



Exploring the learning and adaptive processes required to manage disruptive technology from a normative re-educative organisation development lens

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Griffith Business School
Department of Business Strategy and Innovation
Griffith University

Exploring the learning and adaptive processes required to manage disruptive technology
from a normative re-educative organisation development lens

Doctor of Philosophy
By
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Bachelor of Business – Logistics and Supply Chain Management
Bachelor of Business (Hons1)

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Doctor of Philosophy*

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Abstract

In this thesis, the human collaboration required to manage disruptive technologies has been investigated. Radical innovation of this type is described as a revolutionary change in technology (Utterback, 1994; Flor, Cooper, & Oltra, 2017) and a process of creating new products and services that disrupt large organisations (Zheng, Hui, Ting, & Cao, 2017). Within the context of disruptive technologies also exist the concepts of ‘disruptive change’, the process of managing disruption (Bower & Christensen, 1996) and the more complex idea of ‘disruptive innovation’, the process of creating a new business model (Christensen, Raynor, & McDonald, 2015; Ramdorai & Herstatt, 2015). Both, ‘disruptive change’ and ‘disruptive innovation’, are discussed for clarity, however they do not form central component of the research undertaken.

Disruptive technology was used in this research to understand the radical end of innovation, from the Organisation Development (OD) perspective of human collaboration and engagement required to turn concept into reality. The existing research on disruptive technology is influenced by the process and resource based model (Christensen, Raynor, & Verlinden, 2001b; Lund & Puijk, 2012), and the OD aspects of collaboration, cooperation and engagement are under-researched creating a gap in the literature. Normative re-educative OD theory was selected as the most human-focused OD approach to provide a lens to understand the human participation, collaboration, cooperation and engagement required to achieve disruptive technology as a product/service outcome (Argyris, 1995; French, Bell, & Zawacki, 2005; Stewart & Gapp, 2018). Within normative re-educative OD, different theories explain how people learn at both the group and individual level through the application of; action learning, systems thinking, continual improvement, and the Gapp-Fisher Model (GFM) (Argyris, 1995; French et al., 2005; Gapp & Fisher, 2007; Stewart & Gapp, 2018). Normative re-educative OD theories produced a deeper understanding of the collaboration required to manage disruptive technology.

A qualitative interpretive methodology (Denzin & Lincoln, 2011) was used to gain a sense of the disruptive technology process through the primary research question: '*How in OD terms is the role of people understood in managing disruptive technology?*'. This fits directly into hermeneutic phenomenology in which a sense of the phenomenon is achieved by finding the essence in the process under investigation (van Manen, 2016). As there is no specific method to conduct hermeneutic phenomenology (Gadamer, Weinsheimer, & Marshall, 2004), a case study was used as a framework to

bound the study. For this qualitative investigation, semi-structured interviews and observations were used for data collection (Stake, 2005; Denzin & Lincoln, 2011; Yin, 2017). On completion of the data collection process, the hermeneutic cycle allowed the researcher to be immersed into participants' reality from which deeper understanding and meaning was gained (Sloan & Bowe, 2014).

Normative re-educative OD demonstrated the importance of diversity and collaboration required to manage disruptive technology from concept to outcome. The findings highlighted the importance of human dynamics in the disruptive technology process. A positive purpose brings together a team of passionate people. Diversity explains how participants gain richer understanding of the problem. Building relationships creates an environment of openness, trust and collaboration where these ideas can be exchanged to create dissonance (Dick, 2019). Structure and consideration highlighted how understanding the strengths and weaknesses of the people promotes growth by focusing on their strengths. A long term vision creates an environment of obsolescence, which creates continuous growth and development. Perseverance helps endure challenging times and learning from mistakes that increases creativity and innovation. Finally, an environment of participative decision making channels the efforts of every person in the team towards the attainment of the business.

Businesses developing disruptive technologies experience many challenges requiring human interventions and group based critical thinking as well as technological intervention. Diversity and complex tensions create dissonance, which Argyris (1995) sees as a source for creating new ideas essential in the innovation process. Normative re-educative OD demonstrated: (i) how learning, which generates values and beliefs within the organisation context, is central to the success of disruptive technology. (ii) Interpersonal and intergroup collaboration creates learning environments to manage disruptive technology. (iii) This research has identified human values, beliefs and habits and the learning environment which nurtured the attainment within small successful disruptive technology-based businesses. These findings add a deeper understanding of the role of normative re-educative OD in developing and managing effective disruptive technology businesses, therefore, providing new insights to understand the disruptive technology process. Innovators can use these strategies to manage the process of creating disruptive technology by focusing on developing the environment required for the continual learning and development of technologies.

Keywords: disruptive technology, normative re-educative, organisation development.

Statement of Originality

*This work has not previously been submitted for a degree or diploma in any university.
To the best of my knowledge and belief, the thesis contains no material previously
published or written by another person except where due reference is made in the thesis
itself.*

Jose Luis Medina Noël

11 November 2019

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Publications and Conference Proceeding

In June 2018, a poster representing this thesis with the title '*You are not managing your people right*', which achieved a 2nd place, was presented at the Griffith Business School poster competition. Four months later, in October 2018, the researcher gave an oral presentation representing this thesis at the Griffith Business School 3 Minute Thesis competition.

A referred paper and oral presentation were presented in September 2018 at the 2018 British Academy of Management Conference (Bristol, England), with the name '*The learning and adaptive processes required to manage disruptive innovation from a normative re-educative organisation development perspective*'.

Glossary

Collaboration:	Process where two or more stakeholders work together to complete a task or achieve a goal (Martinez-Moyano, 2006).
Cooperation:	Process where two or more stakeholders work together for common, mutual, or some underlying benefit (Lindenfors, 2017).
Continual learning:	Through knowledge and collaboration, people and groups of people can share ideas which leads to multiple cycles of learning through awareness (Gapp & Fisher, 2007).
Disruptive technology:	Process where a market is disrupted through the introduction of products/services with a different value proposition which are cheaper, simpler, smaller, and more convenient to use (Hwang & Christensen, 2008)
GFM:	Gapp-Fisher (2007) Model, based on normative re-educative OD theory. Used as a lens in this thesis to make sense of continual learning, collaboration, cooperation and participation inside disruptive technology businesses.
PDSA:	Plan-Do-Study-Act cycle of continual improvement (Deming, 1982b)
Entrant business:	Term used to describe businesses introducing a disruptive technology (Christensen & Bower, 1996)
Established firm:	Term used to describe large organisations, who are often disrupted by the introduction of disruptive technology (Klenner, Hüsig, & Dowling, 2013)
Business unit spin-off:	Disruptive technology strategy that consists of creating an independent business unit (Sheep, Fairhurst, & Khazanchi, 2017).

Chapter 1: Introduction

1.1. Research Background

This thesis investigates the required human dynamics Australian disruptive technology businesses need to succeed. Disruptive technology contributes significantly to business and management (Gobble, 2016; Holweg, 2018), yet there is a lack of understanding of how to manage the soft systems within this process. Normative re-educative Organisation Development (OD) provides understanding of the human values, beliefs and learning environment required to nurture the attainment within small to medium disruptive technology businesses. The Gapp-Fisher Model (GFM), an application of normative re-educative OD, demonstrates the relevance of interpersonal and intergroup collaboration in creating learning environments for the development of disruptive technology and is used as a lens to understand the human dynamics within disruptive technology businesses. Through the GFM lens, this research seeks understanding of ‘how’ and ‘why’ adopting normative re-educative OD practices benefit disruptive technology businesses. By understanding how to manage the human dynamics in the process of managing disruptive technology through an explorative research methodology, a new dimension is created which generates new knowledge to manage and improve the process of creating disruptive technology.

1.2. Purpose of the Study

The purpose of this thesis is to understand how disruptive technology businesses manage the process of transition from idea to a reality. Disruptive technology presents a linear focus on managing disruptive technology (Gobble, 2016), which has been shaped to create strategies focused on the processes and resources of the company, i.e. business unit spin-offs and acquisition strategies (Assink, 2006; Klenner et al., 2013), which lack understanding of the human dynamics which nurture learning and innovation (Dick, 2019). The linear focus does not consider the human element required to manage the transition from idea to reality. There is a strong focus in understanding how to manage disruptive technology inside large organisations through a reactive process, where this research aims to create strategies to manage this process by understanding the human factors involved in the development of disruptive technology.

Normative re-educative OD helps to explore the human values, beliefs and learning environment that nurtures the development of disruptive technology (Stewart & Gapp, 2018; Dick, 2019). Through systems thinking, a better understanding of the importance of collaboration can be gained (Senge, 1994). Action learning explains how to create dissonance at a personal and group level, which raises awareness and allows re-education (Argyris, 1995). The GFM (Gapp & Fisher, 2007) provides an understanding of how groups of people engaged in cycles of continual learning through the Plan-Do-Study-Act (PDSA) cycle (Deming, 1982b) at a micro level and the Discover-Invent-Product-Generalise (Argyris & Schön, 1978). Normative re-educative OD and the previously discussed strategies are then used to understand the importance of collaboration, cooperation and participation in the management of disruptive technology.

Multiple small to medium businesses in Australia that have demonstrated an ability to develop disruptive technology were chosen to participate in this study (Bower & Christensen, 1996; Li, Porter, & Suominen, 2018). Following qualitative research, hermeneutic phenomenology was used to investigate how participants manage the collaboration inside disruptive technology businesses, and case study was used to create the boundaries for the research (Husserl, 1970; Stake, 1995; Yin, 2003, 2017; Cypress, 2018). Understanding the role of people inside disruptive technology businesses addressed a gap in understanding the soft systems to manage disruptive technology and the applications of normative re-educative OD strategies to manage this process (Christensen & Armstrong, 1998; Zheng et al., 2017).

1.2.1. Disruptive technology.

The literature review, Chapter 2, chronologically presents the radical end of innovation by discussing radical innovation, disruptive technology, and disruptive innovation. The discussion on innovation shifted in the early 1990s from radical innovation, which explained how a new technology disrupts the market (Bower & Christensen, 1996), to disruptive technology which focuses on how new entrants disrupt large organisations through the introduction of new products and services (Florida & Kenney, 1990; Styhre, 2002). Disruptive innovation explains the process of creating a new business unit, which is often hard to understand, especially in new businesses. As disruptive technology and disruptive innovation is interchangeably used in the literature,

and the fact that it is harder to understand the business model (Paap & Katz, 2004; Li et al., 2018; Schuelke-Leech, 2018), this research focuses on disruptive technology.

Disruptive technology is the process where a market is disrupted by the introduction of a different value proposition (Hwang & Christensen, 2008), which creates a new market to satisfy the least-demanding end of the market (Klenner et al., 2013; Dedeayir, Nokelainen, & Mäkinen, 2014). These technologies steadily improve in performance, attracting the most-demanding end of customers (Clark & Koonce, 1997; Adner, 2002; Gilbert, 2003; Henderson, 2006). Disruption occurs when customers switch from using sustaining technology to using disruptive technology (Adner, 2006; Montoya & Kita, 2017).

Business unit spin-offs and acquisition strategies stipulate that by separating a business unit from the values of the large organisation, the new business unit can create new values to manage technological development. These strategies present a strong focus on the processes and resources (Christensen, 2001a; Christensen, Wang, & Van Bever, 2013) which prioritise economic and process requirements to manage disruptive technology (Christensen et al., 2001b). Within this context, there is a low understanding of the collaboration needed to manage disruptive technology (Christensen, 2001b; Ramdorai & Herstatt, 2015; Bulkley & McCotter, 2017).

1.2.2. Normative re-educative OD.

Normative re-educative OD provides understanding of how small to medium Australian disruptive technology businesses manage the human dynamics in the process of creating disruptive technology. Normative re-educative OD investigates the values and beliefs of people through motivation, learning and positive affective factors (French et al., 2005; Gapp, 2006) where attitudes, values and skills can be educated to create an environment of continual improvement and learning. Within the normative re-educative OD strategy, systems thinking explains the concept of learning organisations, which are groups of people who work collaboratively towards the attainment of a goal. The GFM, inside normative re-educative OD, uses Argyris (1976, 1995) Discover-Invent-Produce-Generalise model, Deming's (1982b) PDSA cycle and action learning (Dick, 2009, 2019) to explain how ideas become a reality within an environment of openness, learning and collaboration (Nowak & Ladyshevsky, 2000; Gapp & Fisher, 2007; Stewart & Gapp, 2018).

1.2.2.1. Systems thinking.

Within normative re-educative OD, systems thinking explains how learning occurs at a group level through a holistic understanding of the system and a synthesis of how all of its parts are interconnected (Flood & Romm, 2018; Örtenblad, 2018). Systems thinking shifts away from narrowing the focus to one particular department, and instead, expands it to many parts that have impact upon one another (Senge, 1990; Jambekar, 2000) which creates an understanding of the relationships and the processes which makes up the organisation's context. Systems thinking helps identify the collaboration inside disruptive technology businesses by understanding the values needed to promote learning at a group level.

1.2.2.2. Action learning.

Transformation at an individual and group level starts by sharing knowledge and changing the values, attitudes and beliefs of people through open communication and trust (Argyris, Putnam, & Smith, 1985; Bartels & Wittmayer, 2018; Henriques & O'Neill, 2018), which creates an environment of continual improvement, collaboration and innovation (Stewart & Gapp, 2017). Action learning explains how people, through collaboration and trust, can become aware of the difference between their thoughts and their actions (Argyris et al., 1985; Argyris, 1995; Hinojosa, Gardner, Walker, Cogliser, & Gullifor, 2017; Miller, 2018), which is referred as dissonance. Through dissonance, people and groups of people can create awareness of the gap between their thoughts and their actions, and improve towards achieving the end goal. Double-loop learning takes place when errors are recognised and corrected by questioning and challenging the underlying assumptions which leads to education of goals, frames, assumption, values and standards for performance (Argyris, 2002; Peek & Stam, 2019). Action learning provides the knowledge to understand the processes inside disruptive technology which create dissonance for change to occur.

1.2.2.3. GFM.

Continual improvement creates learning and innovation through iterative cycles of improvement (Deming, 1982a). The PDSA cycle (Deming, 1982b) provides an understanding of continual improvement at a micro level in the GFM, where ideas are tested to create cycles of improvement. The Discover-Invent-Produce-Generalise model (Argyris, 1976, 1995) provides an understanding of how the process of learning in

people and groups of people through a continual learning process which is represented at a macro level in the GFM.

The GFM synthesises normative re-educative OD to understand the ongoing cycles of improvement where people and groups of people learn at a personal and group level through a five step process. The GFM learning process starts by monitoring and evaluating external and internal environment (Namada, 2017; Reddick, Chatfield, & Ojo, 2017), synthesising knowledge and understanding (Gapp & Fisher, 2007), transforming ideas into actions, developing strategies and tactics, and, finally, internalising and operationalising the process (Gapp, Fisher, & Stitt, 2005; Holten, Bøllingtoft, & Wilms, 2015). The GFM provides the lens to understand the continual learning process at a personal and group level in managing disruptive technology. Creating disruptive technologies is a process where a technology is significantly more valuable than established technologies (Christensen & Overdorf, 2000). The GFM provides a conceptual framework for the complements of learning and action required to achieve innovation as seen in disruptive technology. Through this model, the value of soft systems in the development of disruptive technologies can be understood.

1.3. Research Questions

A lack of understanding in relation to the soft systems required to manage and achieve disruptive technology provided a clear gap in the literature which would benefit from further research. Normative re-educative OD provides the means to understand the collaboration required to manage the process of transforming an idea into reality within disruptive technology businesses. This research argues that the role of people is critical in developing disruptive technology, which leads to the following primary research question which aims to create deeper understanding of the collaboration required to manage disruptive technology through a normative re-educative OD.

‘How in OD terms is the role of people understood in managing disruptive technology?’

The research question explores the role of people related to the process of creating disruptive technology. Normative re-educative OD explains how values and beliefs of people can be educated through motivation, learning and positive affective

factors (French et al., 2005; Gapp, 2006). Systems thinking helps understand the values needed to promote learning at a group level. Action learning explains how to raise awareness through dissonance. The GFM provides a lens to understand the learning process inside disruptive technology businesses.

1.4. Methodology

In this research, interpretivism is used to make sense of how participants understand the collaboration within disruptive technology businesses. The qualitative approach, within interpretivism, creates understanding of the research questions through an exploratory approach which allows underpinning deeper understanding of social phenomena (Blaikie, 2007). Within the qualitative approach, hermeneutic phenomenology provides a methodology to make sense of the essence of the transformation process from idea to reality (van Manen, 2016), while case study creates the boundaries for the research, where “disruptive technology” is the unit of analysis (Stake, 2013; Yin, 2017).

A total of 19 CEOs and Founders of Australian small to medium disruptive technology businesses participated in semi-structured interviews and observations, which allowed gaining rich and meaningful data to make sense of the process of managing disruptive technology (Tracy & Hinrichs, 2017). Founders and CEOs were selected and added to the pool of data until thematical saturation was reached (Fusch & Ness, 2015). Observations were noted in the researcher’s journal before, during and after the interviews to collect thoughts, emotions and other relevant information to make sense of the participants’ reality, which provided richness to the data while increasing rigor, which was gained through confirmability, transferability and dependability.

1.5. Significance of the Study

Disruptive technology has a strong process and resource focus with a low understanding of the collaboration required to manage this process (Zheng et al., 2017). The lack of understanding of the human development can be challenged as the understanding of innovation occurs within the context of the people’s needs and behaviours (Gapp, 2006). Normative re-educative OD provides understanding of the collaboration required to manage disruptive technology by focusing on the soft systems including human dynamics, relationships, collaboration and trust required for the attainment within small to medium disruptive technology businesses.

The findings highlighted the importance of collaboration within the process of managing disruptive technology. A total of eight themes were discovered which explained how finding a problem and bringing passionate people to help through diversity, openness, trust and collaboration within an environment that balances structure and consideration creates disruptive technology. Nurturing people that want to continually innovate is also highlighted along with perseverance and the relevance of learning from errors. Finally, having a common voice within the organisation is discussed to explain how participants make sense of their reality, which leads to the understanding of how to manage disruptive technology businesses.

The theoretical implications of this research include understanding the soft systems required to manage disruptive technology, to broaden the understanding within disruptive technology strategies through normative re-educative OD, and increasing the application of normative re-educative OD strategies to help the development of disruptive technology. The practical implications include the opportunity to create a better understanding of the process of managing disruptive technology to provide innovators with new tools.

1.6. Outline of this Thesis

This thesis has 6 chapters, this chapter, Chapter 1, introduces the research and provides a general overview of the study including the research background and the purpose of the study. Disruptive technology and normative re-educative OD are then explained and justified, followed by the research questions, a summary of the methodology, and the significance of the study.

Chapter 2 provides a review of the literature, where disruptive technology is chronologically presented in terms of radical innovation, disruptive technology, disruptive innovation and disruptive change. The different strategies to manage disruptive technology presented in the literature are discussed to evidence the strong resources and process focus within disruptive technology. From this point, a gap is found where the collaboration within disruptive technology businesses need to be understood. The literature on normative re-educative OD is then discussed through systems thinking, action science, continual improvement and the GFM. Finally, the rationale is discussed, and the research question presented.

Chapter 3 justifies the methodology, which follow interpretivism paradigm through an abductive approach. To explore the role of people inside disruptive

technology businesses, a qualitative approach was selected as it helps gain richer understanding of the phenomenon under investigation. Within the qualitative approach, hermeneutic phenomenology methodology was chosen to make sense of the participants reality, and case study was used to create the boundaries for the research, which analyses disruptive technology. Triangulation of methods and participants is then discussed. From this point, semi-structured interviews and observations are justified as methods for data collection. Finally, the way in which the researcher gained ethical clearance, following Griffith University procedures is discussed.

Chapter 4 explains the data collection, data analysis and findings following the hermeneutic phenomenology methodology and the case study framework. Data collection discusses how the researcher prepared for the data collection process, as well as the participants and the data collection process. Data analysis explains the process of coding the interviews and observations and how sub-themes and themes were identified. The findings are then presented, where eight themes were discovered including: holistic collective, diverse wisdom, achievement through collaboration, structure and consideration, stress adverse, innovative mindset, learning from mistakes, and engaged synthesis. This chapter ends with a discussion of how rigor was increased through richness in the data collection and analysis process.

Chapter 5 presents the discussion between the findings, disruptive technology and normative re-educative OD strategies. This starts by discussing how the findings link to normative re-educative OD, and the theories within, including systems thinking, continual improvement, action learning and the GFM. This is followed by a discussion of how the findings improve disruptive technology. The research questions are then answered followed by a discussion of how the findings improve thinking, the learning outcomes and how the findings can be applied. A discussion is then presented in how the findings add value to the OD side of disruptive technology, and finally, future directions are discussed.

Chapter 6 states the results and implications of the research and summarises the research by presenting the conclusions on disruptive technology and normative re-educative OD. Implications for theory, the methodological implications, and the practical implications are then discussed. Finally, the limitations and future research is discussed.

Chapter 2: Literature Review

In this chapter, a review of the literature on innovation and organisation development is presented. The structure of this chapter is a chronological discussion of key aspects of innovation. Radical innovation explains the process of revolution of the current structure (Schumpeter, 1942). Disruptive technology is the process of creating new products and services that disrupt large organisations (Florida & Kenney, 1990; Styhre, 2002). Disruptive innovation is the process of creating a new business model. Disruptive change is the process of managing disruption (Christensen & Overdorf, 2000). The relationship between disruptive innovation and disruptive technology is then discussed to justify the use of disruptive technology. A gap in the literature was found in the engagement between disruptive technology and the humanistic application of Organisation Development (OD). A description of different OD strategies is then presented to justify the use of the normative re-educative OD to understand the collaboration required to manage disruptive technology. The normative re-educative OD strategy is further divided into action science, systems thinking, and continual improvement which are then linked to the Gapp-Fisher Model (GFM) which provides a lens to understand how groups of people learn. The rationale behind the study in relation to identified gap is then discussed followed by the main and supporting research questions.

2.1. Innovation

Innovation is the process of creating a new idea, product or service (Rogers & Shoemaker, 1971; Peschl & Fundneider, 2016). Businesses need to understand the importance of innovation to stay competitive. “Perhaps the greatest challenge business leaders’ face today is how to stay competitive amid constant turbulence and disruption” (Kotter, 2012, p. 1). Developing new ideas creates competitive advantage, i.e., faster computers and improved features in motor vehicles (Stagni, Fosfuri, & Santalo, 2017; Sternlund, Strandrot, Rizzi, Lie, & Tingvall, 2017). These new products improve the position of businesses within the market (Gobble, 2016).

Customers, organisations, academics and employees perceive innovation differently. Customers see new products as the improvement of quality and service (Ramadani & Gerguri, 2011). For organisations, improving products is an opportunity for growth and development. Academics explain technological development as a

practice, idea or material artefact perceived to be new by the relevant unit of adoption (Dewar & Dutton, 1986). Employees think of new developments as an opening to learn and have more exciting jobs. Innovation, therefore, is the process of creating new products and services that increase the prosperity of customers, employees and the business (Usman & Liu, 2015).

The radical end of innovation is chronologically presented in this chapter by discussing radical innovation, disruptive technology and disruptive innovation. Change management is then discussed to introduce the term disruptive change which explains the strategies required to deal with the disruption created by the introduction of a disruptive technology. Following the chronological explanation of disruptive technology, the difference between disruptive technology and disruptive innovation is addressed to favour the use of disruptive technology in this research. Evidence is then presented to explain the gap found in the disruptive technology literature, where a linear view is discussed, and a gap in terms of understanding the soft systems in the management and development of disruptive technologies found. From this point, normative re-educative OD is used to investigate the identified gap.

2.1.1. Radical innovation.

Innovation is on a spectrum transitioning from incremental to radical innovation (Utterback & Suárez, 1993). Incremental innovations are minor or simple adjustments of products and services that improve or grow information and understanding (Dewar & Dutton, 1986; Utterback, 1994). Better fuel economy and improved cabins in cars are examples of incremental innovations (Norman & Verganti, 2014). Small improvements allow the continued development of products through minor product advancements (Chuang, 2016).

Radical innovations represent revolutionary changes in technology (Dewar & Dutton, 1986, p. 1422). Radical comes from the Latin word *radix*, which means “roots” (Robson & Waite, 2017, p. 41). Innovation from the root focuses on the creation of products and ideas with a clear departure from existing practice (Chua, 1986b, 1986a; McDermott & O'Connor, 2002; Flor et al., 2017). The introduction of mobile phones is an example of radical innovation by moving from a voice communication product to a technological interface with multiple novel applications (O'Connor & Euchner, 2017).

The shift from radical to incremental innovation can be appreciated by understanding the three periods of product development: the period of flexibility, the

intermediate years and the full maturity of the product (Figure 1) (Abernathy & Utterback, 1978). The period of flexibility occurs when the product enters the market, intermediate years, when the product changes to comply with the customer requirements, and full maturity, when firms scale production costs.

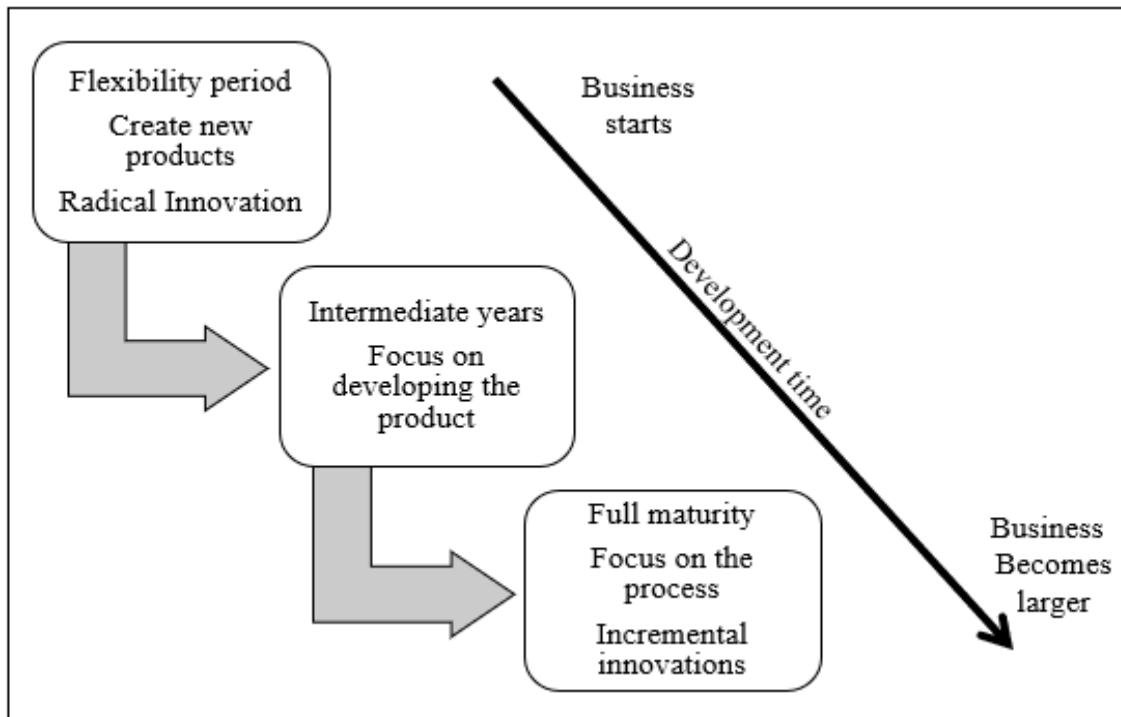


Figure 1. Stages in the development of a product (Abernathy & Utterback, 1978)

The characteristics of each of the three stages of the product development process link to different types of innovation. Radical innovation commonly occurs within small technology based businesses developing during the period of flexibility (Burdon, Kang, & Mooney, 2017). Not all businesses creating radical innovation succeed and only a few survive in the market (Utterback, 1994; Wessel & Christensen, 2012). During the second stage, the intermediate years, the level of radicalness of innovation starts to fade and transitions towards incremental innovation. Full maturity follows when the firm becomes more substantial and creates economies of scale by reducing manufacturing costs through engineering and financial adjustments (Abbas, 2017). The shift from radical to incremental innovation is completed during full maturity (Abernathy & Utterback, 1978). Robots replace humans in some parts of the process, products use cheaper parts, and some are adjusted to reduce costs. It is at this stage that the longevity of the firm is at risk as entrant businesses developing new

radical innovations have the potential to displace the ‘old’ products of established firms (King & Tucci, 2002; Hill & Rothaermel, 2003; Daim, Madjdi, & Hüsig, 2011; Christensen et al., 2015).

The transition of large organisations from radical to incremental innovation creates the opportunity for new entrants to disrupt the market. “Innovation within an established industry is often limited to incremental improvements of both products and processes” (Abernathy & Utterback, 1978, p. 5). Established firms rarely create radical innovations and focus on reducing costs to make profits (Christensen & Van Bever, 2014). The focus on efficiency by large organisations creates an opportunity for entrant businesses to develop radical innovations and disrupt established firms (Denning, 2016). New businesses disrupt established firms as their product becomes obsolete compared to the new radical innovation created by the new product generations. Radical innovations represent revolutionary changes in technology (Dewar & Dutton, 1986). When these technologies have the potential to disrupt the market, they are considered as disruptive technologies, which switches the focus from the revolutionary change in technology to the disruption created. As evidenced in radical innovation, the focus is on the efficiency of the process, and the stages of the product development, with little understanding of the importance of people in this process.

2.1.2. Disruptive technology.

Radical innovation and disruptive technology explain the development of new products through two different focuses. Radical innovation focuses on how revolutionary is the new product, whereas disruptive technology focuses on the disruption created by the new technology (Norman & Verganti, 2014). The discussion on radical innovation shifted in the early 1990s to explain how a new technology disrupts the market (Bower & Christensen, 1996). This shift from radical innovation to disruptive technology explains how new entrants disrupt large organisations through the introduction of new products and services (Florida & Kenney, 1990; Styhre, 2002).

Disruptive technology describes a process where a market is disrupted through the introduction of products with a different value proposition which are cheaper, simpler, smaller, and more convenient to use (Hwang & Christensen, 2008). Disruptive technology initially creates a new market to satisfy the least-demanding end of the market looking for a new value proposition where there is no competition (Figure 2) (Klenner et al., 2013; Dedeayir et al., 2014). The introduction of mobile phones

allowed people to use telecommunications away from landlines. Although the clarity in the voice was inferior to telephones, the ability to call when mobile satisfied the lower-end of the market. Over time, the performance of these technologies steadily improved attracting the most-demanding end of customers (Clark & Koonce, 1997; Adner, 2002; Gilbert, 2003; Henderson, 2006). Disruption occurs when customers switch from using sustaining technology to using disruptive technology as a consequence of the decreased marginal utility provided by the sustaining technology, and the practicality of the disruptive technology (Adner, 2006; Montoya & Kita, 2017).

Not all technology developments are disruptive (Gobble, 2016). New technological developments that do not disrupt a market are considered sustaining technology, which “improve the performance of established products, along with the dimensions of performance that mainstream customers in major markets have historically valued” (Christensen, 1997a, p. xv; Cho, Yoon, & Kim, 2016). Improvements in performance give customers something more or better than the attributes they already value (Bower & Christensen, 1996). Technological developments in mobile phones, laptops and cars are examples of technologies developed by large organisations that improve the attributes that customers value. As large organisations over-serve the market with sustaining technology, new entrant businesses have the opportunity to disrupt the market with the introduction of new technologies (Klenner et al., 2013; Dedeayir et al., 2014).

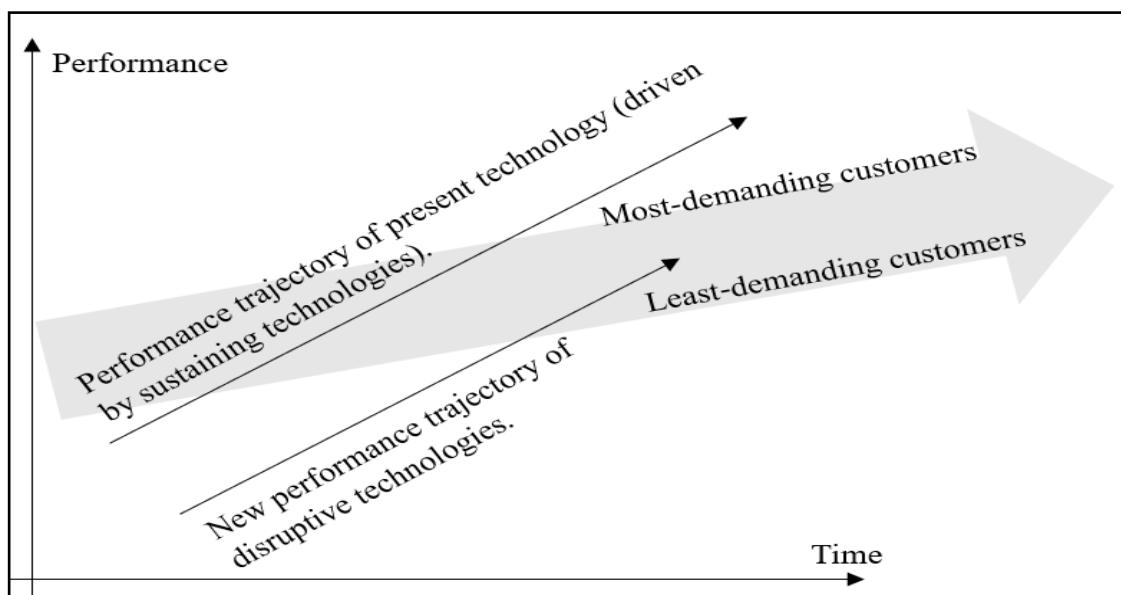


Figure 2. The progress of disruptive technology (Adapted from Christensen, Bohmer, & Kenagy, 2000, p.105).

When disruptive technologies enter the market, they satisfy the necessities of the least-demanding customers and continue to grow (Figure 2). Disruptive technology was introduced by Christensen and Bower (1996) to explain how small companies can create new technologies that disrupt large organisation's products (Christensen & Rosenbloom, 1995; Christensen, 1997c; Christensen & Armstrong, 1998; Lyytinen & Rose, 2003), which was the result of an analysis of the disk drive (Christensen, 1993), microelectronics and the steel industry (Rosenbloom & Christensen, 1994; Bass & Christensen, 2002). The analysis of these industries and how they evolved explains the disruption caused by the introduction of new technologies in the market (Figure 3) (Baughn & Suci, 2015; Greco, Locatelli, & Lisi, 2017).

Disruption in the digital world is considered digital disruption (Bolden & O'Regan, 2016). Digital disruption is digitising technology that eases processes by providing ways to perform tasks through the use of technology (Lucas & Goh, 2009; Weill & Woerner, 2015). Examples of digital disruption include web-based services that organise information, communication interfaces and a variety of applications that simplify everyday tasks (Reimers, 2013). These applications facilitate the transmission of data through email, calendar, cloud storage, videos and more (Cramer & Krueger, 2016). In this thesis, developments in the digital world are considered disruptive technology (Utesheva, Simpson, & Cecez-Kecmanovic, 2016).

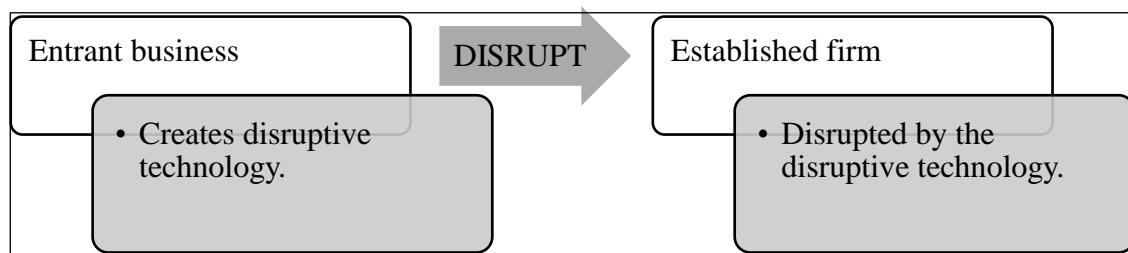


Figure 3. Disruption of established firms (Adapted from Yu & Hang, 2010, p.437).

