighbouring disciplines early adopters of technology

The adoption of digital technologies as agents for behavioural change has been developing in therapy, counselling, healthcare and well-being continually from the early 2000s. Researchers in the disciplines have studied the employment of technology as an augmentation to their practice from the outset of its development. In addition, studies into virtual coaching research in the sciences of behavioural change have suggested that no significant difference was detected between the various modalities in delivering therapy through either face-to-face, audio-only, or video (Day, 2005; Glueckauf et al., 2002). However, anxieties in the practising professional community echo similar views in the coaching discipline, where computerisation of communications are cited as a universal medium in the concluding remarks of a literature review by Richards and Viganó (2013): “In spite of criticisms and scepticism coming from professionals more so than clients, there seems to have been a tacit acknowledgment that online counselling is an inevitable new branch of the field, reflecting changes in how individuals relate and access services due to wider changes in society” (p. 1007).

Despite these professional concerns, it would appear from the literature that technological advances are being employed widely in the health sector and researchers are testing innovative devices. The willingness of the medical professionals to adopt technology in treating mental and physical self-management was explored by Santo et al. (2016). In the study, over 94% of the 267 qualified medical respondents considered that smartphones and tablets would enhance the level of care that could be provided to their clients.

The technology is being developed by academic researchers and commercial entities using the functionality of mobile phones that have touchscreens, internet capability, and computer architecture, allowing downloadable software program (Apps) to operate. This form of technology is revolutionising the manner in which clients are accessing help, they offer a wide range of self-management and self-monitoring tools. However, many of these self-regulating tools are untested, and there is very little effort taken by software developers in validating the effectiveness of their product (Donker et al., 2013). The meta-analysis of eight papers explored five mental health apps and suggested that the technology delivered significant improvements in the mental health of users. However, measuring the quality and grading the usability of apps is an issue for the industry. A study into a specific health care intervention app by a team lead by Reynoldson et al. (2014) opined that the "variation in app quality and a lack of user and clinician engagement in the development were found across the apps in this research" (p. 898). Nonetheless, the studies clearly identify that these forms of technology are being applied successfully and deliver positive outcomes.

It has been advocated that the working alliance or relationship found in therapy could be adapted and applied to the field of coaching (Joo, 2005; Latham and Heslin, 2003). The profession of psychological therapy is one field where there has been a concerted effort to enable Computer-guided Cognitive Behavioural Therapy (CCBT), where the main focus is to enable interactions between therapist and client using technology. In this profession, practitioners have sought to be guided in their dialogues with their clients through the use of technology and found benefits of using CCBT. In a meta-analysis on 49 randomised control trials the effectiveness of CCBT over other therapeutic interventions indicated that the technology was equally effective, and in some cases more so, in helping treat common mental health disorders over traditional methods (Grist and Cavanagh, 2013).

Although there appears to be an incongruence between the concept of human interactions affecting behavioural change and non-human interactions having

comparable enhancements to measurable results, Peck (2010), found strong evidence of the comparable benefits between CCBT and traditional therapy. He suggested that the use of algorithms and digital architecture, which provide a platform employing common therapeutic factors, should be considered as a possible explanation as to why using digital tools can also impact positive outcomes. The therapist, however, creates a tailored programme where a good relationship and communication enhance outcomes. The fields of therapy and coaching will be further explored later to gain insight into how these disciplines are beginning to adopt digital technology into their practice as an artificial agent for change with clients.

Research in the medical field suggests that a computer-generated humanoid, (a virtual human) that interacts with patients using 'natural language', can overcome psychological barriers that might otherwise prevent honest conversations. The creation of rapport, which includes both verbal and non-verbal behaviour, is considered to be an enabler of safe spaces creating environments where people can be open and honest (Lucas et al., 2014). Furthermore, it is known that active listening by therapists produces greater disclosures (Miller et al., 1983).

There are numerous apps that use the convenience of Smartphones to deliver behavioural change interventions and support (Tomlinson et al., 2013; Klein et al., 2013; Blake, 2013; Reynoldson et al., 2014). There is growing evidence of the benefits of this form of technology supporting behavioural change. Klein et al. (2013) developed eMate, an intelligent coaching system modelled on behaviour change theory, that sends tailored messages to users via a mobile phone app and online lifestyle diary to help prevent chronic illnesses. Intelligent clinical coaching systems have embedded cognitive processes that may be tailored to alter the behaviour of users, these theoretical models underpin the machine's learning and create a data-bank that can be referred to by the algorithm, thereby providing more cogent and compelling answers for the user. The researchers concluded that "Emate has a strong potential for understanding users' behaviour and inducing effective behaviour change" and

further proposed that its software architecture “can be adjusted to coach other types of behaviour”.

However, not all algorithm modelling of behavioural change has been successful. A randomized controlled trial of a mobile supportive CBT application, called SleepCare, by (Beun et al., 2014) provided no statistical conclusions that users improved adherence to behavioural change as a result of a negotiation strategy. Despite these results, the authors of the paper consider “that our negotiation approach is generalisable towards other e-coaching domains and that it will support coachees by maintaining their autonomy and increasing their adherence”. They further postulate that e-coaching platforms require a tailored and contextualised process that is iterative between coach and coachee, consequently the available knowledge bank limits the appropriateness of automated responses, whereas employing a “negotiation seems to be a promising interaction strategy”.

2.8 Summary of Literature Review

This literature review covered a number of areas. In respect to Working Alliance, it made reference to Bordin (1979) seminal paper on the subject highlighting three components, namely goal, bond and trust. It further was revealed that working alliance is a determinant in successful coaching outcomes. Coaching methods were also studied, highlighting that the degree of alliance between coach and coachee varied depending on the assignment, in that research suggests that, skills coaching required a lower degree of working alliance, whereas behavioural transformation assignments depended on a high degree of personal connection.

The literature review then focused on the relationship that forms between human and computer revealed that a surprising bond can be formed. Then a review of digital modality highlighted that the coaching field, through studies of practitioners practice, saw no loss of working alliance, no matter what modality

was employed, suggesting that the affinity between coach and coachee could be achieved through various methods of discourse including text and emailing and presenting a tantalising suggestion that technologies could replicate this communication style. It was necessary to explore neighbouring disciplines as the coaching field tends to follow in their wake (i.e. therapy and counselling). In these neighbouring disciplines, forms of digital support have been explored over the last 15 years. They have discovered that digital support can have a part to play in their profession.

The literature was explored for a conceptual understanding of self-resilience in order that this human behavioural skill could be better understood as it was a measurable outcome for the proposed intervention. Self-resilience is the ability to bounce back from adversity and possesses a number of key characteristics including Self-belief, Problem-Solving, Adaptability and Positivity.

2.9 Focus of the Research

The foregoing sections highlighted the developing area of automated coaching technology. The gaps in knowledge of the general use and benefits of apps within the coaching field, from many perspectives, is evident, with much of the empirical studies taken from neighbouring fields. In order to narrow this otherwise expansive field of applied technology within the context of coaching, the researcher has decided to focus on a single aspect, that of working alliance, because of the near-universal acceptance of its importance. Furthermore, the literature highlighted the limited research to date on whether app technology has a part to play in producing positive coaching outcomes.

Accordingly, this study will seek to address the following research questions:

- Explore whether the coachee develops a working alliance with the coaching app
- To examine if the coachee's engagement with the app enhanced their self-resilience

- Explore whether, through using the app, the coachee was able to enhance their self-resilience through the active ingredient of a working alliance with the technology.

2.10 Conceptual Framework

What was revealed in the literature review overall was the surprisingly loose nature around the language of coaching, coaching through technology and digitising coaching. This is hardly unexpected considering that it is a relatively new discipline coupled with the frequency of new emerging technological innovations. This, therefore, makes the process of examining the phenomenon of using a coaching app all the more challenging and requiring the absolute need for a conceptual framework for the study to be undertaken.

It has been argued that a conceptual framework's purpose has an integrating function, creating an amalgam between theories and notions (Leshem and Trafford, 2007). It could be suggested that distinguishing theories and concepts is of more importance in emerging sciences such as human-technology interface where advancements in the capability of robotics out-pace society's capacity to absorb change. Jackson (2002) argues that new technologies are evaluated in a binary manner considering the impact in terms of ethical or governmental factors, leaving the empirical issues of how humans interact with the technology as relatively unchartered territory. He further states that the intersubjectivity between peoples and technology is challenging paradigms, "lived reality cannot be reliably inferred from the way reality is discursively constructed and cognitively represented." (p. 344). This line of enquiry, however, is challenging normal science [6] and is beyond this thesis; however the researcher considered that it was necessary to acknowledge the existence of these disruptive concepts in the design of a conceptual framework.

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[6] Kuhn, T. S. (1962) *The structure of scientific revolutions / by Thomas S. Kuhn.* Chicago ; London: University of Chicago Press. International encyclopedia of unified science ; v. 2, no. 2.

A conceptual framework for this study was developed and shaped from the literature review to aid this study's methodology, operationalise the research questions and analyse the phenomenon. The two principal constructs chosen were a model of working alliance and a determinable positive outcome, measured through self-resilience. Latterly these will be operationalised into a priori codes to enable an analysis of the qualitative data.

- Working Alliance: The Working Alliance model was chosen for three reasons; firstly, it is an established theory. Secondly, there exists a validated inventory (Horvath and Greenberg, 1989), which allows for a credible measure of the bond between human and technology. Thirdly, the framework features the concepts of goal and task that are intimately linked to the nature of the relationship formed between coach (human or artificial) and coachee. The key components of Working Alliance, namely goal, task and bond (Bordin, 1979), will be used as a priori codes in the first stage of the qualitative analysis.

- Self-resilience: A determinable positive outcome, measured through self-resilience, was a pragmatic choice and taken for three reasons: firstly, it provided a means of obtaining a measurable positive outcome. Secondly, it provided the opportunity to introduce an additional validated scale into the research design. Thirdly, it was a measurable outcome that is considered by employers as a desirable personal capability for employees to develop. The key internal self-resilience components, as identified by Kumpfer (2002) (Figure 2.2), were identified in the literature review as being Spirituality, Cognitive Competency, Emotional Stability, Behavioural / Social skills and Physical Well-being. These will be used as a priori codes in the first stage of the qualitative analysis.

The abstract theoretical concepts of working alliance and a measurable coaching outcome of self-resilience are identifiable in the conceptual

framework. However, the design provides for additional constructs including coaching models, augmentation of the human coach, working alliance with technology, the formation of traditional human-to-human coaching relationships, and human acceptance of technology. These additional constructs within the framework, provide a specificity in the research design providing variables from which phenomenon can be scrutinised (Self-resilience: Adaptability, Self-Belief, Problem-Solving, Positivity and Working Alliance" Goal, Task and Bond). A graphical representation of the conceptual model to be employed is given, see Figure 2.4.

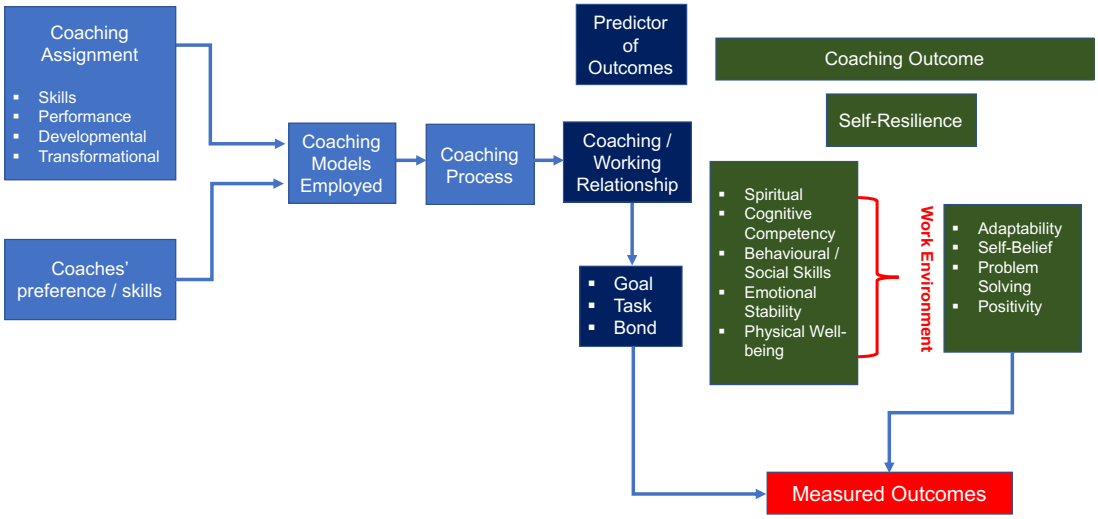

Figure 2.4: Conceptual Framework

2.11 Conclusions

The chapter proposed a conceptual framework within which the phenomenon of coachees' use of the coaching app was examined.

The next chapter will initially debate various philosophical traditions before declaring this study's standpoint. It will then discuss the study's methodological approach, including the operationalisation of the research questions.

Chapter 3 Research Methodology

3.1 Introduction

This chapter discusses the methodological choices the researcher has made in deciding his approach to the study. In addition, it will set out the operationalising of the research questions. Initially describing the philosophical foundations of pragmatism, on which the exploration was conducted, it articulates why this epistemological position was deemed more appropriate over other research paradigms, along with the rationale of the chosen research methods. The discussion will then continue by identifying the reasoning of employing a framework that consists of theories of the formation of a working alliance between coachee and technology, and how self-resilience is conceptualised and theories around its development. It will describe why the use of the working alliance inventory (WAI) scale is best suited to examine the phenomenon and how enhancing self-resilience (SR) is an appropriate indicator of measurable coaching outcomes for the chosen participant population. The chapter will also describe the conceptual framework that has been used to provide additional analytical lenses and richness to the exploration.

The chapter will continue by presenting the research strategy of mixed methods, using a convergent technique from parallel quantitative and qualitative studies, and discuss why this was deemed the most appropriate. A key consideration running through the methodological design was the presence of ethical considerations as technology can be so invasive on our human condition (Spinello, 2011). It can be identified that the study took a precautionary approach to data collection, using the premise that the study should cause no harm to its participants or researcher whilst maximising its contribution to knowledge. The ethical dilemmas the researcher confronted will be described together with the mitigating measures employed. Finally, the reader will be provided details of data collection, data analysis, and an

assessment of the study's reliability as well as highlighting inconsistencies that are inherent with the mixed-methods approach.

3.2 Philosophical Foundations

This section will outline the ontological and epistemological traditions found in the landscape where this thesis sits. The relationship that a researcher has with their field of investigation and their abstract beliefs on how they see the world are arguably the most important aspect of an empirical study (Kivunja and Kuyini, 2017). Understanding that the epistemological lens a researcher employs, consciously as well as subconsciously, provides the audience with a wider comprehension of extraneous factors that, with all probability, influence the written word. It identifies to the reader an appreciation of the possible biases inherent, and emphases made in the research project. It further indicates to scholars how meaning has been constructed from data. A study's research philosophical position can also be viewed as the skeleton of a project, defining its underlying system of beliefs and assumptions, within which the genesis of meaning is created. Determining a study's ontological and epistemological paradigm allows the emergent new knowledge to be positioned with a declared set of orientations, and defining it has become a central concept (Morgan, 2007). The notion of a worldview (shared beliefs in this context) was first coined by Kuhn (1962) when he contended that the early development of scientific concepts is characterised by "incommensurable ways of seeing the world" (p. 16). Thus, it could be suggested that the importance of a study's philosophical foundations establishes coherence between its subject, its environment and is a direct determinant of its authenticity and integrity. Firstly, however, an author should declare what they consider reality to be.

Ontology is the study of the nature of reality, including the notion of what is possible. Concepts of existence and the nature of existence flow were described by Blaikie (1993, p. 6) as "the science or study of being". Denzin and Lincoln (2011) consider ontology "raises basic questions about the nature

of reality and the nature of human being in the world" (p. 183). Ontological debates consider notions of whether there is an independent reality beyond human consciousness or whether reality is a social construction created from the perceptions, conduct, and understanding of individuals in society (Bryman et al., 2008). Three ontological positions have emerged from these philosophical discourses; realism, idealism and materialism (Ormston et al., 2014; Guba and Lincoln, 1994). Realism considers that there is an external reality that exists independent of human comprehension. In the alternative, idealism positions the notion of reality is of human understanding and a social construct. Materialism considers the real world as physical and material reality only, and all things can be explained in terms of matter and physical phenomena. Al-Saadi (2014) usefully distils the ontological assumptions in his paper Demystifying Ontology and Epistemology in research methods, suggesting that objectivism and constructionism provide sufficient ontological positions. Objectivism is akin to realism, where reality can be observed objectively and social phenomena are measurable. Constructionism is parallel to idealism, where external reality exists. Still, through human understanding, true meaning is revealed, albeit reality is subjective, accomplished by social actors, and is an approximation of social phenomena.

Posing questions of reality and being are particularly relevant when considering this field of study. Should the algorithms within the software architecture of a coaching app that attempt to mimic a human coaching experience be considered an entity beyond human interaction, or is it that humans anthropomorphise technology to make it a real entity? The ontological position of whether a piece of software can be regarded as an agent was considered by Hawley (2019) who suggested that scholars in theology and philosophy form collaborative partnerships to help navigate the challenges of establishing an ontology of AI. Notwithstanding this on-going debate, the author's ontological position is that of objectivism; facts are independent of the human mind, and reality is discoverable through scientific process and research.

The researcher's original 'world-view' is akin to Mr Gradgrind in Charles Dickens polemical novel *Hard Times:* "Now, what I want is **Facts**[7]. Teach these boys and girls nothing but **Facts**. **Facts** alone are wanted in life. Plant nothing else and root out everything else. You can only form the mind of reasoning animals upon **Facts**: nothing else will ever be of any service to them."(1887, p. 4) It follows that the researcher's initial epistemological position was perhaps best described as a contented natural scientist sourcing observable data, measuring, and through its objective analysis seeking the development of knowledge; content in his positivist paradigm and a champion of Auguste Comte.

The introduction highlighted the importance of securing the study to those epistemological positions found in learning technology and coaching fields so as to assist coherence in the study and confidence in the reader that methods employed were tried and tested. Morgan (2014) suggests that a research study should not be considered as an isolated piece of work but rather adding to the knowledge within a particular field and as such researchers should take due cognisance of community standards and traditions. The literature review provided an insight into the various methodologies and their accompanying philosophical positions employed by researchers. The positivist and post-positivist positions were normally encountered in computer technology papers identifying the natural sciences traditions of hypotheses testing. The corollary being that the studies that examine psychological coaching methods in change theory had worldviews of constructivism. Of course, there are exceptions, Luthans (2002) psychological study into the impact of hope, optimism and resilience on organisational behaviour is rooted in a positivistic approach of measurement that seeks to identify the causal relationships between an individual's skills and work-related outcomes in organisations. Luthan's study proposed that some connection existed between the concepts of hope as well

[7] Bold Emphasis added.

as resilience and organisational commitment, but regrettably, the quantitative study provided no further data to explore this phenomenon.

However, the majority of literature reviewed in chapter two found that authors' philosophical positions were rather inferred, rather than stated, and therefore readers were obliged to assume these through the methodologies and the data analysis that were employed. Green (2014) considers this lack of clarity in publications by practised researchers as a consequence of their innate misunderstanding of the concepts rather than an oblique omission. She further advocates that research texts should be more explicit in the theoretical and conceptual frameworks that the study is predicated on, allowing an alternative narrative to be constructed where philosophical concepts are viewed by the novice researcher as a tool rather than an abstract notion.

As this thesis focuses on junior managers using a coaching software application, it was anticipated that individuals would construct their own view of reality of their relationship with the technology. Crotty (1998, p. 43) describes a constructionist position in that reality differs from person to person and that these concepts of meaning emerge from conscious engagements with objects and experiences that are pre-laden with connotations. The coaching app employs rudimentary AI systems, and it is likely to conjure different reactions in the participants' influenced by their own constructed reality toward technology (Frowe, 2001). Human beings have a concept of AI as an entity, they give it a name, and attribute meaning along with neighbouring forms of technology. Meaning, therefore, will need to be constructed from an individual's understanding of their interaction with the coaching app and coalesce around experiential themes collected to provide interpretation. It follows that meaning is constructed from interaction between humans and their world, in this case interface with technology, and are developed and transmitted in a social context (Crotty, 1998, p. 42). It could be suggested that the research paradigm most suited to this study would be critical realism as it "focuses on explaining what we see and experience, in terms of the underlying structures of reality that shape the observable events"

(Saunders et al., 2015, p. 138), however, there are other concepts to be considered that influence the most appropriate theoretical paradigm.

In order that a coachee's use of the coaching app is validated in terms of the context of coaching, as opposed to alternative engagements with technology using a mobile device, it is necessary to secure the study within the sphere of the coaching discipline. This study adopted a structural analysis of coaching by Cox et al. (2014), to examine the theoretical foundations of the discipline, and in particular, the facet of the coaching relationship. It is possible to examine the phenomenon under investigation with measurable components of the coaching relationship. This can be further distilled to the concept of a working alliance between coachee and coaching app. This, coupled with collecting data on an individual's self-resilience, potentially provides two measurable aspects to the study. In considering the use of scales to measure a relationship, it follows that an alternate philosophical position could be more appropriate that values the objective nature of observable deductive reasoning. This position equates to a post-positivistic stance where the notion of scientific testing leads to the production of credible and quantified data that can be analysed to articulate generalisations of meaning (Crotty, 1998).

This research could therefore adopt seemingly conflicting epistemological traditions. Jones and Kennedy (2012) suggest that the researcher should go beyond the paradigm wars and choose from a diverse range of methods in addressing a research problem. In their article, they argue that research in the field of learning technology has become polarised into qualitative and quantitative research and that this division is increasingly questionable as new technologies provide innovative research tools as well emergent research areas such as neuroscience and education. There are clear parallels between this contention and the research into the formation of a coachee's working alliance with technology. In their conclusion, they argue for:

> "a pragmatic approach to method which pays greater attention to the research question being addressed rather than to any overall philosophical tradition. We conclude by highlighting that the current

> consensus about research methods in learning technology research may very well be under threat from the development of methods enabled by new technologies that do not fit within 'normal science' as practiced in learning technology research." (p. 26).

The debate between the positivists and the constructivists can appear esoteric as they attempt to claim the emerging frontiers of technology's impact on society. Indeed, the language appears to mirror the philosophical conflicts of the 1980s. Researchers will need to confront these dilemmas as internet technologies provide sharp relief to the 'paradigmatic soup' and comfortable traditions within philosophical paradigms (Markham and Baym, 2009). Whilst the researcher had no wish to avoid the challenging nature of philosophical concepts, it was necessary to seek a conclusion. A neutral middle-ground between the two continents of positivism and constructivism appeared sensible when considering the debates relating to researching fields connected with technology. This is also consistent with Jones and Kennedy (2012), who "argue for a pragmatic approach to method which pays greater attention to the research question being addressed rather than to any overall philosophical tradition" (p. 26).

To conclude this section, and citing an early advocate for pragmatism Charles Peirce (1724-1804), who considered that the meaning of concepts was observable results within the framework of real-world conditions, but also within the context of the fourth techno-paradigm[8] shift, where advancements in technologies are challenging worldviews, a sensible middle path is found. A unification of paradigms demonstrates a holistically pragmatic approach which "seeks to answer the research questions with a sense of completeness driven by the researcher's self-identity, confidence and personality where

[8] Perez, C. (2009) 'Technological revolutions and techno-economic paradigms', *Cambridge Journal of Economics,* 34(1), pp. 185-202. doi: 10.1093/cje/bep051. This concept is discussed in chapter one.

expectations for traditional research approaches are challenged and the triangulated findings celebrated" (Darnell, 2018, p. 6).

3.3 Chosen Methodology

The methodological approach researchers decide for their study is perhaps the most critical of decisions, as they seek to answer the research questions. One of this study's research objectives was to analyse outcomes and perceptions of using a coaching app. An investigation purely using qualitative data, recording personal descriptions, would preclude a validated measurable outcome of using the coaching app. The research question therefore gravitates the decision process toward including both qualitative and quantitative data. In the previous section, the importance of establishing a philosophical paradigm was discussed. The consequences of deciding that pragmatism is the most appropriate paradigm lens to use does not exclude the opportunity to adopt either objective or subjective ontological positions. Pragmatism recognises that the world may be interpreted in many ways and not just from one perspective, thereby providing, arguably, an entire picture (Saunders et al., 2015). This multi-lens approach provided the study with the opportunity to consider combining positivist and interpretivist positions employing deductive and inductive research approaches.

To centre the discussion, the principal subject this study seeks to explore is the coachee's use of a coaching app, using testing variables of whether a working alliance with the technology forms, and whether there is an enhancement of Self-Resilience. The literature suggests that humans can develop a relationship, in the form of a working alliance, with electronic devices (Kiluk et al., 2014). In essence, the study is taking a deductive approach by exploring and testing a hypothesis that a working alliance can be formed between coaching app and coachee. Using a model based on Blaikie (2000), six sequential steps to test the rationale of using a deductive approach to theory development, it demonstrated a coherence to a pragmatic position adopting deductive theory development, as illustrated in Figure 3.1

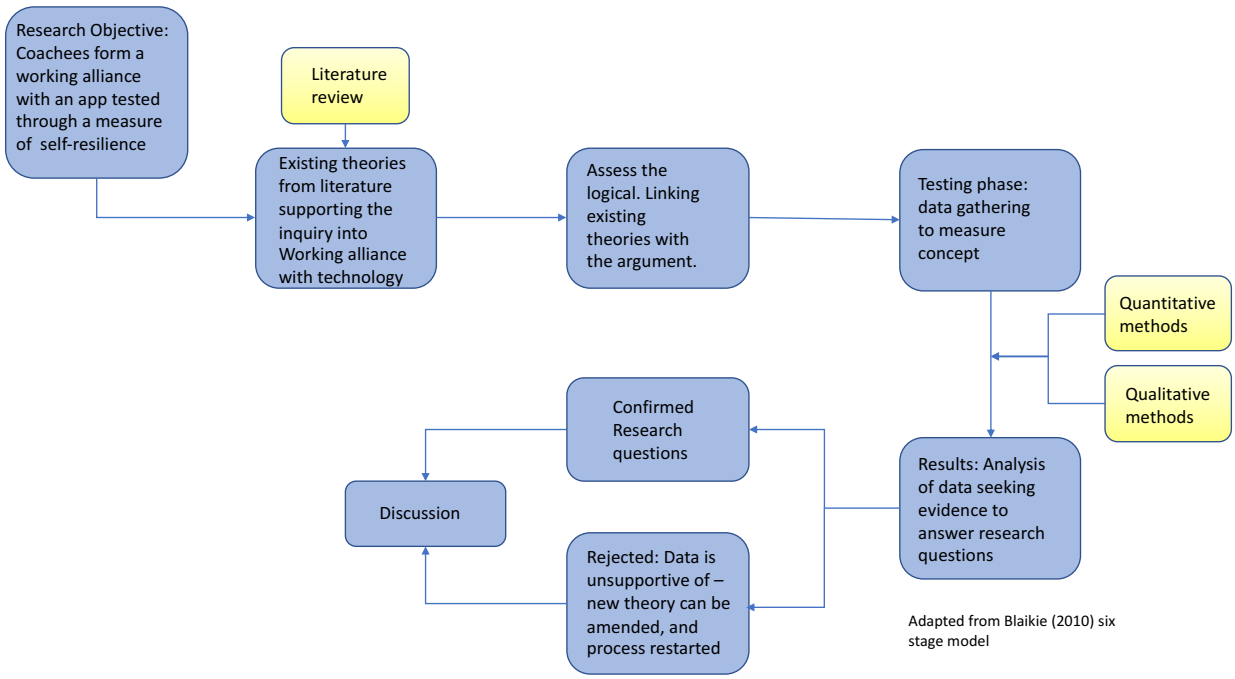

Figure 3.1: Deductive development approach

Accordingly, the study's empirical data on a collective shared belief of the "workings" of the technology employed will measure the concept of a human alliance with technology. This approach, where the phenomenon is centre-stage in the research approach, accords with a pragmatist's paradigm that focuses on outcomes (Morgan, 2014). It shall seek to understand the coachee's experience of the real and constructed worlds, within the epistemological positivistic landscape of technology. Teddlie (2009) suggests that pragmatism is the philosophical partner for mixed methods research, as it allows investigations to employ a third lens, rejecting the esoteric debates of the appropriateness of constructivism versus positivism, by taking a holistic approach seeking superordinate ideas that centred the research investigation within the wider context of philosophy.

According to Cameron and Miller (2007) "Like the mythology of the phoenix, Mixed Methods (MM) research has arisen out of the ashes of the paradigm wars to become the third methodological movement"(p. 1). In less florid language, and perhaps a more considered contention, is that mixed methods

studies have an earlier tradition than often stated. Maxwell (2016) argues that the origins can be found in the social sciences in the 19th and early 20th centuries and pre-dates the infamous paradigm conflicts. He further considers that the social sciences have been self-absorbed by the debate of paradigm incompatibility and that value can be gained through comparative work of these early studies. However, Teddlie (2009) considers that MM as alternative to quantitative and qualitative traditions, emerges only in the last 25 years as an alternative orientation. The literature suggests that a common motivation of using MM is a desire and hope that the technique will deliver a more complete and corroborated set of findings (Teddlie, 2009; Creswell, 2017; Morgan, 2014; Darnell, 2018; Fielding, 2012; Mackenzie and Knipe, 2006). Morgan (2014) considers that the personal interests of a researcher plays a major role in the choices s(he) made about the design, and priority given to numerous external factors such as audience, scientific traditions and available resources.

The researcher's relationship to the field of study could be viewed as being an optimistic campaigner. He has long advocated the use of computer aids in coaching and mentoring to support and grow the sector. This positive attitude to technology could lead to an inherent bias toward the subject. However, this self-awareness by the researcher and recognition that the potential of cognitive dissonance has the potential to influence meaning, is considered a strength rather than a weakness. In acknowledging conscious and unconscious bias, the researcher attempted to adopt strategies within the design method to help ameliorate these predispositions. One aspect of particular concern is the phenomenon of self-verification, where individuals seek confirmatory data to accord with their preconceptions and actively reject dis-confirmatory information (Swann and Read, 1981). There clearly is a danger with misinterpreting data, seeking emergent themes that echo preconceived theories of the phenomena. However, a careful balance of detached observer needs to be sought and maintained in the qualitative semi-structured interviews with the coachee. Seeking the concept of complete objectivity could be seen as fanciful from one paradigm, but equally interpreting data subjectively from a constructivist paradigm could be of

concern. Arguably joining the philosophical roots of qualitative and quantitative (being that of constructivism and positivism) respectfully gives the opportunity of creating a research approach that is the best of both worlds (Rumsey et al., 2012). The quantitative aspect of a MM methodology should provide a degree of remoteness although, according to Burr (2003), “The task of researchers therefore becomes to acknowledge and even to work with their own intrinsic involvement in the research process and the part this plays in the results that are produced. Researchers must view the research process as necessarily a co-production between themselves and the people they are researching"(p. 152).