The process of disruption starts with the introduction of disruptive technology by new entrant businesses. As companies grow, their ability to enter small and emerging markets decrease (Christensen & Overdorf, 2000), which creates an opportunity for smaller businesses which are capable of assuming more risk and less profit (Knudsen, Tranekjer, & Cantner, 2017). Creating technologies at a lower cost and increased value helps entrant businesses increase market share and profitability (Lui, Ngai, & Lo, 2016;

Schmidt, 2018). Introducing different value propositions and new market applications creates a new market through the inclusion of non-mainstream customers (Christensen, 1997c; Gobble, 2016). Disruptive technology is viewed as unattractive by established firms as they do not initially serve mainstream customers (Lewis, 2004). Over time, these products improve as they enter the mainstream market, often with a lower cost structure (Christensen, 1998; Denning, 2016). The profitability and market share of established firms are then affected, which creates a need in large organisations to compete against the new entrant businesses (Christensen & Bower, 1996; Christensen, Horn, & Johnson, 2008).

Large firms are not capable of exploiting the disruptive technology potential before being disrupted by smaller businesses (Christensen & Bower, 1996; Ahuja & Morris Lampert, 2001; Hill & Rothaermel, 2003; Paap & Katz, 2004). Established firms focus on improving the process by increasing efficiency, reducing manufacturing costs and having more competitive prices (Gilbert, 2001). Forging new technologies inside existing business units requires new values and structures in line with the innovation which differs from the values inside an established firm (Kiel, 2014; McGowan & Westley, 2015). The inability of large firms to reinvest in disruptive technology give entrant businesses a better chance of success due to their smaller size, shorter history and ability to attack low-profit markets when dealing with disruption (Walsh, Kirchhoff, & Newbert, 2002; Christensen & Raynor, 2003; Macher & Richman, 2004; Dyer, Gregersen, & Christensen, 2011).

A strategy to develop disruptive technology inside large organisations is business unit spin-off. Separating a business unit allows the allocation of resources to the development of new technologies (Sheep et al., 2017). When a business unit spin-off is not created, resources are used to support sustaining technology before being given to the development of new technologies (Christensen & Bower, 1996). The business unit spin-off strategy emphasises the focus on the process as opposed to understanding the people (Ramdorai & Herstatt, 2015).

Understanding the needs of minorities (small groups of the market) generates new ideas for the development of disruptive technology (Hart & Sharma, 2004). Technologies can then be created to fulfil those needs (Kaplan, 2012; Kiel, 2014). Partnering with other businesses can help in the design of improved products, and increased market share (Baaken & Teczke, 2014). Agility and resiliency can be used to manage disruptive change by preserving a sense of identity and purpose (McCann,

2004; Selsky & McCann, 2008; Mukerjee, 2014). Identity can be preserved by actively planning for crises and contingencies and making difficult choices for recovery and renewal (Doz & Kosonen, 2010; Cagnin & Loveridge, 2011; Shin, Taylor, & Seo, 2012). Scenario-planning is also used to manage disruption by identifying the nature of the disruptions and how they evolve (Ramírez, Selsky, & Van der Heijden, 2010; Marchais-Roubelat & Roubelat, 2011).

The focus of this study is on disruptive technology. The literature often misunderstands the differences between disruptive technology and disruptive innovation, using these two terms interchangeably (Christensen & Raynor, 2003; Paap & Katz, 2004; Li et al., 2018; Schuelke-Leech, 2018). Disruptive technology explains the process where a market is disrupted through the introduction of technologies with a different value proposition (Hwang & Christensen, 2008), whereas disruptive innovation explains the process of creating a new business model (Gobble, 2016). The linear focus of disruptive technology has been discussed in this section providing more support to the little or no understanding of the importance of soft systems. Disruptive innovation is defined below to justify the use of disruptive technology in this research.

2.1.3. Disruptive innovation.

In 2006, the literature on the development of new technologies shifted its focus from how disruptive the new product is to the business model (Markides & Geroski, 2005; Yu & Hang, 2010; Gobble, 2016). When Markides (2006) explained that disruptive technology is the process of creating technologies that are “new to the world”, Christensen (2006, p. 49) suggested a new theory – disruptive innovation – to describe “a business model problem, not a technology problem”. Disruptive innovation differs from disruptive technology and explains the process of reconstruction of a value proposition in the market (Dumestre, 2012; Christensen, Bartman, & Van Bever, 2016a).

Disruption is used in the business literature to describe the process where new products or services disturb the market (Bower & Christensen, 1996). This process starts with the introduction of a product or service that shakes the common conception of a product (Bellamy, 2008; Buhalis et al., 2019). Disruptive innovation focuses on how a new business model causes disruption. The focus is not “any situation in where an industry is shaken up, and previously successful incumbents stumble” (Christensen et al., 2015, p. 1), the focus is on the process of reconstruction of a value proposition in

the market (Christensen, Johnson, & Rigby, 2002). By offering a new value proposition in the market, a small company is capable of beating an industry giant (Christensen, Hall, Dillon, & Duncan, 2016b). These innovations impose new threats to large firms creating a sudden need to develop new products capable of competing with these innovations (Aggarwal, Posen, & Workiewicz, 2017).

Disruptive innovation is defined as a process that starts by successfully targeting those overlooked segments and gaining a foothold by delivering more-suitable functionality, frequently at a lower price (Christensen, Craig, & Hart, 2001a). As large businesses over-serve their customers and increase prices, customers turn to new alternatives at a lower price. When a positive outcome occurs, market share shifts to the entrant and disruption has occurred (Wessel & Christensen, 2012; Connery, 2015). A positive outcome then leads into the acquisition by a much larger incumbent, or a long battle for market significance (King & Tucci, 2002; Schmidt & Druehl, 2008).

Management teams have to reshape their mindsets and actions to create disruptive innovation (Christensen & Eyring, 2011). Innovation occurs by understanding customer needs (Danneels, 2004; Banff, 2006; Christensen & Euchner, 2011). Making test products and getting an expert's opinion can also help in understanding customer needs (Kaltenecker, 2015). Timing is crucial. Disruptive innovation must happen where there is an opportunity to develop an idea and time for the innovator to develop the idea (Christensen et al., 2008; Schramm, 2017). This development can occur over years, and even decades; "disruptive innovation is a process, not an event" (Christensen, 2006, p. 46). Large organisations are often not capable of developing this end of innovation and can only develop sustaining innovations.

Sustaining innovations are products which enable firms to sell more of the same products to their most profitable customers (Adner, 2006; Christensen, 2006; Christensen et al., 2015). Numerical objectives, including profits and key performance indicators, force middle managers to place their resources into sustaining innovations instead of disruptive innovation to demonstrate growth to upper organisational levels (Denning, 2016). Sustaining innovations are products and services that are improved to make them better in the eyes of existing customers. These improvements require fewer workers and less capital investment when compared to disruptive innovation (Christensen & Raynor, 2003; Huang & Sošić, 2010; Reinhardt & Gurtner, 2015). Mobile apps for ride-sharing and house sharing can be classified as sustaining

innovations because they are not creating a new business model and offer a service similar to the taxi industry or hotel industry with some sustaining improvements (Christensen et al., 2015; Cramer & Krueger, 2016).

Distinguishing between sustaining innovations and disruptive innovations has created debate and confusion in the literature. Some authors have mistakenly used house-sharing apps as examples to understand how these apps fit the disruptive innovation theory (Guttentag, 2015). House-sharing apps can be categorised as a sustaining innovation as they provide new features but cannot be categorised as a disruptive innovation as they do not create a new business model (Guttentag, 2015; Guttentag & Smith, 2017). Disruptive innovation creates new ways of doing things, e.g., cars when first introduced changed transportation from horses to motor vehicles (Hart & Christensen, 2002; Christensen & Anthony, 2004), or watching films through internet-based services which disrupted the DVD renting business model (Christensen, Horn, Caldera, & Soares, 2011; Christensen et al., 2015; Chopra & Veeraiyan, 2017). Disruptive innovation creates a new market, attracting people who previously lacked the resources or skills to enter this market (Christensen, Suárez, & Utterback, 1998; Christensen & Raynor, 2003). Over time, the performance of these innovations steadily improves and brings in mainstream customers (Adner, 2002; Henderson, 2006).

Innovation inside organisations is classified into three stages; disruptive, sustaining, and efficiency innovations (Christensen & Raynor, 2003). The disruptive innovation stage creates jobs, and most of the capital is re-invested for product development and innovation (Christensen et al., 2016a; Google, 2016). Sustaining innovation occurs when products only gain small improvements, e.g., faster and more comfortable car models. Sustaining innovations requires fewer workers and less capital investment (Christensen & Raynor, 2003; Huang & Sošić, 2010; Reinhardt & Gurtner, 2015). Middle managers often put their resources into sustaining innovations as a strategy to show growth to upper level managers (Denning, 2016). Efficiency innovation is where jobs are eliminated, and capital is no longer re-invested in the product, e.g., replacing people with robots (Denning, 2016).

Efficiency innovations focus on reducing costs decrease the firms ability to create new technologies. Financial metrics, like return on net assets and the internal rate of return, are used as a guide to measure performance (Christensen, 1997a; Benner & Tushman, 2003; Lewis, 2004; Henderson, 2006). Following financial metrics and short-term thinking limits the vision for new opportunities and innovation while denying the

potential of technological advancements (Deming, 1982a, 1993; Christensen et al., 2008; Christensen & Euchner, 2011). Businesses opting to choose efficiency technologies are using the best possible financial option which only offers short term returns and creates an opening for smaller businesses to disrupt (Christensen et al., 2016a).

Firms can avoid disruption by developing new technologies (Christensen & Raynor, 2003). Large organisations can innovate by creating products that fulfil a specific need of customers (Dumestre, 2012; Christensen et al., 2016b). Strategies to identify how to improve products include finding a product or service that is undervalued by the current customers, introducing new capabilities to the technology and allowing people to accomplish new things (Gilbert, 2003). Talking to niche markets can generate ideas for the creation of new product where new capabilities can be added to already existing technologies.

Disruptive innovation theory continues to grow in its understanding, application and predictability (Leavy & Sterling, 2010; King & Baatartogtokh, 2015). This theory can help create products affordable for the masses including the provision of health services (Christensen, Grossman, & Hwang, 2009). When companies invest in new value propositions, jobs are created to support the new inventions and money is re-invested (Christensen, 2002; Christensen et al., 2016a). Disruptive innovation is also continually being used and applied inside different industries including healthcare (Christensen, Bohmer, & Kenagy, 2000; Kenagy & Christensen, 2002; Ramdorai & Herstatt, 2015), digital news (Lund & Puijk, 2012), tourism (Guttentag, 2015), higher education (Christensen et al., 2008; Christensen & Eyring, 2011; Christensen & Horn, 2011), newspapers (Karimi & Walter, 2016), machine tools (Roy & Cohen, 2015), defence (Dombrowski & Gholz, 2009), retail (Christensen & Tedlow, 2000), photography (Lucas & Goh, 2009) and personal life (Christensen, 2010).

To create better understanding of the innovation literature, disruptive change will be discussed in section 2.1.5. When a disruptive technology or disruptive innovation is introduced in a market, large organisations create strategies to manage the new entrants, which disruptive change explains. Before discussing disruptive change, change management is discussed in the following section to create the foundations for disruptive change, which is the process of managing disrupted firms.

2.1.4. Change management.

In this section, change management is briefly discussed to provide the foundations to understand disruptive change (Norris, Brodnick, Lefrere, Gilmour, & Baer, 2013; Dedeayir, Ortt, & Seppänen, 2017). When disruptive technologies are introduced, large organisations fight against these newly introduced products to maintain their leadership in the market. Disruptive change provides strategies that help large organisations manage this process. Resistance to change provides a context to create understanding of the challenges of managing disruptive change within large organisations. Creating readiness for change within the organisation is a significant part of business development (Ford, Ford, & McNamara, 2002). Top management should explain the gap between the desired end-state and the present state to create awareness of the change process within employees (Armenakis, Harris, & Mossholder, 1993; Hamlin, 2016). Change inside an organisation can trigger fear, resistant personalities and misunderstanding (Motawa, Anumba, Lee, & Peña-Mora, 2007; Ybema, Thomas, & Hardy, 2016). The process of changing an organisation can become challenging when people inside the organisation become reluctant to the new process of adaptation (Lazarus & Clifton, 2001). Resistance needs to be addressed in the early stages of the implementation plan (Shipton, Hughes, & Tutt, 2014).

Strategies to address resistance to change include training and creating a slow implementation plan which helps to channel the resistance (Thomas, Sargent, & Hardy, 2011). Overlooking readiness, which implies the creation of strategies, innovations and training, will produce an unsuccessful intervention as the organisation is not ready for change (Armenakis & Bedeian, 1999; DeRose, 2004). Managers need to create awareness inside the organisation and wait until the employees are positively committed to change (Aladwani, 2001; Steghofer, 2017). Awareness can be raised by communicating the positive outcomes of the system, leaders engaging positively, and users being trained in the new system (Bullock & Batten, 1985; Kotter, 1995; Hwang, Chung, Shin, & Lee, 2017). Managing change requires different strategies for different types of changes.

2.1.4.1. Classifying change

The rate of occurrence, how the change comes about and the level of difficulty for the organisation to overcome obstacles can define the three types of change: continuous, discontinuous and emergent change (Aggarwal et al., 2017). Continuous

change uses small steps towards a goal easy to overcome (Strauss, Weber, & Zubler, 2017). Changes that are easy to overcome are attributed to the business strategy, adapting to a changing market, value creation or as a need to increase efficiency (Huh & Reigeluth, 2017). Discontinuous change is characterised by more significant changes which occur intermittently and are difficult to overcome (Todnem, 2005; Shepherd, McMullen, & Ocasio, 2017). Finally, emergent change describes rapid changes which are difficult to effectively identify, plan, and implement (Kanter, Stein, & Jick, 1992).

Change is also classified on a spectrum from incremental to radical (Scifres, Chrisman, & Memili, 2016). Incremental changes are smaller changes in the organisation that often do not present contradictions and are in line with the common practices of the organisation. Radical change is a response which requires an immediate reaction, often imposed by external factors (Johannessen, Olsen, & Lumpkin, 2001). External factors include a shift in knowledge, action or technology in the workplace (Benner, 2007; Bode, Wagner, Petersen, & Ellram, 2011). Disruptive change is associated with radical change which is the observed response to the creation of disruptive technology (Christensen & Overdorf, 2000; Gilbert & Bower, 2002). Disruptive change explains the strategies required to manage the disruption inside established firms when an entrant business creates a disruptive technology (Mace, 1976; Helfat & Bailey, 2005). Within disruptive change, multiple strategies are discussed to manage the process within large organisations to compete against disruptive technologies. These strategies are linear, and present little understanding of how to manage the soft systems in this process.

2.1.5. Disruptive change.

Disruptive change explains how established firms can manage the disruption created when a new entrant introduces a disruptive technology (Macer, 2013; Norris et al., 2013). This type of change is similar to downsizing and reengineering which require quick action and commitment from the top management and employees (Balogun & Hope Hailey, 2008). The key determinant in business vitality and effectiveness relies on getting people aligned behind the goals and objectives of the company (Clark & Koonce, 1997).

Disruptive technology can displace large firms through a significant disruption in its markets (Gilbert & Bower, 2002; Helfat & Bailey, 2005; Todnem, 2005; Aggarwal et al., 2017). Managing change within large businesses is often a reactive

process (Banff, 2006). As the new entrant increases its market share and profitability, established firms require different strategies to maintain their market dominance (Christensen & Bower, 1996; Christensen et al., 2008).

Disruptive change can be seen as a threat creating defensive routines or as an opportunity creating more deliberate and reasoned actions within the organisation (Gilbert & Bower, 2002). Framing the disruption either as an opportunity or as a threat is incorrect. When disruption is seen as a threat, too many resources are committed quickly (Gilbert & Bower, 2002). When disruption is framed positively, insufficient resources are committed for its development (Selsky & McCann, 2008).

There are five principles to understand disruptive change (Table 1) (Lewis, 2004). The first principle describes the nature of disruptive technology as being hard for mainstream customers to understand, i.e., electric cars which took decades for people to use (Ganguly, Das, & Farr, 2017). The second principle explains that disruptive technology provide little margins. Many large organisations do not initially invest in developing disruptive technology unless they are being disrupted. The third principle addresses the challenges in understanding and creating a new market which does not yet exist (Nagy, Schuessler, & Dubinsky, 2016). The fourth principle explains that developing technology requires a new culture inside the organisation, which leads to business unit spin-off and acquisition strategies. The last principle explains that customer's requirements need to be clearly defined, as they are often given more value than what they ask for or are over-supplied.

Table 1. *Principles for disruptive technology* (Adapted from Lewis, 2004)

Principles of disruptive change	
1	Old customers do not see the value of new products.
2	New products do not start being big money makers.
3	Analyse the new market as this new market does not yet exist.
4	Isolate the rest of the firm or change the culture inside the organisation.
5	Understand customer's needs.

To create disruptive change, large firms need to change the culture inside the organisation (Christensen & Overdorf, 2000). Culture can be changed by creating a new organisational structure within corporate boundaries, business unit spin-off, or by acquiring a different organisation to develop new processes and values to manage the development of the new technology (Figure 4) (Jacobson & Jazowski, 2011; Sund, Bogers, Villarroel, & Foss, 2016). These strategies are used depending on the fit with the organisation's processes and values (Kreitz, 2015).

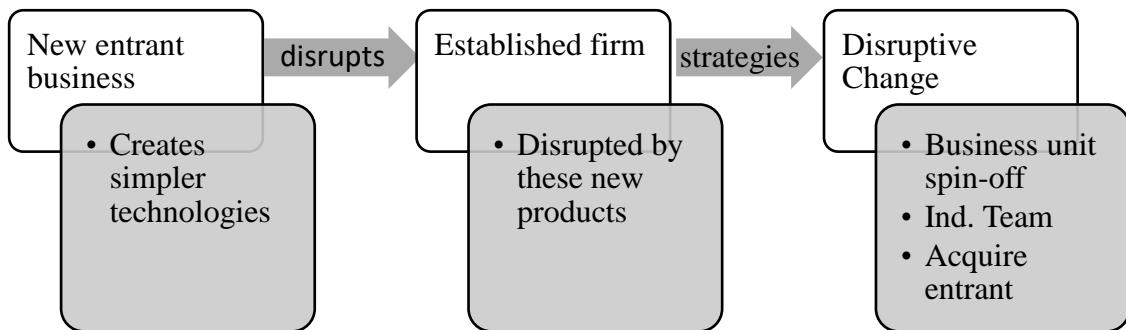


Figure 4. Disruptive change strategies (Adapted from Yu & Hang, 2010, p.437)

Business unit spin-offs consist of creating a new organisational structure by isolating and creating an independent business unit (Danneels, 2004; Markman, 2018). A business unit spin-off strategy helps when the required values and processes do not fit those of the firm. When the values and processes are similar to those of the firm, the change can be done inside the firm using an independent team (Christensen & Overdorf, 2000; Orellana, 2017). The new business unit helps to allocate the necessary resources and focus on the customer's needs rather than on the companies' capabilities by listening to both current and potential customers (Christensen & Raynor, 2003; Hart & Sharma, 2004; Paap & Katz, 2004; Christensen et al., 2016b). The second strategy, to create an independent team, allows the creation of a different structure for the new organisation which follows the culture needed to overcome the new challenges (Sheep et al., 2017). The final strategy is to acquire businesses that already have the needed processes and values.

Using the business unit spin-off and acquisition strategies have proven effective in managing disruptive change. Lund and Puijk (2012) analysed two businesses (24/7 broadcasters) dealing with the transition from traditional news to rolling news using disruptive change strategies. Both businesses started with an experimental phase, but

then VG, a written press, used the business unit spin-off strategy while the second business used an acquisition strategy to buy a company that was already producing the needed product. Managers inside both companies pointed out that cultural differences were the main difficulty to overcome. Even though both initiatives followed different methods, they both were successful in dealing with the disruptive change inside their industry.

Creating a new business unit helps in the development of new values. Organisations need to abandon old patterns and establish new ones inside the new business unit (Harding & Tager, 2014). By unlearning deep organisational values an opportunity is created within these organisations to develop new technologies (Govindarajan & Kopalle, 2006). Large organisations interpret disruptive technology differently based on the context of their organisation's resources, processes and values (Daim et al., 2011; Yeh & Walter, 2017), which need to be changed to manage the disruption (Grush, 2010). Resources include the goods and services the company holds. Processes include the interventions and actions to implement the change (Pettigrew, Woodman, & Cameron, 2001). Values are the set of rules or standards by which employees adhere to make decisions (Armenakis & Bedeian, 1999; Christensen & Overdorf, 2000). Time and resources should be provided to the independent business unit to manage the change (Christensen et al., 2008; Macer, 2013). Resources, processes and values can be changed by controlling different aspects of the company.

Different aspects of management including policies, quality and employees need to be monitored within the business to create the necessary change. Policies need to be continuously re-designed to accommodate the new needs (Jacobson & Jazowski, 2011). The firms also need to control costs, assure quality, implement a process of continual improvement, and innovate (Connery, 2015). From the employees perspective, a proper selection process should ensure that capable people work in the organisation with processes and values that match the task desired for the change to happen (Christensen & Bower, 1996; Tushman & O'Reilly, 2002). Self-directed managers are required in these times of disruptive change in order to anticipate what lies beyond the horizon by creating innovative solutions to complex problems (Kaufman, 2014). Managers should be appointed to consider all cost reductions and value improvement initiatives and to identify the unmet needs inside the market, develop new programs to fulfil those needs, implement them and evolve them (Norris et al., 2013).

Similar to disruptive technology and disruptive innovation, disruptive change presents strategies focused on the resource and process view, with little understanding of the importance of people in their development. Following the discussion of the radical end of innovation including radical innovation, disruptive technology, disruptive innovation and disruptive change, the reasoning for selecting disruptive technology over disruptive innovation is explained in the following section. Disruptive change is not used as it explains how to manage a company affected by the introduction of disruptive technology, and not how to create disruptive technology.

2.2. Disruptive Technology and Disruptive Innovation

The division proposed by Markides (2006) and Doz and Kosonen (2010) of disruptive innovation into technological innovations and business model innovations highlights the confusion inside disruptive innovation. Although the difference between disruptive innovation and disruptive technology is discussed in the literature (Bower & Christensen, 1996; Markides, 2006; Yu & Hang, 2010; Dumestre, 2012; Christensen et al., 2015; Gobble, 2016; Nagy et al., 2016), these theories are used interchangeably (Christensen & Raynor, 2003; Paap & Katz, 2004; Li et al., 2018; Schuelke-Leech, 2018). “Disruptive technology is increasingly absorbed into the framework of disruptive innovation emphasising the target disruption's capability to create monetary gains.” (Li et al., 2018, p. 294).

The difference between disruptive innovation and disruptive technology is based on understanding the business model as the innovation (Christensen & Overdorf, 2000; Christensen, 2006; Desjardin, 2012; Brumme, Simonovich, Skinner, & Van Wassenhove, 2015). An example of this difference can be observed in the computer industry when Microsoft acquired the MS-DOS operating system from Seattle Computer Products (Millar, Udalov, & Millar, 2012). When this transaction occurred, Microsoft knew there was a market for the development of the personal computer, a position IBM failed to understand. In 1943 Thomas J. Watson, chairman of IBM stated: “I think there is a world market for maybe five microcomputers” (Schultes, 2004, p. 1). The disruptive innovation was in the new disk operating software developed by Seattle Computer Products (Dewar & Dutton, 1986; Utterback & Suárez, 1993; McDermott & O'Connor, 2002). The business model change which took this innovation to a new market proposition was realised and achieved by Microsoft when targeting overlooked segments of the computer market (Christensen et al., 2016a; Karimi & Walter, 2016).

The complexities of disruptive innovation favour the use of disruptive technology in this research. Understanding the business model is more challenging than recognising a technology. To consider a new idea as disruptive innovation, it needs to create a new business model. Understanding the business model of a newly created business is a challenging process. It is not enough for the innovation to be new (radical innovation) or to have a focus on the product (disruptive technology) for it to be a disruptive innovation (Buhalis et al., 2019). Wireless telephones were considered a disruptive technology due to their radical product innovation (Johnson, Christensen, & Kagermann, 2008). From a business model perspective, wireless telephones are only a sustaining innovation relative to wired telephone companies as they targeted the same customer needs while offering some additional features, in this case being wireless (Govindarajan & Kopalle, 2006; Christensen et al., 2016b). Following the complexities involved with understanding disruptive innovation, this research will use disruptive technology.

The validity of disruptive technology was questioned by Tellis (2006) and Danneels (2004), who questioned Christensen (1997a) predictions of disruptive technology, arguing that he made those predictions ex-post (after) the disruption had happened (Klenner et al., 2013). According to Christensen (2006), the model was derived from history, and its definition exists independent of the outcomes. Govindarajan and Kopalle (2006) and Schmidt and Druehl (2008) confirmed that the disruptive technology framework could make ex-ante predictions. Tellis (2006) argued that the definition of disruptive technology does not provide a precise and consistent definition of disruptive technology, a claim which was refuted by Christensen (2006) who suggested that disruptive technology is a fact of theory building. Paap and Katz (2004) tried expanding the theory by highlighting how listening to the customer brings new ideas. This view was refuted by Christensen and Raynor (2003) explaining that customers do not know what they want, and only want to satisfy their needs (Christensen et al., 2016b).

Different authors have attempted to create divisions for disruptive technology. Govindarajan and Kopalle (2006), Lin, Zhang, and Yu (2015) and Linton (2002) added a measure based on high-end and low-end disruption which demonstrates the differences between initial price and performance (Kassiech et al., 2002; Walsh et al., 2002). Schmidt and Druehl (2008) and Schmidt (2004) added a further distinction to this measure refining new-market disruption into two types; fringe-market low-end

encroachment, and detached-market low-end encroachment. Creating these distinctions is not pertinent for disruptive technology as the definition itself explains that the new product will be high cost, and low-profit margin as the product is in its developmental stages. For the second criteria, low and high performance, when the product is first introduced, the performance will be reduced compared to the market leader products and present a new business model that can, through time, improve. By understanding disruptive technology, it can be demonstrated that all these assertions are not in line with the definition of disruptive technology (Dumestre, 2012; Christensen et al., 2015; Gobble, 2016).

The literature on disruptive technology has been shaped to create strategies to manage the disruption by managing the processes and resources of the company (Assink, 2006; Klenner et al., 2013). A strong focus is given to the business strategy (Kotter, 1995; Christensen, 1997b) and resources (Christensen, 2001a; Christensen et al., 2013) which prioritise economic and process requirements to manage disruptive technology (Christensen et al., 2001b). To improve efficiency, large organisations allocate resources to projects supporting sustaining technology. To create disruptive technology inside established organisations, managers need to be consistent with the principle of resource dependence, which stipulates that access and control over resources are essential to organisational success (Bower & Christensen, 1996; Pfeffer & Salancik, 2003).

Disruptive technology has a low understanding of the collaboration needed to create disruptive technology (Christensen, 2001b; Ramdorai & Herstatt, 2015). The business unit spin-off and acquisition strategies demonstrate the resources and processes based focus (Christensen & Raynor, 2003; Yu & Hang, 2010; Dotsika & Watkins, 2017). These strategies fit well within the economic aspects of business planning and modelling as it readily describes logical and linear information (Christensen, McDonald, Altman, & Palmer, 2018). The resource base model uses a mechanistic model that misses the human component where involvement, learning and adaptive processes are required to create, manage and innovate (French et al., 2005). The resource focus is limited and can be challenged as the understanding of disruptive technology occurs within the context of people's needs and behaviours (Gapp, 2006). "When innovation is primarily viewed as a linear process, rather than a complex and adaptive one, choices and issues beyond the examined path are generally ignored" (Rice & Martin, 2007, p. 212).

People are important in creating radical innovation, and the only way to survive is to have “appreciation of the people who build and sustain their firms and in their ability to learn and to adapt to changing and challenging circumstances” (Utterback, 1994, p. 1). A focus on the human aspects is needed to better understand this process (Knudsen et al., 2017; Holweg, 2018; Schuelke-Leech, 2018). The soft systems include different cultures, values and emotions which require management and identification of different stakeholders (Deming, 1982a; Checkland & Winter, 2006; Farag & McDermott, 2015). Soft systems are often harder to understand as they are nonlinear and chaotic (Zheng et al., 2017). Continual learning helps business know itself and deal with disruptive change as the business develops a capacity to anticipate and address change (Cagnin & Loveridge, 2011; Peek & Stam, 2019). Education and innovation are essential in the process of managing disruption (Armenakis et al., 1993; DeRose, 2004).

The literature on disruptive technology, disruptive innovation, and disruptive change present a strong linear view. This section has justified the use of disruptive technology over these other theories. Following the under researched areas of soft systems within disruptive technology, OD will be used to create understanding of the human dynamics required to manage this process. OD draws on multi-faceted socially constructed realities by developing models of human activities to improve the situation (Durant-Law, 2005; Checkland & Poulter, 2006). To understand social realities, the existing situation needs to be first accepted, and then the complexity of the problem can be understood and expressed in a structured way. OD looks at the human aspects of the organisation which helps understand the involvement, learning and adaptive strategies to promote development and well-being in groups of people (Cox Sullivan, Norris, Brown, & Scott, 2017).

2.3. Organisation Development

OD evolved from the cognitive science (Bartunek & Moch, 1987), social science (Porras & Berg, 1978) and applied behavioural science fields (French et al., 2005) to focus on social relations (Smither, Houston, & McIntire, 2016). More specifically, it focuses on values, beliefs and attitudes of individuals, groups or culture to develop the organisation and its people (Bushe & Marshak, 2009; Ong & Yue, 2018). Behavioural science improves and reinforces the strategies, structures and processes leading to organisational effectiveness, continual improvement and innovation (Argyris, 1970; Desplaces, 2005; Cunningham, 2011; Cummings & Worley, 2015). Development of

social relations provides the means to adapt to new technologies, markets, and challenges (Bennis, 1969, p. 2) by understanding the dynamics of people and groups of people (Greiner & Cummings, 2004). By focusing on social relations, organisational effectiveness and individual well-being can be improved.

OD strategies improve organisational effectiveness and individual well-being by addressing human dynamics inside organisations (Farag & McDermott, 2015; Wang, Liu, & Mingers, 2015). Human dynamics can be managed through intervention techniques, theories, principles and values that show how to take charge of developmental efforts and achieve success (Rana, Bansal, & Gupta, 2015). This process should be system-wide and follow behavioural science activities; be reflexive, educational, self-examining and foster learning (Ryan, Gwinner, Mallan, & Livock, 2017). Through interventions, OD attempts to make organisations better able to attain their short and long term objectives by teaching people how to manage processes, structure and the culture more effectively (French et al., 2005). These implementations need to define the nature of the program and the nature of the change activity, i.e., educational, reflexive, self-examining, or self-taught. The target includes values, beliefs, attitudes or relations and the required outcome, which is to adapt better, cope, solve or renew a system inside the organisation through human development (Ishikawa, 1982, 1985, 1989, 1990; Gapp & Fisher, 2007). The following quote presents the definition of OD.

Organisational Development is a process of planned system change that attempts to make organisations better able to attain their short and long-term objectives. This is achieved by teaching the organisations members to manage their organisation processes, structures and culture more effectively (French et al., 2005, p. 3).

Intrinsic values need to be changed to promote development by creating a learning space (Watkins & Golembiewski, 1995; Argandoña, 2003). Creating a learning space allows the development of skills, personal growth, creativity, and productivity which improves employee's quality of life while increasing the effectiveness of the institution (Tannenbaum & Davis, 1969; Alderfer, 1977; Cunningham, 2014). Improvement is achieved through inquiry-based methods that encourage groups to increase collective self-awareness and productive conversations (Robbins & Barnwell, 2006; Bushe & Marshak, 2009). Candidness and responsibility across the organisation

creates improved ways to work together and a more effective working environment in where personal and shared goals are achieved (Neilsen, 1984).

There are three broad areas into which OD strategies can be divided: the empirical-rational, the normative re-educative and the power-coercive (Bennis, Benne, & Chin, 1985; Szabla, Dardick, & Devlin, 2016). The empirical-rational strategy suggests that change is achieved through communication and an increased number of incentives (Robertson, 2011). Increased numbers of incentives allow people to follow their self-interest once they understand it. The normative re-educative OD strategy assumes that people are social beings who adhere to sociocultural norms grounded in their values, attitudes and beliefs (Chin, Bennis, & Benne, 1969; Boone, 2015). Businesses improve by redefining and reinterpreting norms and values while developing a commitment to these new norms and values (Mann-Feder & Litner, 2004). The power-coercive strategy explains that people follow directions based on political or economic power. Successful change is based on the exercise of authority and the imposition of sanctions to create change (Bennis et al., 1985; Robertson, 2011; Thomas et al., 2011). Economic and political power create related implications for non-compliance (Boone, 2015). A fourth strategy, environmental-adaptive, proposed by Nickols (2010) assumes that people oppose disruption.

2.3.1. Environmental-adaptive.

The recently created fourth strategy, environmental-adaptive, assumes that people oppose loss and disruption, however, adapt readily to new circumstances. Change is based on creating a new organisation while gradually transferring people to the new unit (Nickols, 2010; Zhang, 2015; Salam & Alghamdi, 2016; Chalise, 2018). By gradually transferring people, the problem of managing people is alleviated by exploiting the adaptive nature of individuals who readily adapt to new circumstances and avoid the complications related to changing people or their culture. The environmental-adaptive strategy lacks an understanding of the human component to manage this change making it less appropriate for understanding the human dynamics required to create disruptive technology. Additionally, the disruptive change business unit spin-off strategy presents some similarities with Nickols (2010) approach as it presents a high focus on the process and resources needs, rather than the ‘soft’ needs for the new business unit. For these reasons, the environmental-adaptive strategy will not be used in this research.

2.3.2. Empirical-rational.

The empirical-rational strategy proposed by Bennis et al. (1985) is based on Taylorism and focuses on achieving maximum performance through the analysis of numbers and figures (Barnes, 2017). In the early twentieth century, large organisations hired people to manufacture cars, clothes and other products in assembly lines (Wilson, 2014). During this time, managing people inside organisations was an unknown science, and people based their decisions on doing what was more efficient and effective in the short term (Zhang, 2015). Efficiency can be improved by recording the time it takes to do tasks and finding the optimal number of people required to increase efficiency and profit (Nikolaeva & Russo, 2017), which follows the assumption that people are rational beings that follow their self-interest once they realise them (Robertson, 2011).

Using psychometric and socio-metric tools and techniques presents limited value as it promotes system maintenance, not system change and focuses on the role, not revealing the sociocultural difficulties needed for a change to happen (French et al., 2005). The lack of fitness of employees for different positions represents a constant need to replace employees as a condition of social progress by removing the unfit and replacing them with those more capable of performing the tasks. Change is achieved through communication and a continually increasing number of incentives (Chin et al., 1969; Bennis et al., 1985; Thomas et al., 2011). Due to the focus of the empirical-rational strategy on efficiency and use of numerical data, this study will not use this strategy as a lens (Ravnjak, Grget, & Kovacevic, 2014).

2.3.3. Power-coercive.

The second strategy, power-coercive, is used in governments and businesses where decisions are made based on economical, hierarchical and political power (Land, 2001). Political power refers to policies and procedures which are enforced through sanctions (French et al., 2005). Economic power is the coercive influence exerted by those providing economic rewards (Ojo, Ree, & Carretta, 2016). Legitimate and authoritative power are used as a means to create change. Successful change is achieved through the exercise of authority and the imposition of sanctions where non-compliance has related implications (Riasi & Asadzadeh, 2016). Those with less power need to comply with the plans and direction of those with more legitimate or authoritative power (Patterson, Branch, Barker, & Ramsay, 2018).

Groups of individuals inside organisations can use different power-coercive strategies to achieve a goal including non-violent protests, change in the structure of the power distribution, and use of political entities to change in line with laws and moral rights (Nickols, 2010; Boone, 2015; Zhang, 2015). A new organisation may be needed to promote change (Bennis et al., 1985). Due to the nature of this strategy, which requires political power rather than collaboration and understanding of the values inside organisations to promote change, this research did not use the empirical-rational as a lens (Knorr, 2016).

2.3.4. Normative re-educative OD.

Learning relying on human development can be promoted through the normative re-educative OD strategy (Gapp & Fisher, 2007). Providing information and education improves people's behaviour (Mitchell, 2013). Intelligence is social and people are guided by habits, values and meanings (Mann-Feder & Litner, 2004; Stewart & Gapp, 2018). Sociocultural norms influence the behaviour of people through unconscious and non-rational thinking (Mayo, 1949; Beckhard, 1969; van Manen, 1997b; Mann-Feder & Litner, 2004). Based on these principles, the normative re-educative OD strategy is a participative strategy that creates change through learning (Argyris, 1977a; Revans, 1982; Brook, Pedler, & Burgoyne, 2012). Non-cognitive determinants of behaviour affect values, beliefs, attitudes and relationships at a personal level and sociocultural norms at a group level (Bushe & Marshak, 2009; Ellis, 2019). People improve through mutual support (Argyris, 1970; Revans, 1982; Gapp & Fisher, 2007) and by continually learning from ongoing experience (Chin et al., 1969; Stewart & Gapp, 2017).

The concepts of norms and re-education need to be discussed to understand the process of learning (French et al., 2005; Stewart & Gapp, 2012). The normative re-educative OD strategy empowers long-term improvement by changing cultural norms that affect employees by gradually improving people's behaviour through formal and informal interactions (Middel, Coghlan, Coughlan, Brennan, & McNichols, 2005; Zhang, 2015; Brydon-Miller & Damons, 2019). There are two elements to this model; the *normative* which is the setting of norms through demonstration and the *re-education* which is to create new sets of values and belief (Rogers, 2018).

Re-education is the process of changing a person's cognitive structure, values and belief system, and their actions (Lewin & Grabbe, 1997; Rogers, 2018). This process links to the membership and identification with groups (Coghlan & Jacobs,

2005). When entering a new workplace, new behaviours, values, beliefs and habits need to be interiorised and applied to be part of the community. Re-education is aimed at re-establishing the capacity and intellectual reactions from the person involved which allows the social perception of an individual or group of people to be changed (Duerson Stout, 1925).

The normative re-educative OD strategy takes place through the acquisition of new values and belief systems which need to be freely accepted by the individual (Bakker, 2012). As discussed in section 2.1.5, values need to be changed to manage disruptive change (Christensen & Overdorf, 2000; Grush, 2010; Daim et al., 2011; Yeh & Walter, 2017). The process to acquire the normal or the abnormal is fundamentally alike (Enke & Poskey, 2018) and requires fulfilling a task equivalent to a change in culture (McLaren et al., 2015; Mannion & Davies, 2016). Experience by itself does not create correct concepts; reflection must be brought into the open to test assumptions (Raelin, 2000). Top management cannot force innovation and put it into practice at an individual or group level in a short time (Rise & Steinsbekk, 2016). People need to be educated for innovation to happen (Coghlan & Jacobs, 2005). Attitudes will then start to change leading to the development of new behaviours (Senge, 1994; Schein, 2009; Schein, 2017).

Values and belief systems of people need to align with the purpose of the organisation. Normative re-educative OD is based on motivation, learning and positive affective factors. When managers try to impose a new behaviour without increasing the knowledge and attitude in their employees, resistance to change occurs (Gapp, 2006). Employees are positively committed to change but differentially related to support change (Shin et al., 2012). Most investigations focus on how to manage people while few understand the implications of shifting values inside the managerial level to adapt to the new changes (Bode et al., 2011; Chong, 2014). Attitudes, values and skills can be educated by understanding people's need for satisfaction and realisation (Roos & Van Eeden, 2008). People are inherently active and need to internalise meaning, habits and values. At an organisational level, normative re-educative OD provides development of the structure, institutional roles, relationships, and cognitive and perception orientation (Salam & Alghamdi, 2016; Davidson & Kinneen, 2018). Patterns of action and practice follow sociocultural norms and the commitment to norms. People are then brought to change old normative patterns of orientation to develop new ones. These changes in

orientation create new changes in attitudes, values, skills and relationships (French et al., 2005).

According to Zhang (2015, p. 25) “there is no one single appropriate change strategy”. The normative re-educative OD strategy provides autonomy and growth to the employees inside the system through the development of values and continual learning (Burnes, 2004; Desplaces, 2005). Development is a communication-based and communication-driven phenomenon (Ford & Ford, 1995). Within this model, the direction for innovation comes from the individuals within the process through collaboration and continual improvement (Lepore & Cohen, 1999). Normative re-educative OD provides understanding of the role of humans to create and manage disruptive technology.

Changing behaviours and attitudes of people without increasing their knowledge and attitude leads to resistance to change. Resistance to change is defined by Argyris (1977a) as defensive routines, which explains the reasoning behind communication problems in the workplace, loss of trust and other factors inhibiting learning in organisations. Organisations can avoid defensive routines by increasing collaboration, decreasing their hierarchy and bureaucracy levels and by enabling the flow of information by appointing leaders who operationalise this focus (Stewart & Gapp, 2017).

Within normative re-educative OD, the GFM (Gapp & Fisher, 2007) provides a lens to understand the soft systems involved in the development of disruptive technology. The GFM uses the Discover-Invent-Produce-Generalise Model at a macro level and the Plan-Do-Study-Act (PDSA) cycle at a micro level to understand continual learning (Argyris, 1976; Deming, 1982b; Argyris, 1995). Action science and action learning explain how people can learn by re-educating their values and behaviours through dissonance (Argyris, 1995). Systems thinking involves learning at a group level (Senge, 1990). These concepts are defined and discussed below, leading to the discussion of the GFM.

2.3.4.1. Action science.

Action science is a broad approach to social practice that links human meaning making with the discover of the causal theories of the social world (Papachristos, Kohler, & Halbe, 2018). People hold theories governing their actions which can be changed based on evidence (Argyris, 1995; Dick, 2019). Latent beliefs are examined to

motivate personal and interpersonal relationships to improve individual, interpersonal and organisational effectiveness through the analysis of real-life situations (Raelin, 1997; Coghlan & Jacobs, 2005). Knowledge is created to promote learning among individuals (Friedman & Rogers, 2008; Scott, 2016) through cycles of action and reflection in a personal and interpersonal level (Middel et al., 2005; Coghlan & Brannick, 2014; Sum et al., 2016). Adhering to the rational aims of science provides re-education at an individual and group level (Schön, 1983; Argyris et al., 1985).

Providing knowledge creates new values and behaviours (Gapp, 2006). Transformation at an individual and group level starts by sharing knowledge and changing the attitude through open communication (Argyris et al., 1985). Action science is a strategy capable of explaining phenomena, informing practice, and adhering to the rational aims of science (Schön, 1983; Argyris et al., 1985).

Interpersonal relations are enhanced by building goodwill and negotiating in good faith with others. The culture inside the organisation is influenced by organisational productivity. The corporate culture should promote an ecosystem of interdependent relationships based on trust and communication (Bartels & Wittmayer, 2018; Henriques & O'Neill, 2018). The integration of knowledge promotes learning with and among individuals and systems (Friedman & Rogers, 2008). Managerial effectiveness requires win-win performance and partnership agreements to synchronise persons and the business which can be achieved through negotiations and synergistic agreements with two-way openness (Burrell & Rahim, 2018). Internal cooperation, loyalty to mission and constancy of purpose are the basis for internal unity (Morales, 2019).

Action science uses group participation as a medium of learning. Research, education and action are needed to improve technology, knowledge and patterns of action (Lewin & Minton, 1986). People need to be conscious of their actions to become free (Kris, 1950; French et al., 2005). Agent and client interactions are needed to create this state of consciousness by re-educating self-awareness, self-understanding and self-control. There are five steps to achieve this; (1) emphasise the client's system and his involvement by bringing the problem into a dialogic relationship with the way the agent sees the client and the problem. Then, (2) the problem will lie in attitudes, values, norms and relationships of the client system. The agent (3) will learn to intervene by defining and solving the client's problem. The (4) non-conscious is brought to a conscious state and is publicly examined and reconstructed. Finally (5) these methods need to be used

selectively, relevantly and appropriately by the client and the agent avoiding manipulation and indoctrination of the client.

Action science explains how people develop their norms through dissonance (Argyris et al., 1985) as a process of comparing people's actions with their way of thinking (Hinojosa et al., 2017). Learning occurs by making people conscious of the gap between their theory-in-use and their espoused-theories (Argyris, 1995). The theory-in-use is what people usually do but may not be aware of. Espoused-theories are the mental models which determine how people act (Argyris, 2002) consisting of beliefs, values and attitudes. Finding the gap between a person's theory-in-use and espoused-theories creates dissonance which lead to a change in behaviour (Bokeno, 2003; Bulkley & McCotter, 2017).

The behaviour of individuals and groups of people is guided by theories of action that shape through experience and the interactions of individuals. Through re-education, people are capable of creating an ambience of mutual collaboration and trust, and change their behaviours to those of continual improvement, collaboration and innovation (Stewart & Gapp, 2017). The gap between the theory-in-use and espoused-theory are evidenced in an open environment so that awareness can be created for change to occur (Miller, 2018). Action learning uses reflection to understand the differences between espoused-theories and theory-in-use to create dissonance at a personal and group level (Ossa Parra, Gutiérrez, & Aldana, 2015).

2.3.4.2. Action learning.

Action learning is a process in which a group of people come together to help each other learn (Bloodworth, 2018). The key element inside organisations able to promote innovation is the creativity and ability performed by employees (Saleem, us Saqib, & Zahra, 2015). Education, understanding and sufficient time are needed for learning to occur (Gapp & Fisher, 2007). When proper time is given the implementation process becomes more natural and quicker (Bolden & O'Regan, 2016). "All meaningful knowledge is for the sake of action, and all meaningful action for the sake of friendship" (Revans, 1982, p. 2). Through action, people are capable of learning to solve problems (James & Augustin, 2018) and without action, learning is absent (Coughlan & Coghlan, 2018). Action learning allows collaborative problem solving to alter or educate the values, attitudes and norms of the people involved (Torlone, 2018).

The three main components of action learning are; people, who accept the responsibility for action, problems, or tasks that are acted on, and a group of people, who meet on a regular basis to challenge and support each other to take action and learn (Pedler & Burgoyne, 2008; Dick, 2009, 2019). Development of people is achieved by making the task the vehicle for learning (Argyris, 1970; Deming, 1982a, 1994). Self and group development is promoted through a working philosophy, not a set of techniques or standard practice (Reese, 2018). Human systems are improved for the benefit of those who depend upon it (Stewart, Gapp, & Houghton, 2019a). To overcome an issue people need to improve their problem-solving skills, decision making and implement processes that help them be more effective in these activities (Argyris, 1970). The intervener needs to present valid and useful information allowing free informed choice (Harwood & Eaves, 2018; Newstead, Worch, & Brahier, 2018). Trust, collaboration, innovation and creativity can be enabled through proper intervention using normative re-educative OD strategies (Argyris, 2002; Edmondson, 2015). Faulty organisation learning creates the inability to uncover errors and unpleasant truths (Argyris, 1977b). Missing this capability to learn can result in under or overproduction, faulty manufacturing and other problems which affect efficiency and efficacy.

2.3.4.2.1. *Double-loop learning.*

Social learning provides the means to solve complex problems through stable learning outcomes that enable the build-up of capacities, action, and behavioural change in the long term (Johannessen & Hahn, 2013). Action learning allows the development of people and groups of people to go from a single to a double-loop learning model. Learning loops go through iterative cycles of learning which start when a group's espoused-theories are inconsistent with their theory-in-use (Schön & Argyris, 1996). Learning should be subsumed to a process that allows institutional learning and adaptation of the decision-making elements (Williams & Brown, 2018).

Technical learning relates to single-loop learning (Argyris & Schön, 1978) which occurs when action strategies are changed, but the espoused-theories remain the same. Single-loop learning is both encouraged and easily adopted as is based on error detection and correction in the context of established actions. Dick (2009) uses cruise control as an example to explain the difference between single and double-loop learning. Single-loop learning is activating the cruise control to a certain speed where the car will only adjust the speed to attain the desired speed (Davies & Nutley, 2005).

Double-loop learning is changing the goals, frames, assumption, values and standards for performance (Peek & Stam, 2019). Applied to the previous example, double-loop learning implies using other information including surrounding cars or traffic lights to decrease the speed to a new desired speed.

Double-loop learning takes place when errors are recognised and corrected by the questioning and challenging of the underlying assumptions. Underlying assumptions can be corrected through re-education of goals, frames, assumption, values and standards for performance (Peek & Stam, 2019). Re-interpreting goals, frames, and values allow re-education of people (Williams & Brown, 2018). The main difference is the consideration of new situations that are difficult to fit into existing patterns and schemes. Learners need to educate themselves and understand or accept something that is significantly different (Illeris, 2009). Learning outcomes concern changes in the organisation's knowledge base, new objectives, or new policies (Argyris, 2002). Double-loop learning arises from exploration, which instead of only trying to correct an error, requires innovation that could prevent the error from happening in the first place.

2.3.4.3. Systems thinking.

Learning at a group level requires a holistic understanding of the organisation. The fifth discipline of Senge (1990) provides a systemic view or holistic view of the organisation. A holistic view provides understanding of the relationships inside an organisation and how a complex system works by synthesising how all of its parts are interconnected (Flood & Romm, 2018; Örtenblad, 2018). Understanding how all parts of the system interact means dealing with an increasing number of variables and complexity within the system. This complexity provides a method for describing, analysing and planning complex systems to understand complex real-world problem. Systems thinking shifts away from narrowing the focus to one particular department and instead expanding it to many parts that impact upon one another (Jambekar, 2000). By expanding the focus, further understanding of the relationships and the processes which makes up the organisation's context is created.

Systems thinking focuses on engaging and co-creating the meaning of different aspects of the world (Romm, 2015). Engagement and co-creation provide the means to understand the dynamics inside organisations improving employee's ability to innovate (Ackoff, 1994). Gathering different perspectives into a problem and prioritising them is a common characteristic of learning organisations (Flood & Romm, 2018). Through

engagement and co-creation, employees and managers can understand the dynamic relationship between different departments and activities. Collective reflection and learning are created through a holistic understanding of the organisation. By understanding the significance of having a holistic view of the organisation and how to educate people through double-loop learning, the next section describes learning organisations that implement these ideas to keep learning.

2.3.4.3.1. *Learning organisations.*

Learning organisations are continuously able to adapt, change and renew how they operate (Ranta, 2018). Through re-education based on past experience and challenges in the market, organisations can use double-loop learning and systems thinking to foster learning (Argyris & Schön, 1978; Osborn, 1982). Individual learning is not sufficient; group learning is necessary for organisational learning, where learning is encouraged at an organisational and personal level (Micic, 2015). The organisation needs to be a facilitator of this process by supporting or arranging group learning activities (Ala-Laurinaho, Kurki, & Abildgaard, 2017). Knowledge and insights are created, acquired, and transferred by integrating people and structures leading to continuous learning and change. Learning needs to be ongoing, or continuous for the organisation as discussed below (Namada, 2018).

2.3.4.4. *Continual improvement.*

Continual improvement provides the means to learn and innovate (Deming, 1982a). An organisation is a shared system comprised of interdependent relations (Mupepi, Mupepi, & Motwani, 2019). Communication needs to be continually encouraged inside organisations to create dissonance and actuate double-loop learning (Lepore & Cohen, 1999). The systemic nature of an organisation needs to be understood by discovering the profound causes of the problem by looking at the processes, not their result. Personal mastery is one of the practices of learning organisations (Senge, 1990), which requires individual's needs to be catered with the aim of improving group work. Developing individual skills creates an opportunity for the organisation to learn. The culture needs to have a desire for continuous improvement (Hill & Wilkinson, 1995). Learning and continual improvement can be actuated through the PDSA cycle.

The PDSA cycle enables knowledge to be gained through cycles of continual improvement (Deming, 1982b). This cycle of improvement can be used to improve

processes in a cyclical manner (Stewart, Houghton, & Burns, 2019b). In the first step, ‘Plan’, a structure for the process is created. At this stage, there is no need to have a perfect process, but a start which then can be improved. The second step, ‘Do’, is the implementation of the plan. During this stage, the process is performed as defined in the planning stage. Then comes ‘Study’ where the process is meticulously analysed to find places where improvement can be created. Finally, ‘Act’ refers to the process of creating changes required to improve those points that need improvement (Gapp & Fisher, 2007; Donnelly & Kirk, 2015). The PDSA quality improvement methodology is “designed to achieve real-world change by repeated practice-improvement cycles. A learning curve exists through numerous cycles of PDSA leading into optimal change” (Cartwright et al., 2017, p. 1). The PDSA cycle is used as a micro model within the GFM to explain the importance of continual improvement at every level of the GFM.

2.3.4.4.1. *Discover-Invent-Produce-Generalise.*

Argyris’ Discover-Invent-Produce-Generalise explains the process of new knowledge development through a process of continual improvement (Argyris, 1976, 1995). Learning involves *discovering* a problem, *inventing* a solution, *producing* the invention and *generalising* the learning outcomes to other settings (Argyris, 1976). *Discover* is where knowledge is identified (Biswas, 2011). Awareness is created during the first stage through feedback and reflection (Namada, 2017; Reddick et al., 2017). *Invent* is where knowledge and understanding are synthesised and the process of learning and understanding start. Then comes the *produce* phase when action takes place; strategies and practices are developed. This is the stage where a product is created. Finally, the *generalise* phase occurs when the process is internalised and operationalised (Gapp et al., 2005; Holten et al., 2015). During the generalise phase, the knowledge can be applied to other fields. The following quote from Argyris explains how experience leads to learning:

No matter how much formal education and training people receive, they will not really be equipped for a position of responsibility unless they have the ability to learn from their experience (Argyris, 1976, p. 8).

The Discover-Invent-Produce-Generalise model represents a continual cycle, where feedback informs espoused-theories and creates double-loop learning. Attaining

generalisation is not the final goal, but part of a new cycle of new knowledge development. The Discover-Invent-Produce-Generalise Model is used as a macro model in the GFM to understand the process of learning.

2.3.4.5. Gapp-Fisher Model (GFM).

The GFM uses the Discover-Invent-Produce-Generalise model, the PDSA cycle and action learning to explain learning inside organisations (Gapp & Fisher, 2007; Stewart & Gapp, 2018). Through the application of concepts from Deming (1994) and (Argyris, 1995), the GFM explains how people and groups of people learn, which is achieved within an environment of collaboration, cooperation and participation. This model complements Senge's (1994) learning organisations in relation to understanding the system as a whole, highlighting the importance of systems thinking, within a process of continual learning as a method of improvement. The GFM explains how concepts in thought-form (espoused-theories) move through the transformation zone (from concept to reality) towards the end-used application (theory-in-use) (Figure 5) (Nowak & Ladyshewsky, 2000; Bulkley & McCotter, 2017). The introduction of the transformation zone provides understanding of how espoused concepts become theory-in-use, which occurs through deeper understanding of the problem (Stewart & Gapp, 2018).

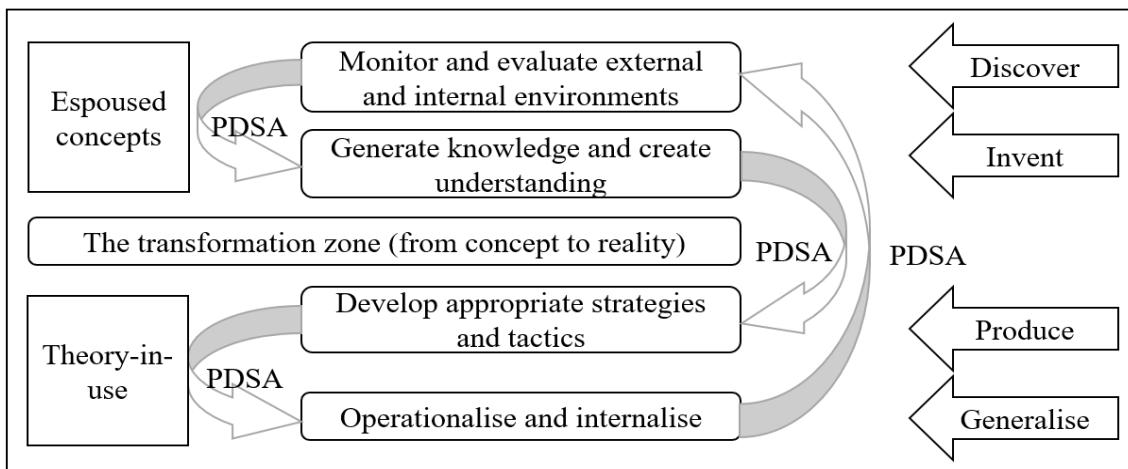


Figure 5. Gapp-Fisher Model (Gapp & Fisher, 2007, p. 618).

The GFM provides a doorway to enable inclusion of the people dimension (Gapp & Fisher, 2007) by creating the means to understand internal learning and development. Learning and development is achieved through ongoing PDSA cycles

(micro level) in each step of the Discover-Invent-Produce-Generalise model (macro level) which creates cycles of continual learning. Using the GFM provides the means to understand the transition from idea to reality of disruptive technology through the ongoing cycles of learning.

2.4. Study Rationale and Research Questions

The transition zone within the GFM can be used to understand how to manage the process of creating disruptive technology. The process and resource view found in disruptive technology has a low emphasis on human dynamics and soft systems thinking (Zheng et al., 2017). Disruptive technology uses a mechanistic model that misses the human component where involvement, learning and adaptive processes are required to create, manage and innovate (French et al., 2005). Disruptive technology excludes the soft systems which require management and identification of different stakeholders (Checkland & Winter, 2006; Farag & McDermott, 2015). The lack of understanding of human development can be challenging as the understanding of innovation occurs within the context of people's needs and behaviours (Gapp, 2006).

The GFM provides a lens to understand the human component, more specifically; *how* and *why* disruptive technology is developed (Gapp & Fisher, 2007). The transformation zone provides the means to investigate how espoused-theories become theory-in-use through double-loop learning within organisations (Williams & Brown, 2018; Peek & Stam, 2019). The GFM provides a lens to explore multiple successful disruptive technology businesses.

Through the analysis of disruptive technology, a gap in terms of understanding the importance of people in the development of disruptive technologies within the disruptive technology literature was identified specifically in the area of normative re-educative OD. This gap provided an opportunity to understand the transition of disruptive technology from idea to reality focusing on 'soft' factors. More specifically: what are the roles of relationships, values and beliefs in people working towards the attainment of disruptive technologies, and how why the role of people in understanding disruptive technology is essential for effective innovation. The primary research question: '*How in OD terms is the role of people understood in managing disruptive technology?*', seeks to understand the value of people in OD terms during the development of disruptive technologies. The secondary research questions unpack and further elaborate the primary research question:

- *'How is disruptive technology managed through a normative re-educative OD lens?'*
- *'Why does normative re-educative OD provide values to effectively intervene disruptive technology?'*
- *'How can normative re-educative OD provide values to effectively manage and sustain disruptive technology?'*

The first secondary research question seeks understanding of the relevance of normative re-educative OD theories including systems thinking, action science, continual improvement, and the GFM in the development of disruptive technologies. The second secondary research question seeks to investigate the importance of managing the soft systems within disruptive technology by exploring the values normative re-educative OD offers. Finally, the third secondary research question explores the significance and how to use normative re-educative OD strategies to manage the development of disruptive technology.

The theoretical implications of this research include filling the knowledge gap in disruptive technology to understand the soft systems required to manage disruptive technology. This research will broaden the understanding within disruptive technology strategies to better understand how to manage this process through the GFM lens, and will broaden the use of normative re-educative OD strategies to help the development of disruptive technology, which provides a new area where this knowledge can be applied.

The practical implications include the opportunity to create a better understanding of the process of managing disruptive technology, which provide innovators with new tools to manage this process. In other words, by understanding the soft systems required to manage disruptive technology – which will be investigated through the GFM, innovators will be capable of creating better strategies for the management and sustaining of the disruptive technology process, through strategies that promote technological development inside the organisations.

2.5. Conclusion

The literature on the radical end of innovation and the literature on normative re-educative OD were discussed in this chapter. Radical innovation, disruptive innovation, disruptive change and disruptive technology were discussed to justify the use of disruptive technology for this research. Disruptive technology has a strong resource and

process based focus (Wessel & Christensen, 2012; Christensen & Van Bever, 2014; Christensen et al., 2016a; Karimi & Walter, 2016; Dedeayir et al., 2017; Ramdorai & Herstatt, 2017), with little understanding of the soft systems needed to manage this process (Christensen & Van Bever, 2014; Sheep et al., 2017). Within this context, a gap was found in terms of understanding the human dynamics needed to manage disruptive technology (Church, Burke, & Van Eynde, 1994).

Normative re-educative OD, a participative strategy within OD, creates change through action learning and continual improvement (Argyris, 1977a; Revans, 1982; Brook et al., 2012). These changes affect values, beliefs, attitudes and relationships at a personal level and sociocultural norms at a group level (Chin et al., 1969). Normative re-educative OD provides the underpinnings of learning and improving which allows organisations to work in a soft systems manner. Within normative re-educative OD, the GFM was introduced to explore the gap found in disruptive technology, which will create a better understanding of the soft systems and learning required to manage disruptive technology. The next chapter describes how the research was conducted following a qualitative methodology, which allows exploration of the primary research question '*How in OD terms is the role of people understood in managing disruptive technology?*'.

Chapter 3: Methodology

The literature review identified the following gap in the research: a clear understanding of the human collaboration, cooperation and participation required to effectively manage disruptive technology (Christensen et al., 2015; Stewart & Gapp, 2018). A qualitative interpretive methodology following the abductive approach was chosen to explore this knowledge gap. Interpretivism helps understand how participants make sense of their reality (Saunders, Lewis, & Thornhill, 2011; Snyder, 2012; Yin, 2015). In this context, the qualitative approach provides a deeper understanding of reality through interaction and collaboration between participants and the researcher (Cassell & Gummesson, 2006; Stewart, Gapp, & Harwood, 2017). Phenomenology is a qualitative approach that provides a methodology to understand the essence of the role of people (Laverty, 2003; Denzin & Lincoln, 2011). Case study provides the boundaries for the research to investigate disruptive technology through semi-structured interviews and observations. The methodology detailed in this chapter is used to seek understanding and answer the primary research question: ‘How in OD terms is the role of people understood in managing disruptive technology?’, and the following secondary research questions:

- *How is disruptive technology managed through a normative re-educative OD lens?*
- *Why does normative re-educative OD provide values to effectively intervene disruptive technology?*
- *How can normative re-educative OD provide values to effectively manage and sustain disruptive technology?*

Following the justification for the methodology, triangulation of methods (semi-structured interviews and observations) and triangulation of data are justified to increase trustworthiness and credibility (Yin, 2014). Semi-structure interviews and observations are then justified and detailed. Finally, ethical considerations following Griffith University regulations are discussed.

3.1. Philosophical Paradigm

The ontological assumption that people make sense of reality in multiple, intangible mental ways (Burrell & Morgan, 1979; Pereira, De Sousa, Shigaki, & Rezende, 2017) and the epistemological assumption that people transmit experiences in different ways based on underlying personal values are the underlying philosophical assumptions followed in this research (Burrell & Morgan, 1979; Yin, 2011). To make sense of the participant's reality, the researcher needs to occupy the frame of reference of the participant by immersing themselves into their reality through interaction and reflection (Beecher, Devane, White, Greene, & Dowling, 2018; Goldman, Turner, & Daly, 2018).

There are three dominant research paradigms in social science; positivism, critical and interpretivism (Neuman & Kreuger, 2003; Blaikie, 2007; Creswell & Poth, 2018). Positivism separates meaning from consciousness to provide an objective understanding of a phenomenon through a structured approach where facts have more relevance than values (Crotty, 1998; Merriam, 2002; Deltour, 2012; Lagoarde-Segot, 2015; Hasan, 2016). The structured approach of positivism is not in line with the explorative nature of this research which aims to understand the values and beliefs of the participants (Denzin & Lincoln, 2005; Adams & Lawrence, 2018; Bergman & Lindgren, 2018; Kiernan & Hill, 2018). The critical paradigm creates meaning from cultural, social and historical problems in their natural context leading to change and transformation (Creswell & Miller, 2000; Neuman & Kreuger, 2003). Understanding how to manage disruptive technology applies to different contexts, which means that a cultural or historical focus is not in line with the aim of this research.

Interpretivism provides an understanding of social reality through human interaction allowing the researcher to make sense and create a rich description of how the participants understand reality (Geertz, 1973; Chua, 1986a; Bernard, 2000; Kreuger & Neuman, 2006; O'Donoghue, 2007). Experience shapes how people comprehend, give meaning and interact with the world around them (Guba & Lincoln, 1994). Meaning is created by understanding different realities and motives through a participatory environment of co-construction (Richardson, 2005; Stewart et al., 2017). Elucidations of how people act and behave inside disruptive technology businesses is gained through collaboration between the researcher and the participants (Burrell & Morgan, 1979; Neuman & Kreuger, 2003; Goldkuhl, 2012; Woods, Gapp, & King, 2015). The path from interpretivism leads to using the abductive approach (Neuman &

Kreuger, 2003; Gibbs, 2015). Figure 6 highlights the paradigm chosen for this research and how interpretivism links to the selected of the approach, methodology and method. In this chapter, figures like Figure 6 provide a visual guide for the structure of the methodology.



Figure 6. Choosing interpretivism (Adapted from Saunders, 2011, p. 108).

3.1.1. Creating knowledge: abductive approach.

There are three approaches for knowledge creation; inductive, deductive and abductive (Figure 7) (Spens & Kovács, 2006; Woiceshyn & Daellenbach, 2018). Knowledge advancement requires a process of conscious scientific reasoning. The deductive approach moves from theory to data to explain causal relationships between variables in a specific instance, which follows positivism to empirically test hypotheses where the researcher is independent of the research, which is not in line with the explorative nature of this research (Hyde, 2000). The inductive approach uses findings as mechanisms to develop theory through observations of the empirical world and the formulation of concepts to explain the observation (Hodkinson, 2016; Holloway & Galvin, 2016). The exploratory nature of this research is not in line with having pre-conceived interpretations of reality to test them as reality is co-created between participants and the researcher (Spens & Kovács, 2006).

The abductive approach creates new knowledge by encouraging creativity or intuition through a ‘back and forth’ direction within an empirical study (van Maanen, Sørensen, & Mitchell, 2007). Meaning is co-constructed through the continuous interplay between existing theoretical knowledge and real-life experiences of the participants (Blaikie, 2007; Green, Kao, & Larsen, 2009). Knowledge is created through collaboration between the researcher and the participants (Spens & Kovács, 2006; Stewart et al., 2017). After selecting the approach for knowledge creation, the research approach is discussed in the following section.

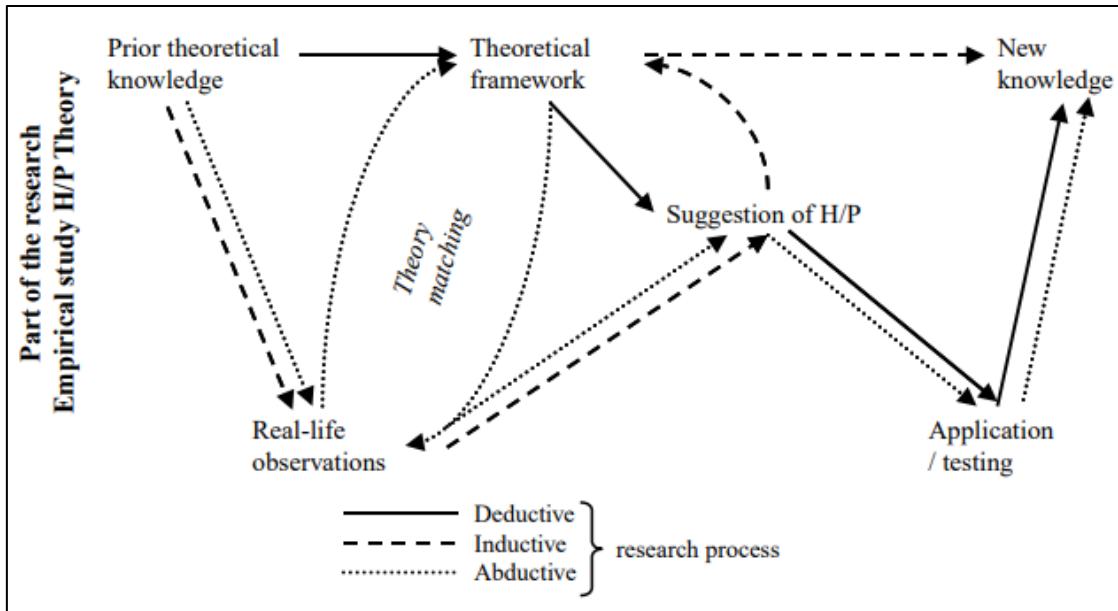


Figure 7. Abductive research approached (Spens & Kovács, 2006, p. 376)

3.2. Research Approach

There are three main ways to conduct research; qualitative, quantitative and mixed methods. The quantitative approach focuses on developing theory through experiments (Punch, 2013). These experiments use an etic approach (outsider) which limits the interaction with participants and decreases the ability to understand meaning and purpose for the action of the participants (Watson, 2015; Akhtar, Dolan, & Barlow, 2017). When the phenomenon is not fully understood, the qualitative methodology should precede the quantitative methodology to gain knowledge of ‘what’ needs to be tested (Cavana, Delahaye, & Sekaran, 2001; Zikmund, 2003).

Qualitative research is used to develop new theory through an exploratory and reflective approach which seeks to answer *how* and *why* questions through the relationship and context of the phenomena under study (Denzin & Lincoln, 2005; Braun & Clarke, 2006; Yin, 2014). An exploratory approach provides understanding of how people relate to their environment, how they feel, what they believe and how they interpret it (Locke, Spirduso, & Silverman, 2000; Sandelowski, 2000; Branson, Turnbull, Dry, & Palmer, 2018). The qualitative approach, therefore, was chosen following interpretivism to explore the collaboration, cooperation and participation required in the disruptive technology process (Figure 8) (Perry, 1998; Cepeda & Martin, 2005; Hammarberg, Kirkman, & De Lacey, 2016).



Figure 8. Choosing between qualitative, quantitative and mixed methods (Adapted from Saunders, 2011, p. 108).

Qualitative research is often challenged for its methodological imprecision and lack of rigour (Glaser & Strauss, 1966; Dubois & Gadde, 2002; Bryman, 2008). The strengths of qualitative research are in the richness and depth of analysis gained through reflection and co-creation of knowledge (Dick, 1999; Alasuutari, 2010; Cassell & Bishop, 2019). Richness and depth are gained by creating trustworthiness and credibility between the researcher and the participants (Stewart et al., 2017; Phoenix et al., 2018; Cassell, Radcliffe, & Malik, 2019). This interaction allows gaining a better understanding of the participant's reality (Neuman & Kreuger, 2003; Cassell & Gummesson, 2006).

3.2.1. Methodology.

Following the selection of the research approach, the research methodology needs to be selected. Qualitative research methodologies include narrative, phenomenology, grounded theory, ethnography and case study (Flick, 2014; Merriam, 2015; Yin, 2015; Butler-Kisber, 2018; Creswell & Poth, 2018; Merriam & Grenier, 2019). The aim of this thesis is to explore the role of people within disruptive technology. As the aim is not to explain the story of a person or group of people, the narrative methodology is not used. Grounded theory helps create new theories through constant comparison as well as intermittent discussion with a group of people to understand their perception of reality (Easterby-Smith, Thorpe, & Jackson, 2002; Corbin & Strauss, 2014; Thornberg, 2017). As this research is using normative re-educative OD to understand disruptive technology, grounded theory methodology is not appropriate for this research (Glaser & Strauss, 1967; Stern, 1980; Strauss & Corbin, 1994). Ethnography aims at understanding a group of people and requires immersion into the community to understand their values and the way they understand their world (Easterby-Smith et al., 2002; Shah, 2017). Ethnography studies the values and behaviours of a community through direct and sustained social interaction (Willis &

Trondman, 2000; Tedlock, 2005). In this research, participants come from varying backgrounds or have different professions, therefore, ethnography does not fit.