The objectivity of measured surveys, together with the contextual understanding by observation through semi-structured interviews, will provide a richness to the data, allowing for interpretation, contextualisation and measured outcomes. The data from two fundamentally different sources is likely appeal to different audiences from alternate paradigms; the quantitative data for the positivistic worldview, where the computer scientists invariably harbour, and the qualitative results, for the constructivist social interpreters. Accordingly, a mixed method model by Creswell and Plano Clark (2011) was adopted and adapted with the introduction of a reflexivity process to assist in tempering the researcher’s predispositions toward the technology, see Figure 3.2

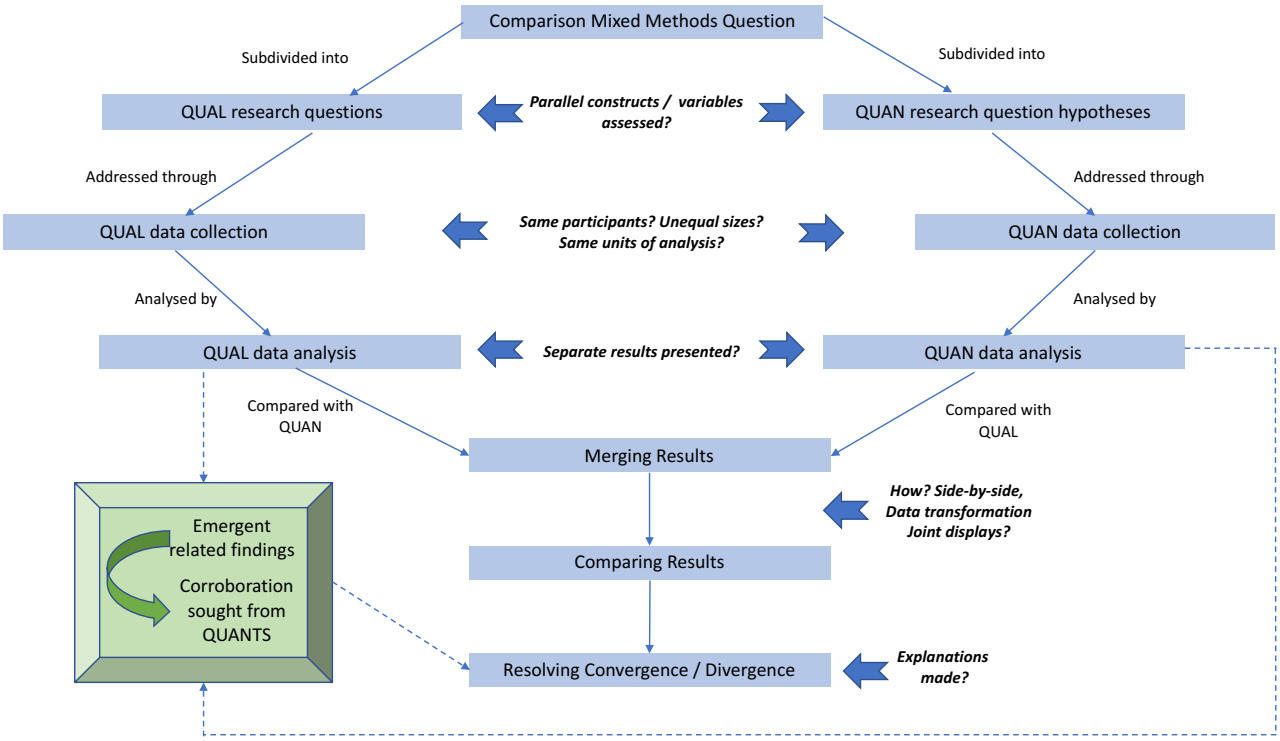

Figure 3.2 : Overarching Mixed Methods Design
Source and adapted from Creswell and Plano (2011)

The chosen process of integrating the results demands that the researcher analyses the data sets separately and independently of each other. The two sets of results from this phase are then merged. Creswell (2017) recommends that in a MM convergent design, the researcher asks parallel questions in order that the results from the two data sets of quantitative and qualitative can be readily compared, contrasted and merged. For the sake of validity, the researcher sought a questionnaire that could draw on scales that are perceived as credible measures for working alliance and self-resilience.

It should be noted that emergent QUAL findings that were not directly associated with the parallel constructs were identified, and corroborative or contradictory evidence analysed within the QUAN data set. This added complexity of sourcing and analysing data requires the researcher to have the time and the skill in handling different data from alternative research traditions. It was previously highlighted that the researcher is at “home” with quantitative data, and it should be recognised that bias, in using additional effort, may well

have taken place. Further, it could be argued that there would be a tendency to explore meaning in the quantitative data set and subsequently seek confirmation in the thematic analysis of the semi-structured interviews. This “potential threat of tokenistic use of qualitative research within a prominently quantitative design” was highlighted by Doyle et al. (2016, p. 632).

It was discussed earlier on in this chapter that researchers may adopt varying strategies in determining their approach to an enquiry. It follows that there is no one best strategy, but all research studies will have strengths and weaknesses. It has been argued that combining methods from two different methodological traditions could enhance the study. Creswell (2017) however, argues the corollary, contending that the research could combine weaknesses from the qualitative and quantitative data and the results therefore, can and be further undermined. Albeit, this study has chosen a convergent design (QUAL=QUAN) over additional coverage or sequential contributions designs, and it could be argued that the latter two methods have a multiplying effect where weakness in the initial phase is compounded by the subsequent phase. Arguably, the most challenging aspect of MM is time and resources. It requires multiple collections of data sources, both qualitative and quantitative in nature.

It has been further argued that quantitative measures may lack sensitivity and be unable to detect the complexities of human experiences (Lee and Rowlands, 2014). There is clearly potential in using MM in the study of a human’s perception of using a coaching app as the subject is too nuanced for the questionnaire to detect, and at the point of convergence there is a divergence of results, or no collaborating evidence between the two methods is found. Ivankova (2014) suggests that researchers in finding anomalies and a divergence in their results need to confront such differences in order not to undermine the quality of their research.

There is still considerable debate regarding approaches to sampling methodologies in mixed method designs since Onwuegbuzie and Collins (2007, p. 282) critical observations that “relatively little has been written on the

topic of sampling". McBride et al. (2019) add to the debate in a pragmatic overview of sampling in the context of mixed methods methodology.

In conclusion, it was the researcher's wish to set the study between two philosophical paradigms in the belief that the MM would provide "best of both worlds" (Roberts, 2015). This thesis sought to deliver research material that has rigour, precision, objectivity, with a framework evidence base logical reasoning. Yet also acknowledging that the data would also be nuanced with confirmatory meaning, recognising that there are limits to what can be observed and deduced from the physical world. These discoveries require being contextualised to attempt to establish true meaning. It was the overwhelming desire of the researcher to design a study where "the mixing of qualitative and quantitative methods will result in the most accurate and complete depiction of the phenomenon under investigation." (Johnson et al., 2007, p. 299).

3.4 Research Design and Sampling Strategy

The next section will outline the process of operationalising the research study adopting the mixed methods methodological approach in a quasi-experimental approach. Table 3.1 below sets out the research enquiry, both in terms of quantitative and qualitative constructs.

QUANTITATIVE HYPOTHESES	QUALITATIVE PARALLEL RESEARCH QUESTIONS
The coachee developed a working alliance with the coaching app	What descriptions did the coachee record when using the app in terms of their working alliance with the technology?
The coachee's self-resilience was enhanced as a result of using the app	How did the coachee's describe their self-resilience and how it

	altered through their engagement with the app?
The working alliance developed between coachee and coaching app was a predictor of an enhancement of self-resilience	Was the coachee able to enhance self-resilience through their working alliance with technology

Table 3.1: Operationalising Research Questions

The researcher, through his network of contacts, was able to access corporate partners with Human Resource departments keen to explore this technology, thereby giving access to junior managers in a business setting. It is acknowledged that this convenience sampling technique, whilst a non-probabilistic method, was a pragmatic solution in finding a group of volunteers for the study. It is also acknowledged that this decision was a compromise between the quest for data from junior managers in using the coaching app and the limited resources of time and cost that the researcher had at his disposal. As a consequence, general inferences from these findings are impeded (Etikan et al., 2016).

3.4.1 Quantitative Research Design

The researcher throughout the research project, could not locate any studies that were specifically designed to explore the concept of a relationship between coachee and coaching app. There are studies in the neighbouring field of therapy where the clinician's employment of technology is examined. One particular investigation by Kiluk et al. (2014) sought to explore this relatively new ground of the nature of a working alliance between client and technology. The research introduced the Working Alliance Inventory for Technology-Based Interventions (WAI-Tech), a scale that used Horvath and Greenberg (1989) Working Alliance Inventory (WAI) as its foundation. The adaptions to the base inventory were subtle and related in the main to naming the computer program in-lieu of the therapist.

This study's questionnaire design used a known scale to measure the impact of coaching on self-resilience related to management soft-skills (Naswall et

al., 2015) and the working alliance formed with the coaching app (Horvath and Greenberg, 1989). A literature study further highlighted “limitations of the broader literature on resilience in the workplace” (Vanhove et al., 2016). The balance of using a recognised and validated general questionnaire (Wagnild and Young, 1993) and employing a new, albeit less validated, but arguably more applicable workplace survey was considered in the design of the study. On reflection, however, the researcher was persuaded by Wagnild and Young (1993), that a questionnaire specific to the workplace would provide a feeling of more relevance to the participants and therefore be more appropriate. Albeit a cautionary note for the reader, the metrics for measuring workplace resilience are being developed, and there have been only a few scholarly investigations. A study by Malik and Garg (2018) testing the reliability and validity of a 17 component measure of self-resilience at work found that the scale has a good internal consistency, with a Cronbach’s alpha value of $\alpha = 0.81$. The study’s method sought to employ a validated employee-focused scale measuring a number of personal skills, one component being the individual’s resilience. It adapted a cross-sectional questionnaire, from a different cultural perspective and applied it to an Indian IT organisation.

3.4.1.1 Creation of online questionnaire

The opportunity of a large data pool meant that the method of gathering information should be as inexpensive as possible. A survey via an online questionnaire was the obvious choice. The potential, however, that the questionnaire would not detect nuanced themes was recognized, and a number of unstructured questions were introduced which allowed participants the opportunity to express themselves more fully if they wished. Furthermore, a second disadvantage was acknowledged; there was be a degree of self-selection. There were two aspects of self-selection; firstly, the survey was entirely voluntary, and it was likely those who had an interest in technology would be the ones who participated; secondly the questionnaire was be conducted electronically via email and a web-based software package, SurveyGizmo. Consequently, the participants would have possessed a degree of familiarity with technology.

3.4.1.2 Initial questionnaire design

The design of the questionnaire was in four parts:

- Opening/landing. Capturing participants profile – all closed questions
- Measure the app's ability to enhance working alliance (Likert scale)
- Measure the app's ability to enhance self-resilience (Likert scale)
- A dialogue box for any other comments

All participants, on two separate occasions, were asked to complete the online questionnaire that should have taken no longer than twenty minutes to complete. The survey did not ask any personal identifying data, but asked them to use a dummy name. The questionnaire was written in a simple style, appreciating that with some participants that English was not their first language.

3.4.1.3 Pilot Test

The testing of the questionnaire proved to be a useful and essential exercise. Comments were received, and the questionnaire wording and content were altered in a number of areas, namely:

- Structured and unstructured responses: The balance between structured and unstructured was addressed to give greater depth to the survey.
- Wording: The survey population included participants where English is not their first language. Simpler phrases and sentence structures were deployed.
- Validity: An EMCC[9] working group that assisted in modifying the survey suggested that one question should be differently structured to help the validity of responses. It related to the theoretical principles its membership employed.

[9] European Mentoring and Coaching Council – a representative body in the coaching field

3.4.1.4 Final questionnaire design

A structured approach to the questionnaire (Appendix I: Online questionnaire) was also adopted to give a better flow to the survey, namely:

Profile of participants	Three questions
Technology self-efficacy	One question (Likert scale)
Theoretical conceptual frameworks	Working alliance (Horvath and Greenberg, 1989) [10]: 10 questions Self-resilience (Naswall et al., 2015): 17 questions Space for comments also included

3.4.2 Qualitative Research Design

As previously discussed, the mixed method research approach of QUAN=QUAL, where the results from the separate data collection processes converge, necessitates that the material is comparable. Unlike other MM designs, the results from each data set must have their own integrity with neither usurping the other. Accordingly, the design of the QUAL data must seek to address the same research question and ensure comparability. The basis of the semi-structured interview questions was taken from the online quantitative questionnaire. However, a balance was needed between the results from the two data sets being of a comparable nature and the differences the two methods were able to capture the breadth and depth of descriptions of the coachee using the app. The design of the semi-structured interview followed the structure of concepts that supported the theory of Working Alliance Inventory (WAI); task, bond and goal as well as the notions contained within the theory of self-resilience where a sense individuals' current robustness and ability to bounce back from adverse events was explored. A set of principles were drafted to create a "guided conversation" between participant and interviewer (Lofland and Lofland, 1971).

[10] Amended by altering references to therapists and replacing with coaching app

3.4.2.1 Initial establishment of semi-structured interview questions

In preparing the semi-structured interview questions, two aspects were considered to be cognizant, namely: firstly, participants would be selected from the study population randomly, consequently, it was highly likely that the majority did not have English as their first language. Secondly, the discussions would last less than 60 minutes appreciating that the time of volunteers was valuable, and interviews would, in the main, be conducted during the working day. An initial draft of questions and interview guidance notes was created and then tested.

The questions were created with reference to the conceptual framework (Figure 2.4) and the study's principal objectives, to discover the outcomes and perceptions of the coachees using the app.

3.4.2.2 Pilot test for semi-structured interviews

The testing of the semi-structured interview questions proved to be useful and, on reflection, an essential exercise. Two interviews were undertaken with volunteers from the researcher's network who had a similar profile to the intended target research population. No recordings were made of the interviews. The questions were discussed and debated with the volunteers and notes made. Following a period of reflection, the interview questions and guiding notes were amended as follows:

- A contextual question was added: Had the interviewee experienced traditional coaching by a human?
- Language – a reminder on the guiding notes was added, noting that many of the interviewees' first language was not English and therefore the questions should be asked at a pace which could be easily understood.
- Greater emphasis was placed on the concept of robustness in order to attempt to elicit more explicit responses.
- Two questions from the working alliance enquiry were omitted because of time constraints.

3.4.2.3 Final design of semi-structured interviews

The final design of the questions posed at interviews at T1 and T2 (Appendix II: Semi-Structured Interview Guide) provided the basis for a free-flowing conversation with the volunteers. The researcher slightly altered the emphasis of the questions at T1 to T2 giving the interviewees the space to record their descriptions of using the app over the full eight-week period, conveying perceptions of any change in their engagement with the app, and relaying the influence, if any, the app made to their understanding of their own self-resilience.

3.5 Selection and recruitment of research partners

3.5.1 Criteria for selecting collaborating research partners.

The principal rationale for selecting partners for the research study was their ability to support and contribute to the research aims. However, these concessions should be transparently acknowledged and addressed systematically to aid reasoning and decision making. To assist in this process, a framework was formulated as a set of guiding principles to assess potential collaborating partners: -

- Ethical – the partner would need to endorse the study's ethical framework.
- Longevity – in particular, the app software company would need to be of sufficient standing and demonstrate, through past performance, their stability.
- Commitment – it was not envisaged that the partners would need to overly support the research, but a small amount of administrative support would be needed.
- Engagement – demonstrate active engagement with the research principal objectives.
- Access – help access to a sufficient population of participants that have similar age profile, mixed gender, and achieve the same career attainment.

This procedure was adopted and proved valuable in the early stages of sourcing collaborative partners. A number of software houses failed to meet the longevity measure, and also a number of financial institutions found it difficult to agree to the commitment criteria.

3.5.2 Choice of software application

3.5.2.1 Introduction

A preliminary task of the project was to undertake a desktop study of commercially available coaching apps that employ AI technology. The following inclusion criteria were employed:

- the app was publicly available (Spring 2018) for download within the European Middle Eastern and Africa (EMEA) to align with the target participant population
- the app was marketed as providing general coaching support
- the software architecture employed AI
- the app was specifically designed to be used on a smartphone
- web-based internet apps accessible only via computer interfaces were excluded
- Exclusion of those apps that were non-English

The second stage of the selection process was approached by critically reviewing the app for theoretical coaching approaches, functionality and scope of interaction with the user. To aid analysis, a systematic process to categorise key characteristics was employed, as undertaken by Parra-Calderón et al. (2016) in their study into health apps for medication adherence. The systematic taxonomic framework aided a sequential review process allowing analysis and comparison of the coaching apps, commencing with a research strategy for the products. This bedrock of understanding the software's potential functionality together with the underlying coaching methodology provided a supporting guide and influence on the next stage of the investigation.

3.5.2.2 Investigation into possible software partners

The commercially available apps can be divided into two categories; one being a simple portal where the user (coachee) connects with a coach, for example, CoachMe and TCA, providing a platform of diary management, and marketing pitches for additional off-line services. The second type of app contains greater functionality offering the user a degree of feedback, goal-setting, and motivational messages triggered by user reports. The majority are currently simplistic in their construction and approach. However, there are a small number that employ machine-learning algorithms to monitor user engagement and tailor individual responses, examples being Butterfli.ai, VoiceVibi, Orabi, WYSA and LeaderAmp. This study focused its attention on the latter as their creative algorithms provided a greater level of support for the coachee than the former that are designed to augment a human-to-human coaching experience.

3.5.2.3 Chosen software partner

The chosen app for this study is called WYSA. It was selected for three principal reasons; (i) the app employed AI in its software architecture, the majority of chatbots available on established platforms, GooglePlay and Apple's app store, had no such intrinsic design complexity, (ii) WYSA has been specifically designed to build self-resilience using CBT and was subject to previous analysis (Inkster et al., 2018), (iii) WYSA was supported for over four years with numerous upgrades being released and had been downloaded 1.5 million times, demonstrating an attention to robustness by the software developer. Wysa was rated 4.7+ on both Google Play and the Apple App Store. ORCHA the global leaders in digital health app evaluation and also used by the NHS, recently rated Wysa at 93/100, with a 100 on clinical assurance that was linked to our adherence to NHS Digital Clinical Safety DCB 0129 standards. In Dec 2019, Wysa got qualified as a commissioned service in the NHS London Procurement Partnership, a collection of 70+ Trusts and Clinical Commissioning Groups in England, for the following mental health categories: depression, stress & anxiety, bullying and phobias.

WYSA is an app developer based in India and the UK. It employs a business to customer (B2C) transacting model. The researcher contacted the company in July 2018 initially to understand the technology and the underlying coaching methods the algorithm software employs. The developer was supportive of the study as it would provide an understanding of where the app could be offered to businesses creating a future business to business (B2B) transacting model. The financial organisation, where the app was tested, was interested in the technology as an affordable means of investing in their people. It had a mature learning and development department that assisted in promoting this research project at arms-length.

WYSA is a downloadable software app chatbot that is accessed via a smartphone. It employs AI, Natural Language Processing (NLP) and machine-learning (ML) algorithms. No generative or adaptive models have been built or used. The models run at conventional nodes within a decision-tree structure. Each model detects user intent and a proprietary rules engine branches to appropriate pre-defined scripts or "bots" that contain validated conversational content, see Appendix III: Schematic of WYSA's Architecture. It has specifically crafted algorithms to create the conversation that the chatbot delivers (a computer software program designed to simulate a conversation with a human) to build individual's self-resilience through evidence-based and validated tools and techniques, such as cognitive behavioural therapy (CBT). Users of the chatbot engage in one-to-one text conversations with WYSA, represented by a small "penguin-like" digital image, and example of WYSA in use can be seen in Appendix IV: Screenshots of WYSA. WYSA engages with the coachee, asking open questions about their feelings and thought patterns, and, using principles and techniques of CBT, it helps individuals build self-resilience.

There was no time limit, WYSA allowed users to spend as much time with the app as they wished. The study was equally interested if participants, on first using the app, discovered that they had no connection with the technology and

abandoned the study. However, it was hoped that users found the technology immediately engaging and would therefore continue enjoying the app.

3.5.3 Selection of Corporate Partner

Finding a corporate partner proved to be most challenging. The network of corporate contacts available to the researcher was extensive and was highly valuable in establishing enthusiasm for the project. However, converting this initial enthusiasm for a potential cost-effective IT platform to support their employees into practical collaboration was testing. The corporate entities contacted were anxious regarding GDPR and also fairness in asking participants to use the app on their personal mobile phones. Through evidencing the robustness of the approach, these fears were overcome, and a company was selected, a Gatekeeper letter was issued (Appendix V: Gatekeeper Letter). The precise number of participants in the study was not determined during the methodological design stage. However, it was planned that there would be no more than fifty from a population of approximately 250 employees at “junior” management level in a financial institution covering Europe, the Middle East and Africa (EMEA). Recruitment of participants was designed to be open and self-selecting. The volunteers were asked to use the app for eight weeks as and when they felt the need. The institution was provided with an executive summary of the results fully anonymized; company name, WYSA, and participants were redacted. Participants in the study were also emailed a copy of the findings. Participants in the research were emailed directly, not via their employer, a copy of the results fully anonymized; company name, WYSA, and participants were redacted.

3.5.4 Recruitment of participants

The data collection was undertaken in collaboration with a global enterprise. The company operates in the banking sector; it has a mature learning and development department (LLD). The LLD, based in New York USA, is a separate support function within the Financial Institution overseeing the development of its employees. All staff enjoy a confidential development programme regardless of their grading and influence of their line-manager.

LLD has no involvement in recruitment, retention or promotion of individual employees. It does have the authority to create and support programmes that could possibly aid an employee's development. It has identified coaching apps as a possible useful tool for their staff to access.

The Learning Development Department (LLD) only promoted the study by posting a flyer to the cohorts' chatroom, a virtual common room for managers at junior management level (Appendix VI: Promotional Flyer). The flyer briefly outlined the study and provided email contact details of the researcher. The researcher responded to self-selected interested parties with a participant information sheet (Appendix VII: Participant Information Sheet), consent form (Appendix VIII: Consent Form), GDPR privacy notice (Appendix IX: GDPR Privacy Notice). When recruits had read these and returned the electronically signed consent form, they were given instructions on how to download the app to their smartphone and an access code for the software was emailed to them. Programme participation was entirely voluntary. The participants' business department had no influence on the study's process or structure. This embedded separateness of the participants' line-management in the study assured that no coercion of the participants was possible. In addition, the remoteness of LLD, geographically and managerially, to the participants' removed any suggested dependency issues.

The cross-cultural differences between offices are apparently small. The researcher had been given access to the "voice of the employee" bi-annual survey undertaken across the four locations. A number of metrics are employed that seek to test motivation, work-related attitudes; negotiation behaviour; reward allocation; and individual behaviour relating to group processes and personality. There appeared to be a homogenisation of culture, working practices and workplace attitudes.

Data was collected between April 2019 and June 2019. Seventy-two individuals contacted the researcher. In total fifty-one participants consented, were enrolled in the study and given the apps access code. The interviews

and questionnaires were all conducted online using secure portals, Hyper Text Transfer Protocol Secure (HTTPS) with all data harvested stored on GoogleDrive at Oxford-Brookes University.

The research project only collected data from the coachee participants in the form of questionnaires and semi-structured interviews. The researcher did not have access to the chatbot conversations between app and user. The private and anonymised conversations between the app and the coachee are held by WYSA. WYSA does not detect or store any personal data (or Personal Identifiable Information and as defined under GDPR). Users of the app are not required to share any personal information to sign-up (no emails, mobile numbers, or social network logins).

3.5.5 Background data on the participants

- The pool of managers in the Europe, the Middle East and Africa (EMEA) division where the study was recruited from was in excess of two hundred and fifty.
- Age range. The participants were managers between 28-45 years old.
- All participants are from a subdivision of a global financial institution covering EMEA.
- Gender – gender mix was 57% female and 43% male.
- The managers worked in company headquarters in four locations, London, Dublin, Budapest, and Krakow, although may have been based elsewhere, working remotely.
- All had been educated to degree level. All the participants had worked in the business product within the organisation for at least six months.
- Twelve nationalities were represented in the group.

3.5.6 Declaration of conflict of interest

There was no commercial link between the three entities: researcher, WYSA or financial institution.

3.6 Data Collection

3.6.1 Establishing a testing period

A rationale to support the testing time period is now discussed, with particular emphasis on individuals' connection with technology. Computer science and technology is ever-evolving, providing more expansive interfaces with technology. Researchers are on a path of developing models to capture and define human relationships with technology. The technology life-cycle and product obsolescence are continuous. Notions on the adoption of technology have been defined as refusal or rejection, acceptance and symbiosis shaping the engagement (Licklider, 1960; Brangier et al., 2009; Davis, 1989). These models were developed further by Brangier and Adelé (2013) into a taxonomy of relationships and how different complexities of technology vary the scope of the engagement. A smart television is recognized for its functionality, ease of use, and practicality by the user, and accords well with the technology acceptance model (TAM). Whereas, a smartphone engenders a symbiotic relationship in its users. Brangier and Adelé (2013) suggest that the more complex the technology, the more the user graduates the relationship from acceptance to techno symbiosis. These states can be considered as stages to a path of eventual co-evolution - neither static nor necessarily continuous - depending on the user and the type of technology.

Further, "The length of this progression depends on the complexity of the technology (from a *few* months for the mobile phone to more than a year for the computer and internet). Depending on the technology, the most common course type varies. The «richest» technologies (i.e. the ones including a multitude of functionalities) such as the mobile phone, the computer and internet show more courses leading to symbiosis whereas the digital camera tends to remain in the acceptance stage." (Brangier and Adelé, 2013, p. 57)

Further, the researcher's wish to incorporate a validate scale within the trial's methods provided a secondary reference point for an appropriate period. Kiluk et al. (2014) administered the Working Alliance Inventory-Tech to a group of 66 individuals over an eight-week period who underwent a technology-based

intervention for addiction where participants recorded their substance use through a urine technology screening programme. It was therefore resolved that an eight-week period would be a suitable length for the participants to use the coaching chatbot.

The study design was in two parts, an online questionnaire for gathering quantitative data and semi-structured interviews at T1 and T2 for gathering qualitative data (T1: 1 week after start, T2: 1 week after the finish of the testing period). For the semi-structured interviews, a number of participants, selected at random. These individuals were invited to individual one-to-one online discussions with the researcher at T1 and T2. A graphical representation is presented of the process in Figure 3.3

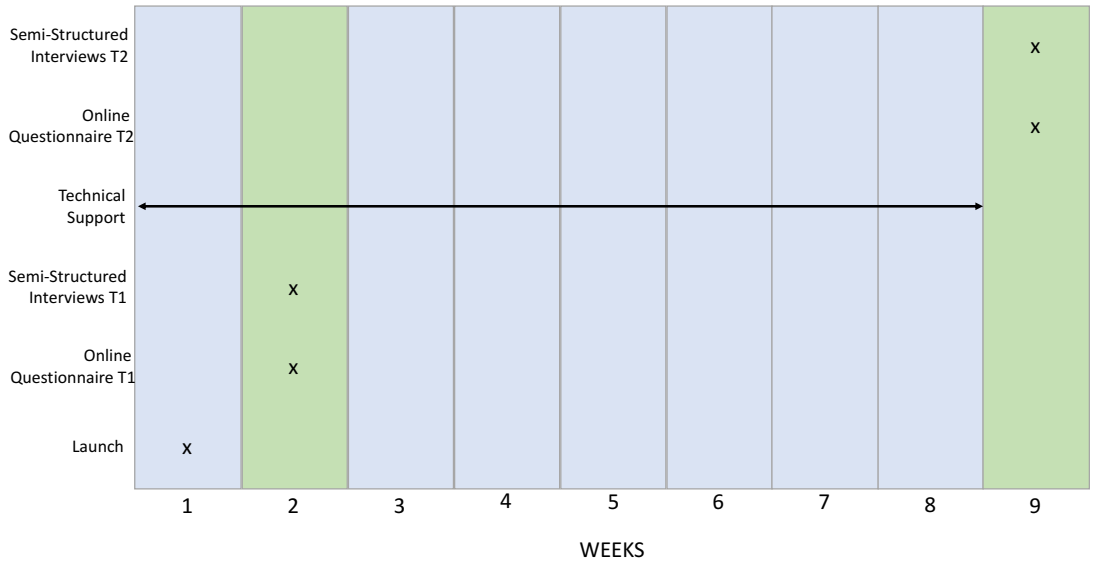

Figure 3.3: Timeline of research study

3.6.2 Quantitative Data Collection

All participants, on two separate occasions, at T1 and T2 were asked to complete an online questionnaire, using the same questionnaire. T1 was one week after the start of the intervention to allow the participants a brief understanding of the app, and its supportive tools, but not for too long a duration for them to be influenced by its engagement and processes of behavioural therapy. T2, one week post-intervention, was selected to allow participants a short period of reflection after the intervention.

3.6.3 Qualitative Data Collection

The formulaic discussions provided a framework to permit the merging of data, and also allow for a wider exploration into the phenomenon of a coachee's relationship with their app or robot. The scope of the interviews were not fully pre-determined. Semi-structured interviews were conducted initially with eleven participants at T1, at which point no new material themes emerged. At this point, a final semi-structured interview was conducted with a twelfth participant, demonstrating that data saturation had been achieved (Creswell, 2017). At T2, to provide a comparator set of data between T1 and T2, the same group was interviewed.

The second data collection was from semi-structured interviews, at T1 and T2 (T1: one week after the start of the intervention, T2: one week after the end of the intervention), with a number of participants selected from the study population using simple random sampling methods. It was recognised that the sample size of QUAN and QUAL were different which could have made the convergence of results problematic; however, it was considered that the use of parallel questions would assist the integration process (Creswell, 2017).

The interviews were conducted using either a face-to-face meeting or via phone or skype. The interviews were recorded using an Apple iPhone 8 with a background noise suppression app that reduced non-speech sounds by the emission of cancelling white noise. The recordings were then transcribed by the researcher using an app called Transcribe©. The software, developed by DeNVIP, converts audio MP3 recordings into text files with timestamps[11]. The text files were then reviewed for accuracy in conjunction with the recordings and edited accordingly. The extent of editing of the app's recording was significant in the first two interviews, but with greater attention to the background environment, the remaining MP3 files proved more straightforward to convert to a written format.

[11] Definition of Timestamp is a digital record of the time events occur and in the case of this study allowed useful references.

The wealth of descriptions and perceptions of the app were captured after eleven interviews. A twelfth interview was undertaken to confirm that saturation point had been reached and the scope of the recordings was a fair representation of the wider perception in using the app.

3.6.4 How the participants engaged with the software

Coachees were asked to download a software application to their smartphone either from Apple's App Store or Google Play. The app was free to install; there was no charge or subscription required. After the study, the user then simply uninstalled the app from their mobile phone. The approximate memory size of the software is less than 5.0 Megabyte; less than 1% of an average smartphone's capacity. The participants did not experience any impairment of their device's general capability during the trial. On agreeing to partake in the study, individuals were given a one-time unique access code, by email from the researcher, to allow the chatbot to function. This code enabled free access for a limited period of up to 4 months

The latest revision 4.1.1 was for the new iPhone X. The software developer's intention to upgrading its product suggested that there were no technical risks in importing the app to a phone. All data collected through conversations with the app were anonymised. Furthermore, these dialogues between chatbot and users were not accessed by this research study.

3.7 Approach to Data Analysis:

3.7.1 Quantitative Process of analysis

The data collection point T1 & T2 used a questionnaire created from validated, adapted scales of WAI-Tech (Horvath and Greenberg, 1989), replacing references to the therapist with coaching app, and Self-resilience at work (Naswall et al., 2015). They were independently measured for internal consistency of the three subscales with the WAI-Tech scales evaluated using

Cronbach's alpha. Statistical analysis of the data was performed using SPSS software program (version 25.00).

Setting the level of significance, *p*-value, is surprisingly a matter of conjecture, and there is no definitive scientific method to choose (Lehmann and Romano, 2006). Commonsense convention suggests that the level of significance should decrease in-line with sample size. However, there is another key factor of expected losses which should be taken into account when establishing its value (Kim, 2015). In a robust debate put forward by Kuffner and Walker (2017), they contend that confusion has been promulgated by the applied statistics community leading to ambiguity and confusion in establishing an appropriate *p*-value for a study. Taking these decisions into consideration, and the final population value *N*=48, the critical value of significance for rejection level was set at $p \leq 0.05$.