Phenomenology is a qualitative approach that explores how people experience real-life situations, which originates from the fields of psychology and philosophy from scholars such as Husserl (Jennings, 2005) and Schutz (Burrell & Morgan, 1979). Exploring the experiential, practical and instinctive is gained by understanding ‘how’ the phenomenon occurs rather than ‘what’ occurred (Dahlberg, 2006; Standing, 2009; Lewis & Staehler, 2010). Through participant’s stories, the researcher can discover vivid descriptions of human experience as they were lived in the context of space, time, body and human relationships (van Manen, 1997b; Lopez & Willis, 2004; Finlay, 2009). Stories provide an understanding of shared meaning (Merleau-Ponty, 1945; Heidegger, 1953; Husserl, 1970; Crotty, 1998). Through common meaning, the essence can be gained, which explains the core meaning of the phenomenon (Moustakas, 1994; Johnson & Armour, 2018).

Within phenomenology, hermeneutics provides approach, following interpretivism, aimed at understanding reality as subjective (Gadamer, 1960; Sloan & Bowe, 2014). The hermeneutic phenomenology follows interpretivism through an abductive approach to understand the essence of the disruptive technology phenomenon (Figure 9) (Matua & Van Der Wal, 2015; van Manen, 2016). Hermeneutic phenomenology creates an understanding of lived experience (phenomenology) together with reflective interpretations of texts (hermeneutics) (Friesen, Henriksson, & Saevi, 2012; van Manen, 2016). Interpreting texts means analysing interviews and observations to gain understanding and meaning of the phenomenon. Knowledge is created by entering the participants’ world to discover wisdom, possibilities, and the essence (Polit & Beck, 2008). Interpretation starts by immersing into the data and becoming part of it, seeking to understand the process and the meaning of being an innovator (van Manen, 1990). The enquiry should be guided by the lived time, space, body and relationships (Larsen, Hall, Jacobsen, & Birkelund, 2018). People who have experienced the phenomenon participate in interviews to share their experience through stories. Meaning is co-created by research and participant through reflexion and intersubjectivity (Armour, Rivaux, & Bell, 2009). Rich and deep understanding of the participants lived experiences are gained through an attentive atonement and open-mindedness (Philipsen, Tondeur, Pynoo, Vanslambrouck, & Zhu, 2019).

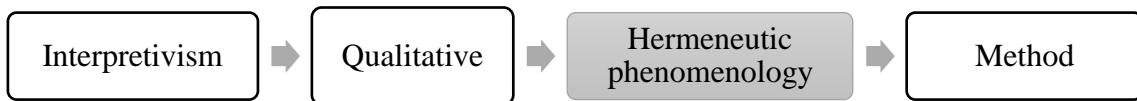


Figure 9. Outline of the methodological framework (Adapted from Saunders, 2011, p. 108).

Creating deep and rich understanding needs to go beyond describing the accounts of lived experiences and search for the meaning gained through the storytelling of the participants (Lopez & Willis, 2004). The researcher plays a critical role in interpreting the stories of the participants. Following hermeneutic phenomenology, a person cannot bracket their own experience, pre-conceptions, and theoretical learning. Consciousness cannot experience itself in the absence of the world (Lewis & Staehler, 2010). Individual's reality is influenced by the surrounding world (Neubauer, Witkop, & Varpio, 2019). Correct interpretation occurs through the researcher's placement in the world of the innovator (Laverty, 2003). Contextualising participant's stories into the researchers own life experience creates enhanced understanding and meaning of the phenomenon (Heidegger, 1953; Lewis & Staehler, 2010).

A vocabulary was developed by Heidegger (1962) to understand phenomena including *dasein*, *thrown-ness*, and *coming to a clearing*. *Dasein* refers to the ordinary activities of human existence, which seeks to understand the meaning of existence (Absher, 2012). Understanding the world and how to adapt to it is an essential part of human consciousness. *Thrown-ness* explains the process of managing a problem that is beyond *dasein* control. When the context changes, an understanding of how to act, react and manage relationships no longer exists. The researcher needs to understand how innovators manage thrown-ness when developing disruptive technology which inherently change the reality of the world. *Coming to a clearing* means getting a real understanding, which for innovators, involves the obtainment of enlightened understanding regarding the development of the technology and the importance of the people around them. True understanding occurs when the innovators obtain a correct interpretation of the process, its impact, and their resulting reactions.

Conducting hermeneutic phenomenology presents some challenges, including that there is no specific method to conduct the research (Gadamer et al., 2004). The lack of specific method creates challenges, a problem which van Manen (1997b, 1997a,

2016) has tried to explain. This challenge adds to the difficulty in comprehending the philosophical underpinnings of phenomenology (Caelli, 2001). To compensate for the imprecision of method, case study is used to explain the method for this research (Siddique, 1990; Thompson, Noë, & Pessoa, 1999; Yin, 2014).

Stake (1995, 2013) and Yin (2003, 2017) provide ways to ensure the exploration of the essence of the phenomenon through case study, by understanding a phenomenon in its real-world context. Case study is better used when the researcher has little or no control over the events, and the focus is on a contemporary phenomenon (Yin, 2011; Clevenger & Simon, 2018). Following interpretivism, knowledge is built from contemporary events (Macpherson, Brooker, & Ainsworth, 2000; Gummesson, 2003; Yin, 2014). A deeper understanding of the role of people inside disruptive technology businesses can be gained using case study (Yin, 2014), which has been used in the past to gain insight into disruptive technology in information systems (Walsh et al., 2002; Lyytinen & Rose, 2003), understand innovation (Minshall, Seldon, & Probert, 2007) and business model innovation (Li, 2009; Habtay, 2012).

There are three categories of case study: *explanatory*, *descriptive*, and *exploratory* (Yin, 2003). *Explanatory* case studies aim to answer a question to explain a causal link in real-life interventions and are used to explore a phenomenon without a clear set of outcomes (Baskarada, 2014). *Descriptive* case study aims at describing a phenomenon and the context where it occurred (Baxter & Jack, 2008). In this research, the exploratory case study aims at reflecting, understanding and making sense of the phenomenon following the hermeneutic phenomenological methodology (Issa, Bulushi, & Zadjali, 2016). *Exploratory* case study analyses contemporary circumstances to answer *how* and *why* research questions (Yin, 2014). *How* questions are exploratory and help gather new information, while *why* questions are explanatory and are used to probe and get further insight into each topic.

One of the pitfalls associated with case study is in it being too broad or with too many objectives as a consequence of not placing boundaries around the cases (Baxter & Jack, 2008). A deeper understanding of real-life situations can be gained through the creation of boundaries (Cassell & Symon, 2004; Hancock & Algozzine, 2011) of time and place, time and activity, and by definition and context (Stake, 2013; Creswell & Creswell, 2017). Boundaries indicate the breadth and depth of the study.

The unit of analysis provides the boundaries to perform exploratory research inside a bounded context (Miles, Huberman, Huberman, & Huberman, 1994). A single

case study was chosen as the context is the same for all the participants (Baxter & Jack, 2008; Gustafsson, 2017; Ridder, 2017). In this research, the unit of analysis is understanding the role of people within disruptive technology. The geographical and population restrictions justify the use of case study methods when a small number of participants are available (Herstatt & Von Hippel, 1992). There are very few disruptive technology business examples in Australia (Njie & Asimiran, 2014; Reddy, 2015). These businesses are hard to find as they are still in the process of development, or they cease to exist following acquisition by a larger organisation or have not disclosed the technology to the public. The difference between sustaining and disruptive technology, discussed in Chapter 2, helps understand the limited number of examples. An analysis was performed to identify businesses that fit the definition of disruptive technology. Government institutions and large organisations are excluded from the research as they represent large organisations and, following the definition, cannot inherently develop disruptive technology as they are in the period of maturity or flexibility. Following the discussion of the boundaries for this research, the way in which a true perception of participant's reality is gained needs to be discussed.

3.2.2. Understanding reality.

Qualitative research suffers from different challenges such as repeatability, making a correct representation of the interaction and the clash in the social agendas of the interviewer and the interviewee (Potter & Hepburn, 2005; Berg & Lune, 2017). The reliability of the data when doing qualitative research can be affected by the subjectivity of the researcher and the multiple views of reality presented by the participants (Eisenhardt, 1989; Yin, 2015; Black, 2018). Comparison helps validate results and ascertain trustworthiness and credibility (Stake, 2003).

Triangulation is used to compare multiple data sources, e.g., different participants, which increase richness and depth while reducing the subjectivity of the researcher itself (Neuman & Kreuger, 2003; Denzin & Lincoln, 2005; Patton, 2005). In addition to using triangulation of data sources, using multiple data collection methods reduces the risk of misinterpretation (Knafl & Breitmayer, 1991) and enhances the accuracy of the interpretation (Denzin & Lincoln, 2005; Creswell & Creswell, 2017; Flick, 2017). This thesis uses two methods of data collection; interviews and observations.

Understanding reality through interpretivism is a complex journey of enriched discovery which improves the ability of the researcher to absorb and immerse into the research questions and the reality of the participants (Stewart et al., 2017). Depth and rigour can be obtained through reflection and co-creation of knowledge between the researcher and the participants (Ugwu, 2017). The researcher needs to first understand the world before attempting to understand how others perceive reality (Stewart et al., 2017). Reality is understood by seeing it from multiple sources and forms (McCusker & Gunaydin, 2015). Understanding of reality occurs through openness during the data collection and analysis process (Anderson, 2010; Ellingson, 2017), where new findings are created through reflection (Lemon, 2017).

Trustworthiness is the creation of confirmability, which is created through ongoing processes of absorption, reflection, interaction, analysis and interpretation (Ang, Embi, & Md Yunus, 2016). Increasing trustworthiness and credibility is a crucial aspect of interpretivism to create rigour (Neuman & Kreuger, 2003; O'Donoghue, 2007; Kornbluh, 2015). Data can be falsified, creating an incorrect interpretation of the phenomena (Lincoln, 1995). Misinterpretation needs to be acknowledged and can be reduced by building trust and credibility with the participants (Patton, 2005; Runeson & Höst, 2009; Creswell & Poth, 2018). Trustworthiness and credibility rely upon transparency, methodical-ness, focus and adherence to evidence (Yin, 2011; Corbin & Strauss, 2014). Transparency is gained by creating a thick description of every account of the research process (Tracy & Hinrichs, 2017). Focus is maintained through continual review of the research questions. Adherence to evidence is the process of step-by-step documentation of the data (Stewart et al., 2017). After understanding how to increase rigour, the following section discusses the criteria for participant selection (Lemon, 2017).

3.2.3. Participants.

Using a single case study helps create themes and issues which can be further analysed (Stake, 1995, 2005, 2013). Owners and Chief Executive Officers of disruptive technology businesses participated in interviews and observations (Figure 10). Following interpretivism, each participant creates their realities differently (Guba & Lincoln, 1994; Willis, Jost, & Nilakanta, 2007; Fetterman, 2010). The variety of participants allows in-depth understanding and analysis of information and comparison

as well as a cross-case analysis where themes and issues are analysed (Stake, 1995; Yin, 2011).

A purposive technique was used to find participants inside businesses that displayed the attributes of disruptive technology (Patton, 2005; Merriam, 2015). For this initial stage, the Austrade Government report of Australian Disruptive Technologies (Austrade, 2017) was used to find small to medium companies within Australia that have developed disruptive technology. The selection of people to participate in the research is purposeful and involves the use of logic following the conceptual framework developed in the theory of disruptive technology.



Figure 10. Interviews and observations

The snowballing technique was then used to gather new participants through recommendations of previous participants until saturation was reached (Biernacki & Waldorf, 1981; Palinkas et al., 2015). Snowballing is useful when the focus of the study concerns a relatively private matter; in this case, access to owners of successful innovative businesses. The snowballing technique allowed access to hidden companies and people for which contact information was hard to obtain (Sadler, Lee, Lim, & Fullerton, 2010). New businesses outside mainstream research were located to uncover a new understanding of the disruptive technology phenomenon (Heckathorn, 1997; Atkinson & Flint, 2001).

The number of interviews was increased until theoretical saturation of data was reached (Mason, 2010). The businesses were initially selected in South East Queensland and expanded to Sydney, Melbourne and Perth to increase the number of potential participants to reach saturation. There is no exact way of determining the required number of participants in qualitative research and a common criticism of qualitative research is that the low number of participants does not allow for generalisability (Denzin & Lincoln, 2005; Swanborn, 2010). “Theoretical saturation generally occurs between 10 and 30 interviews” (Marshall, Cardon, Poddar, & Fontenot, 2013, p. 15). Interviews were added until saturation, (Perry, 1998) which was achieved when no more new information was generated from additional participants (Fusch & Ness, 2015).

3.2.4. Semi-structured interviews.

Face-to-face semi-structured interviews using open-ended questions were used to gain a rich understanding of how participants understand the process of creating disruptive technology (Perry, 1998; Yin, 2011). Within hermeneutic phenomenology, semi-structured interviews help explore and gather stories of lived experiences, where the enquires are guided by lived time, space and relationships (van Manen, 2016). Open-ended questions encourage a conversation where the participant is encouraged to tell their stories in a relaxed manner (Morse, 1995; Minichiello, Aroni, & Hays, 2008) by creating a conversational relationship with the participant to understand the essence (van Manen, 1997a).

Interaction between researcher and participants needs to simulate an everyday conversation (James, Milenkiewicz, & Bucknam, 2007). Follow-up questions, probes and prompts were used to gain richer understanding of the research question and to keep the conversation focused (van Manen, 1990; Barriball & While, 1994; Tracy, 2012). A list of ‘Interview Questions’ (Appendix A) was created to reflect and answer the research questions as the interviews proceeded (Yin, 2015), and served as a reference tool to focus the interview if the conversations departed from the purpose of the research (Creswell & Creswell, 2017). The researcher allowed the phenomenon to present itself naturally, rather than forcing it (Finlay, 2008). Deeper discussion of the phenomenon was achieved through observations (Polkinghorne, 1989; Dahlberg & Dahlberg, 2019).

3.2.5. Observation (researchers journal).

The observation technique was used during and after the interviews (Jorgensen, 2015). Field notes can reveal information that includes uncomfortable aspects that participants do not want to discuss (Creswell & Poth, 2018). This form of data collection requires taking notes of important parts of an event under study. Observations have been used in social sciences to study the customs and habits of different cultures across the world (Easterby-Smith et al., 2002). Notes were created of everyday activities as they occur inside the businesses before, during and after the interviews (Guba & Lincoln, 1994; Tracy, 2012). The researcher’s journal was also used to make notes during the data analysis phase, where the researcher, through reflection, was immersed into the participant’s reality to understand their view of the world. Gaining rich data of

personal behaviour covering events in real time and in the context of the case outweighs limitations such as time and costs of making observations (Yin, 2014).

3.3. Ethical Considerations

To protect participants from vulnerability, privacy considerations of the organisation and its employees need to follow ethical regulations. These regulations aim to protect the autonomy of participants to protect them from the exploitation of their vulnerability. Ethical clearance was gained following the Griffith University procedure to respect the dignity of participants (GU Ref No:2017/948) (Appendix B). Interviews were scheduled through email and confirmed by phone when necessary no less than 24 hours beforehand. Before the interview, each participant received the ethical clearance form and the information sheet outlining the purpose of the research. Informed consent ensured that participants understood their involvement in the study. Each participant signed the ethical clearance form following Griffith University's regulations. Authorisation for the use of the data gained through the interviews was required, including protection of the individual's identity. Participant's names were not recorded, and instead, each was assigned a code to protect their identity. All participants had access to the findings and discussion at their request.

3.4. Conclusion

Following the identification of a gap in Chapter 2 in terms of understanding the collaboration needed to manage disruptive technology (Christensen et al., 2015; Stewart & Gapp, 2018), a qualitative methodology following interpretivism and the abductive approach were justified to explore how participants make sense of their reality (Saunders et al., 2011; Snyder, 2012; Yin, 2015). A qualitative approach provides a deeper understanding of reality through interaction and collaboration between participants and the researcher (Cassell & Gummesson, 2006; Stewart et al., 2017). Within the qualitative approach, hermeneutic phenomenology provides a methodology to understand the essence of the role of people through reflection (Laverty, 2003; Denzin & Lincoln, 2011) and case study provides the boundaries for the research to investigate disruptive technology through semi-structured interviews and observations.

In this chapter, the justification for the methodology follows interpretivism and the abductive approach, which seeks to understand reality through collaboration between the researcher and the participants to investigate and address the research

question: '*How in OD terms is the role of people understood in managing disruptive technology?*'. Using interpretivism through a hermeneutic phenomenology methodology allows the data collection of real-life situations which creates a path for knowledge creation. The single case study method allows the analysis of different businesses through triangulation of methods (semi-structured interviews and observations) and triangulation of data (multiple participants) to build rigor (Yin, 2014). The ethical consideration, following Griffith University regulations, were discussed at the end of this chapter. The next chapter details how data were collected and analysed followed by discussion of the eight themes identified.

Chapter 4: Data Collection, Data Analysis and Findings

Chapter 3 justified the qualitative methodology used to investigate disruptive technology businesses. In this chapter, the data collection process, data analysis and findings are discussed following hermeneutic phenomenology and the case study framework. Data were collected from 19 founders and CEOs of Australian based disruptive technology companies through interviews and observations. The coding method was used to discover themes and sub-themes to describe how participants understand reality. Using the hermeneutic cycle (van Manen, 2016), the researcher reflected on and immersed himself into the participants understanding of the world to answer the research question: '*How in OD terms is the role of people understood in managing disruptive technology?*' From this analysis, eight themes were discovered that explain the collaboration, cooperation and participation required to manage and develop disruptive technology.

Chapter 4 has been divided into four parts: data collection, data analysis, findings, and rigor. The first section, data collection, explains how the researcher prepared before conducting interviews and observations, the participant selection criteria and the interview process. Data analysis discusses how concepts emerged using multiple analysis methods including the hermeneutic cycle and manual coding. Findings presents the eight themes including: holistic collective, diverse wisdom, achievement through collaboration, structure and consideration, stress adverse, innovative mindset, learning from mistakes, and engaged synthesis. The last section explains the process of increasing rigor through trustworthiness and credibility.

4.1. Data Collection

Interpretation is exclusive to the researcher, meaning there is always room for richer, deeper or complimentary interpretations from other researchers (van Manen, 1990). Richer information can be gained through proper preparation, selection of participants, and handling of the interview process. Preparation (detailed in section 4.1.1) included constantly reading the research question to maintain focus (van Manen, 2016) and self-reflection to recognise biases and assumptions that might relate to the phenomenon under study (Laverty, 2003). Selection of participants (detailed in section 4.1.2) followed a purposeful technique, based on participant's anticipated richness and

experience as innovators, and the snowballing technique, which allowed access to less known innovators through participants. The interview process (detailed in section 4.1.3) followed a semi-structured interview method and observations aimed at creating an open environment where participants feel secure and willing to share their insights and stories.

4.1.1. Preparation.

Following interpretivism, the researcher became involved in self-reflection to consider how their own experience might relate to the phenomenon under study (Laverty, 2003) by re-reading the literature review, research questions, and interview documents (Kreuger & Neuman, 2006). Self-reflection allowed for a better representation of the participants' stories while putting aside the researcher's own bias to understand how participants make sense of the world (Geertz, 1973; Gadamer et al., 2004; O'Donoghue, 2007; Denzin & Lincoln, 2011). The list of 'Interview Questions' (Appendix A) was used as a guideline, and not as a questionnaire, before and during interviews to guarantee all questions were answered during the conversation. Preparation also included purposefully selecting participants, field and data collection methods. A checklist, Table 2, was used by the researcher to ensure consistency in the data collection process and organisation prior to conducting the interviews and observations.

In selecting how to conduct the interviews, there were multiple options including face-to-face, telephone and group interviews (De Gagne & Walters, 2010; Frazier et al., 2010). Face-to-face semi-structured interviews were the preferred method of data collection as they allow exploring of verbal and non-verbal areas of communication while building a relationship with the participants (Easterby-Smith et al., 2002). Following the participants' tight schedule and the expansion to multiple Australian states, phone interviews were included, i.e. interview with P9 was conducted while the participant was waiting in the airport (Creswell, 2014). Eleven interviews were face-to-face, eight of which were done in the participant's office and three at a cafe at the participant's convenience. A total of eight interviews were conducted through recorded phone calls.

Table 2. *Field research checklist* (Steps adapted from Neuman (2011)

Checklist	Implementation
Prepare oneself, read the literature, and refocus.	Interview preparation consisted of reading through the literature review, research question and interview questions.
Select a field site and gain access.	Contact potential participants through email. Upon response, negotiate a time and location for the interview, following the participants' preferences.
Enter the field and adopt a social role.	Establish a positive attitude upon entering the premises, show gratitude and controlled excitement for their participation. The attitude of the researcher was gradually changed throughout the interview based on the participant's emotions. Through snowballing, gain access to more participants.
Observe, listen and immerse into the data collection process.	Collect stories through probes and follow-up questions. The researcher's journal was used to note verbal and non-verbal communication.
Disengage and physically leave the setting.	Upon finishing the interview, the researcher thanked the participants. Post-interview notes taken in the researcher's journal. One week after the interview, an email was sent thanking the participants.

The initial point of introduction to participants were emails. Appendix C provides an example of the emails sent to participants, which included the 'Information Sheet' (Appendix D) and 'Consent Form' (Appendix E). A hard copy of these documents were taken to the face-to-face interviews (Creswell & Poth, 2018). Short phone calls with P2 and P19 were held as per the participants' request to explain the research after the initial email. All participants, in coordination with the researcher, selected the field site. Appointment sites and times were confirmed through calendar apps, phone calls and emails. The night before every interview, a checklist was used to make sure everything was in place for the interview including: having two audio recorders, the researcher's journal to collect notes, the site, a printed version of the interview questions, a copy of the information sheet, and a copy of the consent form.

When entering the site, the researcher adopted a friendly approach and, when appropriate, an icebreaker maximised the comfort level between the researcher and the participant (Kelsch & Friesner, 2012; Ranney et al., 2015). For example, when entering

the site to interview P4 and P17, the researcher complimented the office design and their technological development. It was evidenced that participants took around 10 to 20 minutes to talk about the collaboration of people and share stories during the interviews. During the interview, the researcher observed, listened and immersed into the data collection process to make the most out of each interaction. Gratitude was shown at the end of the interview by expressing appreciation for their participation. All interviews were audio-taped and transcribed verbatim.

4.1.2. Research participants.

The purposeful technique is a process that selects participants based on their anticipated richness and relevance in answering the research questions (Yin, 2011). Participants that held information of central importance to the research question were selected purposefully (Gentles, Charles, Ploeg, & McKibbon, 2015). In phenomenology, what is selected is restricted to people (van Manen, 2016; Cohen, 2017). Information was held only by certain members of the community (Tongco, 2007), in this research, CEOs and Founders of disruptive technology businesses, as they can provide rich information to understand the process of developing disruptive technology (Patton, 2015). Participants, therefore, were “selected on the basis of their knowledge” (Van Manen, 2014) to describe a process to which they belong.

Companies from the Austrade Report of Disruptive Technologies in Australia (Online Government Magazine) (Austrade, 2017) and internationally recognised disruptive technology businesses were contacted. Following hermeneutic phenomenology, the aim was to select participants who have lived experience of disruptive technology, who are willing to talk about their experience, and from a diversity of industries to gain rich and unique stories of the phenomenon (van Manen, 1997a). Initially, the target was businesses in South East Queensland, but this expanded to the whole of Australia following the limited number of available disruptive technology companies. Following each interview, more interviewees were added using the snowballing technique, which required asking the participants to nominate prospective participants (Sadler et al., 2010; Palinkas et al., 2015). Referrals from participants helped in reaching people whose contact details were hard to find. Finding participants was a challenging process as only one out of ten showed interest in participating and the remaining nine excused themselves due to the ongoing challenges of their business including travel, meetings and long hours of work, which was reflected

during the interviews with the participants. The interest and willingness showed by the participants, Table 3, demonstrate their commitment to human development, which was a source of motivation and encouragement to proceed.

Table 3. Summary of participants

	Role	Industry	Observation
P1	Founder	Transport / Agriculture	Phone interview
P2	Founder	Health care / Manufacturing	Phone interview
P3	Founder	Telecommunications	Phone interview
P4	Founder	Entertainment	Site interview
P5	Founder	Construction / Computer	Site interview
P6	Founder	Computer / Manufacturing	Investor meeting, Innovation Hub and Cafe
P7	Founder	Aerospace	Site interview
P8	Founder	Aerospace / Manufacturing / Mining	Site visit and team meeting
P9	Founder	Mining / Computer	Phone interview
P10	CEO	Computer / Electronics	University office
P11	Founder	Agriculture / Manufacturing	Phone interview
P12	Founder	Food / Telecommunication	Phone interview
P13	Founder	Manufacturing	Site interview
P14	Founder	Agriculture / Food industry	Phone interview
P15	Founder	Telecommunication / Electronics	Site interview
P16	CEO	Health care / Computer	Phone interview
P17	CEO	Telecommunication / Electronics / Manufacturing	Site interview
P18	Founder	Energy / Manufacturing	University office
P19	Founder	Energy	Cafe interview

A total of 19 founders and CEOs of small to medium Australian disruptive technology businesses participated in this study. The participants, their role in the organisation and the industry are shown in Table 3. The diversity of industries increased the uniqueness and richness of the participant's stories during the data collection process (Laverty, 2003). Participants came from 13 different industries including agriculture, aerospace, construction, computer, entertainment, electronics, energy, food, health care, manufacturing, mining, transport and telecommunications.

4.1.3. Interview and observation process.

Data were collected between May 2018 and May 2019. Before interviewing participants, two separate pilot interviews were conducted with the supervisory team with the aim to improve the researcher's ability to conduct the interviews, assess the suitability of the terminology and the participants chosen. The first pilot interview helped in creating strategies to gain valuable information from participants through questions and probes that encouraged deeper understanding of the phenomenon. The second pilot interview focused on building a relationship with the participants and assessing the terminology being used; e.g. 'product/technology' instead of 'disruptive technology'. These pilot interviews helped in understanding the significance of creating an open environment by building a relationship with the participants which allowed gaining depth and layered insights from participants (Yin, 2017), as exemplified in the interview with P14 through her reflection on founder relationship and the success of the business.

I have two co-founders as well, "Founder A" and "Founder B", so there are three of us, and we had worked previously together in the past. In fact, we actually have a relatively long working history together. I think one of the important things is founder relationship, and we had already established that relationship, so that was a bit of a shortcut to success because we didn't have to navigate that. We knew each other really well, knew our strengths and weaknesses which was good (P14).

Data collection started following the satisfactory completion of the pilot phase. After the first five interviews, a problem became evident in the pool of participants which helped the researcher further understand the difference between innovators,

entrepreneurs and investors. Entrepreneurs and investors do not create disruptive technology; they sustain technologies and focus on the financial side of innovation whereas innovators create disruptive technology – which links to the importance of purposeful sampling, where participants are selected as they hold information of central importance to the research question (Gentles et al., 2015). The researcher then re-read the literature review to create a more specific delimitation of the participants in this research, discussed in Chapter 3 through the case study framework where the unit of analysis is ‘disruptive technology’. This process led to the withdrawal of five interviews, and the decision not to contact many of the people being suggested through the snowballing technique as they were not innovators.

Before starting the audio recording, participants gave their written consent and gave their verbal consent once the recording started (Barriball & While, 1994; Runeson & Höst, 2009; Yin, 2017). P19 asked to have a portion of the interview not used due to confidential information being discussed. This confidential information was not recorded and does not appear in any section of this research. All participants responded positively to being recorded. Data were collected through field notes and audio recordings as the semi-structured interviews progressed. Interviews were double audio recorded to prevent any loss of data.

Richer understanding of the collaboration, cooperation and participation was gained by sensitively asking the participants about their experiences and giving prompts to allow the stories to flow. For example, the following quote came from the interview with P5, where the researcher demonstrated his interest into knowing more about their story. “Participant: Yes, so it started, that’s a crazy answer Jose, but yeah. Interviewer: I love crazy answers. Participant: Oh, no this is not good, I will walk you through this. There are two business owners, there’s Founder B and myself, and...” These stories enriched the conversation and provided the means to make sense of the participants’ reality. Multiple stories were shared during the interviews including a story shared by P5 that explains how through cooperation, she was capable of meeting customers’ expectations.

One of our early clients with the VR, we thought we had it ‘under control’ (in inverted commas), with the hardware, and it was back when the Oculus Rift was the first Oculus that came to the market and we bought, I think we bought 9 units or something, which is what the client

asked for at the time. And then they wanted more, immediately. And then, our guys had some at home, and they just donated theirs (P5).

P5 made it clear that the company then compensated these donations. Stories like P5's story highlight the importance of cooperation inside disruptive technology businesses (Corbin & Strauss, 2008). Additionally, participants' responses evidenced their interest in adding to the research and sharing their experience openly and positively (O'Donoghue, 2007; Stake, 2013).

The researcher's journal was used to engage the researcher in self-reflection by actively experiencing the phenomenon in all its aspects through observations (Günbayi & Sorm, 2018). Within this context, the researcher's journal was used to keep a record of observations obtained before, during and after the face-to-face interviews, visits to the businesses and events (presentations, conferences, lunches, start-up events, and internal meetings) to which the researcher was invited in addition to the interviews (Table 3) (Morse & Field, 1996). Notes were taken during these events through careful watching of the participant's body language and non-verbal communication (Yin, 2017). For example, the interview with P7 was conducted at a table inside the kitchen of the business where different workers came in and out throughout the interview showing openness and trust within the organisation, as well as respect, as the participant introduced them to the researcher.

Being a non-native English speaker, the researcher found the observation process during the interviews challenging. For this reason, during the initial interviews, priority was given to immerse into the conversation, where body language and taking notes of emotions were de-prioritised (Fontana & Frey, 2000). Being aware of this disadvantage, the researcher attempted to maintain alertness by reflecting on the meanings of situations after the interview concluded (van Manen, 1990). Growing in confidence and understanding of the themes, through time, the researcher became more capable of listening and seeing these emotions in the participants as they emerged (Guba & Lincoln, 1994). This led to observing the feeling of 'anger' in P19, and 'achievement' in P6 in specific parts of the conversation which were then included in the open coding.

Saturation occurs when only a little new information is generated, and the data are seen to be repeating themselves (Morse, 1995; Mason, 2010; Yin, 2017). No specific number of participants were planned, and the total number of interviews was

increased until thematical saturation was reached. Although saturation was reached at 15 interviews, four more interviews were added to confirm and gain deeper understanding of the sub-themes (19 interviews in total). No new concepts emerged, but, further depth and understanding of the problem were gained through subsequent interviews confirming the saturation of concepts (Morse, 1995; Fusch & Ness, 2015). The Austrade Report of Disruptive Technologies in Australia (Online Government Magazine) (Austrade, 2017) lists 21 disruptive technology businesses throughout Australia. All innovators from the Austrade report were contacted, but only seven participated. Through snowballing, 12 additional participants were recruited resulting in a total of 19 participants, meaning that saturation for the Australian market was also reached, based on the number of businesses shown in the Government report.

All interviews were recorded electronically, manually transcribed and proofread by the researcher, producing a total of 204 pages of text (167,120 words). The length of each interview varied from 14 to 103 minutes. Transcribing the interviews increased sense making of participants' reality. During this process, the researcher had to educate himself, i.e. firing people was against the researcher's beliefs, however, P9 explained that eliminating "toxic people" is required as they can deteriorate the relationships within the organisation. Self-reflection is in line with van Manen's (1990) cycle of inquiry where the meaning is uncovered through reading and reflection by moving repeatedly from each participant's texts to all interviews as a whole (Prasad, 2005). Each transcript was re-read whilst giving codes to companies, people, and phrases that may be perceived as delicate information. After proofreading, these documents were then printed with the text only occupying the left side of the page, freeing up space on the right side of the page to write notes and codes. Initial concepts were created by comparing new concepts with previous ones in the search for similar and new concepts (Strauss & Corbin, 1994).

4.2. Data Analysis

Within hermeneutic phenomenology, the hermeneutic cycle provides a method to understand participants' reality through reading, reflective writing and interpretation in a rigorous fashion (Laverty, 2003). Van Manen (1997a) identifies the process of writing and rewriting as a crucial step to move the researcher from the identification and comparison of themes to making sense of the phenomenon. Reflecting on the text allows the hermeneutic cycle of inquiry where the process repeatedly moves from the

parts (text) to the whole (context) (Prasad, 2005). The hermeneutic cycle involves understanding the participants lived experiences while becoming aware of the researchers pre-conceptions of the world to understand the difference between the participants and the researcher's view (Merleau-Ponty, 1973; Gadamer et al., 2004; Gadamer, 2008). In staying close to the participants' stories, the researcher was then able to make sense of the essence of the phenomenon (Grant & Giddings, 2002).

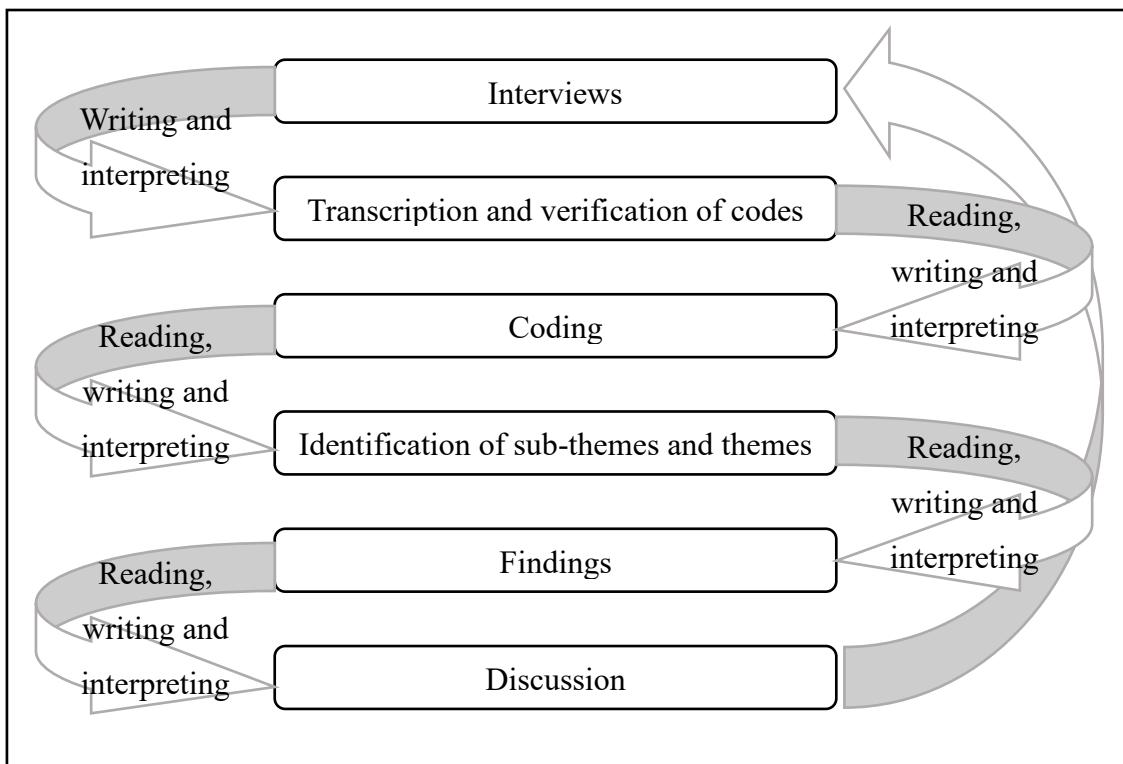


Figure 11. Hermeneutic cycle and the cycles of data collection (Kafle, 2011, p. 195; van Manen, 2016)

Following the hermeneutic cycle, the data analysis was divided into six phases: interviews, transcriptions and verification of codes, coding, identification of sub-themes and themes, findings, and discussion (Figure 11). During the first phase, interviews, the researcher became aware of the participants' reality while writing notes in the researcher's journal. In the second phase, transcription and verification of codes, the researcher immersed and reflected by re-reading all the transcripts while assuring confidential information was coded. Phase three, coding, was the process of manually coding the transcripts (section 4.2.1). Phase four, identification of sub-themes and themes, was the process of comparing codes to discover concepts, sub-themes and

themes (section 4.2.2). Phase five, findings, was the process of explaining how the research question is answered through the data (section 4.3). Finally, phase six, discussion, is presented Chapter 5 to explain how the findings answer the research question.