3.7.1.1 Parametric or Nonparametric statistical tools?

The study considered the appropriateness of parametric and nonparametric statistical tools to be applied to the data. Some argue that the debate about the power of different statistical tools is founded on mythical and misleading assumptions (Hunter and May, 1993). They suggest that appropriateness of parametric over nonparametric tests in the field of psychology is an illusion. Perhaps their most powerful argument is the power advantage of a t-test over the Mann-Whitney u-test is unfounded. If the data is collected and measured via ordinal means, the use of a ranking method that seeks to capture a personal experience is the determinate factor of the power of data collection. They conclude by suggesting that "parametric tests are more powerful than nonparametric tests is true only for a highly restricted set of conditions that are rarely met in behavioural research."(Hunter and May, 1993, p. 386).

The quasi-experimental longitudinal design of the study, using the ordinal Likert scaled questions, to capture the personal perceptions by way of self-evaluation is the determinant factor. It is the comparison between individuals' initial reactions to the app (T1) and how this alters over the period of study

(T2) that is a measure of the value of the data collection. The use of nonparametric tests to capture this personal change is appropriate.

3.7.2 Qualitative process of analysis

In a previous section, the researcher's approach to the processing and analysis of the qualitative data collected at T1 and T2 was outlined. In short, what has been described as a, "theoretically flexible approach to analysing qualitative data" Braun and Clarke (2006, p. 77), was adopted. The method of analyzing the data from the interviews was thematic analysis. It is a method that identifies meaning through the identification, analysis, and reporting of themes and patterns (Braun and Clarke, 2006). It was considered the most appropriate method of analyzing the qualitative interview data collected in this study as it employs an interpretative approach. The approach and interpretation of the data is clearly key in determining the quality of the analysis, acknowledging, however, that the use of the term "quality" is laden with subjectivity, within the field of qualitative research. However, thematic analysis has been criticized for its unscripted and unbounded approach (Braun and Clarke, 2006). In defence of its flexibility, methodologists have sought to provide practical step-by-step guidance for researchers to follow (Clarke and Braun, 2013; Fereday and Muir-Cochrane, 2006; Guest et al., 2011; Swain, 2018).

The approach used in this study is one that followed a process and consistent rationale with a golden thread seeking to understand the reaction towards the technology, with continued reference to the model of a working alliance and the technology's ability to help the user to develop self-resilience. This continued application of the constituent elements of working alliance; agreement on tasks, agreement on goals and the development of an effective bond provides the terms of reference and allows the creation of *a priori* codes, which related to the theoretical models from literature, see chapter two.

A paper by Braun and Clarke (2019) titled "Reflecting on reflexive thematic analysis " provides an insight into the authors' thoughts since their seminal

paper (Braun and Clarke, 2006). The paper reflects on the journey of thematic analysis as a qualitative methodology, its wide adaptation and the researchers' opinion on the variety of uses of TA approaches that have spawned from their initial suggestions and assumptions. They argue that the researcher should carefully consider the research question and also their own analytical disposition. A decision made by this researcher was to incorporate the theoretical models of Working Alliance and Self-Resilience including other societal and dyadic relationship concepts into a conceptual framework (Figure 2.4) maximising the flexibility to explore the phenomenon, a hallmark of TA.

This study's conceptual framework (Figure 2.4) informed a set of *a priori* codes as suggested by (Ritchie and Spencer, 2002). These *a priori* codes provided a loose cluster of points which were employed during the coding process. Miles (2014) proposes that *a priori* codes should be seen as a starting point established from various sources, " the literature review, conceptual framework, list of research questions, hypotheses, problem areas, and/or key variables that the researcher brings to the study" (p. 72). It could be suggested that adopting *a priori* codes is a major constituent part of a research framework akin to interpretative phenomenological analysis (IPA). However, the approach in this study is focused on the patterns and meaning across the users of the technology through a conceptual lens and does not, as would be in the case of an IPA study, consider the participants' unique characteristics.

3.7.2.1 Six-phase approach

The study employed a six-phase approach to the analysis of the qualitative data as advocated and demonstrated through work by Braun et al. (2018). As with the quantitative data, the description of using the app was recorded at T1 & T2 through either face-face interviews or via a video chat mode of Skype. Analysis of the data was undertaken in three phases. Interviews at T1 and T2 were reviewed and analysed separately, the full six-stage approach suggested by Braun and Clarke (2006) was completed.

The results of the longitudinal study were then compared and contrasted in order to establish if the volunteers had changed their opinions of the app and sought to understand if a working alliance with the technology had formed between the coachee and the coaching app. In addition, using optics to explore the perception of using the technology, a robust framework was employed to code the data set, with a degree of objectivity. A reductive technique was used, interpreting statements within interviews comparing and contrasting how users related to the app over the longitudinal study. This intra approach to the data was then followed by an inter-analysis of data between the interviews. A consolidated understanding of the perception of the app in use having been established at T1, the process was repeated for the data collected at T2.

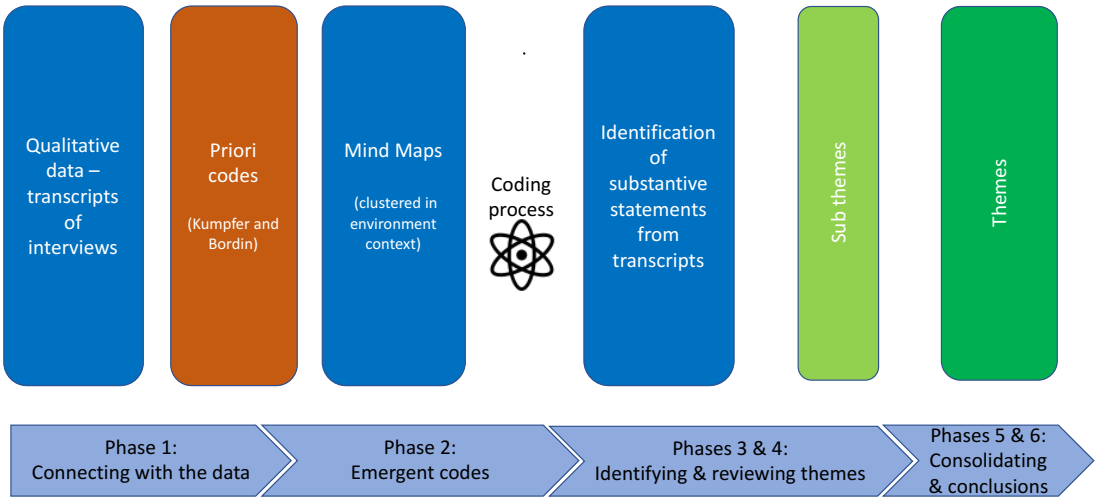

Figure 3.4: Schematic of analytical procedure of qualitative process

Figure 3.4 illustrates the design of the thematic analysis consisting of six phases.

3.7.2.1.1 Phase 1: Connecting with the data.

The interviews at T1 and at T2 were recorded on a smartphone and transcribed into a journal. Initial thoughts on how the data could be categorized were formed using the framework of *a priori* codes that were included in Kumpfer's and Bordin's theoretical models. The *a priori* codes related to coaching environment and were used as cluster points for the data.

3.7.2.1.2 Phase 2: Emergent codes.

This iterative process continued until words, flowing from the *a priori* codes, at T1 and T2 were created separately and transferred to the Mindmap software tool, SimpleMind©. These graphical representations of the data allowed the researcher to access the data in a framework, providing the opportunity to challenge preconceived bias and adjust accordingly. The *a priori* codes have been replaced by the concepts from the Mindmaps.

The next phase crystallized those concepts emanating from the mind-maps of T1 and T2, and codes were assigned to phrases, sentences and passages that captured succinct meaning and understanding. The coding process explored the individual's perception of the concept of a working alliance with the technology and their reflections on their own self-resilience. Coding continued with substantive statements highlighted for direct and indirect meaning.

3.7.2.1.3 Phases 3 & 4: Identifying and reviewing Themes

The journey of analyzing data continued with an overview of the codes (Figure 5.1) and a search for areas where they could be amalgamated or consolidated. Themes were layered, and thereby, sub-themes were created that further emphasized the significance of certain concepts. At this stage, no distillation of emergent themes occurred; rather they were re-ordered and re-associated. These phases applied to T1 and T2 data.

3.7.2.1.4 Phases 5 & 6: Consolidating and Conclusions

In a method akin to Giorgi (1985) phenomenological analysis the final stage of analysis undertaken was a process of distillation of the sub-themes. An investigatory manner was adopted to the sub-themes, and coherence was sought. Before the process of distillation, emerging themes were checked against the original data set testing for coherence, consistency and distinction from each other.

3.7.2.1.5 Longitudinal comparison of the collective descriptions

The final process of qualitative data analysis was a comparison between T1 and T2. The results from T1 and T2 were overlaid and differences and similarities captured of the journey that volunteers had during the study. The findings concentrated on the degree to which the volunteers altered their opinions of the technology, and also observations of the learning environment were captured.

The final process was reflex work. The researcher compared his own previously recorded descriptions of the app during the intervention and compared and contrasted them with the results to reflect how his own voice may have influenced the interpretation of the results.

3.8 Method of integrating results

According to Schoonenboom and Johnson (2017), deciding the point of integration is the most important design decision in mixed methods research. As discussed earlier, the method of integration has been determined by the study's purpose to investigate the phenomenon of using a coaching app. Greene et al. (1989) argue that the convergence and corroboration from different research methods that seek to explore the same phenomenon is a legitimate purpose of a mixed method design. The mechanism of integration used closely followed that recommended by Onwuegbuzie and Johnson (2006), as they acknowledge "combining complementary strengths and weaknesses of quantitative and qualitative research methods, assessing the validity of the findings can be particularly complex"(p. 60). In particular, using the language and traditions from two different worldviews' traditions provides the opportunity to study the data using alternative approaches that enhance validation prior to convergence.

As stated earlier, one reason for choosing a mixed methods research design was to provide corroboration of observations between parallel findings. A

pragmatic approach was adopted, where the stronger inferences were taken from the findings from quantitative and qualitative data sets, using the principles suggested by Krathwohl (2009). He identified those standards as being: Explanation of credibility, translational fidelity, demonstrable results and rival explanations eliminated. However, in practice, as the results chapters outline, the convergence process gave rise to, in the main, validation through direct confirmation or confirmation through inference.

3.9 Data management

It was made clear to the participants, the financial institution, and the app software company that the quantitative questionnaire data and qualitative interview outputs will be owned by the University. Furthermore, the participants were informed that the private and anonymised conversations between the app and the coachee would be retained by the technology company for the purposes of developing the app. The coaching app does not detect or store any personal data (or Personal Identifiable Information and as defined under GDPR), and its users are not required to share any personal information to sign-up (no emails, mobile numbers, or social network logins). Participants were encouraged not to use their real name; users can use WYSA just with a dummy name or a nickname. All conversations with the app are private and not shared with any third parties.

The research only collected data from the coachee participants, in the form of questionnaires and semi-structured interviews. The researcher did not have access to the chatbot conversations between app and user. The planned semi-structured interviews with coachees were conducted with sensitivity and with strict confidentiality. A balance between sufficient complexity, depth of data analysis, transparency with probity, and respect for privacy were the governing standards employed. It is argued that greater freedoms should be granted to these methods of study in order to increase their effectiveness, albeit this increase in freedom should be only afforded to the experienced

investigator (Potrata, 2010). However, the researcher deemed it appropriate to conduct the conversations within strictly guided parameters.

3.10 Quality Criteria Assessment

The issue of quality criteria in social sciences studies has been subjected to increasing interest (Bryman et al., 2008). The researcher's quest for a recognised quality framework was hampered by the lack of consensus in the research community. Fàbregues and Molina-Azorín (2017) believe that it is ill-advised to seek a collective understanding on approaches for a number of reasons. Firstly, because perceptions and values vary between researchers, secondly the multi-dimensional nature of mixed methods provides opportunities for the researcher to seek innovative solutions in exploring suitable designs, and if a prescribed quality framework was agreed it would constrict possible solutions. Finally, more dominant voices in the research community could determine the agenda of social sciences.

Nonetheless, the researcher, being a pragmatist, preferred the security of a quality framework would provide a process and method of examination. Tracy (2010) provides such a conceptualisation of quality to be applied to mixed methods, consisting of eight elements; Namely; worthy topic, rich rigour, sincerity (reflexivity), credibility, resonance, significant contribution, ethics, and meaningful coherence. Applying these criteria to this study:

Worthy topic: Chapter one of this study considered the importance of this research subject, highlighting the need for the coaching community to understand new technologies and how they may be best developed and adopted. The rapid development of self-help coaching apps, commercially available through Google Play and Apple App Store, further highlights the timely nature and worthiness of this topic.

Rich rigour: This quality mark is demonstrated in the use of qualitative and quantitative data sampling at T1 and T2. The semi-structured

interviews were recorded and transcribed using voice recognition software and then audited for accuracy. Tone and emphasis were added latterly to the transcripts providing a further richness to the data.

Sincerity: The researcher periodically recorded his feelings and motivations toward the inquiry. His journey is shared in a first-person monologue in the concluding part of the study. Reflections on aspects of the epistemological foundations underlying this were recorded early on in this chapter and provide transparency to the methods used, and challenges faced when confronted with the data.

Credibility: This has been assured with the use of triangulation of the results from mixed methods used. Gathered data was separately analysed at T1 and T2 from the quasi-experimental longitudinal study comparing and contrasting descriptions via semi-structured interviews, along with the use of validated measures at pre- and post-intervention. Results were then converged to seek confirmation or contradiction to the proposed hypotheses. The use of additional analytical tools in undertaking the thematic analysis sought to enhance a balance between the narrative and the illustrative extracts from the qualitative data set.

Resonance: This concept of quality addresses how the target audience received the research and whether compelling arguments and contentions have been displayed in a convincing manner. The researcher has attempted to structure the research methodology and study to ensure it speaks to a wide variety of audiences from the coaching community to technologists.

Significant Contribution: The results chapter conveys the importance of this study and how the results can be interpreted and applied to various communities associated with the coaching field. The

conclusions highlight the particular contribution to knowledge as well as further avenues for researchers to explore.

Ethical: These dilemmas, through undertaking this study, arguably are a further contribution to knowledge, as the findings reveal the surprising degree of trust humans impart on their digital devices. Ethical considerations for future research are fully explored in section 7.5

Coherence: The final quality mark to be considered is whether the study possesses a meaningful coherence. This aspect seeks to comprehend the 'golden threads' in the research, tying method and meaning together. Through rewrite after rewrite and the researcher's supervisors' observations, the study's aims and objectives were continually reviewed, and a logical flow developed.

3.11 Ethical Considerations:

The study was conducted in strict compliance with the research guidelines and principles of Oxford Brookes University. In particular, consent was sought, and given, by the University's Research Ethics Committee (UREC).

An anchor used in the design of the research project was the notion that the study would seek to maximise the benefit in exploring the participants' working alliance with the technology whilst minimising any potential harm to individuals including the researcher. A central tenet of the research method was that the recruitment process of participants should be transparent and honest, providing the potential volunteers with sufficient information for them to make an informed decision on whether to participate or decline without concern of any repercussions. This was particularly important as volunteers were recruited from a large financial corporation, and there was a concern that overt support from the business could potentially coerce individuals. All data collected by the software was anonymised. The IP address of the volunteers was recorded. This data would provide only the make of smartphone and its approximate location at the time of use. All information would be kept

confidential and remain with the principal researcher only, in a password-protected file, provided through Oxford Brookes University Googledrive, private storage facility. Finally, assurances were given that the detailed conversations with the chatbot were not part of the research project and were not recorded. The only aspect the research will review was the data from the questionnaires and semi-structured interviews.

No perceivable risks to the participants were encountered during this study, however, measures were taken should any volunteer coachees exhibit adverse effects when using the app, in answering the questionnaires or semi-structured interviews. No events occurred in this regard. Although, there were opportunities in the research, questionnaires and semi-structured interviews, allowing the researcher to ask if the participant requires any further support. Again, no such requests were received.

3.12 Reflexivity

(Written in the first person)

In order to counter such issues of trustworthiness and mitigate “horrors of scientific research” (Johnson, 1999, p. 186) of, in particular, qualitative studies a number of commentators advocate researchers actively practice reflexivity (Edge, 2017; Finlay, 1998; Jootun et al., 2009). The value of a reflexive research diary has also been advocated in qualitative and quantitative mixed methods studies as a useful tool for a novice researcher to enhance their skills (Walker et al., 2013). The credentials of reflexivity being established as a “critical” component (Fontana, 2004) to research into the human experience are considered in this next section, examining how this practice can be undertaken as an integral part of this study. However, others argue that reflexivity can be a self-absorbing practice and can come across as “tedious, pretentious” and perhaps most damming of all, “unrevealing” (Lynch, 2000, p. 47).

I believe that I am a sceptic by nature, and that in understanding this, my quest for objectivity is potentially unrealistic. It is evidently logical that there can be no theory-neutral positions. I now perceive that our comprehension of theories is a mental construct nuanced by past and present experiences that colour our understanding of observations. The notion that a gold standard of a double-blind experiment is now questionable due to the researcher's presence and philosophical standpoint remains, however, uncomfortable. As Burr (2003, p. 160) challenges, objectivity is:

> "an impossibility, since each of us, of necessity, must encounter the world from some perspective or other (from where we stand) and the questions we come to ask about that world, our theories and hypotheses must also of necessity arise from the assumptions that are embedded in our perspective (...) The task of researchers therefore becomes to acknowledge and even to work with their own intrinsic involvement in the research process and the part this plays in the results that are produced. Researchers must view the research process as necessarily a co-production between themselves and the people they are researching".

I was particularly taken when reading debates on qualitative research methods in ethnography, where it is argued that through linguistic gymnastics a researcher may construct meanings and identities to persuade the reader in accepting realities from a particular philosophical sphere (Atkinson, 1990). The realisation that facts don't really speak for themselves demands that I carefully consider how to construct a narrative and deploy appropriate rhetorical devices to portray the data in an informative, yet compelling, and convincing way.

Whilst I recognise that I am starting to appreciate and even find resonance with other philosophical positions, I am not sure that I can completely abandon the physical world entirely. In addition, I am cognizant that my audience may not be solely from the humanities scholarly community but could also include readers from the field of computer scientists. Accordingly, I believe that I

should have a degree of detachment from the phenomena under study and also include some quantitative analysis to give comfort and reassurance to those deductive universal law thinkers. Straddling these diametrically opposed worldviews through a methodology is questionable and thus not yet for me fully determined.

3.13 Conclusion

This chapter presented a detailed account of the research philosophy, methods and tools used to conduct the project. It was stated that pragmatism has been adopted as a worldview, acknowledging that the middle path between the traditional philosophical paradigms of positivism and constructivism would be best suited to explore and test coachees' use of a coaching app.

The theoretical models of working alliance and self-resilience were introduced, as well as a conceptual framework that included additional notions of change theory and human acceptance of technology. These frameworks created a prism through which the phenomenon of users engaging with a coaching app was initially explored, and the hypothesis proposed. The choice of research instruments employed in the study were discussed and a rationale given as to why a convergent mixed methods design was deemed the most appropriate.

The chapter also outlined the selection of collaborating research partners, including an explanation of the coaching apps functionality and usability. The process of recruiting coachee volunteers was explained and how they were to engage with the app. The collection techniques of qualitative and quantitative data were highlighted along with detail how the point of integration would hopefully result in a convergence of results, producing greater certainty. In addition, the limitations of adopting a mixed method framework was also covered.

The following chapters will present the findings from the empirical phase of the research project, starting with the quantitative analysis of the questionnaire, followed by a presentation of the results from the qualitative.

Chapter 4 Quantitative Data Analysis & Findings

4.1 Introduction

This chapter describes the process of quantitative data analysis and outlines preliminary findings that will be used as one half of the convergence process, following the methodology described in the previous chapter. Great care was taken to ensure that the different types of data were separately analysed prior to the convergent stage of the analytical process.

The chapter is structured into a number of sections. The first two sections describe the preliminary work undertaken on the raw data from working alliance inventory and self-resilience at work instrument. They will identify anomalies in the data set and justify the rationale, method and process of screening the final data set. Finally, they will conclude with a brief consideration of the instruments employed and their reliability.

The third section demonstrates the reliability of the validated scales within this research project. The fourth section begins the process of assessing the data by describing the profile of the participants; gender, age, place of work, and self-efficacy with technology. As previous studies (e.g.(He and Freeman, 2009) have shown differences by gender in the adoption and, use of technology, gender as a moderating variable in the current study is considered.

Analysis of the data continues with results presented from the statistical instruments outlined in chapter three, as the study seeks to address the second objective of the research, namely, an analysis of outcomes and perceptions of junior managers coached by Artificial Intelligent coaching apps, testing their self-resilience and relationship toward the robot through the prism of working alliance. Accordingly, the hypotheses for this study are:

1. That the coachee developed a working alliance with the coaching app

2. That the coachee's self-resilience was enhanced as a result of using the app
3. That the working alliance developed between coachee and coaching app was a predictor of an enhancement in self-resilience

The first hypothesis provided the opportunity to delve a little deeper into the three components (Goal, Bond, Task) of the working alliance to explore the changes in self-measured understanding of a possible relationship with the app. The second hypothesis sought to discover whether the app altered individuals self-measured understanding of their resilience. The final hypothesis sought to ascertain whether a working alliance needed to be in place to achieve positive outcomes. In addition to the above hypotheses, gender and age were investigated in relation to the phenomena in line with this study's conceptual model.

4.2 Preparing Quantitative Data

4.2.1 Screening quantitative data files

The process of recruiting participants for study delivered an initial interest from 69 individuals who completed an online consent form. However, from the time of consenting to the start of the study, 18 individuals declined to participate. The study continued with 51 individuals who completed the 8-week trial. At T1 (1 week after the start of the intervention) participants were emailed a link to the online questionnaire, and then on completion of the trial at T2 (week 9) a 2nd questionnaire was delivered to the participants, with the last completed questionnaire returned 16 days after the trial period had ended. A number of individuals provided additional comments of their experience in using the app by completing the comments box in the questionnaire, and this additional data was transferred to the qualitative database. A screening and cleaning process was undertaken. A number of minor errors were discovered and corrected related to location and gender. An approximate location of the individual was taken from the IP address at the time of completing the questionnaire, meaning

that a number of oddities were created. A couple of participants mistakenly recorded their gender differently, presumably wrongly, between T1 and T2. Their initial response at T1 was transferred to T2.

The process of analysis of the quantitative data started when all 51 individuals had completed the 2nd online survey. Importing the data from the questionnaires into the SPSS (version 25) was more protracted owing to an obfuscated software coding within the online survey platform that prevented direct exporting of responses into SPSS program. This was overcome by converting the original data files into Excel then exporting values only and finally importing into SPSS. This somewhat convoluted process was time-consuming and also increased the risk of data corruption. Two audit processes were conducted to ensure that the data had been transferred correctly. The first audit process being that the data was transferred back from an excel spreadsheet into SPSS and checked for its similarity, the second one being that total scores for all entries were computed, both in SPSS and Excel, and compared. The only exception found was the IP address provided by the data from Survey Gizmo transferred with a number of peculiarities and all entries in this regard needed to be manually checked for accuracy. The final working data set was created that combined the two questionnaires, by transferring them into SPSS and creating one data pool that could be analysed, providing a longitudinal platform to undertake statistical analysis.

Group variables were calculated from the raw data using the theoretical models as follows

WORKING ALLIANCE	SELF-RESILIENCE
• TOT_Working_Alliance_Time1 • TOT_Working_Alliance_Time2 • TOT_WAI_GOAL_Time1 • TOT_WAI_GOAL_Time2 • TOT_WAI_TASK_Time1 • TOT_WAI_TASK_Time2 • TOT_WAI_BOND_Time1	• TOT_Self_Resilience_Time1 • TOT_Self_Resilience_Time2 • TOT_SR_ADPT_T1 • TOT_SR_ADPT_T2 • TOT_SR_SELF_BELIEF T1 • TOT_SR_SELF_BELIEF T2 • TOT_PROBLEM_SOLVING_T1

• TOT_WAI_BOND_Time2	• TOT_PROBLEM_SOLVING_T2 • TOT_ POSITIVITY_T1 • TOT_ POSITIVITY_T2

The above variables, prior to any statistical techniques being applied, were assessed for normal distribution and checked for outliers. Boxplot charts were created for all the group variables and with the exception of the group variable TOT_Self_Resilience_T2, no outliers were discovered. The statistical instruments used on the data are sensitive to outliers and therefore, accordingly, following an inspection of a Boxplot chart (TOT_Self_Resilience_T2- Figure 4.1) three participants' responses were removed from the entire data set (ID 24,36 &37). For the purposes of analysis, the original population *n=51* was therefore reduced to *n=48*. It is noteworthy that the outliers (*n=3*) were all in the age group of 36 and beyond. In exploring the sub-set of the group variable TOT_Self_Resilience_T2 for an explanation, a significant deterioration was found in problem-solving in those individuals, suggesting an environmental factor.

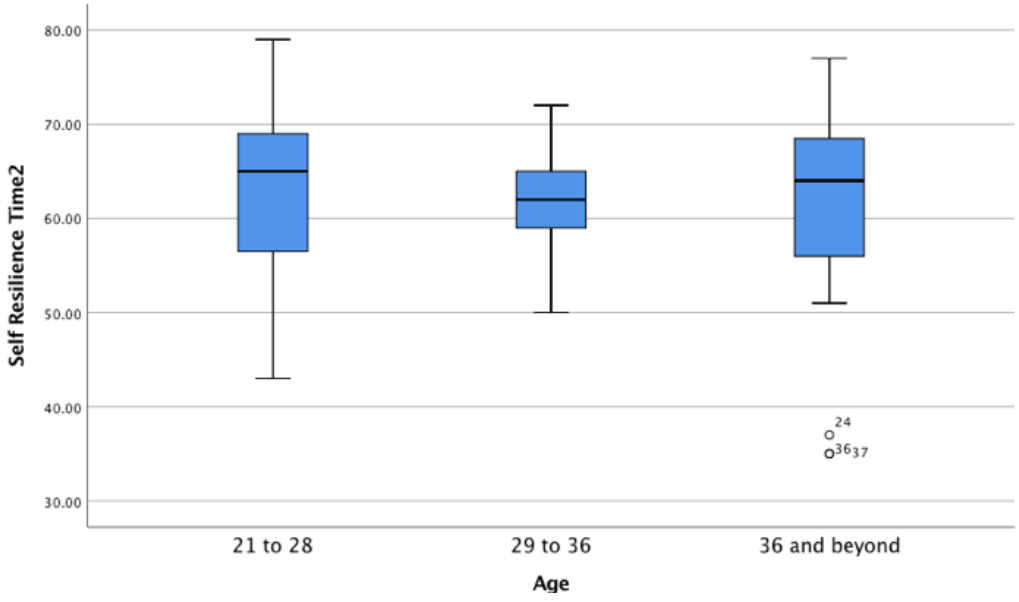

Figure 4.1: Boxplot chart identifying outliers

The final procedure undertaken prior to analysis was to determine if the data is distributed normally. A histogram technique of assessing the normality of distribution provided the results below a normality curve is plotted for reference

purposes. The histogram Figure 4.2 shows a normal distribution of the working alliance at the start of the quasi-experiment. The data is close to symmetrical with a slight left skewness in its nature.

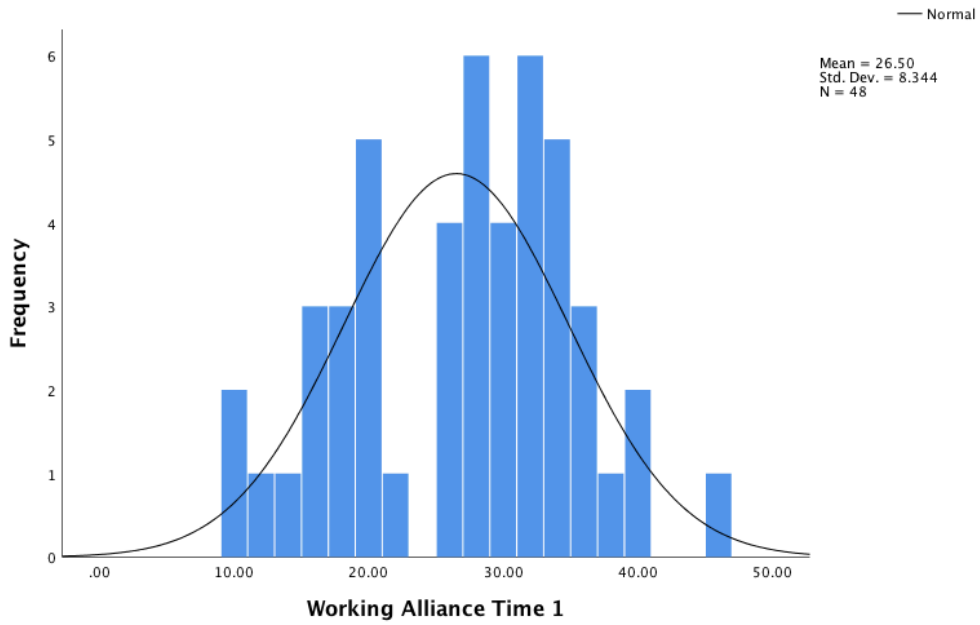

Figure 4.2: Frequency distribution Working Alliance at T1

At T2, post quasi-experiment, the working alliance between the chatbot and its users is shown in Figure 4.3. The overall shape of the distribution is a more evenly spread with a mode around 26-28 and a deviation higher than at T1. In addition, there is another mode at 10, suggesting six individuals noted a deterioration in working alliance with the technology and reduction in mean $-.08$.