4.2.1. Coding.

The coding phase followed van Manen's (2016) holistic and detailed reading approach which involves finding phrases that capture the fundamental meaning of the text and comparing it with the whole, which means looking at every transcribed sentence or cluster of sentences to see if they answer the research question (Braun & Clarke, 2006; Gibbs, 2007; Miles, Chapman, Francis, & Taylor, 2013). Transcribed interviews were re-read as a whole to immerse and create a general understanding of the conversation, then, through open coding, every new idea was described with a phrase or keyword in the right-hand side of the page (Gibbs, 2007; Corbin & Strauss, 2008). Breaking up the data into categories helped formulating new levels of interpretation (Coffey & Atkinson, 1996).

As seen in Figure 12, every time a concept was repeated, the same colour was used to create consistency (Lawrence & Tar, 2013) and to distinguish different concepts, e.g. *keep the same culture*, in green, explains a collaborative culture, *hard to find right people*, in red, explains challenges, *grow our own product managers*, in pink, demonstrates growth, *hard to get right organisation structure*, in green, exemplifies structure, *success is about everyone*, in blue, diversity and collaboration, and *everyone is involved* exemplifies a participative environment.

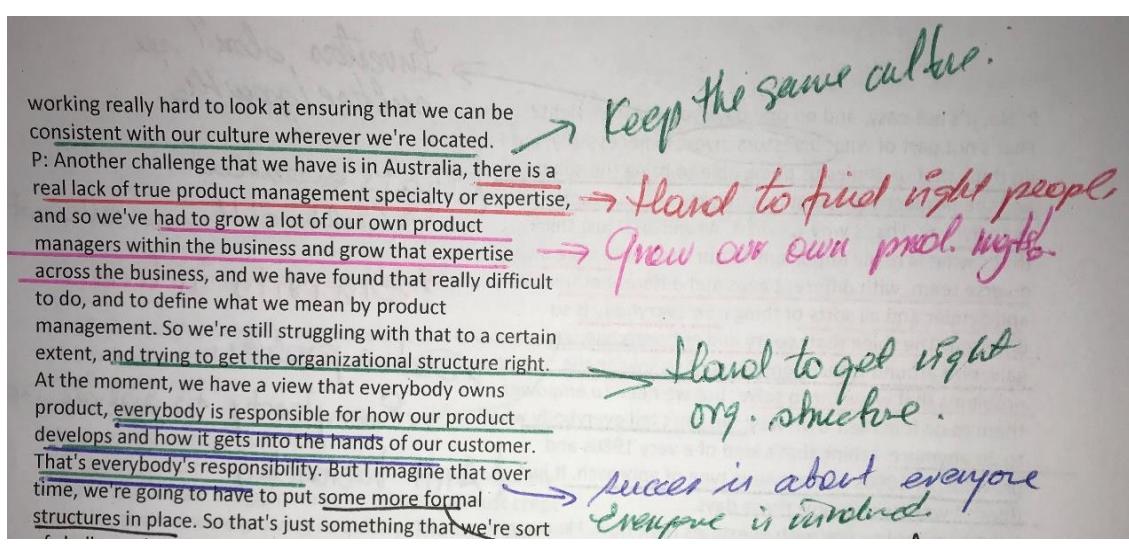


Figure 12. Coding of interview data.

4.2.2. Identification of sub-themes and themes.

Following the completion of each interview's manual coding, the concepts, examples, stories and quotes were compared through manual analysis. Although there are multiple programs like Leximancer and NVivo to organise the data, manual analysis was used because computer programs follow algorithms that learn from human inputs (Welsh, 2002). Without a proper understanding of the phenomenon, which can only be gained through reflection and understanding of the data, the inputs given to the computer program might not give a proper representation of the data. "No software can analyse qualitative data" (Zamawe, 2015, p. 15).

Reflection and understanding of the data was gained through the hermeneutic cycle by constantly listening to the recordings, reading the transcripts, observations and analysis writings (Alvesson & Sköldberg, 2000; Dowling, 2007). Analysing the data was not a linear process, and required going back and forth between these four data sources to clarify ideas, understand emotions, corroborate and compare one participant with another participants ideas, and even to educate the researcher's beliefs to understand participants understanding of reality (for more detail see Appendix N).

Going through the hermeneutic cycle between recordings, transcripts, observations and the researcher's notes helped the researcher identify concepts, sub-themes and themes. One of the critical parts of this process was the ability to make notes and organise the data, for which a notebook was initially used to organise over 550 codes. Microsoft Word was then used, following the large number of codes, to organise and categorise the codes where repetitive codes were eliminated and conceptually similar ideas were grouped into concepts (Corbin & Strauss, 2008) leading to the finding of 51 concepts (DeCuir-Gunby, Marshall, & McCulloch, 2011). Microsoft Word did not offer flexibility to move ideas from one group to another, which led to the utilisation of a tablet application which allowed moving words, figures and groups of concepts which led to sense making of concepts which led to the discovery of 18 sub-themes (Huberman & Miles, 1994). Further understanding of the sub-themes led to the discovery of eight themes, which were discovered by understanding what constitutes the nature of the participants lived experience following the research question (van Manen, 2016).

4.3. Findings

Through the analysis of interviews and observations, eight themes were found that describe the collaboration, cooperation and participation required to manage the process of transitioning a disruptive technology from idea to reality (Table 4).

Table 4. *Themes, sub-themes and concepts.*

Theme	Sub-themes	Concepts
Holistic Collective	Find real-world problem Positive purpose	Solve a problem, find a problem, positive purpose, passion
Diverse Wisdom	Understand the problem Build connections Choose the right people	Find right tool, problem focused, bring experts, share knowledge, diversity, build connections, choose right people, find sources of knowledge
Achievement through collaboration	Keep small and nimble Build relationships	Light team, collaboration, people are key, have fun, build relationships
Structure and consideration	Authenticity Caring and understanding Structure	Authenticity, both way loyalty, trust, acceptance, invest in people, manage expectations, motivate people, challenge people, play to people's strengths, regular meetings
Stress adverse	Perseverance Take the risk	Takes time, resilience, perseverance, challenging, timely execution
Innovative mindset	Passion Encourage innovation	Knowledge hungry people, passionate, constant improvement, learning environment, honest feedback, creative environment, freedom to innovate, obsolescence
Learning from mistakes	Accept failure Fail fast	Development through learning, explain technology, tolerance to failure, failure key to success, deal with problems
Engaged synthesis	Involvement Focus	Commitment, consensus, vision expander, focus, test in market, develop product

The first theme '*holistic collective*' describes the problem these businesses are trying to solve and how these problems motivate and bring passionate people to help. The second theme, '*diverse wisdom*', highlights that bringing people with different backgrounds provides understanding and generates solutions to a problem that has not

been solved before. The third theme, '*achievement through collaboration*', explains how keeping the company small creates an environment of trust and collaboration that nurtures innovation. The next theme, '*structure and consideration*', discusses the how finding a balance between caring for people and creating a structure helps innovate. '*Innovative mindset*' explains the significance of bringing and nurturing people that want to continually improve things. '*Stress adverse*' discusses the benefits of taking risks while being perseverant in the process. '*Learning from mistakes*' highlights how participants learn from mistakes, which helps them finding new ways to improve. Finally, '*engaged synthesis*' explains the significance of having a common voice within the organisation driven by a synthesis of ideas coming from everyone in the organisation.

4.3.1. Holistic collective.

Managing the disruptive technology process starts from the ability to solve a problem and transmit a positive purpose that inspires passion, commitment and motivation which brings the attention of multiple stakeholders. The theme *holistic collective* explains how participants start by finding a problem worth solving. A positive purpose is created which brings multiple stakeholders who, through passion, are committed to the development of the organisation. The theme holistic collective was found by bringing together the sub-themes *find a real-world problem* and *positive purpose* (Table 5).

Table 5. *Holistic collective sub-themes and concepts*

Theme	Sub-themes	Concepts
Holistic Collective	Find real-world problem Positive purpose	Solve a problem, find a problem, positive purpose, passion

4.3.1.1. *Find a real-world problem.*

As seen in Table 5 the first sub-theme *find a real-world problem* emerged from understanding that the process of creating a disruptive technology starts by finding and solving a problem. P14 explains the significance of focusing on a real-world problem:

“the thing that really matters is not so much the idea, it's whether or not that idea is, once again, solving a real-world problem” (P14). Participants find problems through experience where a solution to a specific need is not available in the market. Personal experience and proximity to people that have undergone a problematic process create the intrinsic motivation within innovators to find a better way. The following citation provides an example of this process.

There were a number of problems that had not been solved for over decades, and it just seemed like there was some emerging technologies, as well as just the growth of digitisation, generally, that was going to allow for new solutions to come to the market (P14).

Participants have been involved with a technology or the problem they are trying to solve before starting the disruptive technology business. For example, P12, a lawyer, helps multiple businesses integrate blockchain technology in their products. With more than 10 years of blockchain experience, he used this knowledge for a positive purpose, in this case, decrease the number of fake products. The high level of understanding required to develop disruptive technology was evidenced by the frustration of P12 when listening to consulting firms who pretend to know a lot about blockchain, however, had a low level of understanding as explained in this quote.

The so-called consulting. And that's why, they've got people standing up to the overnight experts who have been in the field for 9 months, and they read lots of newspaper articles, and now they are outspooking. We've got new products, such as such, and such. And the level of understanding, and the level of, to form those dots, when you are, they give you a whole different appreciation for how things are coming together. You just don't get it. It's just tedious, there's some conferences I just don't want to go to anymore, because it's just too, they've lost their way, they have lost what was really rewarding and challenging about them (P12).

Disruptive technology businesses are created by people who have years of experience and involvement in an area that exposes them to a problem. As presented in Table 6, P1 was working in a project that sent environmental scientists to life threatening places, P2 found that there was no solution for “children who were very

disabled and disadvantaged” (P2), and P12 found that some people receive fake medicine for fatal diseases. P19 explains this process as “finding a problem that a customer has with a use case” (P19).

Table 6. *Find a problem*

Find a problem
“People went down across the development of a big project” (P1).
“They were children who were very disabled and disadvantaged” (P2).
“Fake medicine kills one million people a year” (P12).

The rapid technological development seen in the past decades has created an opportunity to bring new solutions to the market. Technologies including blockchain, Internet of Things (IoT) and 3D printers provide ways to solve problems. Within this context, P19 describes disruptive technology as a process of “solving a problem that hasn't been solved before”. In Table 7 there are some examples of how participants are solving real-world problems through the application of different technologies. For example, P1 tested multiple technologies including helicopters, planes and drones to decrease the number of environmental scientists going to dangerous places. P2 used his skills as a surgeon and 3D printing to develop the first custom implant put into a patient in the early 1990s. Finally, P12 is using blockchain technologies to track fake products and reduce the number of medicines and consumable goods in the world.

Table 7. *Solving a problem*

Solving a problem
“Do something differently” (P1).
“We looked at what the applications of that were” (P2).
“Combat fake products” (P12).

In managing disruptive technology, the solution should not only be driven by the technology. Multiple technologies need to be tested to solve the problem. Within this context, P14 explains that he is “open, from that perspective, as to what the best solution might be, and often it's a composite of solutions, or a convergence of different technologies that all come together to provide the solution set” (P14). P19 explains that a variety of technologies should be tested to solve a problem.

It's not complicated. I think a lot of people overcomplicate this. People become too technology-centric and focus on technology as a means of solving a use case versus looking at a use case and then looking at a host of technologies, and they're not even technologies but a business model that can solve that use case (P19).

4.3.1.2. Positive purpose.

Positive purpose, the second sub-theme within holistic collective, explains how passion and motivation is created within disruptive technology businesses. Following the selection of a real-world problem, creating a clear purpose for the organisation brings the attention of key stakeholders and creates a sense of direction for the company. “They may be working on many different inventions, but they are really clear about what class of business problems they're trying to solve” (P10). Innovators use phrases like: “Big Hairy Audacious Goal” (P5) and “Massive Transformative Purpose” (P6) to explain their aim of having a long-term clear purpose that inspires people and steps away from traditional vision statements. As P10 explains: “vision statements get written by people in a corporate world and get forced down like foie gras into the organisation”. Within disruptive technology businesses, a distant purpose builds the direction of the organisation and creates an environment that is constantly evolving. As explained by P7 “the ones with the longest visions and the grandest ambition are normally the ones that win”. Shortcuts and improved solutions can be created through this awareness. P12 explains in the following quote how a clearly defined purpose transmits the long-term goals of the company and creates a focus in solving a specific problem.

You have to have a clear statement of what you are doing, beyond the elevator pitch. And then you've got to truly believe it. Because you got to go out and sell that to people that are going to fund it, or going to

devote time to it, or leave other jobs and come work for you. So, you got to distil your ideas and boil it down and boil it down until you start to come up with something that holds together as a message (P12).

Participants explain that innovation starts from the ability to “see a better way” (P11). The desire to create a product that can create a positive impact on society is what drives hard work within the team. For example, P11, who developed a technology that simplified the process of harvesting a consumable good without needing previous experience, has a positive purpose which is: “caring about the environment and the habitat that we all completely depend on” (P11). Other examples of participant’s positive purpose are presented in Table 8, where P1 is reducing the number of environmental scientists needed in dangerous field sites, P2 is saving thousands of lives through 3D printed implants and P12 is reducing the number of fake products.

Table 8. *Positive purpose*

Positive purpose
“Save lives” (P1)
“Helping children who need loads of surgery” (P2).
“Combat fake products” (P12)

When people understand and are passionate about the business positive purpose, they want to be part of it. For example, P7, who started developing front-line aeronautical technologies in 2016, gets “an average of 12 applications per week”. According to participants, people want to feel pride in their work and feel that their effort creates value for the customers. Within this context, P2 explained that a positive purpose like helping “children who need loads of surgery” is “obviously is a strong motivating force for people to help”. As seen in Table 9, P1, P12 and P19 also evidenced how passionate people are easier to manage. P12, a cancer survivor, discussed his motivation to combat fake medicine as some people are given fake chemotherapy treatments, and finally, P19 highlights that being an innovator is just like

any other job, with the difference being that the innovator follows his passion to create a positive impact in the world.

Table 9. *Passion*

Passion
“Surround yourself with people that are conducive to that idea” (P1).
“That obviously is a strong motivating force for people to help” (P2).
“I’m a cancer survivor and I can’t imagine going through the torment of being injected with a fake medicine or a harmful medicine, when it’s your last chance in life” (P12).
“It is just another job but it's a job that you can get passionate about, follow your heart, develop things” (P19).

Participants believe that what they do should be worthwhile and beyond a positive purpose. For example, P11 repurposed left-over materials to create a new product in line with their purpose to support the environment and gave all the profits to projects aligned to their purpose in fields like education and advertising. Within this context, it is evidenced that participants motivation is to “make the world a better place” (P4), and not just to make money.

“Life is too short to just worry about money” (P12). A positive purpose is what drives passion and motivation within people to come and help inside these businesses. When people perceive value in their work, they dedicate everything they have and even sacrifice their own income to develop something they are passionate about. “There is no point in spending years of your life building something if all it does is a pile of money and doesn’t achieve much else” (P12).

Although money is required to keep the organisation running, money is not what motivates people in the process of developing disruptive technology. Participants explain that motivation comes from the experience of doing something of value and enjoying the process. As evidenced in the following quote from P2, a positive purpose helps in the process of recruiting people and creates a group of passionate people.

What we are doing had a very positive impact. That's the most important thing, that people thought they were doing something useful. I think what motivated people the most is that we were helping children and people with quite severe problems. I think that probably was the single biggest factor in recruiting people (P2).

Together the sub-themes *find real-world problem* and *positive purpose* create the theme *holistic collective*, which detailed the significance of finding a problem which solution creates a positive impact. The process of managing disruptive technology needs to be *holistic* as everyone's focus is on solving the problem, and its *collective*, as the problem or technological development motivates and inspires passion in every member of the team. Understanding and solving the problem requires the involvement of multiple stakeholders who bring different ideas. Diversity is further discussed in the theme 'diverse wisdom'. Appendix F provides a list of more participant quotes to support the richness of the theme *holistic collective*.

4.3.2. Diverse wisdom.

Developing disruptive technology requires the involvement of a diverse group of people. The theme *diverse wisdom* details how bringing a diverse group of people to the team creates diversity of knowledge, experience and skills which help to understand and solve a real-world problem (as discussed in the theme *holistic collective*). In Table 10 the sub-themes and concepts are shown for *diverse wisdom* including: *understand the problem, build connections, and choose the right people*.

Table 10. *Diverse wisdom sub-themes and concepts*

Theme	Sub-themes	Concepts
Diverse Wisdom	Understand the problem	Find right tool, problem focused, bring experts, share knowledge,
	Build connections	diversity, build connections, choose right people, find sources of
	Choose the right people	knowledge

4.3.2.1. Understand the problem.

Managing disruptive technology requires creating a deep understanding of the problem. As P19 explains: “it is about understanding the problem itself, not understanding what an ideal solution is” (Table 11). This was further evidenced by P10 who used hacker’s attacks into his security systems to find issues in the programming, and by P14 who explained that the problem needs to be seen from “multiple angles”.

Table 11. *Problem focused*

Problem focused
“You would have people from Russia or China or North Korea trying to hack into this, to try to find a way into our system. And what we would do is we would capture that information” (P10).
“We want to look at a problem from all different angles” (P14). “It is about understanding the problem itself, not understanding what an ideal solution is” (P19).

Participants explain that a better understanding of the problem can be gained through diversity by bringing multiple stakeholders to explore the problem from multiple angles to create a deeper understanding of the problem. From this point, the team needs to engage with the problem and distinguish between crucial and non-crucial information. Crucial information is identified by focusing on a specific problem and finding information that can help understand the causes of the problem. “The foolish entrepreneurs are the ones who do a sort of superficial understanding of the problem and they go off to build and raise capital to launch and pitch” (P10). Within this context, P10 explained the significance of gaining a deeper understanding of the problem, through an example of the problem associated with customer’s lack of capital. By gaining a deeper understanding of the problem, it was evidenced that the problem was in the customer’s ability to document finances well enough to get loans and the fact that customers had too many loans.

What you may find that at the end of the day, the problem is not fundamentally capital or adequate access. It might actually be that people can't document their finances well enough to get loans, right? Or maybe they get too many loans and they can't manage to repay them which you might think is about access to capital; it might actually be about managing budgets (P10).

“Going straight into building a solution without understanding the problem can become a problem for innovators. Innovators need to rethink the nature of the business problem and find a better way to solve the problem” (P10). Participants explain that finding a solution to a problem requires spending the time understanding the problem. From this point, different ideas can be discussed to create a solution. “Sometimes you need a screw driver. You shouldn’t be hammering the screw in there right?” (P6). Gaining a deeper understanding of the problem helps choosing the right tools to solve the problem. P19 adds that choosing the right tool is a consequence of understanding the problem, and highlights that trying to use one technology to solve every problem is not the best way to create a disruptive technology.

It's not complicated. I think a lot of people overcomplicate this. People become too technology-centric and focus on technology as a means of solving use cases, versus looking at a use case, and then looking at a host of technologies (P19).

Participants agree that gaining a deep understanding of the problem is essential to create disruptive technology. As seen in Table 12, focusing on one technology is not the solution to every problem. Creating disruptive technology requires looking at multiple technologies and combining these technologies to solve a problem. P14, who develops logistics and communication solutions, explains how she uses multiple technologies.

I'm very open, from that perspective, as to what the best solution might be, and often it's a composite of solutions, or a convergence of different technologies that all come together to provide the solution set. I'm much more wedded to being able to clearly articulate what the problem is, to ensure that that problem is large enough and worth solving, and to be

able to test that with the users and to be able to talk sensibly with the users about the product that we're building (P14).

Table 12. *Find right tool*

Find right tool
“Not just because you now learn about neural networks, everything new you find you want to solve with neural networks” (P6).
“Move it across, shape it, put it on some glue, bind it, and do something that no one else is doing” (P16).
“Looking at a smorgasbord of technologies and then acquiring those technologies” (P19).
“I am not loyal or wedded to a particular technology” (P14).

4.3.2.2. Build connections.

After explaining the significance of gaining a deep understanding of the problem, through connections, participants gain a deeper understanding of the problem through diversity, which creates an opportunity to further understand the problem, explore different technologies and gather ideas. Some examples of diversity are seen in Table 13 where P14 highlights how they have diversity of ages, race, and gender, P16, diversity of knowledge, and P15 diversity of skills.

Table 13. *Diversity*

Diversity
“We have a very diverse team, with different ages and different ethnicities and gender and all sorts of things.” (P14).
“I'd do a law degree, and I'd never practice it. I'd put it in my back pocket, then I'd go in business” (P16).
“It comes down to having a range of skills in the core group” (P15).

Wisdom can be gained internally and externally through team members, investors, mentors, business and customers. Investors and mentors are external people or groups of people that bring money, resources and ideas to help in the development of the product. P7 explained that the best investors are those that help the innovator attain their goal by sharing their experience to help them succeed. “That’s probably a good secret of success for innovative companies, have a good investor partner” (P7). Within this context, “mentors” (P11), “external auditors” (P5), and “investors” (P4, P7, P8, P10, P13, P19) bring diversity to disruptive technology businesses and play a crucial role in understanding the problem and improving the technology. The involvement of external stakeholders in the disruptive technology process is not limited to a monetary support but building a close relationship where ideas can be exchanged for the purpose of improving the products and help the business overcome challenges along the way. The following quote provides an example of this process where an investor came to see P7 at two different sites and helped him expand the company’s vision.

I really enjoyed it because they were just asking me a whole lot of stuff that I hadn’t even thought about. But I didn’t feel threatened that I hadn’t thought about it. And then we kind of strategized together about it. And that’s kind of when I knew, ok I think they are keen to invest, but I really got a lot out of this, even if they don’t, it actually helped me, you know, expand my vision of what I should be doing (P7).

Diverse wisdom is also gained by collaborating with other businesses and getting involved in a community. By helping other businesses, new technologies can be learned and used to develop the disruptive technology. As seen in the quotes from Table 14, partnerships bring opportunities for new markets and technologies. P6, who used to live in the US, explains the significance of creating a community where everyone helps each other and builds connections. P12 highlights that through connections, innovators can get to “C level managers” (P12) who have the final decision in projects.

Table 14. *Build connections*

Build connections
<p>“You really need to be able to have partnerships and you have to be prepared to travel extensively” (P2).</p> <p>“That’s how it works, everybody helps everybody, and it’s connections great” (P6).</p> <p>“If you are not talking to a decision maker, most times you are just wasting your time” (P12).</p>

Participants agree that sharing knowledge and helping other businesses builds a community where everyone helps each other. As seen in Table 15, participants agree that sharing knowledge is a good practice within disruptive technology businesses where new knowledge can be gained from these interactions. For example, P7 explained how some of their people would work inside a large organisation for a short period of time. Through this collaboration, the large organisation learned from the people coming to work with them, and, at the same time, the disruptive technology business gained knowledge from the practices and technologies of the large organisation, which were then implemented into the development of the disruptive technology.

Table 15. *Share knowledge*

Share knowledge
<p>“The philosophy of the company is to try and share information and share our knowledge to help people” (P2).</p> <p>“Almost quick per quo collaboration where we don’t have to pay them money, we can send someone down for three months to work with them” (P7).</p> <p>“Helping young people get started” (P12).</p> <p>“You learn a little bit more about their thing” (P12).</p>

Collaborating with other businesses can be challenging; however, it provides understanding of new technologies and technological requirements. The following quote from P12 explains how sharing knowledge with other businesses creates learning opportunities.

You get as much probably as you put into it. They have their area of expertise, whatever it may be, video production, or web design, or whatever it is you know, and you learn a little bit more about their thing. So, again more dots, the more dots you gather for a client when you are trying to do your business it subconsciously you draw all this knowledge and connections (P12).

In addition to the knowledge gained from working with other businesses, P8 and P5 explained how working for large organisations can give the company stable income. “Nosotros dependemos mucho de los proyectos, uno de los secretos es que cada vez que hay un proyecto pelear para buscar el proyecto” (P8) – (We depend a lot on these projects, one of the secrets is that every time there is a project, we fight to get the project). Within this context, building connections with customers can create a stable income, bring new knowledge, and helps in the development of the product. For example, P2 builds products to perform surgeries on children and people with severe problems. These products need to be designed to the surgeon’s specifications, which requires him to be “responsive to the surgeons and making sure we’re dealing with their needs and trying to deliver high quality device that will help that patient” (P2). Further evidence of the relevance of engaging with the customers was given by P11, who explained how the final product was strongly influenced by the feedback from the market.

Yes, in terms of it, was essential to get the feedback from our market, before we launched. So, in terms of improving the design, yeah, I think so as well. I think definitively, we ended up with a beautiful looking (product), which I think is played a, not a minor role in what we are doing, but a major role. And the crowd founding (product) didn’t look that great. I mean, it was a mouldy type box which had been polished up a bit to make it look good for the video. But that was the red painted roof on it that I think made a huge amount of difference. We did that

for the video, but turned up into the product. So, you are right there, that the video helped us, refine what we were doing (P11).

For some technologies, feedback can be subtle; some customers are not aware they are using the technology itself, especially in the digital world, where the team needs to find ways to gather information while customers use the product. P10 gave an example of this situation, where he developed the security system for online payment. Customers rarely understand these technologies, especially in the early 1990s when they were first introduced and were not able to provide substantial feedback. For this reason, P10 had to see how customers interacted with the website; where they clicked, what letters/numbers/signs they pressed to understand the problems within the system and improve.

And the feedback is quite subtle, I mean for example, we learned in the payments space, you know payments is an interesting thing, you don't have long term relationships with the people making payments to you. And your customers who are merchants don't really care a lot about what you're doing except that when it doesn't work, they get upset. So, it's like Maslow's hierarchy, right? If it doesn't work they get angry, but beyond that, they wouldn't even know or care who you are, right? (P10).

By understanding the significance of building external connections, internal connections are equally, and probably more important, in developing disruptive technology. When choosing the people for the team, getting people with high levels of experience and knowledge within the problem or technology associated with the problem helps in gaining a better understanding and solution to the problem. P19 explained: “I try to get people who are the best that I can afford at the time, people who are as convinced of the concept and are willing to take a level of risk” (P19). Within this context, P1 explained how she got “people that have six thousand hours” of experience using drones to reduce the number of environmental scientists going to dangerous sites, P4 brought the person who “ran ‘Business’, the largest technology company in the southern hemisphere”, and P5 brought Founder C who was “an executive out of a large gaming company in Hong Kong” to help develop the gaming side of the technology (Table 16).

Table 16. *Bring experts*

Bring experts
“The people that have six thousand hours of flying time” (P1).
“He ran “Business”, the largest technology company in the southern hemisphere. He's now the chairman of the board here” (P4).
“Founder C is an executive out of a large gaming company in Hong Kong” (P5).

4.3.2.3. Choose the right people.

Through diversity, a deeper understanding of the problem can be gained. Choosing the right people plays a critical role in understanding the problem and creating a solution to the problem. Participants search for people with different skills, experience and knowledge with the aim of increasing diversity within the organisation. There is no specific list of skills required to create disruptive technology. What is required is a diverse group of people who can see the problem from different angles and create a solution through divergent thinking. P14, who developed a solution for the transportation of consumable goods, explains that having different skills, attributes and experiences within the team provides different angles to understand the problem.

We're all very experienced supply chain and agricultural professionals, that's where we've spent our whole career, and we're all farmers as well, but we all have slightly different skills and attributes and experiences that we bring to the founder journey and also to the product journey (P14).

Getting the people right is about finding experts that can expand the vision of the company. Within this context, the team needs to recognise the skills already present in the team to find those skills that are lacking to provide a different perspective on the problem. As seen in Table 17, participants explain the significance of having a diverse and productive group of people that fit in the culture of the organisation.

Table 17. *Choose right people*

Choose right people
“If it's someone who's also critical, then it's the team aspect to it” (P2)
“They need to have the right attitude and the right culture” (P9).
“If I withdrew from everything else and did nothing but interview people all day long, that would be the best possible thing I could do for the company” (P4).
“It's very hard to find someone that's not feeding you a script, that's productive” (P16).

New ideas can be brought to the development of the disruptive technology through people with different experiences, skills and attributes. “You get answers from divergent mindset” (P17). Having people that can challenge the vision of the company helps in the process of constant improvement. Within this context, participants demonstrate how they are open to receive honest feedback, which can be devastating to some people; however, it provides new insights into the development of the products and new ideas which may challenge the vision of the founder, but through collaboration, achieves the attainment of the organisation.

It's like gathering connections, and you start to see, this person knows this, that person knows that, and maybe this person can help me in this area, and sometimes they will do it as a friend and sometimes you take them, hire them for a short engagement, sometimes you take them as a casual employee. It really depends, and you start forming a team (P12).

Finding the right person is a combination of finding people with the right culture and skills. A cultural fit requires the person to be motivated by the purpose of the organisation and passionate about the industry the organisation works in. Motivation is a personality trait. It is not enough to have completed a degree as a developer. P10 explains that a candidate who has never written software outside university assignments will hate a job that requires programming for more than 40 hours a week, which, as explained by P10 will be a “miserable suffering individual working in the workforce” (P10).

As seen in Table 18, bringing people that fit the culture to work collaboratively inside the team. Participants explained that “gathering connections” (P12) helps finding and bringing sources of knowledge, or “very, very smart” (P13) investors and “founders” (P5).

Table 18. *Find sources of knowledge*

Find sources of knowledge
“Keep accumulating knowledge in that particular area of expertise, and it’s like gathering connection, and you start to see, this person knows this, that person knows that” (P12).
“A wild story how I met him, but as soon as I did, he just became an investor and he's a very, very smart man” (P13).
“We were lucky enough also for me to take Founder C” (P5).

We hire sort of different functional traits, so we have a marketing family, the sales family, project team, we have two development teams, design team, and culture and people, finance and my office the office of the CEO, there are worlds inside of those teams that need to be filled, marketing people that are inside, and project managers and product managers, all of that inside the office, so we have skills in those areas, and we have got to be skilled to be able to run that. But we may not hire a person just because they've got the skills. They need to have the right attitude and the right culture (P9).

The people becoming part of the team need to be chosen carefully. When going through this process, participants try to get the best they can afford, by calling experts in the fields and people with vast experience in similar fields. “We are effectively well reducing our risk, with regards to performance by making sure we choose the best of the best of the people that do what they were doing when they were doing it” (P1). One commonly used technique is to involve the team in the selection process of new candidates. Participants explain that involving team members in the selection process

helps identify people that are passionate, can work in a team and fit the culture of the organisation.

Our recruiting process is quite streamlined, we have a couple of one on one meetings, with various people in the team, as in our recruiting team, do the first round of meetings, then the team leader does the next round, then I, depending on the role, a small group of people may do an interview, and then we do what it's called a round table, where we have a large group of people do a final interview with that person. And each one of those, is a culture gate (P9).

Participants highlight that when choosing new candidates, they look for people who are honest, capable of working in a team, open to discuss, and that are passionate about the problem the company is trying to solve. Ego driven people do not fit these innovative businesses. Within this context, participants are constantly looking for self-driven people that have the right attitude, can work in a team and have integrity. The goal is to create a culture where people can have normal sustained lives. P7 explains that a lot of recent graduates fit these requirements, as they are passionate about making the world a better place, are eager to innovate, are committed to teamwork and have integrity. “Graduates that came from Australia are just leagues ahead. And product knowledge, and intensity, and drive and motivation, and thinking out of the box” (P7).

Participants also agree that managing a group of people is not an easy process. Finding the right fit is a constant challenge for innovators. When choosing the right people, innovators need to have the capacity of hiring, retaining and firing people. This is a challenging position, as many create a relationship with the people in their team or have been friends for a long time. “You are going to need a team of people. And then that requires management skills, knowing how to hire people, pay them, not pay them too much, otherwise you go broke very quickly” (P12). The following quote from P4 described the moment when he realised, he was being “too nice”, and realised he had to make a change. People were taking advantage of the way he was running the business, by working less hours, not being productive and wasting the money in a way that was not going to be sustainable over time. From this point, he had to take some action, and fire people, which helped him change the culture of the organisation. From that point forward, he described the process of selecting people as one of the most important roles inside the organisation.

If you're not prepared to cause a bit of pain sometimes, then you shouldn't take that position, because that's not what you've agreed to. So, I had to, I also had my lead programmer saying, "You had a chance at making a good company, but the place is filled with dead wood, you've been too nice." I never thought of that as a concept. Too nice leads in the wrong direction? Isn't good and nice always the thing that leads the right way? No. There is a balance. There is a balance. Sometimes the lesser of two evils is what you're stuck with, so to speak. So, I had to remove about a third of the staff and bring them all into my office one by one. I did not think I would be able to do that. "I'm sorry but the company is running out of money. We have had to select who is staying and who is going" (P4).

Managing teams within disruptive technology companies, therefore, is a challenging process. P9 describes someone with a culture that does not fit the culture of the organisation as “toxic” and explains that dealing with toxic people is a problematic situation, which sometimes requires firing people. Participants agree that firing people is one of the most challenging processes innovators must go through. However, they recognise it is inevitable in creating a culture of technological development.

We never hire a person just because they've got the skills. Someone that has got a bad culture is toxic. We made mistakes where we hired some people where we thought they had the right culture fit, and as it turns out they don't, and have really had an impact on the business so we just keep on recruiting the labour recruits to reduce the number of times we recruited the wrong person (P9).

The theme *diverse wisdom* has explained how participants create a team with a diverse group of people which helps them understand the problem from different angles. *Diversity* explains the significance of having a group of people with different backgrounds, and *wisdom* is the relevance of choosing smart people who have the right culture, skills, passion and experienced. Managing disruptive technology businesses requires the help from external and internal stakeholders who can give insights from different angles in the process of understanding the problem and solving the problem. After understanding the significance of diverse wisdom, the next theme details how building connections inside the organisation helps creating an environment of open

communication and discussion. Appendix G provides a list of more participant quotes to support the richness of the theme diverse wisdom.

4.3.3. Achievement through collaboration.

An environment that promotes relationship building and collaboration is required for the attainment of disruptive technology businesses. Achievement through collaboration explains how the interaction of people inside these businesses allows discussing ideas at an intragroup and intergroup level, which promotes learning and continual improvement through openness and trust. The theme achievement through collaboration was discovered from the sub-themes *keep small and nimble* and *build relationships* (Table 19), which highlight the significance of building an environment of trust and collaboration.

Table 19. *Achievement through collaboration sub-themes and concepts*

Theme	Sub-themes	Concepts
Achievement through collaboration	<u>Keep small and nimble</u> Build relationships	Light team, collaboration, people are key, have fun, build relationships

4.3.3.1. *Keep small and nimble.*

Participants suggest that the best way to manage people is to keep small and nimble as it helps in the dynamics of the people through trust and collaboration. Following cash flow limitations and low investments at the initial stages of the development, these businesses start with a small group of people. Participants explain, as presented in Table 20, that managing disruptive technology becomes easier when “you have a new super light team” (P1), as the effort of each member of the team directly impacts the attainment of the organisation, creating a sense of responsibility in every person and the “ability of moving much more quickly towards a solution” (P19). Within this context, P12 adds that as the business grows, the relationships and collaboration “will be hard to hold together” (P12), which highlights the capacity to build an environment of trust and collaboration within small groups of people, which is deteriorated as businesses become larger, as seen in large firms.

Table 20. *Light team*

Light team
“You need to make sure you have a new super light team that you can trust” (P1).
“When you've got a small number of people working in a company, they're sort of working for themselves, really” (P2).
“I think the culture will be hard to hold together as we grow, and there is no doubt about it” (P12).
“The speed that you have is real when you're smaller, and you have the ability of moving much more quickly towards a solution” (P19).

Relationships are easier to build within a small group of people, where people meet not only to discuss problems associated with the business, but outside the organisation. P5, who worked in the construction industry, explains that the environment inside disruptive technology businesses is far more collaborative.

I think for me, the difference, because all I can compare with is a totally different industry which is the construction industry. This environment is far more collaborative. This for me previously was very dictatorial and master – servant style relationships. Here is very collaborative, and everyone has got a say in what we have got to get to and deliver and what have you. To a degree. And, yes. So far different (P5).