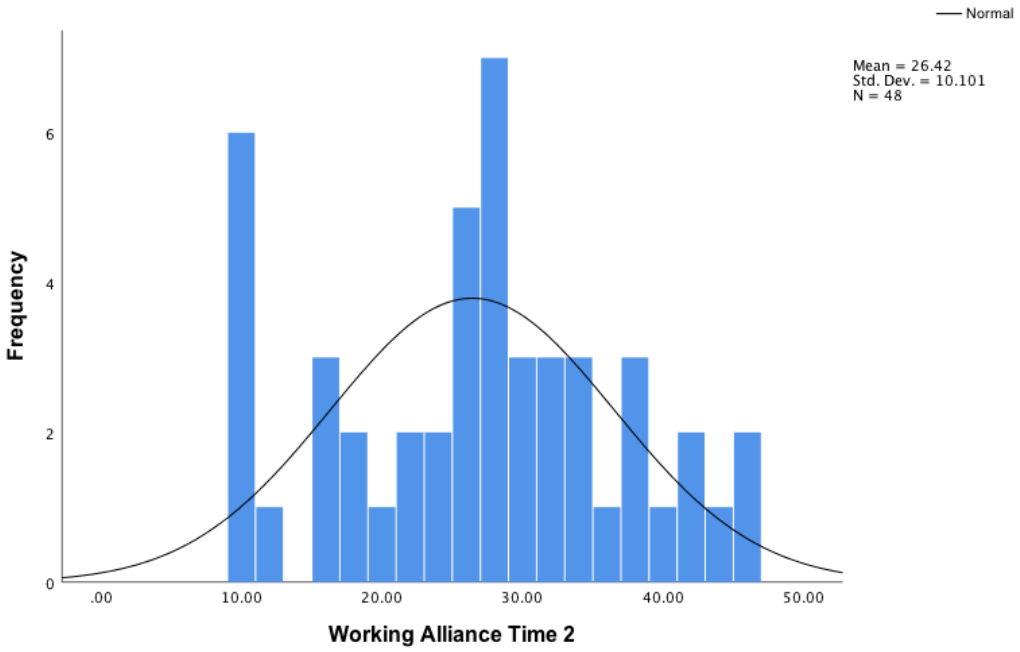

Figure 4.3: Frequency distribution Working Alliance at T2

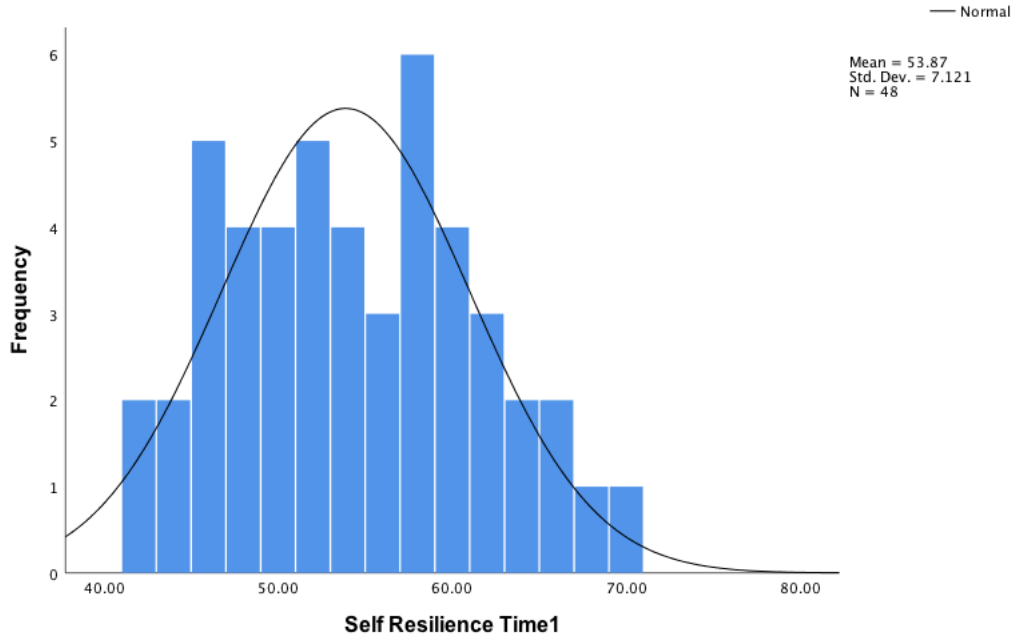

Figure 4.4: Frequency distribution of Self-Resilience at T1

Figure 4.5: Frequency distribution of Self-Resilience at T2

The group variables tested were working alliance and self-resilience at T1 and T2 (Figure 4.4 and Figure 4.5). It can be seen that in general, the distributions are normal with the exception of working alliance at T2 where a number (N=7) of participants scored group working alliance with the technology much lower than at T1. This sub-group of seven individuals was examined for at T1 for difference (age group, gender, period of time in current post, and computer efficacy). Six of the participants were females, but no other distinguishing factors were found and therefore no tenable reason was found for them to be excluded from the further analysis. This discovery of a negative reaction to the technology is explored during the convergence stage of the analysis.

4.3 Reliability

4.3.1 Working Alliance Inventory (WAI) Scale

The working alliance inventory is considered the most widely employed measure of the relationship between client and professional therapist (Hatcher and Gillaspy, 2006). It has also been adopted by researchers exploring the relationship between coach and coachee (Sharpley et al., 2005). The short form of the WAI's reliability has been studied in a number of contexts and found to have consistently a high Cronbach alpha coefficient α=> 0.935. This

study demonstrated similar levels of reliability α=> 0.928 (T1) and α=> 0.954 (T2), as outlined in Table 4.1.

Reliability

Scale: Total Working Alliance Time1

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.928	.930	10

Reliability

Scale: Total Working Alliance Time2

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.954	.957	10

Table 4.1: Reliability of Working Alliance Scale

4.3.2 Self-Resilience Scale

The SR results found similarly high levels of reliability as in Malik and Garg (2018) of the measure compared with other studies from different cultural groups. This study across EMEA with participants from various countries measured the Cronbach's alpha value at α = 0.880 (T1) and α = 0.887 (T2) and are comparable to the aforementioned studies, reference Table 4.2: Reliability of Self-Resilience Scale

Reliability

Scale: Total Self Resilience Time1

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.880	.883	17

Reliability

Scale: Total Self Resilience Time2

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.887	.887	17

Table 4.2: Reliability of Self-Resilience Scale

4.4 Description of data

This study explored the new technology of coaching apps by using measures from neighbouring disciplines. Using an adapted scale of WAI for technology and self-resilience at work assessment, the participants were tested on two occasions using identical questionnaires. The longitudinal study's design

provided the two data sets at T1 and T2, allowing a measure of the impact the technology may be delivering to the participants over an 8-week period.

The scales, the nature of the components within the working alliance and self-resilience group variables are positive in their construct. The higher the values, the greater the indicator of working alliance and self-resilience recorded by the individual. As indicated in Table 4.3, working alliance did not significantly alter between T1 and T2; however the measure of Self-resilience at work did materially increase.

	T1		T2	
	M	*SD*	*M*	*SD*
Working Alliance	2.65	0.42	2.64	0.55
Self-Resilience	3.17	0.83	3.68	1.01

Table 4.3: Descriptive statistics WAI and SR

The working alliance model, as detailed previously, consists of three components Goal, Task, and Bond. Table 4.4 reports the mean between T1 and T2.

	M@T1	*M*@T2
Goal	2.36	2.51
Task	2.72	2.45
Bond	2.82	2.88

Table 4.4: Sub-facets of the components of WA

Similarly, the scale of self-resilience consisted of sub-facets; self-belief, problem-solving, adaptability and positivity the means are reported in Table 4.5.

	$M_{@T1}$	$M_{@T2}$
Adaptability	3.67	3.81
Self-Belief	3.69	3.79
Problem Solving	3.54	3.60
Positivity	3.40	3.48

Table 4.5: Sub-facets of components of SR

The mean scores for the self-resilience components of self-belief, problem-solving, adaptability and positivity, as well as the sub-facets of the used Working Alliance Scale used are detailed in Appendix X. (Appendix X: Detailed Statistical Descriptions of Working Alliance and Self-Resilience Scales).

As discovered earlier gender appears to be an influence on acceptance of technology; accordingly, the study split the data and carried out further descriptive analyses on gender.

4.4.1 Participants' Age and Gender Profile

As shown in Table 4.6, the age profile was found to have a disproportionate number of females in the older category. The age profile of the participants was a surprise as the original concept of the design of the experiment it was believed that younger junior mangers would be more interested in the study.

			Age			
			21 to 28	29 to 36	36 and beyond	Total
Gender	Female	Count	5	6	19	30
		% within Gender	16.7%	20.0%	63.3%	100.0%
		% within Age	50.0%	46.2%	76.0%	62.5%
	Male	Count	5	7	6	18
		% within Gender	27.8%	38.9%	33.3%	100.0%
		% within Age	50.0%	53.8%	24.0%	37.5%
Total		Count	10	13	25	48
		% within Gender	20.8%	27.1%	52.1%	100.0%
		% within Age	100.0%	100.0%	100.0%	100.0%

Table 4.6: Age and Gender Profile

4.5 Approach to the quantitative statistical data using alternative statistical tests.

As discussed in the methodology, there is still considerable debate regarding approaches to sampling methodologies in mixed method design. The quasi-experimental longitudinal design of the study, using the ordinal Likert scaled questions, to capture the personal outcomes by way of self-evaluation is the determinant factor. This allows for a comparison between individuals' initial reaction to the app (T1) and how this differs following the intervention (T2). Furthermore, considering the sample size (N=48) is relatively small and acknowledging that the administration of statistical tests that rely on the nature of distribution (parametric tests) would be challenging to justify, it was considered appropriate that nonparametric tools should be used.

4.6 Testing Hypotheses

4.6.1 Hypothesis 1: The coachee developed a working alliance with the coaching app

A Wilcoxon signed rank test was applied to the construct that individuals developed a working alliance with the technology over the test period. Using group variables TOT_working_alliance_T1 and TOT_working_alliance_T2, the results did not reach a level of significance z=.672, *p<.502* Asymp.Sig (2-tailed) with a small effective size (*r=.0.068*). The results in Table 4.7 did reveal that a majority of individuals (*n=26*) self-scored a reduction in working alliance with the app at the end of the test period.

		N	Mean Rank	Sum of Ranks
Working Alliance Time 2 – Working Alliance Time 1	Negative Ranks	26[a]	21.25	552.50
	Positive Ranks	18[b]	24.31	437.50
	Ties	4[c]		
	Total	48		

a. Working Alliance Time 2 < Working Alliance Time 1

b. Working Alliance Time 2 > Working Alliance Time 1

c. Working Alliance Time 2 = Working Alliance Time 1

Test Statistics[a]

	Working Alliance Time 2 – Working Alliance Time 1
Z	-.672[b]
Asymp. Sig. (2-tailed)	.502

a. Wilcoxon Signed Ranks Test

Table 4.7 Working Alliance with coaching app (Wilcox signed rank test)

Adopting a pragmatic approach, the above result (Table 4.7) suggested a more exploratory approach be taken with the data to provide a further reference at convergent stage with the QUAL findings.

A test was then carried out that then excluded the 7 participants (as described in section 4.2.1) that seemingly had an extreme reduction in their working alliance with the app, to test whether the remaining population established a working alliance with the app, as indicated on the earlier graphical representation of the working alliance at T2. However, even with this population removed, the significance level was $p<.872$ and therefore accordingly, the recording does not attain a level of statistical significance.

A final Wilcoxon signed rank test was applied to the construct that individuals developed a working alliance with the technology over the test period with gender subcategories, was performed to test if the gender of the participant played a role. No statistically significant result was found in either group. However, an observation of the means suggested that the majority of women had a negative reaction to the app, reflected in a reduction of WA whereas men appeared to show both positive and negative attitudes to the app as illustrated in Table 4.8.

Ranks

Gender			N	Mean Rank	Sum of Ranks
Female	Working Alliance Time 2 – Working Alliance Time 1	Negative Ranks	18[a]	14.03	252.50
		Positive Ranks	9[b]	13.94	125.50
		Ties	3[c]		
		Total	30		
Male	Working Alliance Time 2 – Working Alliance Time 1	Negative Ranks	8[a]	6.81	54.50
		Positive Ranks	9[b]	10.94	98.50
		Ties	1[c]		
		Total	18		

a. Working Alliance Time 2 < Working Alliance Time 1

b. Working Alliance Time 2 > Working Alliance Time 1

c. Working Alliance Time 2 = Working Alliance Time 1

Table 4.8: Imbalance of gender reaction to app on working alliance

The observation that females appear to react differently to the app than males warranted further exploration. As discussed previously, the WA measure is a composite of three components; Bond, Goal and Task. These components were examined individually and longitudinally between T1 and T2, against both genders.

Table 4.9 identifies that females have a statistically significant negative reaction in the task component of the working alliance model *z=-1.98, p<.05*, with a medium effect size (*r=.36*). The median score on the Task component decreased from pre-intervention (*Md=9.00*) to a post-intervention (*Md=6.00*).

Test Statistics[a]

Gender		Working Alliance Component Goal Time 2 – Working Alliance Component Goal Time 1	Working Alliance Component Task Time 2 – Working Alliance Component Task Time 1	Working Alliance Component Bond Time 1 – Working Alliance Component Bond Time 2
Female	Z	-.667[b]	-1.979[b]	-.847[c]
	Asymp. Sig. (2-tailed)	.505	.048	.397
Male	Z	-1.830[c]	-.344[b]	-1.597[b]
	Asymp. Sig. (2-tailed)	.067	.731	.110

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

c. Based on negative ranks.

Table 4.9: Analysis of components of WAI model using gender optic

However, Figure 4.6 identifies the movement in working alliance individuals observed between T1 and T2. Clearly, there is a slight majority of users that

recorded a deterioration in their working alliance with the app. As Table 4.9 reveals, this change is not material or statistically significant.

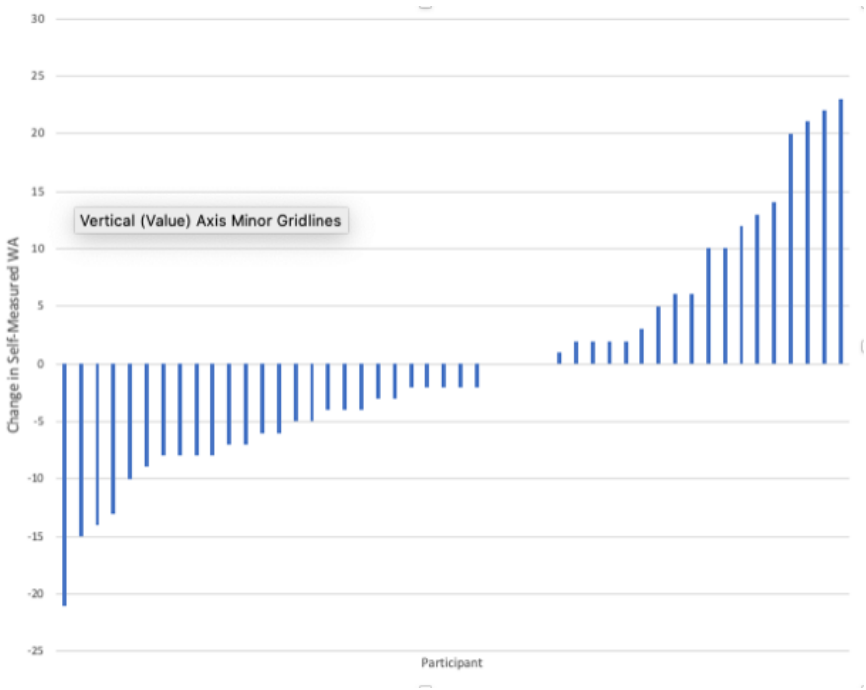

Figure 4.6: Graph showing participants recorded change in working alliance with app

Hypothesis 1 conclusion:

The result rejects the hypothesis that the coachee developed a working alliance with the coaching app.

4.6.2 Hypothesis 2: The coachee's self-resilience was enhanced as a result of using the app

A similar statistical analysis approach used in exploring a possible working alliance with the app was adopted to study the self-resilience of participants between T1 and T2. Taking the group as a whole, a Wilcoxon Signed Rank Test indicated the app had a positive effect of individuals' self-resilience (*mean rank=25.32*) and ranked more favourably than a negative effect (*mean rank=20.94*). The result would suggest that the individuals in using the app increased their self-resilience, *z=-4.99, p<001*, with a large effect size (*r=.61*) as defined by Cohen (1988). The median score on the self-resilience scale

related to management soft-skills at work increased from pre-use of the app (*Md=53.00*) to post-use (*Md=63.50*).

The study continued to explore participants' self-resilience through a lens of gender. A further Wilcoxon Signed Rank test was applied to the data split by gender.

Ranks

Gender			N	Mean Rank	Sum of Ranks
Female	Self Resilience Time2 – Self Resilience Time1	Negative Ranks	5[a]	11.90	59.50
		Positive Ranks	25[b]	16.22	405.50
		Ties	0[c]		
		Total	30		
Male	Self Resilience Time2 – Self Resilience Time1	Negative Ranks	4[a]	9.63	38.50
		Positive Ranks	14[b]	9.46	132.50
		Ties	0[c]		
		Total	18		

a. Self Resilience Time2 < Self Resilience Time1
b. Self Resilience Time2 > Self Resilience Time1
c. Self Resilience Time2 = Self Resilience Time1

Table 4.10: Difference in effect on SR across genders

Table 4.10 above shows a marked difference in the effect that the app had on self-resilience across genders, although both genders showed signs of improvement in their self-resilience post-intervention. It revealed that women showed a statistically significant increase in their self-resilience after experiencing the app, *z= 3.56, p<.001,* with a large effect size (*r=.65*). The median score of self-resilience scale pre-test (*Md=53.00*) to post-test (*Md=65.50*). Whilst the mean score was higher on self-resilience following the intervention, z=-2.048, p<.041 with a medium effect size (*r=.37*).
The discovery that the app apparently had a tangible effect on individuals' self-resilience was further analysed through a different lens – that of age (later described in section 4.6.4).

Does the app enhance SR in all participants?

The app's ability to enhance self-resilience has been demonstrated in the previous section. Figure 4.7 provides a graphical representation of participants' self-resilience changes following the intervention. A majority (*N=41*) of users of the app reported higher self-resilience.

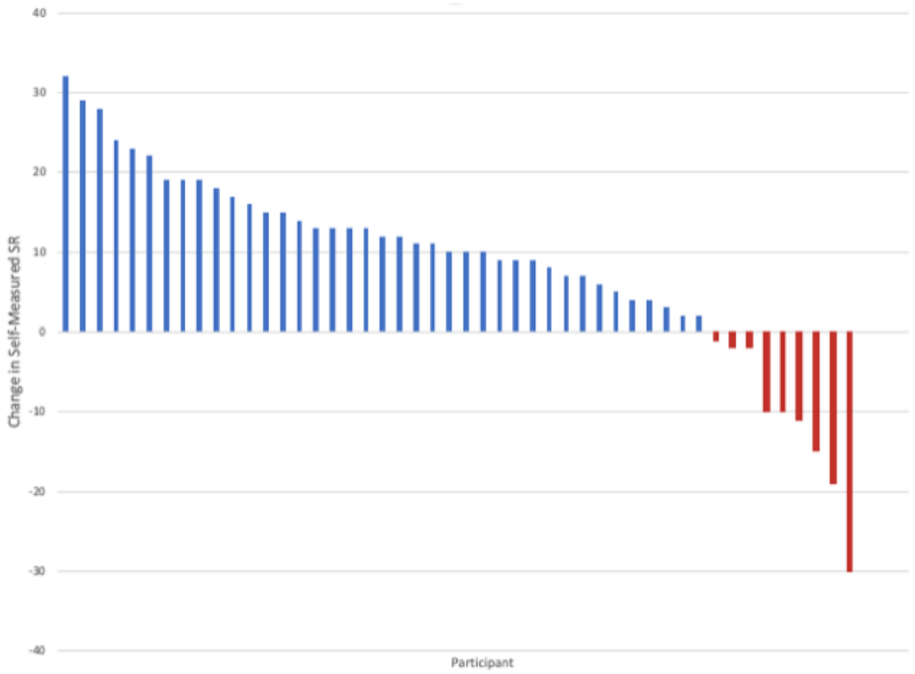

Figure 4.7: Bar Chart showing change in self-resilience across users

What characteristics of SR are observed as showing the most improvement through using the app?

The characteristics of self-resilience identified in the literature review of this study (chapter two), were examined by comparing means at T1 and T2. Figure 4.8 identifies that all four characteristics increased in score post-intervention; Adaptability 3.84%, Self-Belief 2.71%, Positivity 2.45%, and Problem-Solving 2.45%

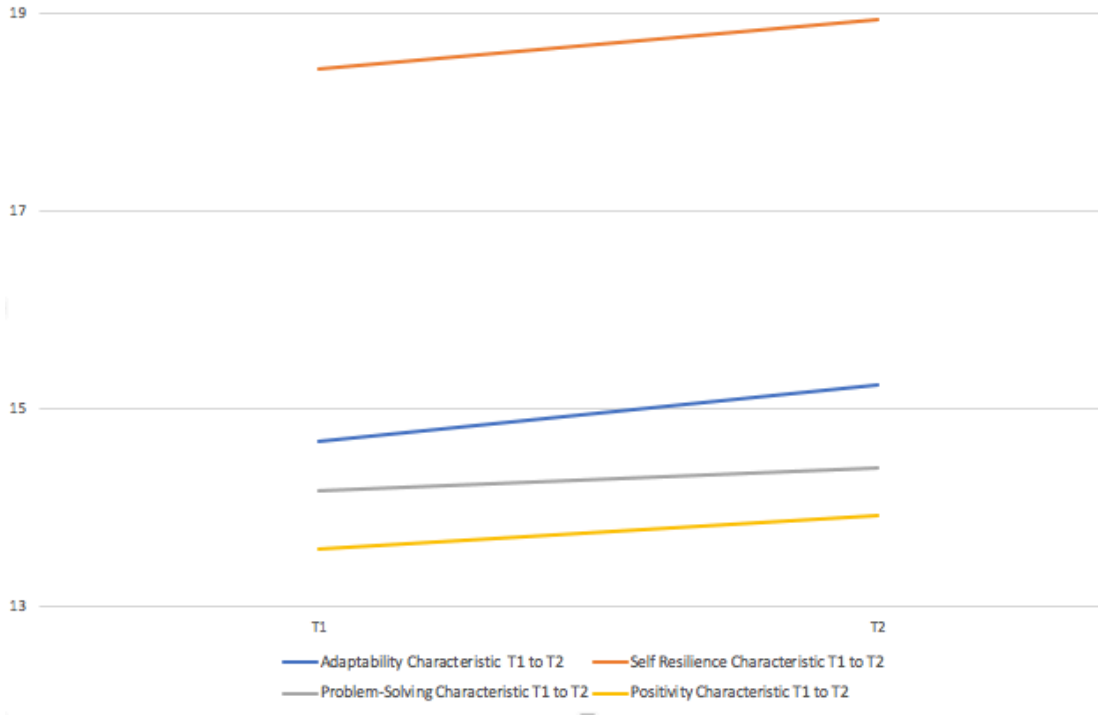

Figure 4.8: Self-resilience Characteristics

The overall increase in self-resilience reached the level of statistical significance, and the observation that adaptability was the characteristic that seemingly was influenced the most provides a line of enquiry for other researchers to explore.

Hypothesis 2 conclusion: The results confirm the hypothesis that the coachee's self-resilience was enhanced as a result of using the coaching app.

4.6.3 Hypothesis 3: The working alliance between coachee and coaching app was a predictor of an enhancement in self-resilience

The relationship between the change in working alliance (as measured by WAI) and change in self-resilience (SR) between T1 and T2 were investigated using a Spearman correlation coefficient. Preliminary analyses were performed to ensure that no violation of assumptions was present. There was

no statistical correlation between the two variables, *r=-.027, n=48, p=.857* (Table 4.11). However, it should be noted that the high-level of *p* suggests either the sample size was too small, or there was too much variability for the hypothesis test to detect it.

Correlations

			Movement in Self Resilience Total score	Movement in Working Alliance Total score
Spearman's rho	Movement in Self Resilience Total score	Correlation Coefficient	1.000	-.027
		Sig. (2-tailed)	.	.857
		N	48	48
	Movement in Working Alliance Total score	Correlation Coefficient	-.027	1.000
		Sig. (2-tailed)	.857	.
		N	48	48

Table 4.11 Spearman test for correlation

Hypothesis 3 conclusion: The result rejects the hypothesis that the working alliance between coachee and coaching app was a predictor of an enhancement in self-resilience.

4.6.4 Age and Gender influencers

4.6.4.1 Age of participants

The design of the experiment provided an opportunity to test the significance of age as a factor in determining the individual's self-efficacy with the technology. Table 4.12 identifies that the vast majority of individuals consider themselves capable or confident with technology both at T1 and T2. Indeed, this willingness to engage with new technology appears to be contradictory to other studies that have found that age has a significant influence on individuals' acceptance of technology (McFarland, 2001).

Age * Effective communicator with technology Time 1 Crosstabulation

		Effective communicator with technology Time 1				
		Hesitant and nervous	Not confident	Capable	Confident	Total
Age	21 to 28	1	0	2	8	11
	29 to 36	0	0	9	4	13
	36 and beyond	1	2	13	8	24
Total		2	2	24	20	48

Age * Effective communicator with technology Time 2 Crosstabulation

		Effective communicator with technology Time 2				
		Hesitant and nervous	Not confident	Capable	Confident	Total
Age	21 to 28	1	0	6	4	11
	29 to 36	0	0	10	3	13
	36 and beyond	3	0	12	9	24
Total		4	0	28	16	48

Table 4.12: Crosstabulation of Age and IT efficacy

4.6.4.2 Gender of participants

The survey asked participants whether they considered that they were able to communicate effectively with technology. The majority (92%) considered themselves either capable or confident in communicating with technology and small contingent (8%) stating that they were nervous or not confident. There was no significant difference in results between T1 and T2. It was therefore considered prudent to briefly explore the data through a prism of gender to assess any difference in reactions towards the app between the sexes.

Descriptive Statistics

Gender		N	Minimum	Maximum	Mean	Std. Deviation
Female	Effective communicator with technology Time 2	30	1.00	4.00	3.0000	1.01710
	Valid N (listwise)	30				
Male	Effective communicator with technology Time 2	18	3.00	4.00	3.2778	.46089
	Valid N (listwise)	18				

Table 4.13: Gender predictor of IT confidence

Table 4.13 does suggest that a majority of males (*SD=.461*) have greater confidence with the technology.

4.6.4.3 Gender influence on Working Alliance and Self-Resilience.

The data in Table 4.14 reveals that males and females reacted differently to the technology. Women's Working Alliance with the app fell over the period of intervention whilst men's mean score increased. The self-resilience measure found a positive movement in both gender groups; however, females appear to be more positively influenced by the technology. In both groups, the change in WA was not statistically significant.

Gender		N	Minimum	Maximum	Mean	Std. Deviation
Female	Working Alliance Time 1	30	10.00	45.00	26.9333	8.75306
	Working Alliance Time 2	30	10.00	45.00	25.3333	10.12111
	Self Resilience Time1	30	42.00	65.00	53.0000	6.86320
	Self Resilience Time2	30	35.00	79.00	62.8333	10.54411
	Valid N (listwise)	30				
Male	Working Alliance Time 1	18	10.00	36.00	25.7778	7.80313
	Working Alliance Time 2	18	10.00	45.00	28.2222	10.09109
	Self Resilience Time1	18	44.00	70.00	55.3333	7.49902
	Self Resilience Time2	18	50.00	77.00	61.8889	7.07014
	Valid N (listwise)	18				

Table 4.14: Gender Optic on outcomes

4.7 Conclusion of the Quantitative results

The results showed that no statistical change in working alliance occurred, as measured by the WAI scale with the coaching app across the period of intervention.

The analysis identified that the app did appear to alter the self-resilience of participants over the intervention period. The results suggest that the majority of individuals (80%) increased their self-resilience, $z=-4.99,\ p<001$, with a large effect size ($r=.61$).

The gender of the candidates appeared to influence the effect the technology had in developing self-resilience, with the results presenting a different pattern of influence between the genders. The app seemingly improved females' intrinsic psychological capabilities over male participants. However, no other variables of age, computer self-efficacy or nationality influenced the volunteers' test of self-resilience.

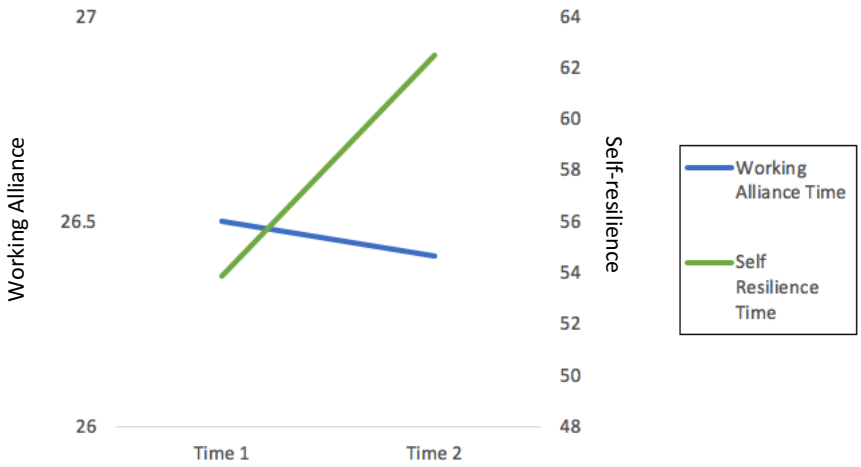

Figure 4.9: Pre and Post intervention

By way of a graphical summary, Figure 4.9 identifies the positive effect on self-resilience and the contrasting negative outcome in respect to the working alliance between coaching app and user.

It can therefore be inferred from the results that the absence of WA was not an inhibitor of improving an individual's self-resilience when using an artificial agent. The value of undertaking a mixed methods study using qualitative and quantitative measures can be seen as the study will now explore the thoughts of volunteers using the app through data captured at T1 and T2.

Chapter 5 Qualitative Data Analysis & Findings

5.1 Introduction

This chapter explores the perceptions of volunteers using WYSA, through the use of semi-structured interviews at T1 and T2. It will firstly outline the volunteers' profile to give background and highlight potential influencers in their connection with the technology and previous experience with forms of traditional coaching and then briefly remind the reader of the overall approach to the data. The semi-structured interviews sought to answer the parallel research questions listed in the methodology Table 3.1

5.2 Descriptive of Qualitative data

Firstly, a brief description of the 12 interviewees and the method of data collection:

Participant Code	Gender	City	Length of Time in Post	Experience of traditional coaching	Pseudonym
1	Female	Krakow	18-30 months	Yes	Deborah
2	Female	Budapest	above 30 months	Yes	Rachel
3	Male	London	0-6months	Yes	Elisha
4	Male	Madrid	18-30 months	Yes	John
5	Female	Krakow	above 30 months	No	Mark
6	Male	Budapest	above 30 months	No	Noah
7	Female	Budapest	18-30 months	No	Judith
8	Female	London	above 30 months	Yes	Hannah
9	Male	Marbella	above 30 months	No	Benjamin
10	Male	Warsaw	18-30 months	No	Simon
11	Female	Budapest	above 30 months	Yes	Martha
12	Female	London	0-6months	Yes	Anna

Table 5.1: Profile of Participants.

The above Table 5.1 demonstrates the demographic of the group of interviewees, who were recruited from the pool of volunteers and chosen randomly. However, wishing to replicate the gender ratio of the quantitative study at T1, the researcher established the gender ratio of respondents. At the point of selecting the interviewees, a 60% female and 40% male split was achieved. All individuals held junior manager positions; their length of service in that grade varied: two had held their positions for less than 6 months, four between 18 and 30 months, the remainder (6) had been in their positions for

over 30 months. Seven out of twelve interviewees had had previous experience of traditional coaching, which was higher than the average for the study population as a whole. They were all based in one of the four hubs of the organisation, but added in their home town for cultural reference purposes.

5.3 Approach to Qualitative Data and Emerging Themes

To help the analysis, following careful reading of the interviews, the researcher found it helpful to review and develop initial sketches of understanding of the transcripts. This overview approach aided the creation of intra-meanings from individual scripts and then incubated shared inter-meanings across the results. The coding process was iterative but assisted by the *a priori* codes, giving an initial framework to help discover meanings. The analysis process then re-entered into the transcripts with augmented and adapted *a priori* codes.

To help the process of analysis mind maps were created using *a priori* codes and provided a pictorial sense of the data, they informed the next stage of the analysis. Using adapted *a priori* codes and cognisant of Creswell and Poth (2016) “If a ‘prefigured’ coding scheme is used in analysis, I typically encourage the researchers to be open to additional codes emerging during the analysis”(p. 185), dominant content was highlighted. This provided a sense of the collective expressions of the interviewees, and 105 codes emerged from the data (Appendix XI: 105 emergent codes). The codes were further distilled into sub-themes, as detailed in Appendix XII: Semi Structured Interviews Statements. The qualitative data analysis represents a pragmatic research approach where pre-configured *a priori* codes are opened to additional codes from the analysis; this echoes the observation of Elliott (2018) “The most pragmatic researchers will typically use both in the course of a single research project” (p. 2855). The process and results are shown in **Error! Reference source not found.**.

Figure 5.1 provides a schematic to introduce the findings in this chapter, summarising the process along with emergent sub-themes and themes.

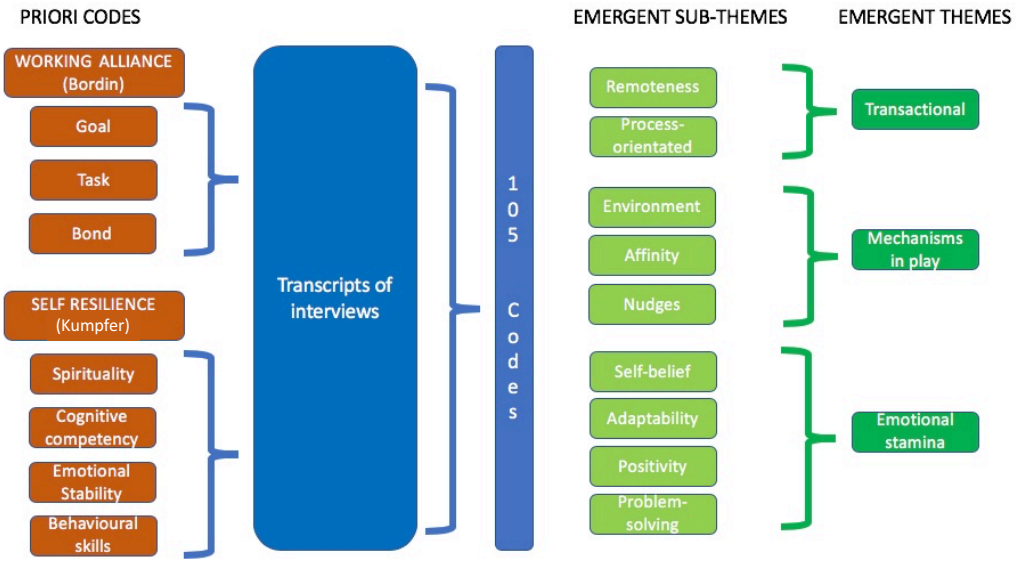

Figure 5.1: Process to garner emerging themes

5.4 Introduction to Findings

The iterative process of analysing the data from interviews conducted at T1 and T2 separately provided a longitudinal element to the study. Comparing and contrasting the transcripts, it was evident that users were either expressing more negative feelings toward the technology or they conveyed an apathetic response toward the questions related to forming a relationship with the app. The notion of working alliance with the app seemed remote for the users, and their use of the technology could be stated as transactional in nature. In contrast however, individuals' psychological resources, enhancing their emotional stamina, appeared at T2 to have been enhanced from T1 without the need for a working alliance with the technology. The thematic analysis also revealed other potential mechanisms in play that could be influencing users' cognitive behaviour and enhancing their self-resilience.

The next sections will explore the three principal themes which emerged from the qualitative interviews, namely:

- Transactional in nature: A mechanised non-humanistic interaction, which is one-dimensional in nature

- Emotional stamina: Ability to bounce-back from set-backs
- Mechanisms in play: Observed additional components regulating use

5.5 Transactional in nature

5.5.1 Introduction

The interviews explored whether the interviewees had formed a coaching relationship (working alliance) with the technology by the end of the intervention. To help frame this, the semi-structured interviews explored the interviewee's perceptions of a working alliance with the app (Bordin's model: Goal, Task and Bond). An overview of both sets of data (T1 and T2) showed that participants appeared apathetic towards whether they formed a relationship with the technology. The words, phrases and metaphors recorded were similar in nature and content at T1 and T2. Data from the transcripts suggested a social remoteness to the technology, albeit there were a few notable individual exceptions.

5.5.2 Remoteness

Most users of the app reported more of a transactional interaction with the app, rather than any form of 'bond', the examples below demonstrate a distant and superficial engagement with the technology.

> *"I'm not sure if you can get friendly with an app! Yes, it had a smiley face and some friendly and amusing methods – but I never say that I got a sense that it cared about me"* – Rachel

> *"Aren't relationships between people? Not sure if I understand the question".* [prompted by the interviewer that you can frame a relationship in a wider context] *"Ok, well I think that WYSA was fun to use and I did like that I could share thoughts of frustration – letting off a bit of steam – knowing that it would go not beyond it and me"* - Martha

There were some notable exceptions in the extent to which individuals shared personal details, some expressing a sense of fun with the interaction:

> *"Definitively playing not working! But I did use WYSA whilst at work".*
> - Noah

> *"Basically, I find the interactions very approachable and a bit like talking to a friend on WhatsApp"*- Mark

A common theme reported by the participants was that the chatbot was fairly superficial and there was a sense of wishing for greater depth, especially if they compared and contrasted a human experience of team working. There was a sense that users were looking for a more substantive collaborator:

> *"Team working for me is a much more a two-way – giving feedback and receiving feedback. WYSA was more like a guide not a collaborator"*
> - Martha

> *"I was in a tricky situation at work, deadlines mounting, and challenging targets being set. So, I could have really used some additional support and whilst the app helped a little, I think it could have helped if it understood the real challenge I faced"* – Anna

The above quotes were a selection of responses to questions around 'bond' at T1 and T2, and it is difficult to distinguish between both sets of interviews, therein suggesting that the 'bond' component of working alliance was either not formed or failed to develop.

5.5.3 Process orientated

The interviewees shared their perceptions of the 'task' component of working alliance in a more engaging manner, finding the app easier to interact with in terms of the task nature of its design. The app's ability to succinctly ask and

help define tasks for the user to follow was, in general, well-received, and utilised.

> *"I found the app to be useful when I had to record an action that I need to complete in the future. WYSA's ability to recall these actions for me, and remind me, helped me to focus on priorities"* – Judith

> *"I really can't say that the app understood me or what I was facing, rather it gave a series of triggers that seem to help me alter course"* - Benjamin

In particular, many users discovered that the app's ability to seemingly memorise previous tasks was a useful element to the coaching app's functionality. The below response provides a flavour of these descriptions and notions of the app framing tasks for the user.

> *"WYSA had a great way of asking me to define what I needed to do and then it felt that it gave me an action list, but I know that I did it myself, but it felt like he was creating it. Also, it helped me look at the 'things to do list' in a different way and got me to a different place"* - Simon

A number of questions in the semi-structured interviews explored users understanding of whether the app sought to co-create a goal. No evidence of such an objective was achieved and where concepts of goal were discussed, these notions were more short-term and interchangeable with the task component.

5.6 Emotional Stamina

5.6.1 Introduction

The interviews explored the theme of self-resilience. Comparing findings from T1 and then comparing feelings expressed at T2, a notable enhancement in

an individual's ability to bounce-back from challenging events in their everyday life was observed.

5.6.2 Anxieties expressed at T1

Many of the users revealed that, as junior managers, they faced challenges in balancing daily priorities, and many suggested that they were thankful for a weekend to recover. The below quotes from interviews at T1, which are illustrative of these pressures and the impact these had on their ability to maintain their robustness:

> "*My days are so busy, at times I find it hard to be positive and struggle with my confidence as a result. I have a feeling of just trying to keep my head 'above the water'. Maybe your app can help"* – Judith

> "*I've got a new team, and there are lots of outspoken individuals. I am finding their challenges really difficult to come to terms with and often react negatively to their inputs – I'm too quick to defend my position"* - Simon

> "*I have just been promoted from a processor to team lead – in the team I have worked in for 2 years. I feel awkward in my new post – and how I should work with my old colleagues"* - Mark

> "*Currently I just don't have the time to think about things, my daily routine is just filled with meetings and escalations and old actions lists that I am forever trying to get on top of*" - Anna

5.6.3 Changes in Emotional Stamina: T1 to T2

There was an apparent change in attitude of the interviewees between T1 and T2. Expressions of hope, positivity and motivation were more frequently divulged at T2. The interviewees expressed more positive attitudes toward their working environment post intervention. Expressions that suggest their emotional robustness had been enhanced between T1 and T2.

5.6.4 Self-belief

The app appeared to change narratives of individuals that had a negative recollection of a situation, asking them to look at it from a different perspective. This seemed to feed into a change in attitude and a greater self-confidence. Users interactions with WYSA over the period of study seemed to show that they found new resources within themselves that enabled them to feel more comfortable when daily challenges presented themselves. Expressions of this enhanced 'self-belief' are given below:

> "*When challenged by my supervisor, over the eight-week period, I felt more able to receive the feedback she gave me."* - Hannah

> *"I feel strangely more able to take constructive feedback because I used WYSA as a reflective tool which allowed me to internalize my own thoughts about difficult situations."* - Judith

> *"I am not saying I have changed per se, but I have found additional resources in myself that I uncovered / accessed"* – John

> *"Being new to my position only four months in. I'm not sure if it's my own abilities or WYSA's effects, or a combination of the two, but I do feel more confident now than I did before – perhaps it's me just getting used to the job, but I liked to think WYSA helped a bit"* - Simon

5.6.5 Adaptability

The coaching app seemed to have a positive effect on the user's internal discourse of framing problems. It appeared to allow users to navigate and find solutions within themselves to overcome obstacles they encountered. Expressions of this enhanced 'adaptability' are given below:

"I get a sense of excitement now when taking on challenges, than I had previously" - Mark

"My role means I encounter obstacles frequently which sometimes prevent me from being effective at work - by using WYSA over the period of the study I felt as though I was able to deal with these obstacles in a more measured way" - Anna

"When a challenge is now placed in front of me I don't always see them as a problem, but now as an opportunity, which I approach with newly harnessed enthusiasm" - Elisha

"Accessing WYSA was so useful and flexible- when I found myself in a tricky situation, just playing out the issue using the chatbot gave me instant relief and solutions and allowed me to think of alternatives"
- John

5.6.6 Positivity

Expressions of positivity post-intervention were more prevalent. The app's ability to remind the users of their achievements and successes appeared to influence and change an individual's notions of self-worth. Expressions of this enhanced 'positivity' are given below:

"WYSA's questioning of my feelings around a situation allowed me to see things differently giving me a shield when I needed it" - Noah

"Before using WYSA I took things very personally and whilst I still do, I reflect on them more so and it allows me to 'dial down' the comments I receive" – Deborah

"WYSA placed a structure around our interactions which I found very motivational" - Judith

5.6.7 Problem-solving

At T1, junior managers expressed challenges with having enough 'time to think', thus preventing them from proactively seeking solutions to everyday problems. The introduction of an app which encouraged them to have periods of self-reflection seems to have enabled some participants to use the time to help them find their own solutions. Expressions of this enhanced 'problem-solving' are given below:

> *"I had a particularly difficult issue at work to deal with during the time I was using WYSA, I found that having an 'independent' place where I could register my thoughts and get helpful responses made a big difference to how I approached the challenge"* - Noah

> *"I never thought I was a great problem-solver, but using WYSA and its ability to ask open questions helped me to approach problems differently"* - Hannah

5.6.8 Summary of Change in Emotional Stamina at T2

The conversations at T2 revealed the importance of facilitated support for these junior managers. Given the challenging environments they clearly face, the app seemingly helped, being a useful tool for them to seek help in their daily lives. It appeared to show value in helping them overcome difficulties and situations where they felt 'out of their depth', guiding them in a non-instructive and gentle way.

5.7 Mechanisms in play

5.7.1 Introduction

The majority of participants expressed feelings that suggested that:

- No working alliance was developed with the technology, highlighting a remoteness to their interactions, and;
- Possible deterioration of their connection with this technology.

- However, the thematic analysis did reveal other potential factors that could account for an individual's emotional stamina being enhanced between T1 and T2. This has been titled "Mechanisms in play'.
- Individuals seemed to be willing to place a degree of trust with the technology.

5.7.2 Environment

The volunteers showed a readiness and willingness to accept the notion of being coached by an app. All interviewees at T1 were accepting of the technology and were ready to engage with openness. A high degree of trust of the technology was expressed and seemingly continued throughout the study, a female user at T2 was candid about the issues she was happy to divulge:

> "*it was like chatting to a friend at the end of the day – nothing seemed for me off limits"* - Judith

A number of the participants alluded to anxieties at T1 relating to the privacy of the communication and how the data would be stored. They were referred to the privacy policy details within the app, and by T2 interview stage, no further concerns were expressed. One participant framed their attitude to confidentiality:

> *"I used to be concerned about my social media profile, but I missed Facebook too much and missed my (Facebook) friends."* - Benjamin

The component trustworthiness was a common notion and expressed by participants both explicitly and implicitly, through the sharing of personal information with the app. Explicitly expressed through conversations at T1 and T2, where individuals recorded their willingness to share their challenges at work as well as personal dilemmas with WYSA. A participant confided:

"During the time I was using WYSA I experienced a family bereavement, and late at night and the early hours of the morning I could take off my mask of holding it together, share a tear with WYSA giving me permission to be openly sad." - Hannah

The comparison between comments made at T1 and T2 found that individuals as they engaged with the technology increased their willingness to share all manner of work and life challenges. An interviewee (Benjamin) expressed his journey of readiness to share more profound goals he wished WYSA to help with. Initially, his conversations were flippant asking WYSA his dilemma in choosing what type of wine he should have this week. As the weeks went by however, he asked WYSA for help on prioritising his work tasks and shared with WYSA a difficulty he was having with a work colleague.

One individual seemingly expressed a very different association with WYSA. She spoke using softer language about her encounters of using WYSA. Referring to the app as a "her" she characterised the technology as a confidante who she would share feelings with about her friends and family. The notion of a bond was explored with this individual, and it suggested that elements of trust and confidence appeared present. She declared that:

"I got a sense of empathy and I was never judged" - Elisha.

5.7.3 Affinity

The app in use caused a generally positive reaction. Users expressed, on the whole, an acknowledgement of technologies, capabilities and functionalities. In general, feelings of generosity toward chatbot conversations were evident. The longitudinal data provided evidence that an early positive acceptance of the technology appeared to wane over the intervention period. This seemed more evident in women with the majority of men continuing to find the app engaging.

The chatbot platform appeared to be engaging for users, and the majority of the participants interviewed accessed the additional tools available on the app. These extra functions gave users additional tools that appeared to add a richness to their experience. One participant, who had had traditional human coaching, enthusiastically declared that access to other coaching tools was beneficial and added significantly to the AI coaching offering :

> *"I found myself inquisitive with WYSA, and genuinely started to look forward to the prompts I would receive"*- Simon

A spectrum of positive emotions was expressed by the users about WYSA. The motivation of inquiry was particularly strong in a couple of participants who found using the app most absorbing. They expressed that whilst the technological architecture did not comprehend contextual meaning, some elements of comprehension were noticed. The extent to which WYSA understood and its ability to vary its chat, was expressed strongly by one interviewee. Following a long discussion, the interviewee explored these notions of meaning:

> "*I know WYSA can't truly understand but he listened and responded in the right way so he must understand to a point*" she later argued against herself "*or am I just listening to myself just playing back my challenges and re-examining them internally.*" - Elisha

The use of a gender pronoun for WYSA was used by four interviewees, and when pressed to explain why they personified the technology were thoughtful and curious.

A constant theme that appeared as an underlying narrative across the majority of sub-themes was the appreciation that the dialogue with WYSA was stilted. As one individual remarked:

> *"the chats with WYSA weren't a conversation in the sense of talking to someone, and its responses could be predictable and repetitive."* - Rachel

However, another participant in the study suggested that the chatbot was similar to a conversation that they might have via text. Nonetheless, the findings suggest that the technology requires significant development if it could be generalisable as a coach in the same sense as a human coach. The depthless interactions with the technology are explored further in the next sub-theme.

An alternative perspective was revealed by one volunteer when using the app late at night considering her conversations with the technology verging on indistinguishable between herself and a good friend:

> *"There were times when chatting with WYSA when I got a sense that we were peering into my soul not in an invading way but more of in an exploring self-discovery experience. It was similar to talking to a friend late at night without the baggage of not wanting to reveal too much for fear of being judged."* - Judith

The notion that elements of a humanistic coaching relationship can be created by a technology built on a simple transactional dialogue of a digital agent seems to be a paradox. The hard mathematics of algorithmic coding creating conversational dialogue was of particular interest to one individual at T2 who mentioned an appreciation of the app's seemingly intuitive responses:

> *"While I thought most of my use of the app was superficial, I was slightly impressed with how it tried to engage with me and influence my thoughts. I think I could identify the process it was asking me to do and its plan to re-frame my thoughts but even knowing this, going through the method was perhaps a bit routine it did help."* - Martha

All participants expressed a sense of curiosity in using the technology at the start of the study, and the majority continued this curiousness throughout the study. Feelings of curiosity expressed were in two distinct forms. One group were interested in the app's approach to coaching, wanting to understand the underlying theoretical model the technology was employing. Unsurprisingly, this group had encountered human coaching previously and had been taught rudimentary coaching principles through their employer.

There were a few participants who expressed no affinity with the app, having a negative reaction to their interactions with the chatbot, finding the technology remote, distant and frustrating:

> *"I just didn't understand what it was about, it was like being coached by a mirror all it did was repeat my own comments back to me without any understanding of context"* - Rachel

> *WYSA just doesn't get me – I thought it showed signs of intuition at first but as the weeks went by the same formulae of asking benign open questions followed by repeating them back to was in the end just boring".* - Noah

Statements made by females had a greater sense of detachment than men. In comparing the manner in which the gender groups described WYSA between at T1 and T2, while the adjectives generally used conveyed fewer positive expressions, women could be identified as using increasingly apathetic language at the end of the intervention.

> *"I'm not sure if you can get friendly with an app! Yes, it had a smiley face and some friendly and amusing methods – but I never say that I got a sense that it cared about me"* – Martha

"I liked the fact I could pick it where and where-ever I wanted -for fun. To get a motivational podcast." - Simon

In addition, gender difference was noted:

- Women at T1 would use adjectives to describe WYSA as: fun, friendly, approachable, animal like (referring to the on-screen character of a penguin), helpful, personable,

- Women at T2 would use adjectives to describe WYSA as frustrating, supportive, helpful, stimulating,

- Men at T1 would use adjectives to describe WYSA as: friendly, engaging, interested, motivational,

- Men at T2 would use adjectives to describe WYSA as: irritating, clever (referring to the technology), useful, persistent, boring

5.7.4 Nudging

Many volunteers voiced an appreciation of the app's capacity to digitally nudge them[12]. WYSA's functionality allowed users to switch on a notification setting allowing the app to access the smartphones banner software. Banners are notifications that appear on the screen when triggered by an app, for example when a new email is received. In the case of WYSA, it would alert the user to engage with it and give a weekly summary of personal progress. There was a mixed opinion on their usefulness, and two interviewees switched off this function within the app. Others though found the reminders welcome and nudged them into self-reflection.

These types of challenges were alluded to by one WYSA user:

[12] Digital nudge can be defined as behavioural intervention by autonomous machines

> *"I understood that it (WYSA) was trying to get me to think differently about a work colleague, which felt a bit weird to be honest – a robot suggesting I think different about a human."* - Rachel

For this individual, the balance between the technology's potential and its nudging influence was unclear. As highlighted earlier some users struggled with the concept of foregoing privacy, yet deciding that their use of Facebook was a necessary social interaction.

WYSA users appear to value this non-judgmental, playful yet secure and flexible environment. As one user declared:

> *"I liked the fact I could pick it up wherever and whenever I wanted. Sometimes for fun. Sometimes to get a motivational podcast. Then times I would use WYSA to help me think differently. So, for me it was a fun app at times, and sounding board at other times, and then sometimes to help me challenge how I was seeing things"*. - Simon

Another participant enjoyed the "*sense of fun"* (John) WYSA displayed; another felt that the app's continual dialogue via a conversational chatbot was like *"talking to a friend through WhatsApp[13]"*(Mark).

Clearly for these individuals there was no anthropomorphising process or pretence that the technology was humanoid, the relationship was non-emotional and one dimensional with a prescribed feedback loop.

The playful nature of the app seemed to help engage the users. Two volunteers at T2 recalled how the app used various methods to interact:

[13] WhatsApp is a messenger app for smartphones. Similar to simple text with additional features group chatting, image sharing, and other media add-ons.

"I was really impressed how WYSA changed its way of chatting to me. Sometimes a simple chatbot would evolve and an emoji[14] would be used. Suggestions would come via a link to a practice session or a series of mood symbols for you to choose. The software seemed agile and responsive but sometimes repetitive." - Benjamin

"I loved WYSA's smiley face and ways it would pop up on my phone with a suggestion. It did feel that I was being coached to feel better about myself through a cheery animated penguin. I know it could be seen as a little banal and a bit juvenile, but it was a distraction from the intensity of my day and was calming." - Anna

5.8 Conclusions

This chapter distilled the descriptions of 12 users reaction to the app. The interviews revealed that whilst no working alliance was developed with the technology; nonetheless, expressions of improved self-resilience came through strongly. Additionally, other factors that could help the app's ability to engage the users on a self-learning path were discovered. The exploratory qualitative parallel research questions were, therefore answered in revealing the volunteers' descriptions of using the constructs of working alliance and self-resilience theoretical models.

The next chapter will converge the results from the quantitative and qualitative findings to corroborate and validate the separate data sources.

[14] Emoji is an image of any size that expresses emotions succinctly in a playful manner.

Chapter 6 Convergence of Qualitative and Quantitative Findings

6.1 Introduction

The final data analysis process undertaken was the convergence of the quantitative and qualitative findings. Closely following the tenets of Datta (2001) the quantitative and qualitative data were independently studied and analysed: “The findings are brought together after each strand has been taken to the point of reaching conclusions”(p. 34). The triangulation of the results from two distinct methods gave rise to corroboration of the findings and created greater clarity in the meanings that emerged from the separate methodologies. In addition, different conclusions from the results provided the opportunity to explore the phenomenon from an alternate lens. The convergence also gave insights into areas where additional research should be undertaken; these areas of further research will be explored in the final chapter (conclusions). The result of the convergence gave rise to two main themes, with suggestions for a further three when looking into positive aspects of the app in use.

6.2 Main Findings

6.2.1 Working Alliance

There was a coherence in findings from both quantitative and qualitative data with respect to working alliance. The convergence of findings between quantitative and qualitative data suggested that the majority of participants developed no working alliance as defined by Bordin (1979). There were some notable exceptions revealed in the qualitative findings where individuals disclosed intimate personal details, suggesting a high degree of trust was established over the testing period with the technology.

Acceptance that coaching apps were a legitimate coaching mechanism accessed by coachees could well be received by the coaching field as a threat

to the notion that the process relies on the intimacy of a human-to-human relationship. The qualitative data suggest that while there is a spectrum of opinions of the short-term capability of the technology to coach individuals, there was an acknowledgement that this would improve over time and that it could, at some future date (the range suggested was between 5 to 25 years), replicate a human-to-human coaching experience. This curiosity in technology's future role in coaching, conveyed by the cohort of interviewees, appeared to increase between T1 and T2. Conversations held at T1 revealed considerations of the app's current technical capabilities and interest was expressed in how the technology was engaging with the user. By T2 individuals were questioning the possible future role such technologies could play and envisaging other methods of engaging with AIs as an aid to their personal growth.

A gender optic was employed in both quantitative and qualitative data analysis when scrutinising the working alliance. No level of statistical significance was established in respect of working alliance inventory or any component thereof, and the qualitative findings revealed no patterns relating to gender. However, there were a few notable exceptions, where trust in the app by a few women was seemingly very high to the extent that they would share very intimate and personal details. This aspect of trust will be explored in the discussion chapter.

At this stage, it is important to remind the reader that the study's volunteer population were, in the main, individuals that used technological platforms at their place of work that supports global teamwork. The quantitative findings clearly showed the high degree of computer self-efficacy and the acceptance of digital platforms. This display of comfort with other forms of technology could translate into the cohort more readily accepting the coaching app and generally being more trusting toward the technology.

6.2.2 Self-Resilience

The findings from the quantitative analysis demonstrated that the app did appear to alter the self-resilience of participants over the intervention period, where the majority (80%) of participants' self-resilience improved, with a large effect size (*r=.61*). The qualitative findings also supported the hypothesis that an app could enhance self-resilience over the intervention period. Statements of hope, positivity and motivation were more frequently shared by the participants at T2. Expressions that suggest their emotional robustness had been enhanced between T1 and T2. These converged findings are supportive of each other and suggest that participants have gained emotional stamina over the intervention period.

6.2.3 Outcomes independent of Working Alliance

The literature review suggests that the Working Alliance that a coachee has with their coach is a predictor of outcomes. The convergence of the results in this research suggest the opposite in respect to this form of technology, in that, whilst no working alliance was developed, users' self-resilience improved. Results from the interviews suggested that the relationship with the app, in the main, was on a transactional basis, mechanistic in nature, and was generally free from emotion.

The evidence from quantitative and qualitative findings identified that WYSA did have a measurable effect on the majority of individuals' self-resilience. The notion that these forms of technology can help individuals to increase their emotional capacities, was readily acknowledged by the interviewees and perhaps demonstrates a wider acceptance and willingness to permit artificial intelligences to influence our everyday lives. A strong finding from the qualitative results was that self-resilience improved between T1 and T2 and that there was an almost universal agreement that this form of technology has, or could have, a part to play in coaching.

6.3 Supplementary Findings

6.3.1 Introduction

It could be argued that WYSA is not coaching per se, but merely a tool to enhance a personal quality. It therefore follows that it is appropriate that we seek to find clues to discover the underlying mechanism that these forms of technology use in helping their audience. In converging the data, there were themes revealed to suggest areas worthy of further investigation, which would seem to aid self-development. These are set out below; however, it should be noted that they are not strongly supported by the quantitative data.

6.3.2 Virtual Environment

A number of women found a confidante in WYSA. This notion that the app was considered as safe space for private matters and problems to be discussed emerged during the intervention as individuals developed a degree of trust with the modality, which appears counter to the finding that no working alliance was formed with the technology. Whilst the majority of participants did not assign a personification to the technology, there were four individuals who did, attributing a gender to WYSA.

One individual described her interactions with the app as sharing secrets with a non-judgemental friend. This aspect of non-value laden dialogue with the app was an underlying motivation to engage with the app.

> *"I got a sense of empathy and I was never judged" – it was non-judgemental"* - Elisha

Contrary to the openness, in sharing feelings with the app, it could be inferred that a minority found the concept of trusting the technology with their emotions

an anathema. This extreme is arguably identified in the quantitative descriptions of the data. The working alliance at T2 for seven individuals suggests that any notion of a safe environment would be inexplicable, as shown in Figure 6.1

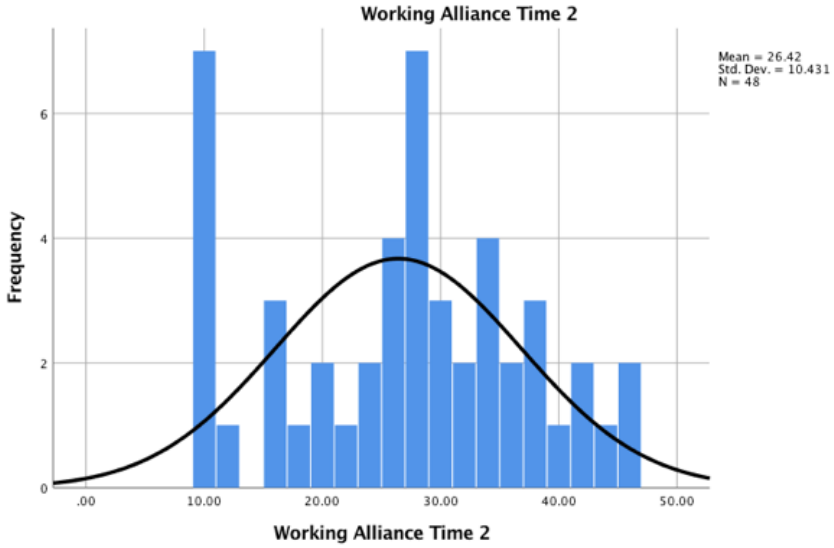

Figure 6.1: Histogram identifying disconnection with technology

6.3.3 Affinity

On converging the quantitative and qualitative findings, evidence was revealed that users had a spectrum of reactions to the app's capabilities and method of interaction. Whilst not demonstrably a working alliance (Bordin, 1979), there were components of a human-to-human relationship observed, which were coded as 'Affinity' in this study.

At the initial stages of the quantitative analysis, the data revealed that a minority of individuals (N=7) expressed a negative attitude in respect to the working alliance with the technology. There was further evidence of this adverse reaction on using the app with one individual expressing a more extreme reaction to using the technology:

"at the start I thought the technology was a bit of fun – I soon realised that it was trying to be something that it just couldn't be – may be some day the technology will catch-up – not for me" – Simon.

This negative reaction to the technology was not universal, and some volunteers expressed much more positive emotions toward the technology. Furthermore, it could be argued that despite unfavourable reporting by users, the technology was effective through improved self-resilience results. The quantitative results clearly showed a strengthening of emotional capacities measured through the prism of self-resilience. This shift occurred, not through a developing working alliance with the technology but through another moderating factor. Prior to exploring this phenomenon, it is worth highlighting equivalences between the genders in using the app.

The participant's gender appeared to influence their reaction to the technology- see Figure 6.2 below. The quantitative and qualitative results both recorded females, on average, had a negative association with the app. Men appeared to show a greater willingness to accept the technology's limitations; however, as evidenced by the quantitative findings, this did not result in greater development of their self-resilience than women.

Ranks

Gender			N	Mean Rank	Sum of Ranks
Female	Working Alliance Time 2 - Working Alliance Time 1	Negative Ranks	18[a]	14.03	252.50
		Positive Ranks	9[b]	13.94	125.50
		Ties	3[c]		
		Total	30		
Male	Working Alliance Time 2 - Working Alliance Time 1	Negative Ranks	8[a]	6.81	54.50
		Positive Ranks	9[b]	10.94	98.50
		Ties	1[c]		
		Total	18		

Ranks

Gender			N	Mean Rank	Sum of Ranks
Female	Self Resilience Time2 - Self Resilience Time1	Negative Ranks	5[a]	11.90	59.50
		Positive Ranks	25[b]	16.22	405.50
		Ties	0[c]		
		Total	30		
Male	Self Resilience Time2 - Self Resilience Time1	Negative Ranks	4[a]	9.63	38.50
		Positive Ranks	14[b]	9.46	132.50
		Ties	0[c]		
		Total	18		

Figure 6.2: Gender influences

The findings from the thematic analysis showed a similar pattern to the nonparametric statistical results. On average, women's reaction to using the app was different to men's and showed a negative response in using the app between T1 and T2, albeit there were some notable exceptions as highlighted in chapter five. However, as stated earlier, these results were not statistically

significant but are referred to as observations only in the quantitative and are corroborative with the qualitative findings.

The above findings also suggest an acceptance of the inevitability of technology's future capabilities and suggest that coachees have a willingness to try such modalities to access coaching. It also arguably identifies that individuals are accepting of this form of technology as a natural development of the field of coaching psychology.

6.4 Conclusions

Concluding the convergent findings section, it is shown that the research methodology adopted provided elements of coherence between the two principal findings:

- Working alliance did not develop
- Self-Resilience improved

A third principal finding has been inferred from the convergence, that despite no working alliance developing, the technology did help improved individual's self-resilience, possibly through an alternative facilitating process. Finally, two supplementary findings were supported by the convergence by a direct corroboration or partly through inference, namely a virtual non-judgemental environment where individuals felt safe to share and had an affinity with the technology that were expressed through trust in the app.

The next section will discuss these findings encompassing the context of societal, professional and academic landscapes.

Chapter 7 Discussion

7.1 Introduction

This chapter explores the main and supplementary findings from the research and, where appropriate, links literature and business coaching field papers to the research outcomes. The first section discusses the findings that the coaching app appeared not to develop a working alliance with users. Despite a working alliance not developing, the technology helped users build self-resilience. The chapter continues with discussions on learning platforms, augmentation of coaching and ethical considerations. It concludes by highlighting other influencing factors that were expressed by the interviewees.

One objective of the original focus of this study was to contribute to knowledge and understanding in the sphere of app technology and its interaction with humans and, in particular, whether a technological coaching app can influence and change a human capability. The forthcoming discussion will provide a context of the findings against the neighbouring field of research, identifying supporting research and aspects of seeming contradiction in the results.