The leading challenge innovators face as they grow is to keep the teams nimble and cohesive. Culture deteriorates as the company becomes larger. P16, CEO of a medium sized disruptive technology business, explained the differences between a team of four and a team of 18, where the team of 18 required structure and goals to be implemented, whereas the team of four can be given a task, a focus, and they will manage themselves in a better way. Within this context, participants provide strong evidence that small groups of people are easier to manage and are capable of building relationships which increase trust and collaboration.

The bigger the team, the more structured probably, which is what we see in development. The more structured and the more focused you need to be on the communication and making sure it happens. Where the

smaller the team, obviously, it's a little easier in terms of maintaining them (P16).

Having few people in the organisation keeps everyone aware and involved in the process. A cohesive team allows everyone to do more than one task where everyone knows each other's names, strengths, weaknesses and personalities. Large organisations cannot rely on this level of relationships and trust requiring a structured process to manage the people within, which hinders innovation and communication. “We want to ensure that we're not just working harder and adding more people, but they're actually working smarter, that we're using the tools and we're using all the skills of the people that we have in the organization” (P14). Within this context, P2 explains, in the following quote, that having a small group of people is a good incentive, as it makes people aware that their contribution is essential for the attainment of the business.

I think part of it, is when you've got a small number of people working in a company, they're sort of working for themselves, really. Because if they're not committed, they're going to lose their job. If the business doesn't succeed, then they lose their job. And I think people, that's a good incentive for people, you know, for people to stick with it and work when they know that what they do is important to keep the business functional. (P2).

4.3.3.2. Build relationships.

By understanding the how keeping the team small creates relationships, the sub-theme build relationships explains how participants create a “psychological space to be innovative and creative” (P10). Building strong relationships between the people inside the organisation is key for the development of disruptive technology. Participants consider people as their most important asset as only humans can be creative which occurs in a collaborative environment where people enjoy working together. As explained by P16: “your partners, the people who work for you, and the people you sell to, are all the key”. The quotes in Table 21, demonstrate the how people are key in the attainment of disruptive technology businesses.

Table 21. *People are key*

People are key
“Trust the people who work with you, for you, the people you supply to” (P16).
“It’s always about the people, because the people, if you don’t have the people, then you never get to those important clients” (P9).
“Definitivamente, las personas son importantísimas” (Definitively, people are very important). (P8).

Relationships cannot be imposed; they grow naturally within the team. An example of how participants build relationships inside their businesses was evidenced by P5 who explained how the people inside the business, including her as a founder, organise activities during the weekends. P5 added that these activities are organised by the people, and she only provides the monetary incentives to make them happen. “Next week we are off to laser force, so that should be interesting” (P5). Relationships are built by spending time with the people inside the organisation, learning what motivates the people in the team, and helping them grow. The quotes in Table 22 give evidence of the significance of building relationships.

Table 22. *Build relationships*

Build relationship
“More important to maintain friendship than anything else” (P11).
“Es una relación de amistad, respeto, cariño” (Is a relationship of friendship, respect and love) (P8).
“Spend some time outside the day-to-day work and delivery, understanding each other” (P16).

Participants explain that an environment of friendship and respect allows communication and understanding which leads into product development. The key is in making everyone comfortable working with each other in this space and finding people

everyone is happy to work with and can trust. As shown in Table 23, participants aim to create an environment where people have fun and enjoy coming to work. Within this context, P16 explained celebrating “when we do something well” makes people “feel good”.

Table 23. *Have fun*

Have fun
“We like making things; that's fun” (P4).
“Enjoy it, because if you don't enjoy it you're going to go home and go, ‘Oh, it sucked’” (P13).
“Making sure you celebrate things together, making sure you know each other, you have fun together” (P16).

During the initial stages of the business, participants bring family members, friends from school or childhood, and people they have worked with before as they know and trust them. By bringing friends and family members to support him in the development of the videos and social media, P11 created a group of people he could trust, where people knew each other and could work together. “My sister is doing the video, my friend who had been marketing in the Facebook page, and my other friend who was a good caterer and could make anything happen. So, we had a very small team” (P11). P17 provided another example of the advantages of bringing people he trusts, by explaining how one of the graduates he hired years ago, has now become the founder of his most recent start-up.

(Founder B) is one of the founders here. I employed him when he graduated from (University Name). He has worked with every start-up, and he's usually working as consultant to someone. Worked there for some years and he'll do another start-up, and he comes back, and he loves the innovation space (P17).

Creating a group of people who trust each other and know each other results in collaboration. Within disruptive technology businesses, collaboration is the ability to share the work with different members of the team, who, together, can come up with new solutions. Participants explain that through a small group of people, where people know each other and trust each other, a collaborative environment with participatory decision making is created (Table 24).

Table 24. *Collaboration*

Collaboration
<p>“We just kind of share up the work” (P3).</p> <p>“Our culture is focused on team work, we talk about that the first day” (P9).</p> <p>“Very collaborative, and everyone has got a say” (P5).</p>

The theme *achievement through collaboration* explained how disruptive technology businesses can create an environment of collaboration through trust and a small, easy to manage, group of people. Having a small cohesive group helps build strong relations between the people which creates an environment of openness and trust. The way in which participants manage these interactions is discussed in the theme structure and consideration. Appendix H provides a list of more participant quotes to support the richness of the theme achievement through collaboration.

4.3.4. Structure and consideration.

Managing the transition from idea to reality requires a group of people who are constantly learning and improving. The theme *structure and consideration* explains the significance of creating an environment that balances structure, for technological development, and consideration, for the development and growth of people. This theme emerged from three sub-themes: *authenticity, caring and understanding* and *structure* (Table 25).

Table 25. *Structure and consideration sub-themes and concepts*

Theme	Sub-themes	Concepts
Structure and consideration	Authenticity	Authenticity, both way loyalty, trust, acceptance, invest in people, manage expectations, motivate people, challenge people, play to people's strengths, regular meetings.
	Caring and understanding	
	Structure	

4.3.4.1. Authenticity.

Developing disruptive technology requires creating an environment of trust and collaboration. Authenticity builds trust and collaboration through openness and honesty allowing people to share their concerns and challenges in an open environment.

Participants explain that being authentic requires honesty, for example, telling people from the onset that they will not get a share of the company, but that they will earn above average salaries. Innovators need to be consistent with the promises made. P10 explains that a lack of authenticity is not a sustainable practice, as people realise they are not being treated equally and with respect, as seen in the following quote.

There's a tendency: come work with me, it's going to be great. You're going to be there with me and we're going to be equal partners, then six months down the track he finds out that I've got all the shares and you don't have any shares or you've got 5% shares, we're both working and every time you want to go home because you've got a girlfriend and I'm in the office going, why are you going home? There's all this stuff to build. That's not a sustainable practice, right? (P10).

Participants highlight the how honesty and ensuring these promises are kept creates authenticity. From this point, people know what to expect, which creates an environment of openness and trust. Participants explain that creating an environment of trust and collaboration requires, as explained by P9, being helpful and caring about the people. “You’ve got to be helpful, first, that whole idea of helping other people as a starting point, which creates that kind of good relationships, and the karma, become that come around and makes you grow” (P9). Therefore, by being authentic and caring about the people, participants can create an environment of trust and collaboration.

Authenticity is evidenced through the quotes in Table 26, where P16 explained the how honest and open communication and P10 authenticity build an environment of openness and trust. P18, through an example, explained the significance of authenticity. According to P18, when he was invited to see new technologies overseas, these businesses trusted him, and did not require him to sign confidentiality papers, which demonstrates how relationships can be built through authenticity.

Table 26. *Authenticity*

Authenticity
“We have a value in our organisation called honest and open communication” (P16).
“None of this was in the non-disclosure agreement, or security passes, or anything” (P18).
“You can be authentic and say I'm gonna own all this, I'm never gonna get you any shares, but I'm gonna create a great place to work” (P10).

P10 suggest that the relationships between founders and the team members should be like the relationship between father/mother and son, where the relationships are not an equal relationship, but is not an egalitarian relationship. P10 explains, the culture is based on “authenticity” (P10) developed through mutual respect. An example of authenticity was given by P19 when asking the following question: “I don't know what you know. So, we don't know each other well enough for me to assume what you do or don't know”. Although this quote can be seen in a negative way, through the eyes of authenticity, the innovator was trying to be honest about his relationship with the researcher, which was proven by the following thing he said: “just call me when you have any more questions, and we'll talk more”.

Being authentic goes beyond having a committed team. Participants are congruent with the decisions taken, the promises given to people, openly discussing the challenges and opportunities, and creating an open dialogue with the people in the organisation which creates loyalty both ways. As P8 explains, there is a dependence from the founder to the people, and from people to the founder, which allows the participants to request things from the people, and, at the same time, people to ask the

founder for help which is not always limited to problems related to the business, i.e. P8 pays in full for the expenses related to one of his team members sick child requirements, as this team member would not be able to pay the high costs of the treatment. Quotes supporting both way loyalty are presented in Table 27.

Table 27. *Both way loyalty*

Both way loyalty
“Dependencia de uno hacia ellos y de ellos hacia uno. (Both way dependence)” (P8).
“While you're really good mates, when I turn around and tell you to do something right now, you do it and that's a very difficult thing.” (P13).
“I just say, this work needs to be done and they do it for me. If they are coming late one morning and they go early to do something, I don't mind” (P12).

Both way loyalty is created through trust. Participants explain that building the relationships in the team requires trusting the team itself. As P1 explains: “you need to trust people to do the best of their ability” (P1). Participants explain that caring about the people and being consistent with the promises creates trust within the team. P15 explains how over the years he has worked with the same people, which has helped him build the trust in the team. Additionally, P5, who develops advanced training systems, allows their team to work on their own projects, including games and other software, with the equipment they have at work. The quotes in Table 28 evidences the significance of trust for participants.

Table 28. *Trust*

Trust
“We allow our guys to work outside of hours on their own things” (P5).
“Worked together before, you know each other well and there is a degree of trust” (P15).
“Trust people to do the best of their ability” (P1).

4.3.4.2. Caring and understanding.

Managing disruptive technology requires understanding the weaknesses and strengths of people. P5, for example, performed a psychological test on every person to gain a better understanding of their strengths and weaknesses, which allowed improved communication as people knew how to handle each person in the company.

P5: It's called the HBDI profile. Interviewer: HBDI profile. I can just look that up. P5: Yes, and, if we had done that years ago, the change that it has made as well, is understanding people, what their strengths are, you know, and if it's not one of their strengths but you need that person to respond in a certain way, you actually now know that person, and that's a totally different (P5).

The previous example explains that accepting people's weaknesses is in line with understanding the strengths and weaknesses of each person. Participants explain that they are always seeking to create an environment people enjoy working at, which can be achieved by understanding people's weaknesses (Table 29). For example, P5 explained that after taking the HBDI test, she realised she was weaker in terms of detailed planning and explained that when "someone comes over to my desk they will come and say: (Founder A), I need you to listen, we are going to do some planning". The previous example evidences how accepting the weaknesses of people allows working through these weaknesses in an environment of collaboration and acceptance.

Table 29. Acceptance

Acceptance
"I want to enjoy where I'm working, and enjoy working with the people" (P12). "You've got to manage your expectations for everybody" (P13). "Don't try ask people to do what is not their expertise" (P1).

In addition to accepting people's weaknesses, participants highlight that playing to people's strengths, creates an environment where people can grow. P7 explained that

one of his team members has grown to manage a major project less than two years after graduating following his passion and dedication. As evidenced in Table 30, playing to people's strengths increases people's motivation by wanting to "work overtime, and they really get behind and their greatest weaknesses".

Table 30. *Play to people's strengths*

Play to people's strengths
<p>"We all play to our strengths" (P16).</p> <p>"He is been in the company two years, he is one of our seniors on propulsion now" (P7).</p> <p>"They are willing, to get in, work overtime, and they really get behind and their greatest weaknesses" (P12).</p>

Managing people requires dealing with problems and tensions. Participants explain that these tensions can be managed by understanding that everyone has weaknesses and that everyone wants to be treated assertively. Within this context, mistakes should be tolerated, addressed and fixed. P13 provided an example of how he approaches different co-founders to solve problems and create a safe environment to talk. With one co-founder, P13 needs to "throw a bit of banter", whereas with the other co-founder, he needs to create a "good tech talk". As explained by P12 in the following quote, the goal is to create an environment that supports people, tolerates and addresses mistakes with the aim of creating a workplace everyone enjoys.

There will always be tensions I think, we are all humans, and the biggest problem in every teams is humans. So, I used to have a role and accepted no one is perfect, everyone has their falls, everyone has their strengths, everyone has their weaknesses, but we all want to be treated assertively, and if we make a mistake it should be tolerated and addressed and fixed. It doesn't mean, unless is wilful, then it's a whole different issue. Most of us, we stuff up, we forget things, we lose things, we don't get things done on time you know. You can either make a culture that supports people, or a culture that tears people down. I want

to enjoy where I'm working, and enjoy working with the people, so I try and have a good team spirit. I'm sure I fall far short of my goal but at least it is an aim (P12).

Managing people requires managing expectations, i.e. P13 explained that he and his co-founder did not initially agree on the number of shares each would have and added: “we left it far too long and so managing expectation was not a strong point for us”. In short, P13 explained that some decisions need to be “managed well before”. As evidenced in Table 31, managing expectations is a significant part the disruptive technology process.

Table 31. *Manage expectations*

Manage expectations
“You’ve got to manage expectation, because everyone wants to be paid the most amount they can be paid” (P12).
“People melting down over lack of clarity, misunderstanding, over assumptions” (P11).
“You have to manage people's expectations and make sure that they understand the broader scene” (P19).

Participants genuinely care about the people in the team and aim to understand how they feel while understanding the reasons for their actions with the aim of finding what works with each of the people in the team. It is a challenging process that requires empathy to understand why somebody reacts the way they do. Every person in the team has different intrinsic motivations, and it is imperative that the company understand these motivating factors to create value for the team members. Ultimately, people should be given the opportunity to grow in what makes them happy, i.e. P9 explains in the following quote how participants care about making their people learn and grow, which adds more value to the company.

You have to care about them. Like, I bring every person in my business, and my goal is to make them grow. And, if I help them grow, and I help

them learn, then obviously they are more excited about what they do at “Company Name”. And that adds more value (P9).

Making people grow requires investing time and money in people. As evidenced in Table 32, the aim is to grow people's expertise which requires investing in people and making them grow. For example, P8 had a security guard who wanted to learn more about the technological development. Through time, P8 taught this person how to work with their systems, went to some courses, and ended up working with the technological development team following his passion and commitment to the team.

Table 32. *Invest in people*

Invest in people
“We've had to grow a lot of our own product managers within the business and grow that expertise across the business” (P14).
I bring every person in my business, and my goal is to make them grow. (P9)
You should always invest in the people. (P6)

Motivating people is critical for the development of the products, as it creates an environment where people can challenge ideas and generate new knowledge. Participants explain that part of investing in people is understanding what makes people happy, and highlight that money is not the primary motivating factor in the context of developing disruptive technology. Creating an environment where people enjoy working inspires people to innovate. The real motivator is being able to come to a workplace people enjoy, where people work together, within an environment of openness and collaboration with the objective of creating a technology that will create a positive impact. P13 explains motivating people requires acknowledging that every person in the team is “putting their faith in you, so if it's a really small team, one person having a bad day can be everyone's bad day, but it doesn't have to be (P13). Participants, Table 33, explain that people can be motivated by finding people's trigger points.

Table 33. *Motivate people*

Motivate people
Ability to enthuse other people. (P10)
I think you just got to be positive and motivate people. (P2)
Knowing where peoples trigger points are for, not happiness as such, but excitement. (P13)

Making people happy requires understanding that everyone in the organisation has a family, social life and specific needs, such as extra time for a holiday. Being flexible with people includes letting people come late, give them extra holidays and allowing them to participate in projects they feel more passionate about, however, not being shy of asking the team to work harder when needed. There needs to be flexibility both ways. P12 gave a good story of when he had rewarded someone for their achievements, but not the person working next to him. They realised how this could negatively impact the other person and decided to do something about it as shown in the following quote.

We send out an email of appreciation. We took some action to make sure we solved, they were rewarded. Three of us just said, let's just fire an email and said, I'm worried that you will go home and feel that someone else got rewarded and he wasn't, and can we take some action, send a formal letter tomorrow, but let's send an email tonight. So, he can go home without the wrong impression and sleep overnight. So, we just addressed the situation (P12).

4.3.4.3. Structure.

Within an environment that cares for their people, there needs to be structure. Founders need to create an environment where people can openly discuss questions or problems, which occurs in an environment of openness where people are encouraged to discuss the challenges they are going through. Participants explain that there needs to be a fine line between having authority and not having any authority. “So, while you're really good mates, when I turn around and tell you to do something right now, you do it

and that's a very difficult thing" (P13). For example, P7 explains that they meet on a weekly basis to review the progress of each project to discuss the problems in the projects and provide honest feedback from every person in the team to keep the development ongoing. Regular meetings provide opportunities to know "exactly what everybody else is doing" (P13), which allows constant collaboration from everyone in the organisation and open discussion of the problems (Table 34).

Table 34. *Regular meetings*

Regular meetings
<p>"We just regularly were meeting" (P3).</p> <p>"Every day, the management team does a stand up" (P14).</p> <p>"Knowing exactly what everybody else is doing and knowing they're on top of it has been a big learning curve" (P13).</p>

Structure also refers to the ability to manage the development of the product through weekly or fortnightly meetings where a new development on the product is expected by every team in the organisation. During these meetings, advances in the work should be presented within an environment that allows everyone to discuss the advances and what everyone is doing in the next weeks. Participants spend time in these meetings making sure everybody gets a good understanding of where the process is at. The following quote from P7 provides a detailed description of this process.

Well we, have a weekly meeting, so we actually had it this morning, we normally have them on Monday, because I arrived this morning, we had it this morning. We go through basically, what did everybody do last week. What are we doing this week and what are we doing next week? You know, almost I remember spending around 40 minutes so everybody gets a good idea, we have names attached to tasks. Who is doing what? So that's how people have a good idea of what's going on (P7).

Through these meetings, the team can promote innovation by giving people the opportunity to grow in their skills (Table 35). For example, during the interview with P4, one member of the team, who had recently joined the business, said that she wanted to develop games as well, to which P4 explained: you can develop games once you do your “hard duties”, meaning, she will be able to work on these games, once she has learned to work with the team and gained the trust of everyone in the team. Within this context, participants aim to first understand people’s strengths and weaknesses to then give people the opportunity to do something in line with their strengths. For example, P14 explains how one person had the opportunity to run the whole organisation for two weeks.

Table 35. *Challenge people*

Challenge people
“We know each other's strengths and weaknesses” (P16)
“She wants to go into making games herself, so she must do her hard duties before” (P4)
“She's around 27, 28 years old. And she actually ran the organization, the whole organization for the two weeks” (P14)

The theme *structure and consideration* explained how building a business that cares about their people helps in the development of disruptive technology. Through caring, people are then given the opportunity to grow in their strengths, while considering the weaknesses of every person to create an environment where people feel happy to work at. Within this context, the development and completion of projects is guaranteed through frequent meetings and communication. A discussion of how innovators overcome challenges is discussed in the following theme stress adverse. Appendix I provides a list of more participant quotes to support the richness of the theme structure and consideration.

4.3.5. Stress adverse.

The theme *stress adverse* highlights the significance of persistency in the process of creating a disruptive technology. This theme emerged from two sub-themes: *perseverance* and *take the risk* (Table 36), to explain how to overcome ongoing financial hardships, unsuccessful products and other challenges. The following quote from P19 illustrates how difficult this journey can be for innovators: “so it’s a lonely existence, it’s not an existence that’s glamorous. It’s pretty f***king depressing actually” (P19).

Table 36. *Stress adverse sub-themes and concepts*

Theme	Sub-themes	Concepts
Stress adverse	Perseverance Take the risk	Takes time, resilience, perseverance, challenging, timely execution

4.3.5.1. Perseverance.

Participants explain that developing disruptive technology presents multiple challenges, where, more than often, people quit pursuing the development of the disruptive technology and become part of a more traditional organisation in the aims of having a more comfortable life with lower levels of stress. As seen in Table 37, there are multiple challenges in the development of disruptive technology including the fact that Australia is an isolated country, political challenges, and customers who are reluctant to using the new products.

For example, P2 explained how he developed a solution to help disadvantaged children over 25 years ago, however, the bureaucratic procedures and policies are making it harder and harder to use these technologies. “It’s just the constant obstacles that are put from bureaucracy, the ecosystem. Health is increasingly clogged with regulations, bureaucracy, interference that make it harder and harder to do anything disruptive” (P2). Participants provide other examples of the challenges within the development of disruptive technology including explaining to customers and investors the benefits of the new technologies, long work hours which are required to develop the

technology, and delays in projects for large organisations where participants have little or no control.

Table 37. *Challenging*

Challenging
“Doing that in Australia, from Australia was just too hard” (P17).
“Things are getting harder, not easier” (P2).
“The hardest thing is getting people to believe” (P13).

Managing challenging times requires perseverance. Participants explain that the best way to do this is to ensure everyone in the team understands the broader scene and see beyond the next wave. “A key thing you have to manage as well is the ups and downs” (P19). According to participants, small businesses go through very stressful times, and the reason why many newly created businesses do not work is because they cannot see beyond the last mistake, where there is a new possibility for another contract or idea to make it through. As explained in the following quote from P19, the company may be going up, and within 48 hours people could be losing everything.

*Until you've been three or four times within 48 hours of a company going t*ts up and people losing everything, obviously having money that you could wind up and not have people lose their entitlements, but I mean not having been that close, it's hard to gain perspective. The level of stress that that causes people breaks people (P19).*

According to P19, most people go through one start-up and then move to less demanding jobs because of the levels of stress. As P19 explained: “you need to be willing to put the blood on the floor”. Managing disruptive technology, therefore, is a process that requires perseverance and resilience (Table 38). Participants explain that having a positive purpose helps building the mindset required for the attainment of disruptive technology businesses by remaining positive and transmitting security to

everyone in the team. As P12 explains, “you have to have that determination, that’s why doing something you think is big and significant and important helps” (P12).

Table 38. *Perseverance and resilience*

Perseverance	Resilience
“Be willing to be patient, but not only with yourself, well with yourself in particular but also with other people” (P13).	“Yeah. That’s right. 100% of my time were spent there in the first 5 years” (P9).
“How do I get to success? Is do not give up” (P4).	“The first 5 years I didn’t get any holidays at all” (P9).
“You have to have that determination, that’s why doing something you think is big and significant and important helps” (P12).	“I think you have to have a lot of perseverance and resilience” (P2).

Some innovators explain this perseverance as being ‘blessed with stupidity’ (P4) or having ‘stubborn persistence’ (P11). Despite the way they explain their perseverance, it is all about keeping things moving, persistence and a sole focus on developing a solution to a problem which attracts people who are passionate towards solving that same problem. For instance, P11, was so determined that even though multiple experts said would never work, he kept on going. “I’m going to do it anyway. And, sure I was, I guess, I get pretty stubborn, I would call it, a very stubborn persistence.” (P11). Creating disruptive technology is a process that has taken years for most participants. Developing disruptive technology is a slow process which requires perseverance and resilience as many prototypes fail, projects do not get through and mistakes are made (Table 39). For example, P1, who was trying to save the lives of environmental scientist, took “9 months to get all the health and safety organised” and for P4, who developed a new graphics engine, it took “13 years to get to the point of making a way to give computers unlimited power”.

Table 39. *Takes time*

Takes time
“It took us 9 months to get all the health and safety organised” (P1).
“It's going to take a long time. It's a very slow process” (P2).
“It was 13 years to get to the point of making a way to give computers unlimited power” (P4).

4.3.5.2. *Take the risk.*

Development occurs as a result of testing ideas. When developing disruptive technology, the team needs to test different technologies to solve the problem. Testing different approaches aims to find solutions to the problem, which requires taking risk and executing ideas in a quick manner. Within this context, disruptive technology businesses struggle for money in the early stages, which requires quick decision making. P7 explains that having people costs money, and that this time needs to be used wisely by making decisions in a quick manner. “If I have them a week, it's costing me money, so I'm definitely invested into quickly make decisions” (P7). As P6 explains: “idea is cheap, execution is not”, meaning that having an idea is easy, the problem is in executing the idea. Developing disruptive technology requires trusting members of the team in executing new ideas and make the necessary arrangements in a quick and efficient way (Table 40).

Table 40. *Timely execution*

Timely execution
“Si no se toman decisiones a tiempo a veces, puede ser un problema” (If decisions are not made on time, that can be a problem) (P8).
“Idea is cheap, execution is not” (P6).
“Sometimes leaders need to make calls, and they need to make calls really quickly” (P14).

Executing ideas requires relationships of trust, where people are empowered to test new technologies and solutions. Participants explain that decisions need to be made in a collaborative environment where everyone is considered before making a decision by selecting the best approach through logical arguments and examples which leads to an idea that is worth taking the risk. Although most ideas could be potentially useful for the company, many times, these ideas can lead to challenges that require a change in plans. When problems occur, the attitude towards these challenges is to learn from these experiences and keep moving forward (further discussed in Theme 5, learning from mistakes). The following quote from P7 explains the reasoning for collaborative decision making, where the team benefits from having a diverse group of people working together towards understanding a problem and finding solutions to such problem.

What I say to senior managers; nobody knows everything about everything. You know, so there's knowledge gaps, in every person, you know, I'm not absolute expert on any particular thing, neither are you. So, you shouldn't think that I'm the only guy that has the answers to this problem. You have to think, I benefit from getting the three of us thinking about it. Then we talk about it, and then we come to some sort of joint decision, or at least listen to what you have to say. So, I encourage that in the team (P7).

The theme *stress adverse* highlighted the challenging process disruptive technology businesses go through, which require perseverance and timely execution. Technological developments take time to happen, there are multiple bureaucratic approvals, experiments, connections and challenges that need to be completed. Innovators need to be perseverant in this process while having the capacity to execute ideas that come from participatory decision making. After discussing the significance of perseverance, the next theme explains how a culture of innovation is created. Appendix J provides a list of more participant quotes to support the richness of the theme stress adverse.

4.3.6. Innovative mindset.

Disruptive technology is developed within an environment of growth and constant technological development. The theme *innovative mindset* explains how to create a culture that keeps improving by creating an environment that continually questions how to do things better. This theme emerged from two sub-themes *passion* and *encourage innovation* (Table 41).

Table 41. *Innovative mindset sub-themes and concepts*

Theme	Sub-themes	Concepts
Innovative mindset	Passion	Knowledge hungry people, passionate, constant improvement, learning environment, honest feedback, creative environment, freedom to innovate, obsolescence
	Encourage innovation	

4.3.6.1. Passion.

P12, a cancer survivor, explains the passion that drives him to develop a solution to combat fake products: “I’m a cancer survivor and I can’t imagine going through the torment of being injected with a fake medicine or a harmful medicine, when it’s your last chance in life” (P12). Every participant, as evidenced in the researcher’s notes, have a passion for making a change, for solving a problem, where participants transmit the problem in a way that even the researcher wanted to help: saving new-born lives (P2), saving the environment (P11), eliminating fake products (P12), and the list goes on and on. A positive purpose “inspires passion” (P16) within the people in the team. P11 explains that participants bring people that are passionate about the innovation or the technological development. For example, P2 explains that helping “very disabled and disadvantaged” is “obviously is a strong motivating force for people to help, to feel that they’re helping children who need loads of surgery” (P2). Through a positive purpose, therefore, participants can bring passionate people who have the intrinsic motivation to solve the problem (Table 42).

Table 42. *Passionate people*

Passionate
<p>“Gotta get my skills up” (P4).</p> <p>“They love innovation, and the invention, and other are there because they love the environment” (P11).</p> <p>“Do something that you like, something the world needs, something you get paid for, and something that you have skills for” (P6).</p>

Developing disruptive technology requires the involvement of a group of passionate and committed group of people with an intrinsic desire for the company to grow. An example of how a passionate group of people can help in the attainment of a business was provided by P5, who got help from the team members to provide one customer with the necessary equipment.

One of our early clients with the VR, we thought we had it ‘under control’, with the hardware, and it was back when the ‘Occulosis’ was the first ‘Oculus’ came to market and we bought, I think we bought 9 units or something, which is what the client asked for at the time, and then they wanted more, immediately. And then our guys had some at home, and they just donated theirs (P5).

After the P5 shared the previous story, she explained that the company replaced these products. Without compromise and commitment, these opportunities would be lost. Innovation occurs within a cohesive group of people, which are brought together following a similar passion and the motivation to create a positive impact. Passion is what drives the team to spend hours developing a product. As P17 explains, the “magic” (P17) is in developing something unique and innovative in a short period of time, which can only be done through passion, motivation, and innovation.

Understanding people’s legitimate expectations in life is a big step in managing people’s commitment and passion to the company. According to P12, “it’s not always money”. People “want appreciation, they want purpose, they want happiness, they want fulfilling work” (P12). Participants do different things to acknowledge people, increase their happiness and make sure they have a fulfilling work. For example, P16, with the

aim of making people have fun, created an “annual conference where we bring all the staff together, where we do some fun things that are outside”. P16 added that through these conferences people feel they are in a “culture of acknowledgement and celebration” (P16) and makes people feel good. Participants highlight that managing disruptive technology is a process of understanding people’s expectations and increasing their commitment and passion towards the company, which is achieved by bringing people with a desire to learn and innovate (Table 43). For example, P4 brought in the person running a large technology company in the southern hemisphere to be the chairman.

Table 43. *Knowledge hungry people*

Knowledge hungry people
“A lot of the people I hire have a natural desire to learn” (P7).
“I think smart creative people, they identify anything in that space” (P10).
“Hay gente muy innovadora que conforman ‘Business B’. (There are very innovative people inside ‘Business B’)” (P8).

4.3.6.2. Encourage innovation.

Developing disruptive technology requires adopting the psychology of becoming which orients people towards continual improvement. People inside the organisation need to be capable of engaging in a cycle of continual improvement, which is achieved through a continuous lack of satisfaction where people continually question results in a constructive way. Through a mentality of obsolescence, the team is capable of continually improving. Participants explain that when people start to think that what they have developed is excellent, or has already accomplished its goal, then no development is achievable, and that is the point at which many businesses die, due to lack of innovation. According to P16: “everyone is guaranteed to lose their job in 5 to 10 years if we can’t be really innovative and clever. Once you get comfortable, you are displaceable” (P16). Everyone in the organisation needs to have this mentality that the product is never finished and that everyone is always working on improvement. It is a

learning mindset, that people have of continuous learning. When the culture is capable of understanding that everything is obsolete, everything then keeps changing and improving, which leads into an environment where everything happens continually (Table 44).

Table 44. *Obsolescence*

Obsolescence
<p>“I've never been the sort of person who likes things being as they are” (P10).</p> <p>“They are torturing themselves until they are the absolute best” (P4).</p> <p>“Todo lo que estas haciendo esta errado, es obsoleto. (Everything you are doing is wrong, is obsolete)” (P8).</p>

Developing disruptive technology requires a mentality of obsolescence, as well as the ability for everyone in the organisation to explore and innovate. In this process, people need to explore and learn from their mistakes. For example, P14 explained how she gives people some pointers and clearly defines the problem she wants to solve, while empowering the team to bring solutions which allows them to explore and create a solution to that problem. Participants explain that people need to be capable of exploring to make them learn and grow (Table 45).

Table 45. *Freedom to innovate*

Freedom to innovate
<p>“These are cultural things that are very important in creating innovative cultures” (P10).</p> <p>“Let them learn their own lesson” (P11).</p> <p>“I think that you need to give people the opportunity to do things” (P17).</p>

Participants aim to create a culture that empowers people. P10 explained that it would be demoralising if “there's someone telling you what to do on Tuesday and

Thursday and how you should build something, and whether or not they might be calling them project managers” (P10). Innovators need to find people that want to keep learning and who are passionate and want to create something of value. It is about finding people that are hungry to learn and are eager to invent and creating a team that helps attain the goal quicker. Once that culture is created within the people in the organisation, the ability to innovate spreads around. “*If you create an innovative culture, which is a culture that is attractive to innovative people, ultimately, that will beat companies that have more money*” (P10). Participants explain that graduates are a great example of the kind of people which fit the culture inside these businesses as they have “product knowledge, and intensity, and drive, and motivation, and thinking out of the box” (P7). Graduates have not gone through a process in which they need to listen and obey. They see the world their own way, and that passion is what drives innovation. Junior people have an innocent passion which motivates their ambition to achieve the problem these businesses are trying to solve.

In addition to getting innovative people, participants explain the need to create a creative environment, which participants often do by having open working spaces, and other tools to brainstorm new ideas. When entering P4’s site, the researcher noticed drawings in the ceilings, pop-corn makers and areas for people to work collaboratively. This was also evidenced with P14, who claimed to have boards on the hallways where people can brainstorm ideas to increase innovation, and P17 who had a collaborative design in the second floor for coders to work together. Participants aim to create an environment where people can be creative, think of better ways and share these ideas with the team (Table 46).

Table 46. *Creative environment*

Creative environment
“What can I be doing better, how can I fix that?” (P12). “They tend to get emotional satisfaction through creativity” (P10). “And there's improvements that we can make, we're always very focused on that” (P14).

Through a creative environment, participants can create a learning environment and constant improvement (Table 47). Constant improvement is created by “constantly iterating” (P19) and aiming to have “a new version of the product” (P10) in short periods of time. For example, P13 showed the researcher the different iterations of his product, where the first iteration had some deficiencies which were improved by adding more layers and using different materials. A learning environment is achieved by giving people the freedom to explore. Through freedom and openness, people can explore new ideas and discuss their implementation, which helps in the process of product development. A learning environment is achieved through a mentality where everyone understands that “fixable problem is not a problem” (P13), and where the message that everyone is “learning all the time” (P16) is understood. An example of how participants create this environment was seen with P9 when he told everyone in the company that he has made more expensive mistakes than anyone in the organisation, which creates a sense of trust in everyone in the organisation, and the realisation that it is fine to be make mistakes as long as they learn from these experiences.

Table 47. Learning environment and constant improvement

Learning environment	Constant improvement
“We're learning all the time, all of us” (P16).	“Every two weeks they're putting out a new version of the product” (P10).
“A fixable problem is not a problem” (P13).	“Constantly iterating, constantly improving” (P19).
“Be curious and open about the technology and willing to learn” (P14).	“As long as we keep improving, which we are, I'm happy with that” (P7).

As evidenced in creating a learning environment, honest feedback helps in the development of disruptive technology. Honest feedback is the ability to trust and provide constructive feedback to any person inside the organisation with the aim of helping them achieve a better outcome. Openness was emphasised by multiple participants who acknowledge there are always going to be errors, which can be fixed through open discussion and collaboration (Table 48).

Table 48. *Honest feedback*

Honest feedback
“Speak openly, to feel as though they can challenge what's going on in the organisation” (P16).
“It does take a special type of person to want to admit that there's lots that they don't know” (P14).
“We talked openly about the number of times you made mistakes” (P9).

The theme *innovative mindset* described the significance of encouraging innovation within the team. People who are passionate about the technological development or the positive purpose of the organisation can bring new ideas for the development of disruptive technology. Learning from mistakes is further explored in the theme *learning from mistakes*. Appendix K provides a list of quotes from participants 1, 3-14, 16, 17 and 19 to support the richness of the theme innovative mindset.

4.3.7. Learning from mistakes.

In the attempt to create disruptive technology, many ideas will fail. Within this context, innovators understand that mistakes are a critical step to success. The theme *learning from mistakes* explains that accepting and embracing failure and mistakes creates learning opportunities. This theme emerged from two sub-themes *accept failure* and *fail fast* (Table 49).

Table 49. *Learning from mistakes sub-themes and concepts*

Theme	Sub-themes	Concepts
Learning from mistakes	Accept failure	Development through learning, tolerance to failure, failure key to success, deal with problems
	Fail fast	

4.3.7.1. Accept failure.

Innovators tolerate mistakes, and in some instances, even encourage them to accelerate learning. “As long as we keep improving, which we are, I’m happy with that” (P7). There needs to be a culture that does not judge mistakes or tries to find who was responsible, but a culture that deals with mistakes as a learning opportunity. People should be capable of openly discussing the mistakes to learn and find different ways to manage the problem. “Being able to understand what caused you to fail and what allows you to succeed” (P19). “You always learn way more from the failure, than you learn from a successful flight” (P7). In the following quote, P9 explains that tolerating mistakes and understanding that disruptive technology requires a culture of people that are learning.