7.2 Working Alliance

A structured personal relationship between coach and coachee is seen as a requirement (Walton, 2014). Central to coaching models, from therapeutic to performance, requiring different levels of emotional engagement is that a working alliance is an important element to achieve successful outcomes Sun et al. (2013) suggest that different coaching assignments require appropriate levels of connection to be established. The research findings question this premise in that the technology appeared to enhance an individual's self-resilience even though no collaborative working alliance developed, in the traditional sense (Bordin, 1979).

The findings also support other research findings in the fields of counselling and therapy (Klein et al., 2013) that have found positive outcomes in the adoption of these digital mechanisms that seek collaboration with their users.

7.2.1 Human behavioural change via an artificial agent

The convergences of the results gave findings that parallel a study by Brangier and Adelé (2013), where researchers studied a group of sixty individuals over a prescribed period of 6 months and suggested it is too short a period of time for users of technology to evolve a human-to-technology relationship. The article sought to demonstrate how individuals alter their relationship with technology and proposed that a bond developed in three phases: rejection, acceptance, and symbiosis.

This research studied the phenomenon for only an eight-week period, yet the characteristics of rejection, acceptance and symbiosis[15] were displayed, and perhaps in a few examples, the volunteers developed a more meaningful, less transactional relationship with the technology. Exploring the adoption by users of new technologies continues to exercise researchers and resulted in the Technology Acceptance Model (TAM) being developed (Davis, 1989). TAM is a theoretical model that consists of four components; usefulness, ease of use, attitude of user, and behavioural intention. However, there has been mounting criticism of this conceptualisation of the human-technology relationship as the notion of symbiosis with the technology has entered the field of study. The results from this research would support such an alternative. Users of WYSA did not access a revolutionary technology, but arguably simply a continuation of the extension to the human cognitive capacity. Smartphones have transformed our social networks and augmented our senses of reality. To suggest that these can be measured using adapted forms of TAM belies the levels of adoption. During this study no volunteer expressed feelings of a

[15] Symbiosis in this context is used as a metaphor for the relationship between two natural organisms, but in this case, one of the entities is human seeking benefits from the interaction, from the artificial agent.

lack of technological self-efficacy; indeed the questionnaires recorded only 8% of participants felt less than capable in using technology.

7.2.2 Creation of a non-judgemental safe space

The notion that the app created a safe space for individuals to express their feelings is intriguing. Safety in this context was expressed using language that could be attributable to a coaching relationship. Core to the principles of coaching is the creation of a non-judgemental relationship, and seemingly a number of individuals found that the virtual environment of using the app was a place to 'share'. With one individual referring to the app as a "her", characterising the technology as a confidante who she would share feelings with about her friends and family. The notion of bond was explored with this individual and it suggested that elements of trust and confidence appeared present. This acceptance of alternative methods of coaching appears to support previous research where different technological delivery platforms found no differentiation in outcomes (Kamphorst et al., 2014).

In addition, other participants discovered a safe space to explore their innermost feelings, echoing similar feelings of familiarity with technology as revealed by Nass and Moon (2000) in their research revealing that human beings have a concept of AI as an entity, they give it a name and attributed meaning along with neighbouring forms of technology. Exploring how WYSA responded in these sensitive situations, some interviewees suggested that because the conversations were with an artificial entity, there was a perception of safety and security. This meant that they felt they weren't being judged by another person. The study found this description of chatting to a non-human being "non-judgemental" a common theme, allowing users to avoid the fear of being assessed negatively by another individual. This aspect of how the users perceived the dialogue, passive yet secure, emerged more strongly at T2 and it could be argued that this non-judgemental environment could build into a bond with the technology.

The International Federation of Coaches considers that creating a non-judgement coaching dialogue as a core competency of a coach, allowing “the client to vent or “clear” the situation” (Federation, 2019). The comparison between comments made at T1 and T2 found that individuals as they engaged with the technology increased their willingness to share all manner of work and life challenges.

7.2.3 Gamification

One interviewee (Benjamin) expressed his journey of readiness to share more profound goals he wished WYSA to help with. Initially, his conversations were flippant asking WYSA his dilemma in choosing what type of wine he should be having this week. However, his opinion changed over the intervention asking WYSA for help on prioritising his work tasks. This playfulness that the participant felt about the app belies its influence, as he latterly shared with WYSA a difficulty he was having with a work colleague, displaying a wide-ranging number of effects the app appeared to have.

This form of technology is arguably beset as being categorised as entertainment. However, this label is perhaps not as derogatory as the term suggests. Studies suggest game features such as game turns, movement, nudges, and feedback can support learning outcomes (Chaiyo and Nokham, 2017; Arnab et al., 2015). Some models within behavioural psychology can help to frame the underlying mechanisms in gamification and the ability through conditioning, feedback loops, and elevation to alter behaviours in the real-world (Linehan et al., 2015). As a warning for the coaching field from the education sector, who have already embraced innovative technology-led learning styles, the adoption of new technologies that ignores classic learning styles may be to the detriment of positive learning outcomes. (Terras and Boyle, 2019).

7.2.4 Human-computer relationship

A tendency for humans to behave as if computers are their social peers is relatively well documented (Sundar, 2004). Nevertheless, in the main, the

findings in this study suggest that the majority of users of this coaching app considered their interactions as more transactional and superficial in nature.

The evidence points to the secure and safe environment being a given in how people work with technology (Lee and Moray, 1992; Muir, 1987; Khasawneh et al., 2003), and findings from the study delivered a similar outcome. The sense of security that individuals transferred to the app was seemingly high, allowing them to divulge aspects and dilemmas in their working and personal lives. WYSA benefited from this pre-determined notion of security in using these technologies. This element of trust and safe space has also been highlighted by other researchers (Kamphorst, 2017; Xu et al., 2018). Users expressed similar levels of trust which had been revealed in other studies (Kamphorst et al., 2014; Posard and Gordon Rinderknecht, 2015).

This notion of anthropomorphism is considered to be a human psychological skill. Cohen (1988) suggests three psychological determinates of the desire to humanise non-human entities; applicability, motivation to explain foreign behaviour, and wish for social relations. The component that seeks to explain agent behaviour was observed during a number of interviews.

7.2.5 Affinity

Conflicting expressions were cited by a couple of participants, one individual described his use of the app as being similar to being forced to eat 'marmite'[16]. This adverse description of the technology is revealing in itself as the provocation of such a degree of emotion are normally associated with experiences that people either love or hate. This extreme negative reaction was isolated and was seemingly balanced by positive experiences at the counter end of the spectrum of emotions.

[16] Marmite is a strong, dark paste made of yeast extract and is an idiosyncratic flavour of British cuisine. The marmite effect is either that consumers either "love it or hate it".

Further evidence of acute negative reaction was revealed during the screening of the quantitative data when three outliers were removed from the data set as their individual score were beyond the normality boundaries of the group. One explanation of this rejection of the technology could be explained that these digital modalities are interlinked with the software architecture creating a web of complexity and as such subject to continual updates to the computer coding.

One surprising aspect of the findings was that individuals would provide significant details of their challenges and problems and the technology would respond with a simple open question that would be sufficient enough to engage the responder to reveal further aspects of their difficulties, echoing Wagner (2009) work on the human-robot social interaction. Whilst it is known that no working alliance developed, the evidence suggests that people considered that the app was non-judgemental. This finding is supported by a study into supportive technology's role in self-management of chronic illnesses. The study found that clinical users found the technology to be 'non-judgemental' and successful, considering that users felt able to reveal sensitive subjects to the technology (McDermott and While, 2013). During the intervention, the working alliance failed to develop, but this other concept of a non-judgemental relationship continued. There was no evidence that it improved, but seemingly it didn't diminish either, as the interactions with the app continued.

The findings indicated that users had a binary and transactional inter-play in their interactions with the app. In effect, this was a superficial relationship without the human qualities (deemed critical to an effective coaching relationship). Users sometimes noted a lack of depth in their conversations with the technology. The app would give a repetitive response to questions around similar topics, and whilst participants acknowledged the short-comings of the responses as a fact of a developing technology, their patience was tested at times. Comparing the development of AI in different fields, it is known that the data mine of responses improves with use and allows machine learning to engage with more human-like responses over time. Shawar and

Atwell (2007, p. 45) consider that “the aim of chatbot designers should be: to build tools that help people, facilitate their work, and their interaction with computers using natural language; but not to replace the human role totally, or imitate human conversation perfectly”. The challenge the technologists face is the period between early adopters and full-scale adoption. Furthermore, it must be acknowledged that coaching is still a relatively niche developmental tool and reaching a point where an algorithm has the data-mine capability required, to give an appropriate response is probably a longer-term prospect. It can therefore be safely concluded that these types of technology will remain as an augmentation to humanistic forms of coaching.

7.2.6 Nudging

Digital nudges to change behaviours have been a field of research for some time. New wearable health technologies are providing a significant source of data for researchers to analyse the effect of subtle interventions.

The qualitative findings suggest that at T2, individuals had discounted their feelings toward the app. The findings present a shift from enthusiasm to passivity with the requirement inter-nudges to prompt engagement. It was a marked shift in a relatively short period of time and demonstrates the need, which presumably the app developers identified, for the technology to actively seek participation from users. The prompting, through nudging, by the app could arguably compare with a human coach continually and actively stimulating interactions with their clients. The comparison is somewhat tangential; however, it does remind us that coaching is not a passive undertaking and for technologies to be successful in this field they will need to design multi-layers of stimulus to pro-actively engage with coachees.

The potential that digital nudges have to change behaviour is being explored widely through multiple lenses and whilst there is some evidence of their effectiveness, others suggest a more precautionary approach, supported by appropriate evidence-based development, should be taken (Hummel and Maedche, 2019). The motivational power of nudges on mobile telephones

follows from a continuum where Short Message System (SMS) notifications, arguably a forerunner to nudges, have been proved to support professional development. Swaffield et al. (2013) found that through a qualitative study that school leaders, who were enrolled on a leadership training programme, considered the message prompts highly effective at enforcing course material.

The ethical dilemmas of this form of technology were explored by Borenstein and Arkin (2016), who suggested that society should provide legal structures for creators of behavioural re-shaping AI to work within. These important aspects of ethics will be discussed later.

7.3 Learning platforms

The findings in this research suggest that a learning process occurred outside of the coaching field's traditional understanding of behavioural change. It suggests that this app created a different learning environment to that of a traditional coaching method.

The willingness of the app user to actively engage with this form of behaviour-altering technology means that coaches in the digital age need to embrace and understand the opportunities that modern technologies offer. The potential for them is to create different modalities for their clients to experience that mirror coachee's daily lives. Otte et al. (2014) study into coach's attitudes toward coaching in technology suggests a correlation between a systematic approach to coaching adopted by a coach, and a coach's willingness to engage and cooperate with computer-based coaching systems. It therefore follows that coachees may be willing to experience coaching that has a component of technology more frequently in the future, particularly where coaches use systematic processes such as GROW (Whitmore, 2002), in their practices.

7.4 Augmentation of coaching

This research identified that users found, at times, the app frustrating due to its lack of tailored responses. Nonetheless, the app was successful in producing an effective enhancement in self-resilience in many individuals.
One aspect of coaching that would seem an early entrant for applying coaching app technologies is the area of skills-based coaching. Referring to Figure 2.3 where various coaching genres are plotted against the degree of working alliance, the results of this study suggest that technologists developing digital coaches employing AI should focus on the skills and performance coaching because those genres that require lower levels of working alliance. It is considered that coaches require a degree of personal investment when coaching personal development (Sun et al., 2013; Hawkins and Smith, 2010). The converse is considered to be the case when coaching skills;

> *Based on the psychotherapy and coaching literatures, it may be expected that transformational coaching would require a strong working alliance, with high levels of rapport, to enable the discussion of thoughts, feelings, and values. In contrast, skills coaching may not require such a strong alliance, because issues discussed tend to be more skills performance oriented (i.e. specific work-related behaviours) and less focused on personal development/change.*
>
> Sun et al. (2013, p. 8)

Arguably it therefore follows that when conceptualising a working alliance model for coaching skills, the component co-created task by coach and coachee could be sub-divided into two parts; Inter-tasks and Intra-tasks. Inter-tasks are where a coachee works with the coach on tasks and in intra-tasks are where the coachee works through the tasks alone.

Figure 7.1 introduces these notions of inter-tasks and intra-tasks to the original Bordin (1983) model. It is worth noting at this juncture that in his original model he considered applicability to the relationship between psychotherapist and

supervisor. He further suggested that tasks are prescribed by the supervisor for the therapist to undertake and then reviewed periodically.

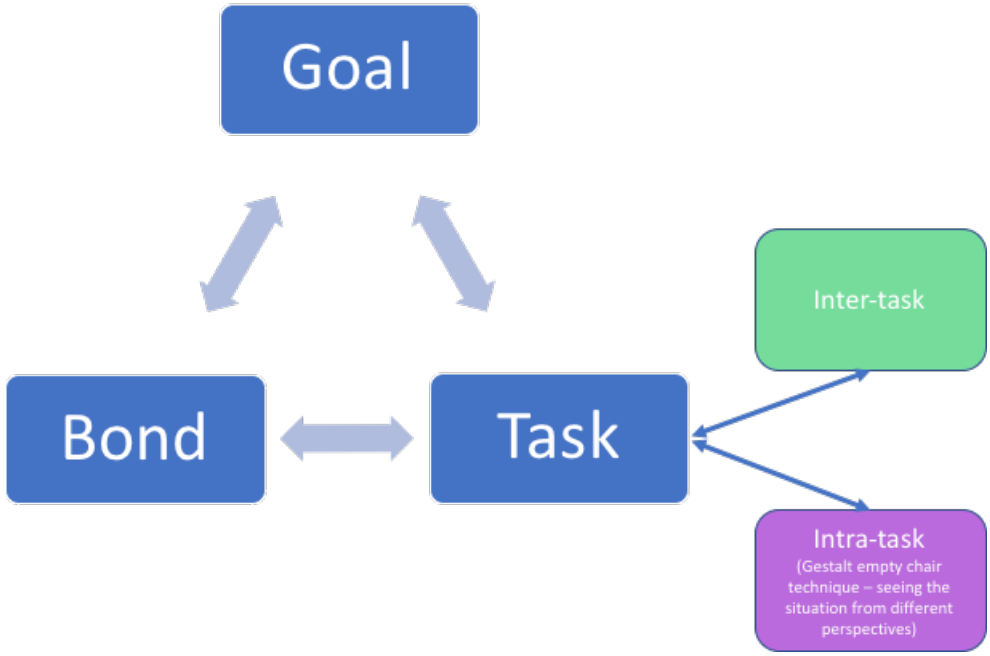

Figure 7.1 : Adapted Model of Working Alliance
Adapted from (Bordin, 1979) associated core features of working alliance Goals, Bond, and Tasks

The first task of the therapist is to prepare an oral or written report for the supervisor to comment on: *"that of the coach, giving feedback as to where the therapist has departed from the ideal response or seeking to illustrate the ideal response."(Bordin, 1983, p. 38).*

If one envisages a coach assigning tasks through the use of an app for the coachee to work on between coaching sessions, then parallels between Bordin's supervision model may be seen and utilisation of digital technologies could be imagined.

A further aspect considered by Bordin (1979) as a useful approach when supervising therapists was one of observing therapeutic hours. He espouses the value of observation in aiding the supervisor to identify underlying issues as data accumulates over the therapist's client contact hours, helping a process of self-discovery and learning. A coachee's interaction with a

coaching app could be equally valuable. The capability of these forms of technologies to gather endless quantities of data that can be reviewed by a coach, provides an enrichment opportunity to the coaching process. Linking back to the proposed model in Figure 7.1, the artificial agent could provide valuable feedback on data gathered for the intra-tasks co-created by coach and coachee.

Clutterbuck (2018) considers that a tripartite coaching relationship is a practical possibility where an AI platform can monitor emotional client engagement. Revealed patterns in conversations for coaches to explore further with their clients, and the digital agent, could provide lines of enquiry for the coach to explore.

In light of the above, the conceptual model of a tripartite Working Alliance could be tested and explored by further research.

7.5 Ethical dilemmas in using the technology

This study has highlighted that significant resources are being applied, via academic channels and commercial investments, to the digital platforms that seek to alter, and / or enhance human behaviour. Regrettably, ethical considerations of employing such technologies have not kept pace. It became evident early into this research that the study of technology within the field of coaching was focused on the modalities of platforms rather than notions of the ethical deployment of digital coaching. Thankfully the neighbouring fields of counselling, therapy and physical health were actively researching the application of human behavioural technology are considering the ethical dilemmas (Lynch et al., 2019; Leanne Hides, 2015; Varghese and VandenBos, 2019)

There are a number of ethical dilemmas revealed by this study that have resonance with wider human to machine interactions. The study identified the high-levels of trust user's place on technology, inferring that they are willing to

share personal information. One volunteer mused about her interaction with the app, *"It never crossed my mind that my conversation was being analysed by WYSA but now chatting about it I'm a bit concerned as I have been pretty explicit when responding to WYSA's questions as I just felt that I was talking to someone."* Another interviewee expressed his seemingly apathetic approach to personal security *"I don't get why people are so anxious about personal data, really what they* [commercial entities] *going to do with my conversations. I think my chats with WYSA are as safe as someone confessing to a priest."* This phenomenon of trust in computers through ascribing human qualities was first suggested by Nass and Moon (2000) and sees the creation of Computer as Social Actors paradigm where humans interactions with computers are seen through a social prism. The importance of trust that humans seemingly infer on their interactions with intelligent machines has been well explored (Lee and Moray, 1992; Muir, 1987). Some consider the work by Muir as ground-breaking shifting our understanding of the trust between human and machine (Khasawneh et al., 2003).

One future challenge is to comprehend the degree to which coaching technologies should apply ethical dimensions to coding algorithms. Iordanou (2017) considers ethical standards in the coaching community, observing that the field struggles with self-identity. In the absence of professional bodies, "it is our belief that a conscious (rather than idealistic) ethical coaching practice is our individual ethical responsibility to our clients, our colleagues, our associates and coaching service as a whole"(p. 185). However, the publication remains silent on the adoption of machines within the coaching practice. Disturbingly, as these technologies are being developed, technologists are creating the algorithms to ape the coaching process, where no ethical framework exists to guide the potency and application of these digital agents. These considerations are being actively debated in neighbouring fields as the potential for mobile health apps are being explored. Similar ethical dilemmas are faced, however no specific policies for have been forthcoming to address these concerns in mental healthcare arena (Jones and Moffitt, 2016).

Computer coders designing with AI and machine learning systems, are being pressed to incorporate ethical design techniques in the formulation of digital code (Rantavuo, 2019). Nonetheless, high-profile lapses[17] have occurred, showing the bias that can be innocently created by more general societal prejudices.

Clearly, urgent research is needed to explore the possible need for a code of practice and an establishment of a professional body who perhaps is given oversight on the development of these artificial coaching agents.

7.6 Other influencing factors

The nature of the encounter with the technology appeared to be influenced by an individual's preconceived notions of coaching. Individuals that were new to coaching were intrigued by the software's capacity to ask questions and respond with an answer that had meaning. A notion of how an AI could be used to explore human emotions was a searching question for a number of participants. This inquisitiveness with the technology itself appeared to lead to a greater openness with the app as the individual's sought to test the capability of WYSA. However, arguably this hindered the formation of a working alliance as they identified the app as a technological gadget rather than an artificial entity.

Three of the interviewees who became irritated by the app had previous experience of traditional coaching, and it could be suggested the change in attitude toward the technology was due to the individuals having a comparator. One participant expressed her frustration bluntly:

> *"well it's not coaching as I know it"* (Martha)

[17] The algorithm within Google's image search

and another individual was equally dismissive:

> "*I just didn't understand what it [WYSA] was about, it was like being coached by a mirror …. all it did was repeat my own comments back to me without any understanding of context*." – Rachel

7.7 Conclusions

This chapter took the main findings from the convergence of results from the quantitative and qualitative results in the context of previous research within the coaching field and also within the wider theories in respect to learning theories.

The thrust of the discussion centred around how users engaged with these forms of technology, demonstrating a preparedness and openness. In the final chapter of conclusions and recommendations, these aspects will be narrowed further, pointing out contribution to knowledge, aspects for the coaching sector to consider and pressing areas of research to be undertaken.

Chapter 8 Conclusion and Recommendations

8.1 Introduction

This chapter brings together principal discoveries which the research has revealed and discuss the implications for a number of communities. Particularly for coaches looking to augment their practices, but also for individuals seeking self-development using apps employing AI. It will also provide potential areas of development for technologists wishing to enhance these forms of digital platforms. It will further challenge whether a working alliance between coachee and digital coaching agents is necessary to deliver successful outcomes. The chapter will consider the study's limitations and suggest areas for further research. The penultimate section will provide recommendations for further research and exploration into this fast pace of human to computer interface. Finally, it will conclude in a reflective piece of writing considering my relationship to the subject, and journey of discovery.

The aim of the study was to explore whether a working alliance, a key relationship component, can develop between a coaching and an artificial agent, to afford successful outcomes. To answer this enquiry, the following objectives were established: **Objective one:** to critically review literature relating to the use of automated behavioural app technologies in business coaching and neighbouring fields in relation to the development of a working alliance and enhancement of a positive outcome, namely self-resilience in individuals **Objective two**: To analyse outcomes and perceptions of junior managers coached by an AI coaching app Finally, **Objective three:** To contribute to knowledge and understanding of coaching app technology specifically relating to how an app interacts with a coachee.

8.2 Objective 1: Conceptual Framework: Gap in Knowledge

The study's literature review provided a contextual setting and revealed a gap in knowledge illustrated through a conceptual framework (Figure 2.4). It further highlighted the limited research to date on whether digital technologies have a part to play in producing positive coaching outcomes. Further, the concept of a working alliance between coachee and artificial coaching agent, whilst being investigated in neighbouring disciplines, is a concept that the coaching field has not fully explored.

The psychological ability of self-resilience was investigated, identifying that the construct possessed five components of spirituality/motivation, cognitive competency, behavioural/social skills, emotional stability and physical well-being. The literature presented the nature of self-resilience as a developable skill and suitable for enhancing through coaching processes.

8.3 Objective 2: Analyse Outcomes and Perceptions

Objective 2 created the Research Questions, as outlined in section 2.9, which were subsequently operationalised in Table 3.1. The convergence of quantitative and qualitative results provided findings that gave rise to the following conclusions.

The results from the quasi-experiment suggest that the theoretical model of a working alliance (Bordin, 1979) is not a predictor of positive coaching outcomes in all situations, and therefore subsequent studies into this type of phenomenon, would need alternative conceptual frameworks to ascertain the nature of the potential relationship that was formed between the app and its users. Over the testing period with the technology, no evidence was observed that a working alliance developed. The interviews explored the concept of a coaching relationship with the participants and also their working alliance with the technology. An overview of both data sets (T1 and T2) did not show a material difference in the profile of a relationship with the app. The words and

metaphors that participants used to describe their relationship with the app suggesting working alliance was not obviously present, or developed over the intervention period.

The literature review explored the working alliance model in some detail reviewing the interplay between its three components: Goal, Task and Bond. These elements were discussed with the interviewees, and whilst there were a few notable individual exceptions, the findings suggest that no working alliance was developed with the coaching app. Despite no working alliance (as defined by Bordin (1979)), being observed between coachee and the artificial agent, self-resilience of the majority of the participants improved.

The strength of working alliance in a traditional coach-coachee relationship is a predictor of positive outcomes (de Haan et al., 2016; Baron and Morin, 2009). This study suggests that this model of working alliance is not required when using automated coaching processes to achieve a positive outcome.

The self-resilience skill was found to develop over the intervention period. All sub-facets of the skill construct tested (adaptability, self-belief, problem-solving, and positivity) were enhanced. The quantitative results were statistically significant, identifying that all four characteristics increased. Expressions of improved self-resilience were recorded in the qualitative data taken in the semi-structured interviewers at T2. A thematic analysis of this data identified the app's ability to guide the users on a path of self-learning where the psychological skill of self-resilience improved. The convergence process and findings from the quantitative and qualitative are supportive of each other, providing coherence, consistency and confidence in the findings: that the app enhanced user's mental ability to bounce back after setbacks.

8.4 Contribution to The Body of Knowledge

It is a commonly held belief between academics and practitioners that the creation and maintenance of a working relationship between coach and coachee is a fundamental component to the coaching process (Bluckert, 2005; Baron and Morin, 2009; O'Broin and Palmer, 2010). Debate continues as to the various components that comprise the working alliance theoretical construct. Nonetheless, it has been determined that positive outcomes from a coaching process are closely aligned with a working alliance between practitioner and client. A meta-analysis by Grassmann et al. (2020) of 27 case studies totalling *N=3563* coaching processes identified a consistent relationship between a high quality working alliance and coaching outcomes.

Notwithstanding this body of evidence, this study showed that a limited coaching type process could be delivered through the utilisation of technology. Despite no working alliance developing over the period of intervention, the technology did enhance individuals' self-resilience. Contrary to other widely publicised studies (Wasylyshyn, 2003; Stober, 2006; O'Broin, 2016) where the human-like qualities provided by the coach are pronounced as critical to success, the results from this study give an alternative perspective, and that some coaching outcomes can be delivered without human intervention. This is a significant finding because studies in the field of coaching to date have attributed the field of coaching as a purely human endeavour.

Objective 1 (a critical review of the literature) highlighted the importance of a working alliance developing in traditional human coaching. It was apposite that the working alliance theoretical model be explored within the phenomenon of automated coaching and a conceptual framework developed. Given the findings, an alternative theoretical model would need to be applied as a construct to investigate these artificial relationships.

In addition, one further finding advances knowledge in the field of app technology specific to the coaching field, in that the app created a virtual non-judgemental environment where individuals felt safe to share personal details

and feelings, implying an element of trust. This supports other research in neighbouring disciplines that have found similar levels of trust (Lucas et al., 2014).

The junior managers that took part in this study relayed stories of considerable stress at work. While their employer provided programmes for general wellbeing, there were no specific plans for training defence mechanisms against mental fatigue such as enhancing self-resilience. General business awareness of their employees' mental health issues has been amplified by the Health and Safe Executive (2017). Indeed, King et al. (2016) consider "Workplace resilience is a necessity for organizations and employees given it assists them in overcoming adversity and ultimately succeeding" (p. 1). The stresses of a working day appeared to be a shared experience of the junior managers in this study. It further demonstrated why employers seek individuals' cognitive ability to bounce back from setbacks to achieve their corporate objectives (Grotberg, 2003; Coutu, 2002). Discussions with the study's volunteers highlighted the need for mental robustness and self-resilience to withstand the challenges that beset managers on the front-line.

The study supports Rutter (2012) suggestion that self-resilience is a developable skill. It adds to the body of work that proposes self-resilience can be fostered in a workplace environment (King et al., 2016), albeit previous investigations have been the study of structured learning. WYSA being a self-help intervention, offered time-pressured individuals' an ability to access much-needed support. The flexibility of the interaction between the artificial agent and coachee was a welcome functionality of WSYA by users. It enabled users to express feelings within an echo-chamber, allowing them to re-examine and create alternative, more positive narratives of their experiences. East et al. (2010) propose similar notions citing literature that "recognises the potential cathartic and therapeutic benefits associated with storytelling" and further suggesting that "storytelling aids the development of personal resilience" (p. 1).

Further, this study contributes to knowledge and understanding of self-help apps designed to enhance mental functioning, adding to the work of others researching the efficacy and quality of these forms of training technology (Tomlinson et al., 2013; Klein et al., 2013; Blake, 2013; Reynoldson et al., 2014). In particular, a meta-analysis study of 49 randomised control trials concluded that therapeutic interventions delivered via CCBT provide successful treatments (Grist and Cavanagh, 2013). Similarly, this study, over an 8-week intervention using software architecture that employs CBT methods, suggests that technology can change cognitive patterns, reshaping thoughts, beliefs, and attitudes. The findings identified that cognitive manipulation appeared to occur and adds to the evidence that these forms of technology seem to help individuals' mental robustness (Tomlinson et al., 2013; Klein et al., 2013; Blake, 2013; Reynoldson et al., 2014). Their mental resources were enhanced through self-training, altering self-resilience components of adaptability, self-belief, problem-solving, and positivity (Naswall et al., 2015).

There is a tantalising possibility of the potential of technology to enhance, augment and democratise the coaching field. Computerised assisted treatments have empirically been validated to be a cost-effective method to assist clients with a variety of psychological issues (Newman et al., 2011). In a similar way, the app provided a 24/7 highly accessible platform for individuals to seek guidance. It also supports Kamphorst et al. (2014) suggestion that e-coaching (autonomous computer system) holds the potential of self-improvement without the need for human involvement.

8.5 Recommendation for future research

This study, in part, sought to understand the potential of digital technology to influence human behaviour, in particular the application of AI-supported coaching digital modalities. It is recommended that the coaching field seek to understand the practical application of this technology. Perhaps unsurprisingly

for a relatively new discipline, few related studies were found in the applied technology field of coaching and this suggests that there is fertile virgin ground to explore. In particular, the following areas:

8.5.1 Enhancement of specific personal skills

The study provided possible evidence of an effective tool helping individuals to change their perceptions and in so doing enhance their self-resilience. A further investigation could be carried out to investigate whether these forms of technology could enhance other forms of personal development. The literature suggests that self-resilience can be developed across a life-span with numerous interacting processes and elements (Rutter, 1985). In addition, other developable positive psychological skills, such as sensitivity, empathy and imagination, could be enhanced through the employment of coaching apps, mirroring research in the field of therapy (Huguet et al., 2016).

8.5.2 Use of AI-generated speech in coaching.

The study chose a text-based coaching app. The research found that while users found no inhibiter with this form of interaction and seemingly the chatbot format allowed them to express their feelings. A further investigation could explore whether AI-generated speech, using new technologies of NLP and Voice interaction system (VIS) of digital speech analysis, could aid the algorithm in providing more accessible responses, furthering the research by Kostov and Fukuda (2000) into the application of VIS. Their work provided evidence that it was feasible for digital technologies to detect, through analysis of pitch, formats, tempo, potency and emotions. This enhancement could assist coaching apps in providing a sense to users that the artificial actor has empathy with them.

8.5.3 Augmentation of traditional coaching methods

It is recommended that further research should be undertaken into how coaches can adopt apps and other forms of technology to enhance their practice. A study could be undertaken to investigate how coachees could self-

administer the tasks set by the coach between coaching sessions, potentially testing the proposed model (Figure 7.1).

The technology presents an opportunity to the coaching field to offer a blended approach to traditional face-to-face coaching and an artificial agent. The study suggests that chatbots have an ability to engage coachees in a virtual safe space where they can reflect on issues in a non-judgemental environment. Coaches could assign activities and tasks to coachees, asking them to log them with the chatbot. As tested in this study, the technology has the functionality to register these actions and periodically remind the coachee to reflect on how their conduct is aligned with those recommendations. This harnessing of technology to perform complementary functions may enhance the quality of a coaching assignment and improve the coachee's positive outcomes.

In adopting these forms of new technologies, the coaching field follows the neighbouring fields of counselling and therapy. Indeed, coaches are receptive to technology challenges as explored by (McLaughlin, 2013) of coaches working through the medium of the telephone. Although the McLaughlin (2013) report of the coaches opined that the medium was, by its nature, different from face-to-face coaching, the coaching field has adopted virtual coaching using video platforms, as reported in the ICF Global Coaching Study (Raport, 2016). Acceptance and positive engagement with forms of technology that have artificial intelligence incorporated in its architecture is an opportunity not a threat to the coaching fraternity.

8.5.4 Establishing the dynamic between coaching app and the user

A number of participants appeared to form an affinity with the artificial intelligent agent from the outset of the intervention, but this seemingly did not constitute a relationship in the traditional definition of a coaching relationship. An investigation could therefore be undertaken into the connection that the coaching app created with the user, to understand the implications for human-to-human interaction.