We are people who are learning, as opposed to people who are proven.

They are always making mistakes, right? That’s the nature of learning, you need a culture that supports people when they make mistakes. And a culture that is very, we do a lot of work compliance, and that is designed to get people from what works and what they can do better definitely takes time so we then never judge people when they make mistakes. That’s a very important pattern within our business culture (P9).

Participants explain that developing disruptive technology requires understanding that not every idea will be a success, and quite often, the group will need to learn from the failure and accept it as a positive outcome. This process requires spending time thinking about the problem, the causes of the problem, and how the problem was identified. For example, P9 explains that they have a model where they openly talk about the number of times everyone has made mistakes, and P9 told the team: “I have made more expensive mistakes, than anyone else in the business. And so that was so that other people know that I am not going to get upset if anyone tried and didn’t work as well as they thought” (P9). Participants explain that failure is key to success, and that they need to create a culture that supports and tolerated failure (Table 50). Participants explain that in the process of creating new ideas, they have failed more times than they have succeeded. Making mistakes is part of the learning process, and the culture needs to understand and acknowledge that mistakes will occur, and that

through these mistakes big improvements will be made, which will allow the re-education of people and technological development.

Table 50. *Failure key to success and tolerance to failure*

Failure key to success	Tolerance to failure
<p>“They failed more than they succeeded” (P16).</p> <p>“Willing to learn, and to say that there's lots of things that we don't know” (P14).</p> <p>“Culture that supports people when they make mistakes” (P9).</p>	<p>“I have made more expensive mistakes” (P9).</p> <p>“We all make mistakes” (P14).</p> <p>“It's the no fear of failure” (P7).</p>

Development through learning, therefore, is the capacity of the team to learn from mistakes, which requires being capable of learning from mistakes, by improving the design to stop the problem from happening again and creating more capacity within the team to find problems in a quicker way. Failures should be accepted but not repeated. There needs to be a learning curve. As seen in Table 51, participants are constantly improving, meaning that the team needs to learn from the mistakes and use these experiences as learning points to keep moving forward.

Table 51. *Development through learning*

Development through learning
<p>“We are constantly developing” (P3)</p> <p>“If we get something wrong, we just need to recognise that” (P14)</p> <p>“You're learning all the way along” (P19).</p>

4.3.7.2. Fail fast.

Disruptive technology is a learning process, which requires learning from mistakes. The key to learning from these mistakes is not fearing failure which allows disruptive technology businesses to continually improve. Within this context, these companies can try multiple ideas to then push the best ideas forward. P14 explained, they “need people to experiment, to try new things and not to feel afraid that they may fail as a result, but just to have the processes in place to support them, to get to that end result, whether it's a fail or success, as quickly as possible” (P14). P7 explained the concept of failing fast through an example: he asks his people to have test the prototypes when they are 80% ready and not 99% ready. Doing so, allows the team to be quicker in making decisions, which leads into faster decisions and improvements.

Give yourself a goal of 99% per cent success rate, you might spend an extra 3 months making sure that everything works perfectly, testing all the other little sub-systems and then do the test, and yet, 99%. Whereas if I tell you, I want you to do it like in a month with an 80% chance of success, if you do that three times in a row, that goes way through 99% per cent and I have got an 80% chance of it working the first time after a month, and then I can keep going (P7).

Everyone, including the top management, should agree to these decisions and incentivise the ability to fail fast. Having a positive attitude towards taking risks, everyone in the organisation takes the same approach and is prepared to fail quick, again and again, to learn more and in the quickest time possible. It “is not whether or not we fail, it's that if we fail, that we can get to that point as quickly as we possibly can” (P14).

The theme *learning from mistakes* detailed how creating an environment where failure is seen as a learning opportunity creates the opportunity to fail fast which leads into quicker technological developments. After explaining the learning from mistakes, a discussion of how to synthesise the ideas of a group of people is presented in the theme engaged synthesis. Appendix L provides a list of quotes from every participant (except P18) to support the richness of the theme innovative mindset.

4.3.8. Engaged synthesis.

Bringing together people with different skills and experiences requires an environment that can, not only embrace diversity, but synergise these ideas towards the development of the product. The theme *engaged synthesis* explains the significance of focusing on solving a specific problem through the involvement of multiple stakeholders. This theme brings together two concepts *involvement* and *focus* (Table 52).

Table 52. *Engaged synthesis sub-themes and concepts*

Theme	Sub-themes	Concepts
Engaged synthesis	Involvement Focus	Commitment, consensus, vision expander, focus, test in market, develop product

4.3.8.1. Involvement.

Openly discussing ideas provides new alternatives to solving the problem. Participants believe that everyone is part of the team, at every level of the organisation, and are constantly trying to generate a collaborative environment. One example came from P14 who used a box to encourage questions from people inside the organisation. P14 explained that for two weeks she “appointed the Head of Community, a younger manager to run the organisation for the two weeks” (P14). After these two weeks, someone asked in the question box: “Did I think it was fair that this person, this employee, and I swap salaries for the two weeks, and would I be prepared to do that?” (P14), to which she agreed and gave the Head of Community her salary for the two weeks, and P14 got hers (P14). The above story shows how openness can create an environment where different ideas can be discussed, challenged and executed. Innovators encourage people to challenge the ideas and processes to find better ways or “shortcuts” (P7) in the technology development process. Openness allows intergroup and intragroup collaboration that allows ideas to be brought to the relevant groups, accelerating the innovation process.

The team collectively is building the product. Each software engineer might have some really relevant insight into market requirements. If the market requirements have come from a technical sort of audience. The person in the marketing team might actually have some software engineering skills (P10).

The concept consensus explains how bringing together the ideas from a diverse group of people through collaborative decision making creates opportunities for development (Table 53). As explained by P14: “I really do like to hear what others think, and what their recommendation might be”. Participants explain that there needs to be a feedback loop where people inside and outside the organisation provide their insight into the problem, which leads into new ideas and improvements for the products.

Table 53. *Consensus*

Consensus
“I really do like to hear what others think, and what their recommendation might be” (P14). “So, it's always this feedback loop of people” (P13). “Based on feedback from real users, evolve that product” (P10).

Improving requires the involvement of a diverse group of people. Within this context, participants need to find people that fit the culture, as discussed in the theme achievement through collaboration, and people that can expand the vision of the company. The concept vision expander explains the relevance of bringing “incredibly smart” (P13) people to the team. As explained by P10, is about having a group of “enablers”, or people that can make things happen, which is the result of an environment where everyone shared and can “bring new ideas” (P8). For example, P13 explained how one of his investors is a senior person who has been involved for a long time in start-ups and P7 explained how their investors are also experienced, world recognised investors, who provide lots of feedback and ideas in the process of creating disruptive technology (Table 54).

Table 54. *Vision expander*

Vision expander
“He’s incredibly smart, he was here last week helping us with the project, incredible” (P13).
“We were a little bit of that big puzzle, but very much enablers” (P10).
“Todo el mundo comienza a aportar idea” (Everyone starts to bring new ideas) (P8).

Managing disruptive technology requires trust. These businesses do not run in a hierarchical or through a feudalistic approach as evidenced during field observations, where workspaces are designed to allow collaboration and sharing of ideas. For example, the interview with P7 was held in their kitchen, and the people in the team were often coming in and joining the conversation. These businesses use teamwork as the primary fuel to keep innovation happening. Innovators suggest that these businesses run like families. It is about honesty and credibility which creates high levels of trust within the team and openness for everyone to do the “best of their ability” (P1). As explained by P16, divergent thinking creates an opportunity to generate new ideas that can challenge the way things are done. *“You put people who’ve got totally divergent and lack of experience, and you get answers from divergent mindsets, not from concurrent of popular fiction”* (P16). Commitment, therefore, is the result of a group of people who are passionate and eager to make a change. As seen in Table 55, there are different examples showing how commitment link to the team’s passion and participants responsibility towards the team.

Table 55. *Commitment*

Commitment
“Surround yourself with people who are wanting to risk things and wanting to change things” (P1).
“I was able to quit my job and come work for free” (P13).
“If you are taking people’s money and then you have the same responsibilities as any other business” (P12).

4.3.8.2. Focus.

Focus is a critical aspect of creating disruptive technology. P13 explains this process explaining that if he gives a vague instruction to the team, they will “end up in a different result than you wanted them to and now that time is wasted” (P13). For this reason, there needs to be focus, and there needs to be constant communication and a structure in the organisation that allows everyone to be aware of the direction of the company. Focusing on specific problem channels the efforts from everyone in the team. Through focus, the problem can be further investigated, and different ideas discussed to solve the problem (Table 56). Within this context, the team continually improves the understanding and causes of the problem leading to the creation of better solutions, which helps attain the goal quicker through shortcuts or the use of better technologies. “You have to track people and rally people to that vision” (P19).

Table 56. *Focus*

Focus
<p>“There's a lot of noise and it's very hard for people to focus and support something when there's so much going on” (P2).</p> <p>“You just need to just focus on that” (P3).</p> <p>“They're really clear about what class of business problems they're trying to solve” (P10).</p>

Creating an idea into a reality requires a defined focus. Having different ideas coming from a team of people with different skills is not enough to create disruptive technology. There needs to be a focus among all the people in the organisation that guarantees the development of the product where the development of certain features are prioritised to fulfil the purpose of the organisation. Within this context, a sense of drive is created among all the people in the team. “You've got to keep bringing things back to a focal point. Does it do this?” (P12). Focus is about the ability to hold and articulate a clear purpose that galvanizes everybody in the organisation. “Founders need to be able to hold and articulate the product vision very, very clearly, and really that

vision is just as important as sales strategy or customer acquisition and retention strategy. It's really the thing that galvanizes everybody" (P14).

Some start-ups die because of having too many features, which makes the technology too complicated. These companies should stop finding too many problems to solve and just focus on one. "Some of my favourite products over the years just died of improvement. It was so many features, I didn't use any of them, they just blew them, too complicated" (P12). The company requires to focus on the problem and how to solve the problem. Another problem participants find is that their focus might not be in line with what is required in the market, which requires testing the products in the market and the ability to explain the technology to customers. Ultimately, these technologies need to be sold to someone, and without a market, there is no point in developing these technologies in the first place. Participants, therefore explain the significance of testing their products in the market and explaining the technology to customers to make them aware of the benefits of using their new inventions (Table 57).

Table 57. *Explain technology*

Explain technology	Test in the market
"The customers didn't know what they wanted" (P10).	"You have to understand the market" (P16).
"Tienes que entrenar al cliente, sobre la necesidad" (You have to train the client, about the necessity) (P8).	"You are really building things that people need" (P9).
"Validate that methodology before you switch completely" (P1).	"Listening to the outside market, because sometimes you can get stuck in your own world" (P5).

The process of developing disruptive technology, therefore, requires focus and commitment from a group of internal people who work towards developing a specific solution (Table 58). By focusing and understanding customer's needs, innovators are capable of developing products that break "down the boundary conditions that hold things in place" (P10). Internal development of technologies helps in keeping the

knowledge inhouse and helps in the process of picking up problems “a lot quicker so that we can act upon it” (P14).

Table 58. *Develop a product*

Develop a product
“Break down the boundary conditions that hold things in place” (P10).
“Functions are still done internally” (P5).
“Gets picked up a lot quicker so that we can act upon it” (P14).

The theme *engaged synthesis* described the process of involving a group of people in the development of a disruptive technology. People with different backgrounds synthesise their ideas in an environment of honest feedback and collaboration for the attainment of the organisation. Market awareness is also required, where customers can bring new ideas and improvement. Appendix M provides a list of additional participant quotes to support the richness of the theme engaged synthesis. Following the discussion and justification of the findings, section 4.4 presents the justification for trustworthiness and credibility.

4.4. Rigor

Qualitative research needs to follow a step-by-step plan starting from the identification of a gap in the literature through to the discussion of findings to increase trustworthiness and credibility. Some researchers present qualitative research in positivism terms including validity, reliability and truth which take away the sensitivity and versatility of interpretivism (Corbin & Strauss, 2008; Denzin & Lincoln, 2011). The measures to increase trustworthiness and credibility are complex, and the research needs to examine them carefully (Sandelowski, 1986). Some strategies include adherence to the methodology, preparation and transparency (Yin, 2017). Lincoln and Guba (1989) offer three areas to increase trustworthiness and credibility: *confirmability*, *transferability* and *dependability* claiming that a study is credible when it presents faithful descriptions of the process.

Confirmability is achieved by clearly articulating how the data was analysed and reconstructed (Schwandt, Lincoln, & Guba, 2007). Transparency is increased through a detailed step-by-step description and documentation of the data collection, analysis and findings (Yin, 2017). The researcher prepared himself for the interview process through immersion into the interpretivism paradigm, the abductive approach and the research questions. Data analysis started during the interview and manual transcription process, where similarities between different participant's stories were sought. When the transcriptions were completed, the manual coding method (Corbin & Strauss, 2008) was used to discover concepts, sub-themes and themes. The hermeneutic cycle was used during the whole data collection and analysis phases to gain richer understanding of the participants' reality. The researcher cyclically read the transcripts, observations and conclusions at every phase of the analysis to increase credibility (van Manen, 1990). Setting and following an orderly set of research procedures allowed for new insights to be brought to light leading to the establishment of trustworthiness. Upon completion of the themes, a few participants were asked to read a summary of the findings during a conversation in a cafe. In these conversations, the participants recognised and agreed with the findings, which van Manen (1990, p. 27) explains as the "Phenomenological Nod", which indicate that the results are credible.

Transferability questions if the findings can be extrapolated to another group of people. To increase transferability, 19 in-depth semi-structured interviews were conducted where the researcher used interpretivism techniques like probing to gain rich data and stories from participants. Yin (2017) suggest adhering to evidence by using triangulation through multiple sources and methods to ensure credibility (Tracy, 2010). This research used triangulation of sources (interviews and observations) and participants (19 participants from 13 different industries). The researcher's journal added to the depth of interpretation through researcher's observations before, during and after the interviews were completed.

Dependability explains that over time new insights may be revealed (Lincoln & Guba, 1985). During a review of the participants with two senior researchers, it was noted that some participants did not fit the disruptive technology definition. Through a deeper understanding of the differences between innovators, entrepreneurs and investors (section 4.1.3), five participants had to be withdrawn from the study. These five interviews have not been used for this research as they did not fit the definition of innovators discussed in Chapter 2. The number of participants therefore changed from

24 to 19, but, increased the credibility in the findings as the 19 final participants fit the definition of CEOs and Founders of disruptive technology businesses. The five interviews were conducted during the initial stages of the research and did not affect the findings.

4.5. Conclusion

The data collection, data analysis, and findings have been presented in this chapter along with a discussion of how trustworthiness and credibility were obtained in this research. The first section detailed how the researcher prepared prior to conducting the research through self-reflection and focus on the research question, the process of identifying participants which followed a purposeful and snowballing technique, the process of inviting participants, and the methodology used to collect data including semi-structured interviews and observations. The data analysis was explained in the next section, which started on the interview process where the researcher focused on discovering rich information, followed by the transcription and coding of interviews which used the hermeneutic cycle and thematic coding. From the analysis, eight themes were discovered which highlight the importance of collaboration, cooperation and participation in managing disruptive technology businesses. The eight themes were: holistic collective, diverse wisdom, achievement through collaboration, structure and consideration, stress adverse, innovative mindset, learning from mistakes and engaged synthesis. Trustworthiness and credibility are then discussed explain how *confirmability*, *transferability* and *dependability* increase credibility through faithful description of the process. The following chapter discusses the findings and their relevance to the research question.

Chapter 5: Discussion

The research questions are addressed in this chapter from the findings presented in Chapter 4. Normative re-educative OD provides understanding of the collaboration, cooperation and participation required to manage the creative process of disruptive technology. The Gapp-Fisher Model (GFM) provides a lens to understand learning and continual development within this context (Gapp & Fisher, 2007). This discussion starts by linking the themes the research identified with key aspects on normative re-educative OD including; systems thinking, continual improvement, action learning, and the GFM. Further discussion on how normative re-educative OD provides understanding of the disruptive technology management process follows. The primary research question: '*How in OD terms is the role of people understood in managing disruptive technology?*' is addressed along with the three secondary research questions.

Following the discussion of the research questions, further arguments are presented on (i) explaining how this research has improved thinking, (ii) the learning outcomes which summarise the process of creating disruptive technology through normative re-educative OD, (iii) the application of the findings, which provide 10 components to managing disruptive technology, (iv) a discussion of how the results add value to the OD side of disruptive technology, and (v) future directions.

As discussed in Chapter 2, disruptive technology is the process of creating products with a different value proposition which are cheaper, simpler, smaller, and more convenient to use (Hwang & Christensen, 2008). The GFM underpins normative re-educative OD to understand the soft skills required to manage this process which starts with the ambition of a person or group of people to solve a problem.

5.1. Normative Re-educative OD

Normative re-educative OD provides a basis for understanding the collaboration, cooperation and participation within successful disruptive technology uptake. This is evidenced through how attitudes, values and beliefs can be extended through education learning mechanisms which also enhance individuals satisfaction and realisation in creating new products/services (French et al., 2005; Gapp, 2006). Participants explained that a positive purpose that inspires passion, discussed in the theme *holistic collective*, brings passionate, committed, and motivated people from which a small group of passionate people is created. Small groups of people are easier to manage and allow

educating their attitudes, values and beliefs following their need for satisfaction, which is in line with the purpose of the organisation. As discussed in the theme *achievement through collaboration*, small groups of people can build strong relationships, creating an environment of openness and collaboration. The theme *structure and consideration* explains that understanding people's strengths and weaknesses allows the team to work towards people's strengths, which is in line with understanding people's needs, resulting in learning and growth at a personal and group level.

The findings presented in Chapter 4 demonstrate the importance of collaboration, cooperation and participation within the process of managing disruptive technology. To further understand how these themes link to normative re-educative OD, the strategies within normative re-educative OD have been discussed in line with the findings in the following sections. The GFM uses Discover-Invent-Produce-Generalise, Plan-Do-Study-Act cycle (PDSA), action learning and systems thinking key components of normative re-educative OD to explain how concepts in thought-form (espoused-theories) move through the transformation zone (from concept to reality) towards the end-used application (theory-in-use) where meaning is co-created in a collaborative environment (Gapp & Fisher, 2007; Bulkley & McCotter, 2017; Stewart & Gapp, 2018).

5.1.1. Systems Thinking.

Learning at a group level requires a holistic understanding of the system and a synthesis of how all of its parts are interconnected (Flood & Romm, 2018; Örtenblad, 2018), which is in line with participants aim to bring together the efforts of everyone towards the purpose of the organisation through involvement and consensus, as discussed in the theme *engaged synthesis*. Systems thinking shifts away from narrowing the focus to one particular part of the system and instead expands it to many parts that impact upon one another (Senge, 1990; Jambekar, 2000) to create a deeper understanding of the relationships and the processes which makes up the organisation's context. The significance of intragroup collaboration (*diverse wisdom*) was evidenced in the theme *structure and consideration* where weekly and fortnightly meetings aim to create collective understanding of the problem, where people can provide honest feedback which improves and accelerates learning and development at a group level.

The themes identified earlier including *holistic collective*, *diverse wisdom*, *achievement through collaboration*, *engaged synthesis* and *structure and consideration*

demonstrated how participants create an environment of cooperation and collaboration, where diversity helps in the process of understanding the problem by bringing new ideas. The theme *holistic collective* is linked to systems thinking as it explains the process of solving a problem through a motivated team that works together following a positive purpose. *Diverse wisdom* explains how diversity inside and outside the organisation helps to gain a better understanding of the problem through multiple sources. *Achievement through collaboration* links to the significance of building connections and relationship through knowledge-hungry people who cooperate at an intergroup and intragroup level. *Engaged synthesis* discusses the group's synergy through involvement and commitment of the team who are focused on developing a specific product. Finally, the theme *structure and consideration* links to systems thinking through frequent meetings at every level of the organisation which allows cooperation between different parts of the organisation through honest feedback within an environment of consideration and growth.

Disruptive technology businesses present characteristics of systems thinking, including collaboration, cooperation and diversity within the system. Within the context of collaboration, the findings present the characteristics of learning organisations, where groups of people engage and co-create meaning (Romm, 2015) which improve group dynamics, and therefore, employee's ability to innovate (Ackoff, 1994).

5.1.2. Continual Improvement.

Learning needs to be ongoing to improve technologies (Namada, 2018). A cycle of continual improvement creates learning and innovation (Deming, 1982a). Within the GFM, the PDSA cycle provides a mechanism to understand continual learning at a micro-level (Deming, 1982b). P10 stated that they are continually going through: "that philosophy of observing a problem situation, doing something about it, seeing what happens, and recycling is sort of what we are doing now" (P10), which links to the PDSA cycle. Disruptive technology businesses enable continual learning through an environment of openness and collaboration, where a diverse group of people (*diverse wisdom*) collaboratively (*achievement through collaboration*) bring multiple ideas (**plan**) that are then executed (**do**) (*stress adverse*) through joint control of tasks within an environment of innovation (*innovative mindset*) leading to results from which the team can learn (**study**) (*learning from mistakes*) where valid information is encouraged at an intergroup and intragroup level (*achievement through collaboration*). From this

point, the team analyses the results (*engaged synthesis*) and create new strategies (**act**) that lead into a new cycle through the PDSA (Gapp & Fisher, 2007; Donnelly & Kirk, 2015).

In Table 59, an example of how disruptive technology businesses follow the PDSA cycle is presented where a new product with a focus on cost sensitivity was required. In this example, buying the less expensive market option was the most expensive option after considering the labour costs. From this experience, P7 explains that people educate themselves in considering all the costs associated with developing technology, and not just the market prices.

Table 59. *Disruptive technology through the PDSA – GFM micro level.*

Disruptive technology - action		Example
Plan	Collaborative decision making.	Create new product being cost-conscious.
Do	Joined control of tasks. Execution of multiple ideas.	Bought ‘cheapest’ option, which required many hours of labour.
Study	Open discussion through valid information with customers, meetings allowing intergroup and intragroup collaboration.	“Ended up costing double what the off the shelf component would have been” (P9)
Act	Ability to pivot. Examples: eliminate toxic people, send email to employees, use different technologies. Act then leads into another iteration through the PDSA cycle.	Think about labour costs: Choose between a) 10,000 and b) 5,000 + one month. If that month costs 10,000 then b) 15,000. Best option: a) 10,000.

The process shown in Table 59 educated the team, changing their values and beliefs in future product acquisitions. As seen in the PDSA cycle, the ability of these

businesses to execute ideas and continually try new alternatives followed by a process of studying the mistakes educates the norms and beliefs of people. The ability to execute ideas and learn from their outcomes links to dissonance at a groups level, which is discussed through action learning.

5.1.3. Action Learning.

Transformation at an individual and group levels start through sharing knowledge, within an environment of openness and trust (Argyris et al., 1985; Bartels & Wittmayer, 2018; Henriques & O'Neill, 2018). The theme *achievement through collaboration* explains that disruptive technology businesses are capable of building relationships of openness and trust following the small number of people. The theme *structure and consideration* explains that authenticity increases trust, where participants care about everyone in their team and continuously look for ways to make them grow and feel comfortable inside the organisation. Disruptive technology businesses, therefore, present the openness and trust required to create an environment of continual improvement, collaboration and innovation (Stewart & Gapp, 2017).

Dissonance is the process of creating awareness of the gap between people's theory-in-use and espoused-theory, where people and groups of people become conscious of their actions and can create change (Argyris et al., 1985; Hinojosa et al., 2017). The theme *diverse wisdom* explains that dissonance is created inside disruptive technology businesses through a group of multiple stakeholders who share their different views of the problem within an environment of open communication and valid information. The theme *achievement through collaboration* explains that collaboration is a result of the relationships within disruptive technology businesses, where close relationships are build allowing collaboration at an intergroup and intragroup collaboration. The theme *structure and consideration* explains that through authenticity, participants create an environment of trust and both way loyalty. By creating a diverse environment of collaboration and trust, disruptive technology businesses can create dissonance, which brings awareness at a personal and group level, leading to continual improvement and learning.

The three main components of action learning are; people who accept the responsibility for action, problems or tasks that are acted on, and a group of people who meet on a regular basis to challenge and support each other to take action and learn (Pedler & Burgoyne, 2008; Dick, 2009, 2019). The first component, people who accept

the responsibility for action, is evidenced in the theme *holistic collective*, where a group of passionate people work together to solve a problem. These people join the business to attain the purpose of the organisation through collaboration. The second component, problems that are acted on, is evidenced in the theme *stress adverse*, where challenges are managed and ideas executed, and the theme *learning from mistakes*, where errors are analysed and acted upon. The third component, having a group of people who meet regularly to challenge and support each other, is evidenced in the theme *structure and consideration* which explains how having regular meetings in a participatory decision-making environment where honest feedback is encouraged (*innovative mindset*) creates collaboration, cooperation and participation.

Re-interpreting goals, frames, and values allow the education of people (Williams & Brown, 2018). Participants explain that re-education is achieved through the themes *achievement through collaboration* and *structure and consideration*, where people can try new ideas in an environment of openness and trust. Double-loop learning takes place when errors are recognised and corrected by questioning and challenging the underlying assumptions through re-education of goals, frames, assumption, values and standards for performance (Argyris, 2002; Peek & Stam, 2019). Within this context, participants highlighted the significance of executing new ideas through the theme *stress adverse*, which allows the team to explore and challenge the underlying assumption. The theme *learning from mistakes*, therefore, explains that double-loop learning takes place within an environment of exploration, honest feedback and collaboration, where failure is seen as an opportunity for learning and improvement. An environment of participatory decision making, as explained by the theme *engaged synthesis*, allows multiple iterations through the PDSA cycle which creates double-loop learning through joint control of tasks and execution.

5.1.4. GFM.

Transforming an idea into a reality is a learning process that requires multiple cycles of learning. The GFM explains the process of learning through Discover-Invent-Produce-Generalise which explains the process of new knowledge development through continual improvement at a macro level (Argyris, 1976, 1995), and the PDSA cycle at a micro-level. The GFM provides a lens to understand the process of learning within disruptive technology business by discussion each of the five stages to highlight how they link to the findings and how they are supported by the literature. In Table 60, the

GFM is compared to the stages within the disruptive technology process through the five stages of Discover-Invent-Produce-Generalise and the transformation zone, which is the stage where transformation from idea to reality occurs.

Table 60. *GFM*

		GFM (Gapp & Fisher, 2007)	Disruptive Technology
Discover		Monitor and evaluate external and internal environments	Becoming aware of a problem and create a positive purpose.
Invent		Generate knowledge and create understanding	Bring the ideas of multiple stakeholders together.
Transformation Zone		From concept to reality	Through collaboration, test and develop the technologies.
Produce		Develop appropriate strategies and tactics	Technological development can be tested for further improvement.
Generalise		Operationalise and internalise	Through a participatory environment, new ideas are taken forward for another loop through the GFM

In Table 61, the relevance of multiple iterations through the GFM in the process of managing disruptive technology is shown through an example of how P7 managed the process of developing the technology, bringing more people, and gaining resources from investors by explaining how espoused-theories (*Discover* and *Invent*) go through the *Transformation Zone* and become theory-in-use (*Produce* and *Generalise*). In the example, the first iteration through the GFM helped to choose the best project among five projects. A second iteration through the GFM started with a focus on the chosen project and the inclusion of three people in the team. In the third iteration, more people joined the team to make more tests, which led to venture capitalists' money. As can be

seen in this process, the process of learning is an ongoing process, which created new results, from which new outcomes are learned and implemented in the following iteration of learning.

Table 61. *Improvement over eight years of development through the GFM lens*

GFM	First stage	Second stage	Third stage	Ongoing...
Espoused theory	Tried 5 different projects over a period of 3 years.	Hired 3 people to focus on project ‘4’.	Built team to 10, did more tests.	More testing, bring more people.
Theory in use	Project ‘4’ chosen as the best.	Project ‘4’ worked, then time to invest more money.	Worked, then time to find venture money.	Test, worked? Keep improving.

5.1.4.1. Discover.

Awareness is created during the discover stage through feedback and reflection of the problem (Namada, 2017; Reddick et al., 2017). The GFM explains the discover phase as the process of monitoring and evaluating external and internal environments (Gapp & Fisher, 2007), which links to the process of managing disruptive technology, where participants become aware of a problem through wisdom and involvement of the team. The process of managing disruptive technology is a process of continual improvement, where the team goes through multiple PDSA cycles at a micro level to learn more about the problem, create a positive purpose and bring in multiple stakeholders. The findings link to the discover phase where participants explain the significance of understanding the problem, how it affects people, and how it can be managed. The themes *holistic collective, diverse wisdom, achievement through collaboration, structure and consideration, stress adverse, innovative mindset* and *engaged synthesis* provide an understanding of how participants manage the discover phase of the GFM.

The theme *holistic collective* explained the significance of finding a problem, which links to the discover phase, as the team create deeper understanding of a problem through years of experience and involvement. The theme *diverse wisdom* explained how disruptive technology businesses create understanding of the problem through the involvement of a diverse group of internal and external stakeholders.

Achievement through collaboration explained that creating strong relationships, which participants explain are easier to build within small groups of people, creates the collaboration required to understand the problem. *Structure and consideration* explained the significance of authenticity in building an environment of honest feedback, which helps in gaining clarity to the problem through an environment of openness and trust. *Stress adverse* explained that participants are perseverant in pursuing their vision, which helps in the process of monitoring and evaluating the problem. *Innovative mindset* explained the significance of bringing people with years of experience, which creates wisdom in monitoring and evaluating problems. *Engaged synthesis* explains that through focus and participatory decision making helps gaining a deeper understanding of a specific problem through diversity.

The characteristics of disruptive technology businesses including involvement (*holistic collective*), diversity, knowledge (*diverse wisdom*), collaboration (*achievement through collaboration*), trust (*structure and consideration*), perseverance (*stress adverse*), experience (*innovative mindset*), and consensus (*engaged synthesis*) link to the discover phase, where groups of people work collaboratively towards monitoring and evaluating the internal and external environment. These characteristics create an environment where valid information and joint control of tasks allows continual improvement (Argyris & Schön, 1978; Micic, 2015; Ranta, 2018), which in turn allows the team to better understand the problem through a process of continual improvement within an environment of openness, valid information and collaboration (Argyris, 1977a; Revans, 1982; Brook et al., 2012).

5.1.4.2. Invent.

Invent, the second stage of the GFM, synthesises knowledge and understanding (Gapp & Fisher, 2007) discussing espoused-theories with a diverse group of people, who create dissonance by raising awareness for change and development to occur (Argyris, 1995). The invent phase of the GFM links to the findings in terms of creating an environment of collaboration and bringing together a diverse group of people, which

is further discussed through the themes *holistic collective*, *diverse wisdom*, *achievement through collaboration*, *structure and consideration*, *stress adverse*, *innovative mindset*, and *engaged synthesis*.

The theme *holistic collective* explained how participants, through a positive purpose, can bring together a group of diverse people who are passionate about the solution or technological development. *Diverse wisdom* explained that transparency of the problem is gained through diversity of stakeholders that challenge and expand the vision of the company. *Achievement through collaboration* explained how having a small and nimble group of people helps create an environment of collaboration.

Structure and consideration explained that by caring and understanding the needs of people, participants help people grow in their strengths while supporting their weaknesses which increases intrinsic motivation and loyalty (Fleishman & Peters, 1962; Lowin, Hrapchak, & Kavanagh, 1969). *Stress adverse* explains how a positive purpose inspires the team's ability to endure in this process. *Innovative mindset* explained the significance of bringing people who are hungry to learn and innovate. Finally, the theme *engaged synthesis* explained the relevance of collaborative decision making and added that through commitment, consensus and focus, the company can create a better understanding of the product.

The themes provide strong support for the invent phase of the GFM, where people can gain deeper understanding of the problem and synthesise these ideas through collaboration and diversity. Through a positive purpose (*holistic collective*), a diverse group of people (*diverse wisdom*) is brought to work collaboratively (*achievement through collaboration*) to understand a problem. By understanding the needs of people and making them grow (*structure and consideration*), these businesses can create environments of trust, which through perseverance (*stress adverse*) and joint control of tasks (*engaged synthesis*) allows ideas (*innovative mindset*) to be brought forward for the development of the technologies. Trust and collaboration provide the means to share the different ways in which the development is understood, which creates dissonance. Through dissonance (Argyris, 1995), the team is capable of realising the gap between the theories in thought-form and their theory-in-use (Dick, 2019), in other words, what the team think they are achieving, and what they are actually doing. Within this context, the group can realise the gap, which leads into the following phase of the GFM where ideas become a reality; the transformation zone.

5.1.4.3. Transformation zone.

The transformation zone is the phase where concepts in thought-form become theory-in-use, which in the disruptive technology process is the stage where ideas become a reality (Gapp & Fisher, 2007). In the disruptive technology process, transformation is a consequence of the openness and trust created through relationships, collaboration and continual development, and is evidenced through the themes *holistic collective, diverse wisdom, achievement through collaboration, structure and consideration, stress adverse, innovative mindset, and learning from mistakes*.

Holistic collective explained how a positive purpose creates an environment that motivates and brings multiple stakeholders who are passionate and intrinsically motivated to see the attainment of the organisation, creating a drive for technological development (Donnelly & Kirk, 2015). An environment of continual learning is created through a distant purpose that inspires people to keep working towards that goal.

Diverse wisdom comes from people inside and outside the organisation who provide different ideas for the development of the product. Community involvement, for example, can bring new technologies and solutions to challenges within the organisation. Internally, bringing people with experience, knowledge and skills from different fields provides a holistic view of the problem, which leads to better understanding the problem. Diversity provides the means to work with an increased number of variables and complexity within the problem creating a method for describing, analysing and planning towards the development of the disruptive technology. *Diverse wisdom* links to systems thinking in that an increasing number of variables are used to understand the problem, where the problem is understood through synthesis and not through an analysis of each of its parts (Ackoff, 1994; Mupepi et al., 2019).

Achievement through collaboration explained how intergroup and intragroup collaboration helps expand the understanding of the problem through the involvement and collaboration of everyone in the organisation. Participants highlight that relationships are easy to build within a small group of people. Keeping the business small and nimble helps to build relationships through authenticity which results in the ability to take risks and execute ideas through joint control of tasks (Dick, 2019).

The theme *structure and consideration* explains how an environment of trust, collaboration and open communication is created through authenticity. The concepts

structure and consideration were introduced by Fleishman, Harris, and Burtt (1955). Consideration explains behaviours indicating mutual trust, respect and rapport with a deeper concern for the needs of people which aligns with behaviours that allow two-way communication and participatory decision making (Fleishman & Peters, 1962; Lowin et al., 1969). Structure explains behaviours where supervisors organise and define group activities where the roles, tasks and plans are defined (Fleishman & Harris, 1962). Both, structure and consideration, are considered independent variables meaning that the behaviour of one does not affect the other (Fleishman, 1953a, 1957). Within this context, supervisors can exert considerable direction while maintaining a highly supportive relationship with the team (Fleishman, 1953b). The findings link to these definitions and relationships between these two concepts to explain the importance of *structure and consideration*. Creating these norms creates an environment where tasks can be trusted to the members of the team, creating shared control of tasks (Coughlan & Coghlan, 2018). Authenticity also requires understanding the strengths and weaknesses of the people, which helps to allocate tasks in a way that helps people grow. By understanding people's strengths and weaknesses, multiple strategies can be created to help them work in a more comfortable environment which increases their ability to innovate.

The theme *stress adverse* explains that the process of creating disruptive technology requires the ability to endure many years of multiple challenges and stressful situations. Perseverance is the ability to remain positive while incentivising people to go through multiple cycles of continual improvement despite the many challenges the company goes through. Within this context, the team needs to be capable of planning, take risks, and analyse the results for learning to occur (Deming, 1982b), which support the process of continual learning.