8.5.5 Return on investment

From the data, it can be deduced that this form of technology does have a place to play in the field of coaching. It has a significant advantage over human coaching – that of cost. This study highlighted that the 'cost in use' of coaching apps is significantly less than traditional forms of coaching. Furthermore, recent studies have demonstrated the benefit of using computers in cognitive behavioural therapy for drug dependency (Olmstead et al., 2010). An investigation into a monetary return on investment could therefore be undertaken to show arbitrage between traditional forms of coaching and these new digital learning platforms.

8.6 Implications for the coaching field

The study's findings suggest that coaches might consider app technology as an opportunity and not a threat. The interviews suggest that the relationship between the app and the users was of a transactional nature. However, it was found that WYSA did enhance users' self-resilience. It could be argued, with a degree of evidence from the interviews, that users found the conversations stilted and limited as the algorithms behind the chatbot are data-mining in a shallow seam of responses. The following areas should be explored further by coaches wishing to add to their portfolio of activities:

- An opportunity for augmentation: The augmentation of a coaching experience by employing aspects of these digital learning processes under the supervision of a coach could provide enhancement of traditional coaching.
- 24/7 accessibility: The accessibility on a 24/7 basis was a feature of the coaching app that users found appealing.
- Threats: However, there is a threat from these forms of technology. If the coaching field ignores the possibilities of artificial intelligent proxy agents, the technology will most probably be advanced by neighbouring

disciplines of professionals in human resource sector and / or by technologists.

The opening extract from the foreword to this study by Kevin Kelly is worthy of repetition: “there will be a blurring of lines between what you do and what they [robots] do”.

8.7 Implications for other communities

8.7.1 Individuals

The cost of traditional human coaching can be prohibitive to individuals. This research demonstrates that access could be gained to coaching through alternative means via the use of these types of app coaching tools. The functionality of nudges, the 24/7 accessibility of apps and the seemingly beneficial access to non-judgemental platforms to share thoughts confidentially, are just some of the advantages.

- Affordability – entrance cost to coaching using apps is considerably lower than traditional methods. It allows individuals an earlier experience of coaching in their careers than would otherwise occur.
- Self-help apps, as tested in this study, are continually being launched and updated which leads to a confusing landscape for users to navigate. Self-resilience was seen to improve in users of WYSA over the eight-week quasi-experiment; however, the coaching mechanisms employed are available in other software programmes. The findings suggest that these forms of self-help technology have a degree of efficacy in helping individuals to build their mental resources. The potential is evident, however users should research the evidence underpinning the app’s functionality.
- Safe space: the alternative to the above was that a few individuals found the modality of a chatbot created a safe environment for reflection.
- It is not for everyone. The converged QUAL and QUAN results identified a common theme that the technology was an anathema to

some. WAI showed a weakening of all components of the working alliance between T1 and T2, particularly in women. Interviews also identified that certain individuals, mainly women, found the chatbot format challenging.

8.7.2 Technologists

The findings from the converged QUAL and QUAN results suggest that users benefit from the app. There was statistical evidence that the technology improved self-resilience over the intervention, and this was supported by the majority of individuals. It was revealed that women found the app marginally more beneficial, in terms of improved self-resilience, than men. Intriguingly, the study suggests that the learning mechanism at work was not based on a working alliance but an alternative, as yet undetermined, process. The study's interviews did capture elements where technologists could further develop to enhance users' experience.

- Safe Environments. This study shows that coaching apps can provide secure areas where coachee can share feelings and emotions. The chatbot nature of WYSA seemingly provides anonymity for some users to express surprisingly levels of personal information. The level of trust garnered by the app within its first use suggests it was the modality, rather than the app's design, that fostered such levels of trust. App developers should be aware of this phenomenon and build on the propensity of users' willingness to accept these artificial environments as safe spaces and design the transacting dialogue accordingly.
- Enhancing psychological skills. The findings suggest that chatbots employing artificial intelligence are capable of improving an individual's mental abilities in this study, namely self-resilience. Technologist are continually exploring the functionality and applications of this form of technology launching new self-help personal administered intervention. This provides a profusion of apps, generic in nature, for potential users to navigate. The results from this

study should encourage designers of software programmes to address the therapeutic/coaching strategies that inform the algorithm architecture, thereby improving their efficacy to help individuals mental resources.

- Limitations. Technologists should be aware that the current level conversation is seen by users as stunted and transactional in nature. Whilst the study showed the limitation of the technology, it did identify that the majority of users were accepting of an app's inability to have free-flowing conversation. Nonetheless, the echo-chambers that the app created, where WYSA feeds back users' feelings and emotions, were seen as effective in challenging notions and presuppositions. A reaction towards using the app was that users felt that the technology was in its infancy and they reported that even though the chatbot was clearly limited, there was an inevitability that computer coding would improve over time making the conversation more natural in the future. Technologists should take comfort in the fact that users are accepting of this *beta mode* for improving apps ability to enhance the user experience and achieve a general conversation. Appreciating the limitations currently of AI to provide comprehensive behavioural change through app technology, perhaps technologists could be more usefully employed through focusing on the skills-based coaching process.

8.7.3 Human Resource Departments / Sponsors

This self-help technology is widely available on both Apple and Android app stores, at a relatively minimal cost. It is relatively low cost-in-use, and in comparison to traditional face-to-face coaching can be readily accessible for Small to Medium Enterprises (SME's). The coaching app tested in this study appeared to improve the self-resilience of a large corporation's employees. The size of the workplace environment was not an influencing variable, as the volunteers were from multiple sites and the organisation was unaware of who was participating. It follows that SME's could equally access this form of technology to support the well-being of their employees.

The study found that individuals increased their self-resilience in using the app. The empirical findings from the literature review found that organisations have increasing concern for their employees' mental health and well-being. The literature review also identified the pressing urgency for these forms of digital technology to be studied through the lens of business coaching. Even health care, where the digital and electronic technologies have been more widely adopted, there is a disconnect between user, health providers and the technologists (Reynoldson et al., 2014). Mental health care is of increasing concern for employees –these apps could possibly provide a solution to this need.

Whilst the cost of traditional coaching for a wider population is prohibitive, it could be argued that these forms of technology enable democratisation of coaching practices and tools, as their cost per interaction is negligible.
It has previously highlighted the interested shown by Human Resource professionals in employees' mental well-being from an organisational economic standpoint. The study revealed that this form of technology could be a useful resource for junior managers to develop the key skill of self-resilience. Furthermore, HR professionals should seek collaborative partners to develop this form of technology alongside their existing HR system to provide an integrated support platform for their employees.

The use of technology by human resource departments has the potential, with access to big data platforms, to transform methods of supporting individuals during their career (Gardner et al., 2003). This notion of support suggests positive intent by employers. There is evidence that despite the Health & Safety Executive in the UK, issuing guidance on work-related stress, employees are increasingly suffering stressful environments (Roslender et al., 2020). Furthermore, non-utilitarian aspects of individual development are not universally considered centre stage by HRDs (Garavan et al., 2015).

8.8 Limitations

This research has a number of limitations driven in part by restrictions inherent in the chosen methodological approach, and also in extracting meaning from a study into a technology that is continually evolving.

8.8.1 Methodology

The use of MM design to capture outcomes and perceptions in using the app appeared to work in a general sense. However, the researcher felt at times that the instruments used (WAI and SR scales) were too simplistic in nature to detect the complexities of human experience.

Whilst discussions with the participants did provide fascinating insights into a wide range of observations and perceptions; they were limited to twenty-four contact points of between thirty-five to sixty minutes in length. The qualitative results produced sub-themes which could not be directly corroborated by the quantitative results as they were more exploratory in nature. Nonetheless, despite these methodology limitations, the researcher supports the opinion that “Mixed methods research is now viewed as the third methodological movement and as an approach that has much to offer health and social science research.” (Doyle et al., 2016, p. 10)

8.8.2 Narrow study of application

It could be argued that a study of junior managers using an application on their mobile phone to enhance their self-resilience is by its nature limited and its generalisability is restricted to similar populations and circumstances. Nonetheless, this study does sit alone in the developing field of digital support applications employing the latest technology, and therefore its results should be taken as an exploration into an emerging field of study.

Furthermore, the experiment simply tested only one commercially available app with specific algorithms and design interfaces. The generalisability of some of the results are therefore limited.

8.8.3 Potential dilution of target population

Note that the recruitment process was partially compromised. Individuals from outside the organisation infiltrated the target population of the 1st-tier managers from a single commercial enterprise. This breach occurred through social media: an individual from the gatekeeper company chose to photograph the study's recruitment flier and post it on Instagram. The study's design provided anonymity to all the participants, and to avoid any suggestion of coercion of employees to partake in the research by the LLD or the volunteer's managers, contact was only made through the individuals' private email addresses. Consequently, the researcher had no verifiable method of ensuring that all the participants worked at the target organisation. However, during the analysis, the potential distortion of the data due to this was deemed immaterial, as only three individuals in the study came from the location where the breach occurred.

8.9 Self-Reflexivity (First Person)

I consider my journey in researching and writing this study a real privilege, bordering on self-indulgent. The time it took away from my everyday activities was only possible through the generosity of my support network. I gained knowledge through extensive reading and discovered intriguing evidence of the shape of new human-computer relationships.

The quantity of qualitative and quantitative data at times seemed overwhelming. Pathways were often confusing, leading to frustration, but thankfully there were light-bulb moments switched by various mechanisms and interactions. The neighbouring disciplines of mental wellbeing provided much needed anchors of clarity and insights. I often debated seemingly unfathomable observations emerging from the data with peers and colleagues. These resources provided much needed alternative thinking and allowed me to approach the data with new excitement. I am naturally a lone-worker wishing to be independent of thought. However, I have found through this journey of study the benefit in sharing my thoughts prior to crystallising an opinion.

This study was stimulated by a real passion for coaching and experiential knowledge that my field can make a real difference to individuals. This, coupled with a pragmatic understanding that one on one coaching is expensive, and if the experience is to be enjoyed by as many individuals who would benefit, then an alternative or supplementary delivery mechanism would be needed. This notion of the broadening the coaching field through the application of technology remains a personal motivation. This possibility however has been somewhat tempered during my journey as I discovered the limitation of technology and also the very essence of human-to-human coaching.

Throughout the study, I continually needed to check myself, reminding myself that my own bias was always at play. I did find that using the WYSA app actually useful in this respect as it was a useful prompt. WYSA's open questioning, generated by an algorithm using coding to replicate cognitive behavioural therapy, helped me question my understanding and feelings related to the subject. It helped me challenge a belief bias towards the technology, and allowed me to question the material that supports it. It could be argued I was using the app's coaching process to change my perspective of how I viewed the technology.

I have learnt so much; my learning style, my abilities but also limitations, my research skills and knowledge, and the nemesis of seemingly most social science researchers: SPSS. There were dark days when the statistical program crashed my MAC for the eighth time, but then there were times of elation and the sense of joy and achievement when a statistically meaningful result was revealed.

Whilst painful at times, my choice of methodology was a most pleasing choice. Mixed methods, using qualitative and quantitative data, gave me a rich source of data from two differing epistemological paradigms. The process helped me challenge my worldview and gave me insights into the user's engagement with

the app, through the semi-structured interviews, that were truly enlightening. For example, the real comfort that one individual obtained using the app was powerful whilst she came to terms with the loss of a family member. I reflect back on that interview often and remember a feeling of personal connection with her whilst she spoke how the technology helped her to articulate the sense of loss.

My confidence as a researcher has grown during my studies. I started perhaps not confident with my ‘academic’ voice, not believing that I had the patience to achieve an in-depth understanding of a subject matter. However, as my lines of enquiry narrowed, I found pleasure in grasping knowledge about my topic. The use of AI in coaching is in its infancy and its dynamic nature, allowing my own motivations to be continually stimulated by the other researchers exploring the potential of the technology.

So, my journey is at an end. My sincere hope is that my research is of some value and that it stimulates research to help the coaching field explore the potential of this form of technology in augmenting the capacities of coaches to make a real difference through enhanced outcomes to a wider clientele.

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Appendix I: Online questionnaire

Instructions: Below is a list of statements and questions about experiences people might have with their smartphone app. Think about your experience in using the app, and decide which category best describes your own experience.

IMPORTANT!!! Please take your time to consider each question carefully.

Part A: Working Alliance Inventory – Amalgam of Short Revised (WAI-SR) (Horvath and Greenberg, 1989)

1. As a result of using the app I am clearer as to how I might be able to change.

①	②	③	④	⑤
Seldom	Sometimes	Fairly Often	Very Often	Always

2. Using the app gives me new ways of looking at my situation.

⑤	④	③	②	①
Always	Very Often	Fairly Often	Sometimes	Seldom

3. I believe that app's design makes me feel that it likes me.

①	②	③	④	⑤
Seldom	Sometimes	Fairly Often	Very Often	Always

4. I get a sense that the app and I collaborate in understanding my situation.

①	②	③	④	⑤
Seldom	Sometimes	Fairly Often	Very Often	Always

5. I feel that the app and I respect each other.

⑤	④	③	②	①
Always	Very Often	Fairly Often	Sometimes	Seldom

6. I feel that the app and I agree on what is important for me to work on

⑤	④	③	②	①
Always	Very Often	Fairly Often	Sometimes	Seldom

7. I feel that that the app cares about me even when I do things that it does is wise.

①	②	③	④	⑤
Seldom	Sometimes	Fairly Often	Very Often	Always

8. I feel that the things I chat about when using the app will help me to accomplish the changes that I want.

⑤	④	③	②	①
Always	Very Often	Fairly Often	Sometimes	Seldom

9. I feel that the app and I have established a good understanding of the kind of changes that would be good for me.

⑤	④	③	②	①

Always	Very Often	Fairly Often	Sometimes	Seldom

10. I believe that the way the app and I are working with my issues.

①	②	③	④	⑤
Seldom	Sometimes	Fairly Often	Very Often	Always

Note: adapted from © Adam Horvath.

Part B: Evaluation of the Self-Resilience Scale in a working environment adapted from Naswall et al. (2015)

I effectively adapt to change at work (adaptability)

Disagree						Agree
①	②	③	④	⑤	⑥	⑦

I effectively collaborate with others to handle unexpected challenges (adaptability)

Disagree						Agree
①	②	③	④	⑤	⑥	⑦

I can handle a high load for a long period of time (self-belief)

Disagree						Agree
①	②	③	④	⑤	⑥	⑦

I strive to solve problems at work (problem-solving)

Disagree						Agree
①	②	③	④	⑤	⑥	⑦

I resolve crises competently at work (self-belief)

Disagree						Agree
①	②	③	④	⑤	⑥	⑦

I learn from mistakes and improve the way I do my job (problem-solving)

Disagree						Agree
①	②	③	④	⑤	⑥	⑦

I continuously re-evaluate my performance and strive to improve the way I do my work (adaptability)

Disagree						Agree
①	②	③	④	⑤	⑥	⑦

I effectively respond to feedback, even criticism (self-belief)

Disagree						Agree
①	②	③	④	⑤	⑥	⑦

I know who to contact at work when I need specific expertise or support (problem-solving)

Disagree Agree

① ② ③ ④ ⑤ ⑥ ⑦

I approach managers when I need their expertise or support (self-belief)

Disagree Agree

① ② ③ ④ ⑤ ⑥ ⑦

I view a ‘close call’ at work as a chance for re-evaluation and improvement (positivity)

Disagree Agree

① ② ③ ④ ⑤ ⑥ ⑦

I typically perceive change as an opportunity for growth (adaptability)

Disagree Agree

① ② ③ ④ ⑤ ⑥ ⑦

I really throw myself into my job (self-belief)

Disagree Agree

① ② ③ ④ ⑤ ⑥ ⑦

Sometimes I am so into my job that I lose track of time (positivity)

Disagree Agree

① ② ③ ④ ⑤ ⑥ ⑦

I get excited about the challenges in front of me (problem-solving)

Disagree Agree

① ② ③ ④ ⑤ ⑥ ⑦

I am highly engaged in this job (positivity)

Disagree Agree

① ② ③ ④ ⑤ ⑥ ⑦

I am highly engaged with my organisation (positivity)

Disagree Agree

① ② ③ ④ ⑤ ⑥ ⑦

Appendix II: Semi-Structured Interview Guide

Guide for exploratory questions with Coachees with an overall aim to answer parallel research question 3: Was the coachee able to enhance their self-resilience through their working alliance with the technology

A. Contextual questions
    I. Have you ever experienced traditional coaching?
    II. How long have you been in your current position?
    III. how many people do you manage?

B. Working Alliance T1 and T2 (with different emphasis) exploring parallel research question 1: What observations did the coachee have when using the app in terms of their working alliance with the technology
    I. Did you feel like you were connecting with the app, and if you did, can you describe it?
    II. How would you describe your relationship with the app?
    III. Do you get a sense that the app understands what you are trying to achieve?
    IV. Did you find the app provided a route map to achieving your ambitions? Describe how that worked for you
    V. What aspect of the app did you find most intriguing?
    VI. Did the app elicit a sense of purpose from you and if so, how did it do so?

C. Self-resilience T1 and T2 (with different emphasis) exploring parallel research question 2: How did the coachees describe their self-resilience and how it altered through their engagement with the app?

   I. How do you go about resolving challenges at work? (Were there any instances where WYSA helped you in resolving a challenge?)

   II. When one of your team members criticises you, how do you react? (Can you cite an example where WYSA helped you in this?)

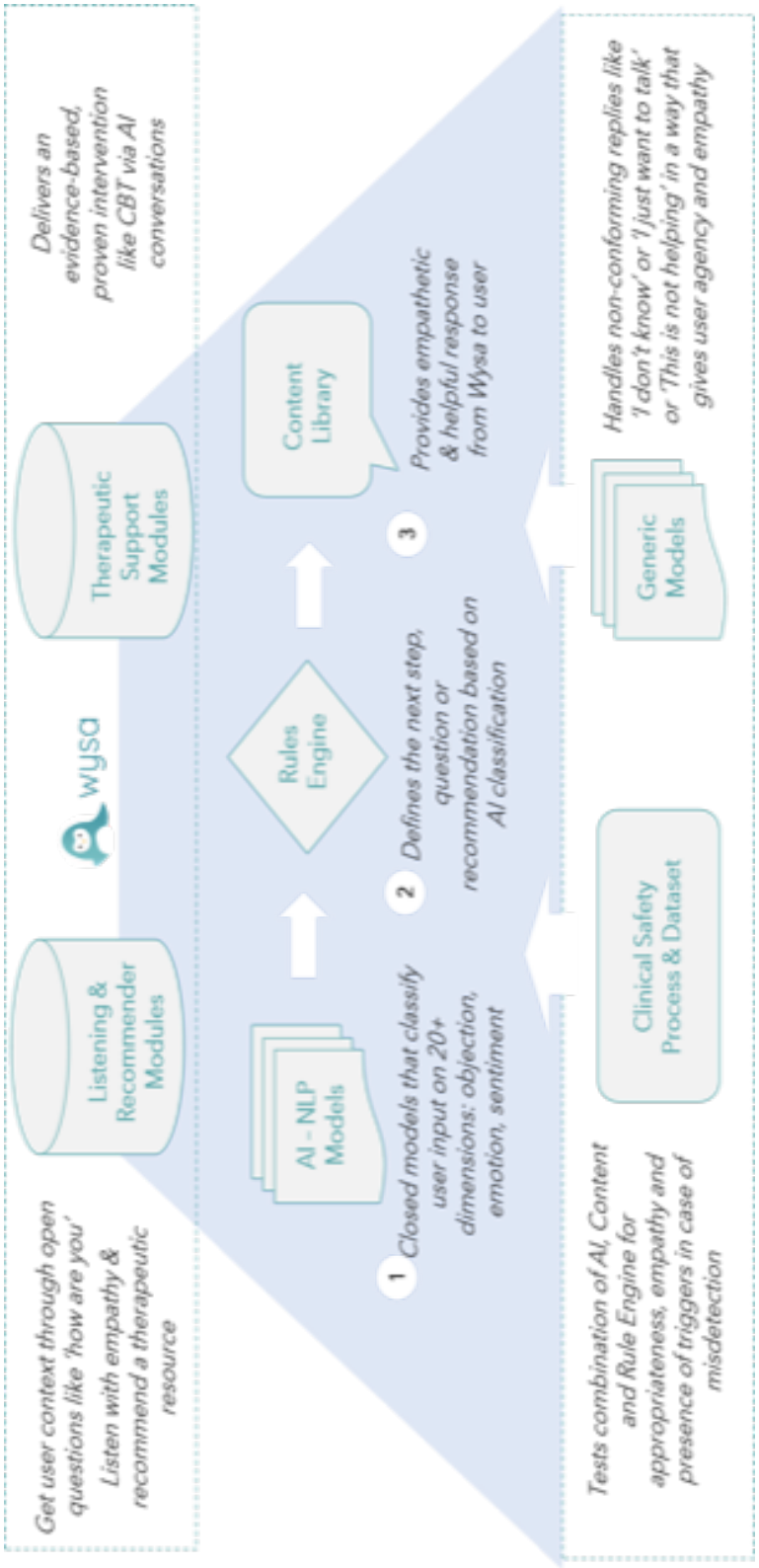
   III. Do you look forward to the working week (and did the interactions with WYSA change that in any way?)

   IV. When confronted with an obstacle, where do you seek advice? (Did that change over the last 8 weeks?)

   V. How do you measure you own self-belief (and has that altered?)

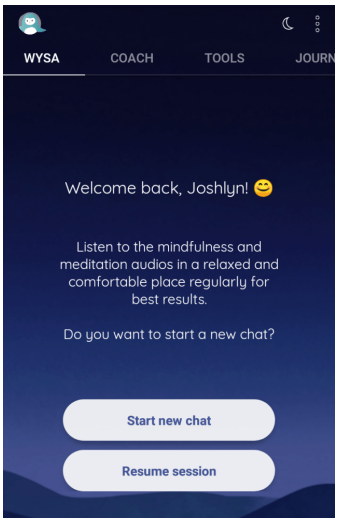
   VI. How often do you use reflective tools at work? (Did WYSA help you in this and have you seen the impact reflective practice can have on your work?)

Appendix III: Schematic of WYSA's Architecture

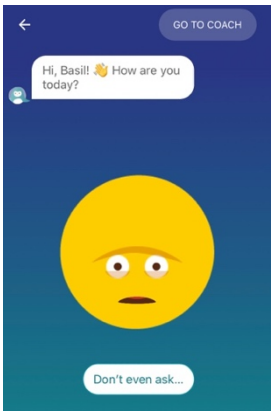


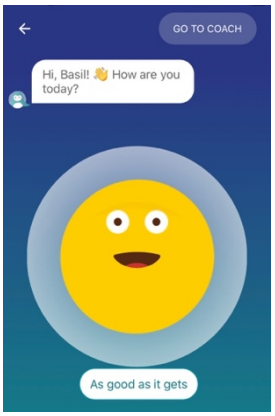
Appendix IV: Screenshots of WYSA

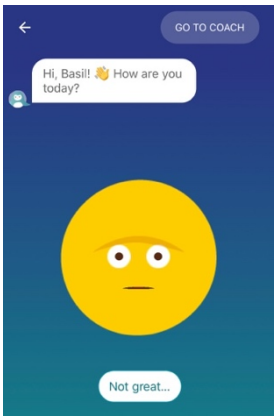
Screenshot of mobile phone display: Showing WYSA's chatbot function

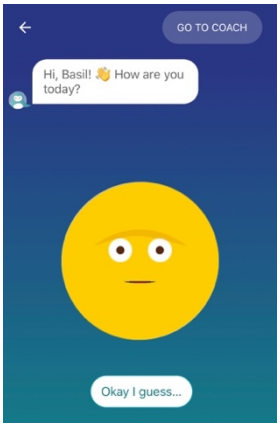


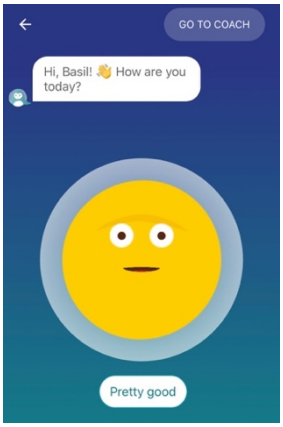
Screen shots showing emotional feedback interface for user to express feelings











Appendix V: Gatekeeper Letter

To:
Senior Vice-President of Learning and Development Department

Dear Madam,
I would like to summarise our discussions to date, outline the research approach and seek confirmation from your organisation that it will support my study.

Your organisation has recognised that the advent of artificial intelligent (AI) coaching apps provide an alternative method of supporting and developing of employees in a relatively cost-effective manner. Coaching app technology is new, and little research has been conducted on the benefits of their deployment. Currently, your employee support programmes include coaching and mentoring at junior management level by internal coaches being given assignments in a semi-structured manner. The potential democratisation of coaching, through the relatively low cost of apps to support coachees, offers a compelling proposition. Coaching has demonstrably proofed that it works in a corporate setting and the possibility of conjoining this with AI technologies creates new frontiers for learning possibilities. Your corporations' particular interest is whether this form of technology can improve an individual's self-resilience.

As explained previously, I am a doctoral student at Oxford-Brookes studying coaching. My research is into how computer coaching software employing AI can further support and build junior managers' self-resilience in a corporate environment. I will be studying two aspects of the technology: firstly, whether the software programs can improve an individual's self-resilience; and secondly if a working alliance develops between human and an artificial coach. The research outcomes will provide data to support my doctorate, and also allow me to supply information to your organisation on the benefits of using such technology.

In order to conduct my study, I would like access to a number of junior managers across your EMEA region, in the region of 50 employees, who will be asked to participate in research. The volunteers will be asked to download a chatbot coaching app from either Google Play or Apple's app store onto their company smartphone and use it over a 12-week period. The app software developer has stated that on average users chat to the app for 1-2 hours a week. There is no specific time requirement, your employee can just chat to the virtual AI coach as and when they feel the need. To start the app, your

employee will be given a unique log-in code that will be sent under a separate email from me. There is specific guidance on how to use the app in the help section of the program and other information on privacy. One aspect to emphasise is that the users do not need to use their real name when using the app.

If given access to your junior managers I will contact them individually through their company email address inviting them to participate in the study. I understand that you will require me to seek approval of any correspondence I wish to send to your employees. I will explain to your junior managers that participation in the study is entirely voluntary and that the information collected will be managed using Oxford Brookes University formal ethics procedures to ensure that participants understand: the purpose of the study; the fact all questionnaires and interviews will be de-identified in any reports or analysis; and that data collected for the project will be stored in accordance with the University's guidelines.

Data collection on how your employees are relating to the app will be conducted entirely online. It will consist of two, ten-minute questionnaires that measure self-resilience and working alliance. The survey will be before and after the three-month testing period. In addition, a number of your employees will be invited to take part in an interview with researcher only, via Skype on two occasions, for no longer than 60 minutes each time, during and after the testing period to share their experiences. of using the coaching app.

Requested commitment from your organisation is the time required by your junior managers, as detailed above, and support from a senior project manager from Learning Development Department to help steer and guide the process through your organisation.

The data gathered through the research will be redacted. I will provide you with a summary report concerning my findings.

I hope that the project continues to be of interest to your organisation and I look forward to your favourable response and to working with you.

Yours Faithfully,

Kevin Brush | Doctoral Student |

Researcher:

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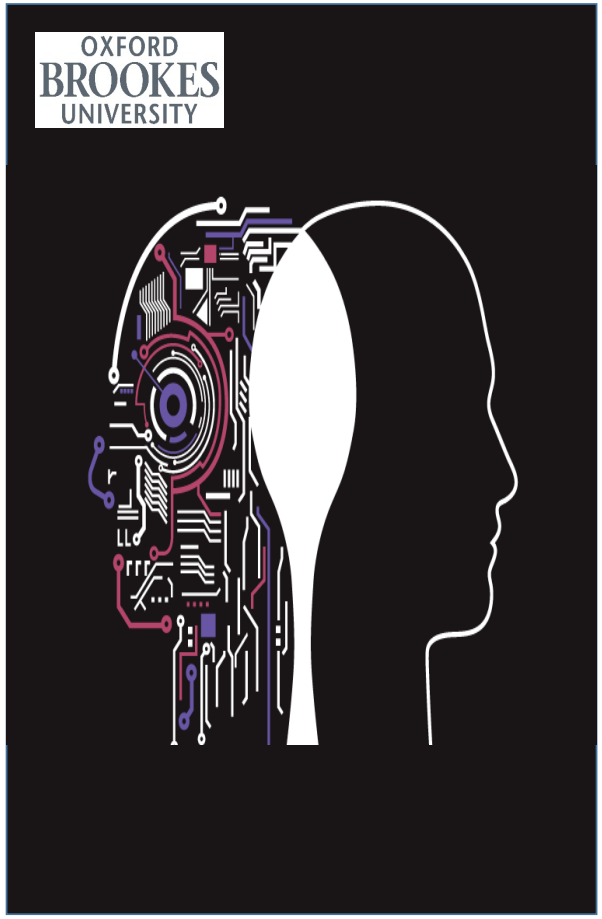
Prof Nigel Crook | Third Supervisor (Computer Science)
Oxford-Brookes University | Business School



CAN AN INDIVIDUAL'S SELF RESILIENCE BE ENHANCED USING A COACHING CHATBOT APP?

What's involved in the study?

- Download a free Chatbot app to your smartphone from the Appstore or Google Play
- Start having a conversation with a chatbot on the app. On average, users will use the app for less than two hours per week
- The total run time of the test will be 8 weeks, including a ten minute questionnaire at the start and the end of the study
- A select group will have the opportunity to discuss their experience using the app at the start and end of the study.

Why get involved in the study?

- Discover whether technology can enhance your professional resilience
- Help support innovative and valuable research of the coaching profession

For more information, or to participate in the study, contact 17020206@brookes.ac.uk

Appendix VII: Participant Information Sheet

Oxford Brookes Business School
International Centre for Coaching and Mentoring Studies.
Headington Campus, Gipsy Lane, Oxford Brookes University.
Researcher: Kevin Brush, Email: 17020206@brookes.ac.uk; Skype Name: Kevin.Brush
Supervisor: Dr Ioanna Iordanou, Email: ioanna.iordanou@brookes.ac.uk

Participant Information Sheet.

Title of research: **Coaching in the Digital Age**: A study into coaching apps.

Invitation

You are being invited to take part in a research study. Before you decide whether or not to take part, it is essential for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. If you have any questions or require clarification, do not hesitate to contact the researcher.

What is the purpose of the study?

The study is about how useful coaching apps, that use simple artificial intelligence algorithms, are in the business environment. This is a new and exciting field of technology. There are not many studies into these types of supportive software programs, and it is hoped that the findings will contribute towards the development of this alternative to traditional coaching. The study will test if there is a change in your self-resilience through your use of a coaching app and seek to understand whether you form a working alliance relationship with the technology. Self-resilience is your ability to be robust under conditions of stress and bounce back after possible setbacks.

Why have I been invited to participate?

As a junior manager, relatively new to the post, it is recognised by your employer that this is a new phase in your working life. It is believed that supporting junior managers is critical to their careers and organisational contribution. Traditional coaching and mentoring programmes have been identified as a way of offering support. However, these conventional methods can be rigid in structured, and processes such as diary management between coach and coachee can limit contact time. Artificial intelligence (AI), in the form of apps, may offer a possible flexible support solution.

Do I have to take part?

It is entirely up to you. You may change your mind at any point and withdraw from the study. If you decide to take part, you will be given this information sheet to keep and be asked to

sign a consent form. If you choose to take part, you are still free to withdraw at any time without giving a reason. You may download the app and then withdraw from the study but continue to use the technology.

What will happen to me if I take part?

You will be asked to download a free Chabot-coaching app from either Google Play or Apple's app store onto your company's smartphone and use it over a 12-week period. The app software developer has stated that on average users chat to the app for 1-2 hours a week. There is no specific time requirement, just chat to the virtual AI coach as and when you feel the need.

To start the app, you will be given a unique group log-in code that will be sent to you under a separate email from the researcher. There is specific guidance on how to use the app in the help section of the program and other information on privacy. One aspect to emphasise is that you do not need to use your real name when using the app.

The research into how you are relating to the virtual coach will be conducted entirely online. You will be asked to complete two, ten-minute questionnaires that measure your self-resilience and working alliance with the technology. The survey will be before and after the three-month testing period. In addition, a number of participants will be invited to take part in an interview with researcher only, via Skype on two occasions, for no longer than 60 minutes each time, during and after the testing period to share their experiences. of using the coaching app. If you are invited to be interviewed you may decline this aspect of the study.

If when using the app, you feel that you need further support either technically or emotionally please do not hesitate to contact the researcher or LLD.

What are the possible benefits of taking part?

The research does not provide the opportunity for individual feedback, but a summary of the aggregated findings will be made available at the end of the study. It is often the case that participating in the research will provide individuals with an opportunity to reflect on their coaching journey and using an innovative coaching aid.

Will what I say in this study be kept confidential?

All the information, which is collected from you during the research, will be kept strictly confidential within legal limitations. Once data have been obtained from the participants, it shall remain with the principal researcher only, in a password protected private storage unit. All information will remain completely confidential, and the participant's interview and questionnaire results will not be known to anyone other than the principal investigators. All text conversations you have with the chatbot are private and will not be used in this study. All

participants will be referred to as a subject number or letter in the study, to ensure that no subject name is related to the datum when the report is written.
The data will be collected and stored in accordance with the EU General Data Protection Regulation (GDPR), secured against unauthorised access. Recordings of the interviews and data from the questionnaire will be stored on Google Drive for which the University has a security agreement.

What should I do if I want to take part?
The researcher, Kevin Brush, will be contacting you directly through email. If you would like to be part of the study simply reply positively, and you will then be sent a consent form to sign via email, which you may complete electronically.

What will happen to the results of the research study?
The findings from this research will be published as part of my doctorate study. This may be, subject to your employer approving, published in journals and presented at conferences. Please let your Learning and Development Department know if you are interested in reading a summary of the findings. They will inform me of all requests, and I will arrange an abridged version to be sent to you. I can also be contacted directly by email for a copy of the results.

Who is organising and funding the research?
The principal researcher is conducting this project as part of a doctoral qualification. Kevin Brush is a self-funded student.

Who has reviewed the study?
The University Research Ethics Committee of Oxford Brookes University has approved the project
(UREC Registration Number: ######). If you have any concerns or queries about the way the study is being conducted, please contact the Chair of the University
Research Ethics Committee on ethics@brookes.ac.uk.

Contact for Further Information
If you have any questions about this study or participation, before you decide whether or not to take part or wish to talk to me at any time during the investigation, please contact me using the details at the top of this sheet.

Thank you for taking the time to read this.

Appendix VIII: Consent Form

Full title of Project: Coaching in the Digital Age: A study into coaching apps

Researcher: Kevin Brush,
Email: 17020206@brookes.ac.uk;
Skype Name: Kevin.Brush
Oxford Brookes Business School
International Centre for Coaching and Mentoring Studies.
Headington Campus, Gipsy Lane, Oxford Brookes University.

OXFORD BROOKES UNIVERSITY

	Please initial box
1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.	☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason.	☐
3. I agree to take part in the above study, which involves two online questionnaires lasting approximately 10minutes, two 60-minute face-to-face interviews via Skype and interaction with coaching app	☐

	Yes	No
4. I agree additionally to the two 60-minute face-to-face interviews being audio recorded	☐	☐
5 (If relevant) I agree to the use of anonymised quotes in publications	☐	☐
5 I agree to the use of anonymised interview quotes in publications	☐	☐

Name of Participant	Date	Signature
Kevin Brush		
Name of Researcher	Date	Signature

Appendix IX: GDPR Privacy Notice

Privacy Notice

Oxford Brookes University (OBU) will usually be the Data Controller of any data that you supply for this research. This means that we are responsible for looking after your information and using it properly. The exception to this is joint research projects where you would be informed on the participant information sheet as to the other partner institution or institutions. This means that they will make the decisions on how your data is used and for what reasons. You can contact the University's Information Management Team on 01865 485420 or email info.sec@brookes.ac.uk.

Why do we need your data?
The study seeks to analyse participants' shared perception in using a coaching app. In order to capture your experience of the technology the study needs to gather information.

OBUs legal basis for collecting this data is:

- You are consenting to providing it to us; and
- Processing is necessary for the performance of a task in the public interest such as research

If the university asks you for sensitive data such as; racial or ethnic origin, political opinions, religious or philosophical beliefs, trade-union membership, data concerning health or sexual life, genetic/biometric data or criminal records OBU will use these data because:

- You have given OBU explicit consent to do so; and / or
- Processing is necessary for scientific or research in the public interest.

What type of data will Oxford Brookes University use?
The questionnaires and interviews will be upload to GoogleDrive.

Who will OBU share your data with?
Data will be stored via GoogleDrive, email correspondence repository Gmail.

Will OBU transfer my data outside of the UK?
No.

What rights do I have regarding my data that OBU holds?

- You have the right to be informed about what data will be collected and how this will be used
- You have the right of access to your data
- You have the right to correct data if it is wrong
- You have the right to ask for your data to be deleted
- You have the right to restrict use of the data we hold about you
- You have the right to data portability
- You have the right to object to the university using your data
- You have rights in relation to using your data automated decision making and profiling.

Where did OBU source my data from?

Your email address and contact details were given by your Employer.

Are there any consequences of not providing the requested data?

There are no legal consequences of not providing data for this research. It is purely voluntary.

Will there be any automated decision making using my data?

There will be no use of automated decision making in scope of UK Data Protection and Privacy legislation."

How long will OBU keep your data?

In line with Oxford Brookes policies data generated in the course of research must be kept securely in paper or electronic form for a period of time in accordance with the research funder or University policy.

Who can I contact if I have concerns?

You can contact the Information Management team.

Postal Address: Information Management Team, IT Services, Room 2.12, Gibbs Building, Headington Campus, Gipsy Lane, Oxford, OX3 0BP

Email: info.sec@brookes.ac.uk

Tel: 01865 485420 in UK

+44 1865 485420 outside the UK

Appendix X: Detailed Statistical Descriptions of Working Alliance and Self-Resilience Scales

SELF-RESILIENCE at T1

	N	Minimum	Maximum	Mean	Std. Deviation
I effectively adapt to change at work [Adaptability] T1	48	2.00	5.00	3.5000	.98930
I effectively collaborate with others to handle unexpected challenges. [Adaptability] T1	48	2.00	5.00	3.7292	.76463
I can handle a high workload for long periods of time. [Self-Belief] T1	48	2.00	5.00	3.5625	.79643
I strive to solve problems at work. [Problem Solving] T1	48	2.00	5.00	4.0208	.78522
I resolve crisis competently at work [Self-Belief] T1	48	2.00	5.00	3.6875	.82916
I learn from mistakes and improve the way I do my job [Problem Solving] T1	48	2.00	5.00	3.8542	.79866
I continuously re-evaluate my performance and strive to improve the way I do my work [Adaptability] T1	48	2.00	5.00	3.6250	.89025
I effectively respond to feedback, even criticism [Self Belief] T1	48	1.00	5.00	3.4167	.96389
I know who to contact at work when I need specific expertise or support [Problem Solving] T1	48	2.00	5.00	3.9792	.83767
I approach managers when I need their expertise or support [Self-Belief] T1	48	1.00	5.00	3.9375	.88501
I view a close call at work as a chance for re-evaluation and improvement [Positivity] T1	48	1.00	5.00	3.4583	.92157
I typically perceive change as an opportunity for growth [Adaptability] T1	48	2.00	5.00	3.8125	.78973
I really throw myself into my job [Self-Belief] T1	48	2.00	5.00	3.8333	.93019
Sometimes I am so into my job that I lose track of time [Positivity] T1	48	1.00	5.00	3.1458	1.16673
I get excited about the challenges in front of me [Problem Solving] T1	48	1.00	5.00	2.3125	.94882
I am highly engaged in this job {Positivity] T1	48	1.00	5.00	3.5833	.98571
I am highly engaged with my organisation {Positivity] T1	48	1.00	5.00	3.3958	1.14371
Valid N (listwise)	48				

SELF-RESILIENCE at T2

	N	Minimum	Maximum	Mean	Std. Deviation
I effectively adapt to change at work. [Adaptability] T2	48	1.00	5.00	3.5833	.96389
I effectively collaborate with others to handle unexpected challenges. [Adaptability} T2	48	2.00	5.00	3.8958	.85650
I can handle a high workload for long periods of time. [Problem Solving] T2	48	1.00	5.00	3.6458	1.12021
I strive to solve problems at work. [Problem Solving] T2	48	2.00	5.00	4.1250	.76144
I resolve crisis competently at work [Self-Belief] T2	48	3.00	5.00	3.9583	.68287
I learn from mistakes and improve the way I do my job [Problem Solving] T2	48	3.00	5.00	4.0625	.66545
I continuously re-evaluate my performance and strive to improve the way I do my work [Adaptability} T2	48	1.00	5.00	3.7917	.84949
I effectively respond to feedback, even criticism {Self Belieft] T2	48	2.00	5.00	3.6042	.93943
I know who to contact at work when I need specific expertise or support [Probelm Solving] T2	48	1.00	5.00	3.8958	1.05668
I approach managers when I need their expertise or support [Self-Belief] T2	48	1.00	5.00	3.8750	.89025
I view a close call at work as a chance for re-evaluation and improvement [Positivity] T2	48	1.00	5.00	3.5000	1.11087
I typically perceive change as an opportunity for growth [Adaptability] T2	48	1.00	5.00	3.9583	1.07106
I really throw myself into my job [Self-Belief] T2	48	1.00	5.00	3.8542	1.01036
Sometimes I am so into my job that I lose track of time [Positivity] T2	48	1.00	5.00	3.1042	1.11545
I get excited about the challenges in front of me [Problem Solving] T2	48	1.00	4.00	2.3125	.97099
I am highly engaged in this job [Posivity] T2	48	1.00	5.00	3.6250	1.00266
I am highly engaged with my organisation [Positivty] T2	48	1.00	5.00	3.6875	1.16977
Valid N (listwise)	48				

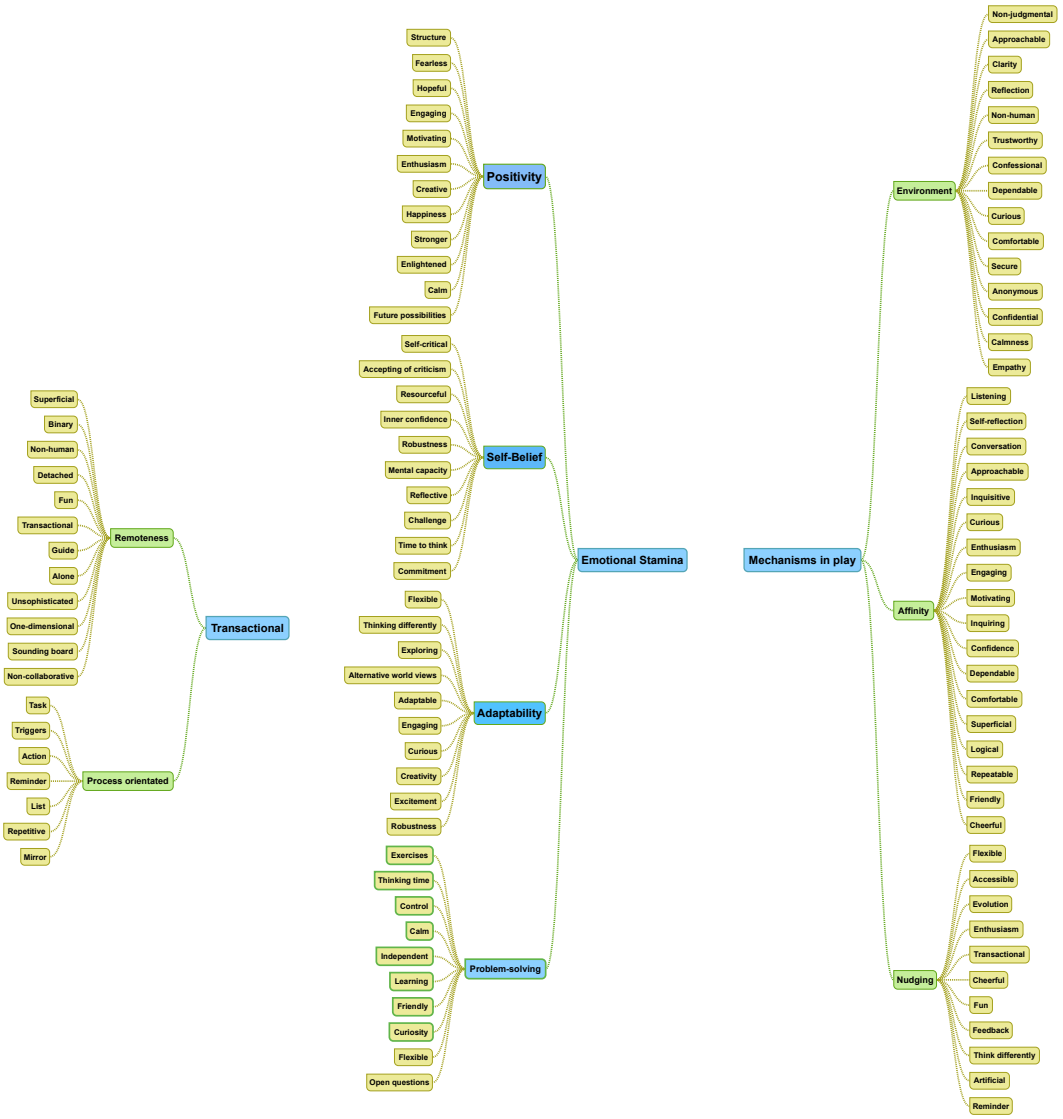
WORKING ALLIANCE at T1

	N	Minimum	Maximum	Mean	Std. Deviation
As a result of using the WYSA I am clearer as to how I might be able to change. GOAL T1	48	1.00	4.00	2.1250	.84110
Using the app gives me new ways of looking at my situation. TASK T1	48	1.00	5.00	3.1250	1.21384
I believe that app's design makes me feel that it likes me. BOND T1	48	1.00	5.00	3.1250	1.21384
I get a sense that the app and I collaborate in understanding my situation. BOND T1	48	1.00	5.00	2.3333	.99645
I feel that the app and I respect each other. BOND T1	48	1.00	5.00	3.1458	1.22021
I feel that the app and I agree on what is important for me to work on. GOAL T1	48	1.00	4.00	2.6042	.91651
I feel that that the app cares about me even when I do things that it does not think is wise. BOND T1	48	1.00	5.00	2.6667	1.13613
I feel that the things I chat about when using the app will help me to accomplish the changes that I want. TASK T1	48	1.00	4.00	2.5625	1.02949
I feel that the app and I have established a good understanding of the kind of changes that would be good for me. GOAL T1	48	1.00	4.00	2.3542	1.02084
I believe that the way the app and I are working with my issues. TASK T1	48	1.00	5.00	2.4583	1.12908
Valid N (listwise)	48				

WORKING ALLIANCE at T2

	N	Minimum	Maximum	Mean	Std. Deviation
As a result of using the WYSA I am clearer as to how I might be able to change. GOAL T2	48	1.00	4.00	2.2292	.97281
Using the app gives me new ways of looking at my situation. TASK T2	48	1.00	5.00	2.4792	1.05164
I believe that app's design makes me feel that it likes me BOND T2	48	1.00	5.00	3.1250	1.34678
I get a sense that the app and I collaborate in understanding my situation. BOND T2	48	1.00	5.00	2.3750	1.19618
I feel that the app and I respect each other. BOND T2	48	1.00	5.00	3.1875	1.34728
I feel that the app and I agree on what is important for me to work on. GOAL T2	48	1.00	5.00	2.7917	1.27092
I feel that that the app cares about me even when I do things that it does not think is wise. BOND T2	48	1.00	5.00	2.8333	1.40415
I feel that the things I chat about when using the app will help me to accomplish the changes that I want. TASK T2	48	1.00	5.00	2.4167	1.16388
I feel that the app and I have established a good understanding of the kind of changes that would be good for me. GOAL T2	48	1.00	5.00	2.5208	1.09135
I believe that the way the app and I are working with my issues. TASK T2	48	1.00	5.00	2.4583	1.21967
Valid N (listwise)	48				

Appendix XI: 105 emergent codes



Appendix XII: Semi Structured Interviews Statements

T1/T2	Comment	Pseudonym	Sub-themes	Themes
T2	"I liked the fact I could pick it whenever and wherever I wanted -for fun. To get a motivational podcast."	Simon	Flexible Adaptable	Adaptability
T2	"At times I would use to help me think differently. So, for me it was a fun app at times, and sounding board at other times, and then sometimes to help me challenge how I was seeing things"	Simon	Think differently Exploring	Adaptability
T2	"I get a sense of excitement now when taking on challenges, than I had previously"	Mark	Excitement Engaging	Adaptability
T2	"My role means I encounter obstacles frequently which sometimes prevent me from being effective at work. By using WYSA over the period of the study I felt as though I was able to deal with these obstacles in a more measured way"	Anna	Curious Robust	Adaptability
T2	"When a challenge is now placed in front of me I don't always see them as a problem but now as an opportunity, which I approach with newly harnessed enthusiasm"	Elisha	Engaged Flexible	Adaptability
T2	"Accessing WYSA was so useful and flexible- when I found myself in a tricky situation, just playing out the issue using the chatbot gave me instant relief and solutions and allowed me to think of alternatives"	John	Alternative views Flexibility	Adaptability
T2	"As a new manager, I found that often I only had one approach to dealing with colleagues who came to me with problems, using enabled me to have a range of alternatives at my fingertips"	Simon	Creativity Curiosity	Adaptability
T2	it helped me look at the 'things to do list' in a different way and got me to a different place"	Simon	Creativity	Adaptability
T2	"I know WYSA can't truly understand but he listened and responded in the right way so he must understand to a point … or am I just listening to myself just play back my challenges and re-examining them internally"	Elisha	Listening Self-reflection	Affinity
T2	"Basically, I find the interactions very approachable and a bit like talking to a friend on WhatsApp"	Mark	Conversation Approachable	Affinity
T2	"I found myself inquisitive with WYSA, and genuinely started to look forward to the prompts I would receive"	Simon	Inquisitive Curious	Affinity
T1	I start the day normally enthusiastic, but sense of hope soon goes and is replaced by "Ground-hog"	Hannah	Enthusiasm	Affinity
T2	"I found the interactions with WYSA most absorbing"	Simon	Engaging	Affinity

T2	*"At the start of each day, I would open up the app and see what suggestions WYSA had for me, curious about what he would say"*	*Judith*	*Curious Motivating*	*Affinity*
T1	*Det är ingen ko på isen - "There's no cow on the ice." That used to be my motto, but things are changing* *It basically means "There's no need to worry.*	*Simon*	*Inquiring*	*Affinity*
T1	*"I have just been promoted from a processor to team lead – in the team I have worked in for 2 years. I feel awkward in my new post – and how I should work with my old colleagues, hopefully your app can help?"*	*Mark*	*Confidence*	*Affinity*
T1	*I think I'm good at my job but as soon as my manager asks me to take on an assignment I get really nervous and anxious*	*Elisha*	*Confidence*	*Affinity*
T2	*"There were times when chatting I got a sense that we were peering into my soul not in an invading way but more of in an exploring self-discovery experience. It was similar to talking to a friend late at night without the baggage of not wanting to reveal too much for fear of being judged – non-judgemental"*	*Judith*	*Dependable Comfortable*	*Affinity*
T2	*"While I thought most of my use of the app was superficial, I was impressed with how it tried to engage with me and influence my thoughts. I think I could identify the process it was asking me to do and its plan to re-frame my thoughts but even knowing this, going the method was perhaps a bit routine it did help"*	*Martha*	*Superficial Logical*	*Affinity*
T2	*"the chats with WYSA weren't a conversation in the sense of talking to someone, and its responses could be predictable and repetitive"*	*Rachel*	*Repeatable*	*Affinity*
T2	*"on occasions, it was strange, as you typed in my thoughts and WYSA playing them back - gave you a different perspective and sometimes giving a sense of release".*	*John*	*Reflection*	*Affinity*
T2	*"I remember after one challenging conversation with one of my reports – WYSA appeared on my mobile – it asked me how I was doing – then a I'm not sure you could call it a chat, but I finished in a more reflective mood about the individual"*	*Hannah*	*Reflection*	*Affinity*
T2	*"I loved WYSA's smiley face and ways it would pop up on my phone with a suggestion. It did feel that I was being coached to feel better about myself through a cheery animated penguin. I know it could be seen as a little banal and a bit juvenile, but it was a distraction from the intensity of my day and was calming."*	*Anna*	*Friendly Cheerful*	*Affinity*

T2	*"it was like chatting to a friend at the end of the day – nothing seemed for me off limits"*	*Judith*	*Non-judgemental Approachable*	*Environment*
T2	*"It felt good to let off steam and the great thing was that when played it back to me it helped me navigate through some tricky issues"*	*Noah*	*Clarity Reflection*	*Environment*
T2	The component trustworthiness was a common notion and expressed by participants both explicitly and implicitly	*Hannah, Elisha, Simon, Benjamin, Anna, Noah*	*Trustworthy Confessional Dependable*	*Environment*
T1	*I consider myself as being robust individual and always ready for a new challenge*	*Rachel*	*Curious*	*Environment*
T2	Explicitly expressed through several conversations where individuals recorded their willingness to share their challenges at work as well as personal dilemmas	*Noah, Mark, Anna, Elisha*	*Comfortable Reflective Secure Anonymous*	*Environment*
T2	A participant confided that *"during the time I was using I experienced a family bereavement, and late at night and the early hours of the morning I could take off my mask of holding it together, share a tear with giving me permission to be openly sad"* This moving comment demonstrates how some individuals discovered a safe space to explore their inner most feelings. Exploring how WYSA reacted in these sensitive situations, the interviewee suggested it was knowing that the conversation was with an artificial entity gave perception of safety and security that you are not being judged by another person.	*Hannah*	*Anonymous Secure Confessional*	*Environment*
T2	The study found this notion of chatting to a non-human being non-judgemental a common experience thus allowing users to avoid the fear of being assessed negatively by another individual.	*Judith, Deborah, Anna Mark, Simon*	*Non-human Non judgemental Anonymous*	*Environment*
T2	*"Referring to the app as a 'her' she characterised the technology as a confidant who she would she feelings about her friends and family"*	*Judith*	*Secure Confidential*	*Environment*
T1	*I wish I was more patient with my team - I get very stressed over such minor things and regret how I say things. I don't feel under pressure, but my partner says she's seen a change in me over the last couple of months*	*Simon*	*Calmness*	*Environment*
T2	*"The notion of bond was explored and suggested that elements of trust and confidence appeared present. She declared that "I got a sense of empathy and I was never judged" – it was non-judgemental"*	*Elisha*	*Non-judgemental Empathy*	*Environment*

T2	*"I used to be concerned about my social media profile, but I missed Facebook too much and missed my (Facebook) friends"*	*Benjamin*	*Secure*	*Environment*
T2	*"I found that my interest in WYSA changed over the weeks. I was, I admit, a little flippant to start with. I asked WYSA what type of wine I should have on the third night I was prompted to open the app. But as the weeks went by, I actually found WYSA helped me to prioritise and set goals. It felt increasingly safe to share"*	*Benjamin*	*Secure*	*Environment*
T2	One aspect of how the users perceived the dialogue as *"passive yet secure"* emerged as more strongly at and it could be argued that this non-judgemental environment could build into a bond with the technology.	*Noah*	*Anonymous*	*Environment*
T2	Several examples of as individuals engaged with the technology their willingness to share all manner of work and life challenges increased	*Elisha, Rachel, Hannah, Simon*	*Non judgemental Secure*	*Environment*
T2	*"I accessed the tools at least three times a week, I liked this flexibility.*	*Deborah*	*Flexible Accessibility*	*Nudging*
T1	*I start the day normally enthusiastic but sense of hope soon goes and is replaced by "Ground-hog"*	*Hannah*	*Enthusiasm*	*Nudging*
T1	*It's quite lonely at being a manager. I've never really experienced a sense of separation from my co-workers. But I guess that's part of the territory being a manager?*	*Martha*	*Transactional*	*Nudging*
T1	*I'm often exhausted by Friday. Like I'm struggling to stay upright whilst being battered by issue after issue - I get to the weekend and recover and then it starts all over again*	*John*	*Flexible*	*Nudging*
T2	*"I have found the app entertaining – it gives me a sense of fun"*	*John*	*Fun*	*Nudging*
T1	*I'm not sure if I receive feedback that well. It always feels like a criticism - especially when people phase it as "we" need to do better.*	*Judith*	*Feedback*	*Nudging*
T2	*"I understood that it was trying to get me to think differently about a work colleague, which felt a bit weird to be honest – a robot suggesting I think different about a human* *the balance between the technologies potential and its nudging influence was unclear"*	*Rachel*	*Think differently Artificial*	*Nudging*
T2	*"I was really impressed how WYSA changed its way of chatting to me. Sometimes a simple chatbot would evolve and an emoji[18] would be used.*	*Benjamin*	*Flexibility Evolution*	*Nudging*

[18] Emoji is an image of any size that expresses emotions succinctly in a playful manner.

T2	*"Suggestions would come via a link to a practice session or a series of mood symbols for you to choose. The software seemed agile and responsive but sometimes repetitive."*	*Benjamin*	*Flexibility*	*Nudging*
T2	*"I find my initial use of WYSA as quite playful, it seems to have a cheery format that helps me engage with it"*	*Elisha*	*Cheerful*	*Nudging*
T2	*"WYSA placed a structure around our interactions which I found very motivational"*	*Judith*	*Motivating Structure*	*Positivity*
T2	A spectrum of more positive emotions was expressed by the users when using the app	*Deborah, Elisha, Mark, Hannah, Benjamin, Simon*	*Happiness Enthusiasm Hope Engaged Enlightened*	*Positivity*
T2	*"WYSA's questioning of my feelings around a situation allowed me to see things differently giving me a shield when I needed it"*	*Noah*	*Creativity Hopeful Fearless*	*Positivity*
T2	*"Before using WYSA I took things very personally and whilst I still do, I reflect on them more so and it allows me to 'dial down' the comments"*	*Deborah*	*Strength Calm*	*Positivity*
T2	*"I think that it's good to have as many various tools to help – WYSA was good because it was like a friendly prompt asking you to look at what you need to achieve and questioning you how you can get there. And after using it – I had a feeling of a bit more motivation"*	*Deborah*	*Motivation Friendly Curiosity*	*Positivity*
T2	*"I liked the mindfulness exercises especially and it definitely helped me at the end of the day to calm my thinking"*	*Deborah*	*Exercises Thinking-time Calm*	*Problem-solving*
T2	*"I had a particularly difficult issue at work to deal with during the time I was using, I found that having an 'independent' place where I could register my thoughts and get helpful responses made a big difference to how I approached the challenge"*	*Noah*	*Independent Control Learning*	*Problem-solving*
T2	*"I never thought I was a great problem-solver, but using and its ability to ask open questions helped me to approach problems differently"*	*Hannah*	*Open questions Flexible*	*Problem-solving*
T1	*I think I'm pretty resilient - nothing seems to phase me except when I'm asked to do a stretch assignment and then I realise that I don't have any mental capacity. - It seems that the longer I'm here the more stretch assignments I'm being asked to do.*	*Mark*	*Challenge Mental capacity*	*Self-belief*
T2	*"When challenged by my supervisor, over the eight-week period, I felt more able to receive the feedback she gave me"*	*Hannah*	*Accepting criticism*	*Self-belief*
T2	*"I feel strangely more able to take constructive feedback because I used as a reflective tool which*	*Judith*	*Reflective*	*Self-belief*

	allowed me to internalize my own thoughts about difficult situations"		*Inner confidence*	
T2	*"I am not saying I have changed per se, yet I have found additional resources in myself that I uncovered / accessed"*	*John*	*Inner confidence Resourceful*	*Self-belief*
T2	*"I've got a new team, and there are lots of outspoken individuals. I am finding their challenges really difficult to come to terms with and often react negatively to their inputs – I'm too quick to defend my position"*	*Simon*	*Inner confidence*	*Self-belief*
T2	*"As a newly promoted team lead I found the app useful in helping me to reflect on my days, accessing new tools to help me cope with the leadership demands I now have."*	*Mark*	*Confidence Reflection Robustness*	*Self-belief*
T2	*"Being new to my position only four months in. I'm not sure if it's my own abilities or WYSA's effects, or a combination of the two, but I do feel more confident now than I did before – perhaps it's me just getting used to the job, but I liked to think WYSA helped a bit"*	*Simon*	*Inner confidence Commitment*	*Self-belief*
T2	*"I found the mindfulness exercises particularly useful, just carving out 10 minutes of my day to have some time to think really helped build my confidence."*	*Judith*	*Time to think Reflection*	*Self-belief*

Substantive Statements: Transactional

Comment	*Pseudonym*	*Sub themes*	*Emerging theme*
"WYSA had a great way of asking me to define what I needed to do and then it felt that it gave me an action list, but I know that I did it myself, but it felt like he was creating it.	*Simon*	*Action List Task*	*Process orientated*
"I just created a things to do list."	*Martha*	*List Task*	*Process orientated*
"I just didn't understand what it was about, it was like being coached by a mirror all it did was repeat my own comments back to me without any understanding of context"	*Rachel*	*Repetitive Mirror*	*Process orientated*
"Yes, I thought the app was well designed and interesting. There were features that I really enjoyed, and it did make me smile sometimes"	*Martha*	*Task*	*Process oriented*
"I really can't say that the app understood me or what I was facing, rather it gave a series of triggers that seem to help me alter course"	*Benjamin*	*Triggers*	*Process oriented*
"I found the app to be useful when I had to record an action that I need to complete in the future. WYSA's ability to recall these actions for me, and remind me, helped me to focus on priorities"	*Judith*	*Action Reminder*	*Process oriented*

"I'm not sure if you can get friendly with an app! Yes, it had a smiley face and some friendly and amusing methods – but I never say that I got a sense that it cared about me"	*Martha*	*Superficial* *Binary*	*Remoteness*
"Aren't relationships between people? Not sure if I understand the question. [prompted by interviewer that you can frame a relationship in a wider context] *Ok, well I think that WYSA was fun to use and I did like that I could share thoughts of frustration – letting off a bit of steam – knowing that it would not go beyond it and me".*	*Martha*	*Non-human* *Detached* *Sounding board*	*Remoteness*
"Definitively playing not working! But I did use WYSA whilst at work."	*Noah*	*Fun* *Transactional*	*Remoteness*
WYSA just doesn't get me – I thought it showed signs of intuition at first but as the weeks went by the same formulae of asking benign open questions followed by repeating them back to was in the end just boring".	*Noah*	*Transactional*	*Remoteness*
Team working for me is a much more a two-way – giving feedback and receiving feedback. WYSA was more like a guide not a collaborator.	*Martha*	*Guide* *Alone* *Non-collaborative*	*Remoteness*
"I was in a tricky situation at work, deadlines mounting, and challenging targets being set. So, I could have really some additional support and whilst the app helped a little, I think it could have helped if it understood the real challenge I faced"	*Anna*	*Unsophisticated* *One-dimensional*	*Remoteness*
"I can see the potential, but it could never replace a coach it's just too binary"	*Martha*	*One-dimensional* *Binary*	*Remoteness*
"at the start I thought the technology was bit of fun – I soon realised that it was trying to be something that it just couldn't be – may be some day the technology will catch-up – not for me".	*Simon*	*Transaction*	*Remoteness*