Innovative mindset explained how a mentality of obsolescence and lack of satisfaction creates the direction for innovation within the team. Within an environment of openness, trust and collaboration (*achievement through collaboration and structure and consideration*) people have the freedom to explore and innovate, which increases creativity and accelerates learning. *Learning from mistakes* explained how understanding failure creates an opportunity to educate people, which helps improve multiple aspects of the process.

The process of transforming an idea to a reality is a process that requires the execution of many ideas and technologies (*stress adverse*), from which the team can

learn and improve (*learning from mistakes*). Ideas are tested within a diverse (*diverse wisdom*) group of collaborative people (*achievement through collaboration*). A positive purpose (*holistic collective*) drives the efforts of these people towards continual technological development through innovation (*innovative mindset*). Managing disruptive technology businesses is, therefore, in line with systems thinking following how participants create environments of diversity, engagement and collaboration (Ackoff, 1994). Different strategies need to be put in place for the continual development of the product itself. Regular meetings (*structure and consideration*) with the involvement of everyone within an environment of open communication and honest feedback (*achievement through collaboration*) creates dissonance (Argyris, 1995) which promotes continual improvement by building awareness of the problems.

5.1.4.4. *Produce*.

The produce phase within the GFM explains the process of developing appropriate strategies and tactics, which occurs when espoused-theories become theory-in-use (Gapp & Fisher, 2007), or more specifically for disruptive technology when ideas become a reality. As ideas become a reality, there is the opportunity to create improvements in the process. During the produce phase, prototypes, pitches, projects and many other things can be tested for further improvement. How disruptive technology businesses manage the produce phase of the GFM is demonstrated through the themes *holistic collective*, *diverse wisdom*, *achievement through collaboration*, *structure and consideration*, *learning from mistakes* and *engaged synthesis*.

As discussed in the theme *holistic collective*, a positive purpose creates the passion inside the group which motivates people to understand the problem. *Diverse wisdom* explained that the outcomes from the transformation zone are analysed by a diverse group of people to find ways to improve the technology. The theme *achievement through collaboration* explains how, through an environment of openness and collaboration, teams develop the technologies through close relationships and intergroup and intragroup collaboration, which allows the discussion which results in improved strategies and tactics.

Structure and consideration highlights how participants make people grow their strengths by targeting the strengths of people and helping them grow in an environment of authenticity. The theme *innovative mindset* explains how creating a mindset of obsolescence, freedom and creativity creates an environment where people continuously

question the way things are done and challenge the vision of the company, which leads into continual improvement. The theme *learning from mistakes* explains that accepting failure is critical in this process, where people need to acknowledge that failure is key to success.

The invent phase has been linked to the disruptive technology process through passion, which is created through a positive purpose (*holistic collective*), which inspires a diverse group of people (*diverse wisdom*) to work collaboratively (*achievement through collaboration*) to continually improve the product. Through intergroup and intragroup collaboration and honest feedback (*structure and consideration*), further developments of the products are discussed (*innovative mindset*), which lead to new learning outcomes (*learning from mistakes*). The integration of these themes link to the produce phase of the GFM, where appropriate strategies and tactics are developed (Stewart et al., 2019a).

5.1.4.5. Generalise.

Generalise is the final phase within the GFM, where the process is internalised and operationalised (Gapp et al., 2005; Holten et al., 2015). As highlighted by the theme *holistic collective*, a positive purpose motivates and engages every stakeholder within the process, which creates an environment where people are willing to work towards the development of the disruptive technology. The theme *achievement through collaboration* explains that building relationships allows sharing problems and ideas through an environment where people are committed to technological development within a collaborative and open environment.

Learning from mistakes explained that participants understand that mistakes create opportunities to learn. From this point, they promote the concept of failing fast, which accelerates learning and links to the generalise phase where the process is internalised. Within this context, *structure and consideration* explains that through frequent meetings, tasks can be operationalised by discussing the mistakes in an environment of openness and collaboration (Fleishman & Peters, 1962).

For example, P13 showed multiple iterations of the product. These required *diverse wisdom* and *achievement through collaboration*, in other words, required a group of diverse minds working together to capture the problems and move forward, multiple times, in the process of continual improvement – going through all the stages of the GFM multiple times. Within this process, the team learned through dissonance

(happening when the product failed) how to improve their norms, which created double-loop learning (Argyris, 2002; Williams & Brown, 2018; Peek & Stam, 2019).

Operationalisation of processes is enabled through an environment of honest feedback.

Through honest feedback, team members can provide constructive feedback for the development of the product. For example, the materials might be too heavy, and someone might know of a lighter material. Through constructive feedback, this person can, within an environment of openness and trust, suggest this new material for future iterations of the product. Therefore, mistakes can be discussed internally, and products tested with external stakeholders such as customers and mentors to gain feedback for the future development of the product. From this point, tasks can be allocated to different teams inside the organisation (*structure and consideration*), where a new cycle through the GFM starts.

The theme *stress adverse* highlights that the process of creating disruptive technology presents multiple challenges. Through multiple iterations of the GFM, people can be educated, and technologies improved. This iterative process highlights the significance of perseverance in the process of creating disruptive technology. The theme *innovative mindset* adds that through honest feedback within the generalise phase of the GFM, education is enabled, as dissonance creates the ability to internalise and operationalise the new norms. Within this context, a new macro cycle through the GFM, where the new norms form the basis for learning which continuously improve.

Without the engagement and involvement of everyone in the organisation, continual learning cannot be achieved. As participants explained, every level of the organisation needs to be involved in these decisions while being capable of changing their norms for the development of the business. By understanding how the GFM links to the process of disruptive technology, the importance of managing the collaboration, cooperation and participation in the process of creating disruptive technology has been evidenced. The next section will discuss how these findings affect the current strategies in disruptive technology.

5.2. Disruptive Technology

Disruptive technology research to date presents a low understanding of the human dynamics needed to create disruptive technology (Christensen, 2001b; Ramdorai & Herstatt, 2015), and present strategies focused on the resource view of the company (Assink, 2006; Klenner et al., 2013; Christensen et al., 2016a). The resource view

explains that large organisations need to be consistent with the principle of resource dependence, which stipulates that access and control over resources are essential for organisational success (Bower & Christensen, 1996; Pfeffer & Salancik, 2003). Participants provided evidence that resources are relevant. Of equal importance was the soft systems of passion (*holistic collective*), perseverance (*stress adverse*), consideration (*structure and consideration*), building relationships (*achievement through collaboration*), taking risks (*stress adverse*), collaboration (*achievement through collaboration*), diversity (*diverse wisdom*), structure (*structure and consideration*), innovation (*innovative mindset*), learning (*learning from failure*), creativity (*innovative mindset*), authenticity (*structure and consideration*), involvement (*engaged synthesis*), and focus (*engaged synthesis*), which demonstrated the importance of managing the human dynamics.

Disruptive technology is not a linear process, but a complex process which requires understanding how learning occurs at a group level to manage the process. Financial metrics do not consider the learning required for the development of the products, and often inhibit learning (Christensen, Kaufman, & Shih, 2010). Focusing on financial metrics decreases the ability to innovate, whereas focusing on building trust and collaboration accelerates learning and innovation (Dick, 2019). Disruptive technology is a complex process which requires creating an environment of openness, trust and collaboration (*achievement through collaboration*) which creates learning (*learning from mistakes*) and technological development.

Business unit spin-off and acquisition strategies do not guarantee the development of disruptive technology. These strategies follow the incorrect assumptions that creating disruptive technology is a linear process and that providing the necessary resources leads to technological development. Values need to be nurtured by building relationships. Business unit spin-off and acquisition strategies are in line with the requirement of new values to develop the disruptive technology. There is, however, lack of understanding of how to manage these values (Lund & Puijk, 2012). Investigating small to medium businesses, provided an opportunity to understand these values, as these businesses are still in the flexibility period where new products are created (Abernathy & Utterback, 1978; Christensen et al., 2015).

Sheep et al. (2017) explain that separating a business unit allows the allocation of resources to the development of new technologies. The findings suggest that participants are capable of enduring months and even years of development without a

stable income source (*stress adverse*). When resources are limited, creativity is increased as the success of the organisation is strongly linked to the involvement of the individuals (*engaged synthesis*). Allocating resources does not assure technological development. Innovation is a process of learning and development (*learning from mistakes* and *stress adverse*), which is achieved within an environment of openness, trust, and collaboration (*achievement through collaboration*). Technological development is not exclusively dependant on the availability of resources, but in the ability of the team to innovate. In other words, disruptive technology is achieved only through an environment that allows continual learning and innovation. Resources are essential for the development of the product, as they provide new alternatives to solve the problem, however, without the ability to explore, trust and collaborate with the team, resources alone cannot guarantee innovation.

The resource and process view of disruptive technology does not contemplate the significance of creating environments of openness (*structure and consideration*) and collaboration (*achievement through collaboration*), which helps in the development of disruptive technology by bringing new ideas (*innovative mindset*), trying these ideas (*stress adverse*) and creating opportunities to learn (*learning from mistakes*), which leads into continual development and learning (Deming, 1982b; Argyris, 2002). Business unit spin-off and acquisition strategies do not contemplate the importance of understanding the soft systems, and focus only on the process, and not on building relationships where people can provide honest feedback and collaborate at an intergroup and intragroup level, which creates dissonance (Argyris, 2002) at a personal and group level, leading to the development of the products and education of the people in the team.

The strategies to understand the needs of small groups of the market to generate new ideas for the development of disruptive technology (Hart & Sharma, 2004) and partnering with other businesses (Baaken & Teczke, 2014) are in line with the significance of listening to multiple stakeholders (*diverse wisdom* and *achievement through collaboration*) which provide a deeper understanding of the problem through collaboration. The strategies to manage disruptive technology including business unit spin-off a acquisition strategies (Christensen & Overdorf, 2000) can be discussed through normative re-educative OD (Stewart & Gapp, 2018). When large organisations use these strategies, a new business unit is created with a small group of people (Yu & Hang, 2010). As these business units grow, the norms of the large organisation

including policies and other performance measurements are imposed into these business units, which decrease freedom, trust and collaboration. P10 explained, “people are, culture is quite resilient so if you take a bank and you cut a bit off a bank, you will have a little bank. You will not have a technology start-up”. Independent business units fail as the culture of the larger organisation penetrates the culture of the independent business unit. Developing disruptive technology is a process of continual development, which requires building relationships to gain trust (*structure and consideration*) and collaboration (*achievement through collaboration*) which enable continual improvement at a personal and group level (Stewart & Gapp, 2018). Trust and openness can only be gained within an independent group of people who can execute ideas (*stress adverse*), have joint control of tasks (*engaged synthesis*) and collaborative decision making (*achievement through collaboration*). Large organisations have policies and procedures which decrease the ability to test new ideas (often delayed for months), which limits learning, development and growth.

The ability of large organisations to develop disruptive technology in the long term is restricted by their own environment which has been shaped to prioritise return on investments and other financial metrics as a guide to measure performance (Christensen, 1997a). Measuring performance limits the ability to find new opportunities and innovate while denying the potential of technological advancements (Deming, 1982a). Managing disruptive technology requires having a group of people which build strong relationships to create an environment of openness (*structure and consideration*) and collaboration (*achievement through collaboration*), where people can explore new ideas (*stress adverse* and *innovative mindset*), and provide honest feedback (*engaged synthesis*). Through a mindset of obsolescence (*innovative mindset*), within an environment of openness and collaboration, new ideas can be discussed (*engaged synthesis*) and executed (*stress adverse*) for the development of the technology.

5.3. Answering the Research Questions

Following the discussion of the findings and how they link to normative re-educative OD, the primary and secondary research questions will now be addressed. The primary research question is *How in OD terms is the role of people understood in managing disruptive technology?* The research question is answered by understanding the significance of creating an environment of openness, trust and collaboration.

Normative re-educative OD provides understanding of collaboration, cooperation and participation to create continual improvement through re-education of values, beliefs and habits of people, which is achieved within disruptive technology businesses by creating an environment of collaboration (*achievement through collaboration*), trust (*structure and consideration*), and openness (*diverse wisdom* and *engaged synthesis*).

Managing disruptive technology starts with a positive purpose (*holistic collective*), which brings together a group of people who are passionate about solving a specific problem. Normative re-educative OD provides understanding of how the values of people can be educated by creating awareness (Argyris, 1995). A positive purpose informs people of a big problem, which attracts passionate people, often who have been affected by these problems, to support the organisation.

Through a positive purpose, multiple stakeholders are brought in to support the technological development. The theme *diverse wisdom* links to systems thinking, action science, and continual improvement. *Diverse wisdom* relates to systems thinking in that it involves a diverse group of people, who work collaboratively towards the development of a product (Senge, 1990; Flood & Romm, 2018). This theme is also related to action science, as through diversity, multiple views of the problem can be acquired, which creates dissonance through understanding the problem from different angles (Hinojosa et al., 2017). *Diverse wisdom* relates to continual improvement in that through diversity, dissonance and systems thinking, the team is capable of creating ongoing cycles of technological improvements and learning at a personal and group level (Deming, 1982b; Lepore & Cohen, 1999).

Diversity is not enough to manage disruptive technology on its own, and the theme *achievement through collaboration* highlights the significance of creating an environment of openness and trust, by building the relationships within the people inside the organisation to create collaboration which leads to an environment of continual improvement where everyone feels welcomed and part of the team. The theme *achievement through collaboration* links to learning organisations, where group learning is necessary and achieved through collaboration (Micic, 2015; Stewart & Gapp, 2017).

The theme *structure and consideration* explain that identifying people's strengths and weaknesses allows people to grow in their strengths, which links to caring about the people and making them grow. Consideration explains the behaviours to promote mutual trust and both way loyalty through authenticity (Fleishman & Peters,

1962; Lowin et al., 1969). Structure provides the necessary information to keep the development process ongoing through weekly or fortnightly meetings, everyone can share their progress (Fleishman & Harris, 1962). *Structure and consideration* links to action science through participative decision making and honest feedback at an intergroup and intragroup collaboration (Coghlan & Jacobs, 2005; Coghlan & Brannick, 2014). This theme also links to systems thinking as it explains that complex systems work by synthesising how all of its parts are interconnected (Flood & Romm, 2018; Örtenblad, 2018).

The process of managing disruptive technology is challenging, and the theme *stress adverse* explains how participants need to endure through challenges and multiple situations, which requires perseverance and the ability to execute ideas. This concept links to continual improvement, where through multiple iterations of the GFM, participants are capable of developing the products (Gapp & Fisher, 2007). Additionally, the theme *stress adverse* explains how executing new ideas, which link to the “Do” stage in the PDSA cycle, practice improvement cycles create a learning curve (Cartwright et al., 2017).

The theme *innovative mindset* explains that participants bring people who are passionate about technological development or the problem they are trying to solve. Bringing passionate people creates a team who are constantly looking for ways to improve, which creates opportunity for technological development and growth. This links to the continual improvement, where the PDSA cycle (Deming, 1982b) highlights that there are always learning opportunities through repeated practice-improvement cycles (Cartwright et al., 2017).

The theme *learning from mistakes* explains how new learning opportunities are created by following the continual improvement cycles, which is in line with continual improvement, which links to the GFM model, which created learning through multiple iterations of the model (Gapp & Fisher, 2007).

Finally, the theme *engaged synthesis* explained how new strategies can be created through participatory decision making and a focus on solving a specific problem. This concept links to the GFM model in that multiple cycles of improvement should be focused on a specific problem.

Normative re-educative OD provides understanding of the role of people to manage disruptive technology. From the themes, it has been evidenced that participants

create an environment of collaboration and openness by bringing passionate people who are committed to solving a positive purpose. A diverse group of people work within an environment of open discussion and collaboration to discuss different ways in which the problems can be solved. Then, different ideas are executed in an environment of joint decision making, which enables people to explore different technologies and alternatives. All these theories are in line with learning organisations and action learning, which promote joint decision making, free informed choice and an environment of openness and collaboration.

Following the execution of different ideas and trials of different technologies, diversity helps understand mistakes through honest feedback and open discussion of the problems. The essence of this process is not in going through a cycle of improvement once, but continually improving, which is achieved by reiterating this process through the GFM and the PDSA cycles of improvement (Deming, 1982b; Gapp & Fisher, 2007). The three secondary research questions provide deeper understanding of the primary research question.

5.3.1. How is disruptive technology managed through a normative re-educative OD lens?

Normative re-educative OD provides understanding of the collaboration required to manage disruptive technology by evidencing how attitudes, values and beliefs of people can be educated by understanding people's need for satisfaction and realisation (French et al., 2005; Gapp, 2006). The process of creating disruptive technology is a process of continual improvement, which the findings demonstrate require diversity, collaboration, perseverance and other skills which can be educated within an environment of openness, trust, collaboration, and participatory decision making.

Systems thinking provides an understanding of the relationships inside an organisation and how a complex system works by synthesising how all of its parts are interconnected (Flood & Romm, 2018; Örtenblad, 2018). In other words, systems thinking helps understand the significance of intergroup and intragroup collaboration (*achievement through collaboration*) as well as the significance of participatory decision making (*engaged synthesis*) which was evidenced by participants as a relevant process in managing disruptive technology, as it creates awareness and engagement of the team.

By understanding systems thinking, action learning explains how dissonance occurs at a personal (*structure and consideration*) and group level (*learning from mistakes*) (Argyris, 1995; Dick, 2019). At a personal level, understanding the weaknesses and strengths of people allows the team to play to people's strengths, which creates a better and more enjoyable working space. At a group level, dissonance is created by working collaboratively with multiple stakeholders in the development of products.

Through dissonance, an opportunity to learn and grow is created, where through honest feedback and discussion, new ideas can be executed from which the team learns. By executing ideas and learning from the outcomes, a process of continual improvement is created which provides the means to learn and innovate (Deming, 1982a). Continual improvement occurs at a micro level, through the PDSA cycle where multiple cycles of improvement occur (Donnelly & Kirk, 2015), and at a macro level, through the GFM model where cycles of learning occur (Gapp & Fisher, 2007).

5.3.2. Why does normative re-educative OD provide values to effectively intervene disruptive technology?

Normative re-educative OD discusses the values required to create an environment that supports continual development and learning through systems thinking, continual improvement, action learning and the GFM. Systems thinking provides a systemic view or holistic view of the organisation (Senge, 1994), which can be used to understand and improve how the business works. In other words, systems thinking provides understanding of the connections, to build from them and improve towards creating an environment of engagement and collaboration within and across different areas of the organisation (*diverse wisdom and achievement through collaboration*). For example, by making people aware of the importance of collaboration, meetings can be created to allow discussion of problems at an intragroup level (Flood & Romm, 2018; Örtenblad, 2018).

Continual improvement creates the opportunity to learn, which requires the ability to execute ideas (*stress adverse*) and learn from mistakes (*learning from mistakes*). Continual improvement is linked at a micro level through the PDSA cycle and the Discover-Invent-Produce-Generalise model at a macro cycle, to highlight how a group of people can create cycles of continual learning inside an organisation. By understanding the process of continual learning, innovators can use this knowledge to

accelerate learning by creating more opportunities to explore new ideas, which leads to increased learning opportunities.

The themes *diverse wisdom*, and *achievement through collaboration* explain the importance of diversity and collaboration, which requires bringing a diverse group of people together to share information to create dissonance in an environment of openness, trust and collaboration. Action learning describes this process as creating dissonance (Dick, 2019), which allows re-education of values, beliefs and attitudes of people at personal and group level. In other words, action learning explains the significance of creating dissonance at a group level to incentivise learning and continual improvement.

5.3.3. How can normative re-educative OD provide values to effectively manage and sustain disruptive technology?

Normative re-educative OD provided understanding of the human dynamics in the disruptive technology process. As evidenced from the findings, managing and sustaining disruptive technology is a technological development process. In other words, sustaining the disruptive technology process, requires a team committed to continuously developing the products, which is achieved through learning in an environment of openness, trust and collaboration.

Cartwright et al. (2017) explains that real-world change is created through repeated improvement cycles. In the context of disruptive technology, improvement cycles are achieved by creating an environment of trust and collaboration (*achievement through collaboration* and *structure and consideration*), where people have free informed choice and joint control of tasks (Dick, 2019) (*stress adverse*). By allowing people to work collaboratively in an environment that allows exploration and execution of ideas, new technological developments are created, which through learning (*learning from mistakes*) can then continually improve.

Sustaining an organisation is in line with the ability of the organisation to solve problems in a timely manner (*learning from mistakes* and *stress adverse*). Normative re-educative OD helps understand that managing and sustaining disruptive technology can be achieved through cycles of continual improvement. Technological development is the result of continual learning, and can be improved through ongoing iterations through the GFM as discussed in section 5.1.4, where customer needs, technological problems, improvements and other issues can be met through changes in the product through a

process of improvement (Gapp & Fisher, 2007). In other words, managing and sustaining disruptive technology is a process of meeting technological requirements, customer needs and many other challenges through ongoing cycles of improvement.

5.4. Improving Thinking

By understanding the significance of human dynamics for the attainment of disruptive technology businesses, this thesis has improved thinking. Some aspects of disruptive technology have been clarified. For instance, finding a problem and solving it is not a new insight. However, the theme *holistic collective* highlights the relevance of creating a purpose that has a positive purpose, which creates passion within the people inside the organisation.

In terms of managing people, the findings suggest that a hierarchical structure inhibits learning, decreasing the ability to create and develop the technologies (*innovative mindset*). Businesses aiming to create disruptive technology need to create an environment of open collaboration and communication (*achievement through collaboration*), where honest feedback is well received, and where everyone feels welcome.

By understanding the human element, the strategies to manage disruptive technology, including business unit spin-off and acquisition strategies, are capable of developing disruptive technology (Lund & Puijk, 2012). However, as large organisations follow policies, hierarchies and performance indicators, these often inhibit learning and continual development by not allowing the execution of ideas, customer feedback and other sources of knowledge that create dissonance. Without the ability to execute ideas or learn from customer's feedback, there are limited sources of learning and continual improvement (Gapp & Fisher, 2007).

Large organisations can develop disruptive technology by creating an environment which is entirely independent in the short and long term from the operations of the large organisation. Following the findings, this new business unit needs to have the capacity to operate independently, including the ability to execute ideas (*stress adverse*) and test products in the market to receive customer's feedback (*engaged synthesis*). Without the ability to create learning outcomes, the ability to learn from mistakes will be hindered by the culture of the large organisation (Deming, 1982b; Donnelly & Kirk, 2015).

From the previous discussion, it is evidenced that the resource-based model (Dotsika & Watkins, 2017) discussed in disruptive technology required an understanding of the human factors to manage this process (Christensen & Raynor, 2003; Gapp, 2006). These factors are in line with normative re-educative OD and require creating an environment of collaboration where a diverse group of people work together towards solving specific problems through multiple cycles of continual improvement and learning (Gapp & Fisher, 2007).

5.5. Learning Outcomes

Creating an environment of collaboration and openness is essential to manage disruptive technology. The process to manage disruptive technology starts with the theme *diverse wisdom*, where participants, through a positive purpose, can bring together a diverse group of passionate people. The team often starts small, which creates an environment of trust, collaboration and friendship, which allows building relationships of openness, authenticity and both way loyalty. Creating an environment with these conditions is imperative to move to the next step. Participants highlight that many start-ups fail because the team dissolves because the founders are not capable of being authentic with their people which is essential to creating long-lasting relationships where people understand their role in the organisation and what to expect from the business from the onset.

Creating an environment of openness and collaboration allows disruptive technology businesses to go through cycles of continual improvement. Through openness and collaboration, the diverse team shares their understanding of problems and provides different ideas to solve the problem. Through *engaged synthesis*, the team can synergise these ideas, and try them to learn from their outcomes. Within this context, multiple cycles of continual improvement can be achieved. Being *stress adverse* comes in place at this stage, as creating disruptive technology is a process that can take many years and challenged, for this reason, the team needs to be aware of this, and celebrate every success, and support each other when challenges arise.

In Figure 13, a representation of the process of continual development within disruptive technology businesses is presented. The themes on the left explain the characteristics of the environment. *Holistic collective* explains how a team of passionate people is brought together by creating a positive purpose. *Stress adverse* highlights the relevance of perseverance in the process of continual improvement, which can take

years to attain. *Innovative mindset* highlights the significance of an environment that is continuously challenging the vision of the company in an open environment to continually improve. *Achievement through collaboration* explains that relationships can be built through authenticity and trust to create an environment of openness and collaboration. *Engaged synthesis* highlights the relevance of having everyone focused on the vision of the company. *Structure and consideration* explains that identifying people's strengths and weaknesses allows the team to help people grow in their strengths.

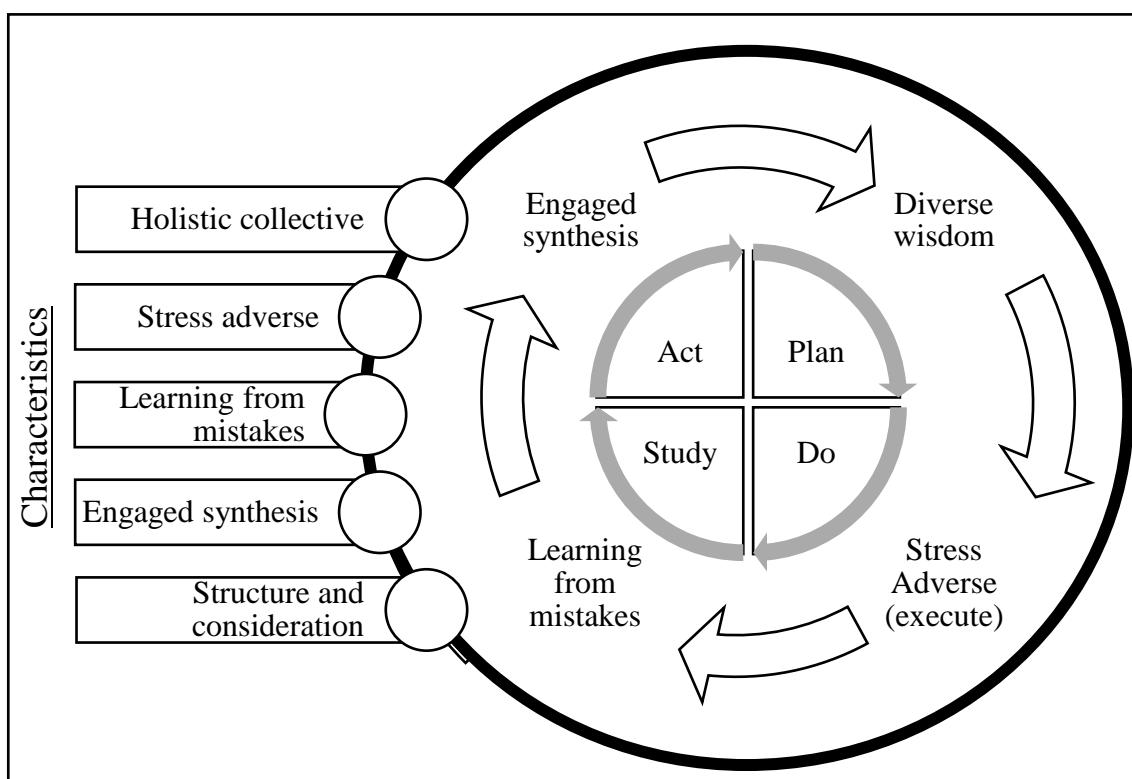


Figure 13. Continual learning within disruptive technology businesses.

Having a group of passionate people, who are perseverant in the process of creating a disruptive technology and that continuously challenge the vision of the company to bring new ideas in an environment of openness and collaboration which is focused on solving one big problem, leads to an environment of continual improvement which is created through the themes displayed in the right hand side of Figure 13.

Through *diverse wisdom*, a group of skilled and experienced people can bring new ideas

through collaboration, which leads to participative decision making. Once the plan is made, the ideas need to be executed, which is explained in the theme *stress adverse*. Once the ideas are tested, the outcomes can be used to analyse the process and find ways to improve the process, which is highlighted in the theme *learning from mistakes*. From this point, and by focusing on the company vision, the team can create new strategies to develop the technology and learn from the process through involvement of everyone in the team as discussed in the theme *engaged synthesis*. Multiple iterations through this process leads to the continual technological development and learning of the people in the team.

The findings from this research provide a better understanding of how to manage the process of developing disruptive technology. Businesses trying to create disruptive technology need to understand the soft systems and the importance of creating an environment of collaboration, cooperation and participation.

5.6. Application of the Findings

Managing disruptive technology requires managing different aspects of the soft systems inside the business. In Table 62, a list of 10 components are presented to support an environment of collaboration, cooperation and participation. The findings evidenced the relevance of understanding human dynamics to manage disruptive technology. These 10 components provide a practical understanding of how to manage the soft systems within disruptive technology. These components need to be used simultaneously and as required.

The ten components highlight the relevance of (1) creating a positive purpose, to bring passionate people, (2) diversity, to create a better understanding of the problem, (3) keep small and nimble, to build relationships, (4) authenticity, to create trust, (5) perseverance, to overcome challenges, (6) take risks, to execute ideas and learn from them, (7) encourage innovation, to create an environment of joined control of tasks and innovation, (8) fail fast, to accelerate learning, (9) focus, to concentrate the efforts of everyone in the team towards one same goal, and (10) build consensus, to create an environment of collaborative decision making.

Table 62. *Managing disruptive technology*

Theme	Component
Holistic collective	Create a positive purpose
Diverse wisdom	Diversity
Achievement through collaboration	Keep small and nimble
Structure and consideration	Be authentic
Structure and consideration	Be perseverant
Stress adverse	Take risks
Stress adverse	Encourage innovation
Innovative mindset	Fail fast
Learning from mistakes	Focus
Engaged synthesis	Build consensus

5.6.1. Create a positive purpose.

Creating a positive purpose is evidenced in the theme *holistic collective* as an significant component to bring the attention of multiple stakeholders who are passionate about solving a specific problem. A positive purpose brings people who are passionate about technological development or solving the problem itself. Forming a group of passionate people assures the continual technological development and commitment of the people inside the organisation and support of multiple stakeholders outside the organisation.

5.6.2. Diversity.

The theme *diverse wisdom* explains the significance of diversity when creating disruptive technology. Diversity comes from a diverse team, business partnerships, mentors and investors. Through diversity, disruptive technology businesses can gain a better understanding of the problems, which helps better understand the causes of the problem, which leads to better solutions. Different experiences within the team members generate ideas to solve these problems through different technologies and tools.

5.6.3. Keep small and nimble.

The theme *achievement through collaboration* highlights the relevance of collaboration within disruptive technology businesses. Participants explain that large organisations often lose their ability to build relationships due to a large number of people, which leads to decreased interaction and trust. Managing large numbers of people is, as explained by participants, an arduous process, and one which requires increased number of policies and performance indicators, which decrease the relationships between people. Participants suggest that small to medium disruptive technology businesses are capable of building family-like relationships which creates an environment of collaboration and cooperation. Therefore, to increase collaboration and trust within these businesses, disruptive technology businesses need to keep small and nimble to build these relationships, which leads into an environment of openness, trust and continual learning.

5.6.4. Be authentic.

The theme *structure and consideration* explain the significance of building a balance between caring for the people and creating a structure within the team to create disruptive technology. Within this process, authenticity builds trust and loyalty within the team members to balance *structure and consideration*. Authenticity, as explained by participants, can be built by openly discussing problems, adhering to promises, and openly discussing the future of the company and how it can affect the people in the company. Through authenticity, therefore, an environment of openness and trust can be created which support collaboration and commitment from the team.

5.6.5. Be perseverant.

The theme *stress adverse* highlights the many challenges participants go through to create disruptive technology. These challenges include lack of resources, financial hardship, employee's problems, technology failure, and many more. Creating disruptive technology is a process that often takes many years. Within this context, innovators need to be perseverant in this process, and manage the stressful situation not only for themselves but for the team, bringing hope through an environment that incentivises people and manages stressful times.

5.6.6. Take risks.

The theme *stress adverse* highlights how taking risks links to ‘do’ in the PDSA cycle, where action needs to be taken to see results (Deming, 1982b). Taking risks within disruptive technology businesses supports continual technological development and learning. Participants highlight that it is often hard for them to let go of control, however, they realise the relevance of letting go and explain that some people can be more capable of assuming those tasks and create better outcomes. Letting go of control supports re-education through free informed choice and joint control of tasks (Argyris, 2002; Donnelly & Kirk, 2015)

5.6.7. Encourage innovation.

Innovation can be encouraged through an *innovative mindset*, which is created within an environment of openness and collaboration. Freedom allows people to explore new ideas and technologies, which accelerates learning. Allocating tasks and trusting people creates an environment that is continuously learning and where, through re-educated norms, people have the freedom to explore, create and test new ideas.

5.6.8. Fail fast.

Continual learning is achieved by creating an environment of openness and collaboration where new ideas and technologies can be tested. The outcomes of these tests can be studied, which generates new learning. Participants highlight the significance of learning, which normative re-educative OD explains as the changed in norms, beliefs and attitudes of people (Bennis et al., 1985). Failing fast, *learning from mistakes*, through the GFM lens, means going fast, and, as many times as possible, through the cycles of learning. To fail fast, the company needs to create an environment of collaboration and openness, where honest feedback is positively received to create dissonance.

5.6.9. Focus.

The previous points explain how continual learning can be achieved, however, without a focus, continual learning can be of no use. The company needs to define a clear vision or focus, which leads everyone in the organisation, at every level, towards the solution of a specific problem. The theme *engaged synthesis* explains that quicker and more efficient ways to solve the problem are enabled through a single focus, which

helps attaining the purpose of the organisation through the collaboration of every member of the team.

5.6.10. Consensus.

Consensus explains how commitment, passion and focus create consensus which helps in the process of solving a specific problem. Consensus is the ability to bring and discuss the outcomes and future ideas in an environment of collaboration, which follows participatory decision making (Lewin & Minton, 1986). Like brainstorming, this component helps bring the ideas from everyone in the team to create dissonance at every level of the organisation through intergroup and intragroup collaboration. One individual does not make these decisions, but these decisions are discussed with everyone in the team, to come to a joint decision, where everyone collaborates.

The 10 components provide understanding of how to create an environment of collaboration, cooperation and participation. These components are interdependent and need to be continuously monitored. For example, to innovate, these businesses need to (7) encourage innovation through a (1) clear positive purpose, (9) focus, (10) participation, and (2) diversity. At the same time, encouraging innovation requires (6) taking risks, which requires an environment of trust and collaboration which can be created within a (3) small group of people through (4) authenticity, and (5) perseverance. As discussed in systems thinking, a holistic understanding of the system is required. These 10 components provide a holistic understanding of the process of managing disruptive technology. As evidenced by the previous example, these components are interdependent and need to happen simultaneously and as required.

5.7. OD side of Disruptive Technology

Creating disruptive technology is not a reactive process, but a process that takes many years of planned continual learning and development. The findings present strong evidence that the process of managing small to medium disruptive technology businesses follows the normative re-educative OD strategies, where the attainment of these businesses is allowed through an environment of collaboration. The process of managing disruptive technology, therefore, can be aided by following normative re-educative OD strategies to manage this process. This research has discussed eight themes which strongly relate to managing disruptive technology, based on diversity within an environment of openness and authenticity, which result in collaboration at an

intergroup and intragroup level. When coupled with the ability to execute ideas and learning, collaboration leads to continual development and attainment of the organisation.

Disruptive technology is focused on understanding how to manage the disruption inside large organisations. Strategies like business unit spin-off and acquisition strategies do not understand how to create an environment of continual improvement, valid information and trust, which disruptive technology businesses are capable of managing. There was a poor understanding of how to manage the development of disruptive technology, especially from a normative re-educative OD point of view. Through normative re-educative OD, a new understanding of the relevance of people and how to manage the people inside these teams for the development and attainment of disruptive technology businesses has been created.

5.8. Future Directions

This research aimed to understand the role of people in managing disruptive technology businesses. In terms of methodology, this research followed a qualitative abductive approach to understand the essence of this phenomenon through hermeneutic phenomenology (Denzin & Lincoln, 2011; van Manen, 2016; Yin, 2017). Further understanding of how to manage disruptive technology can be gained through a quantitative methodology, which would highlight the significance of different aspects already discussed including how to manage the balance between *structure and consideration* (Punch, 2013). Additionally, future research could address the level of experience required to have the capacity to create disruptive technology. Participants had over 10 years of experience in their fields. Therefore, quantitative research could further investigate this field to understand the level of skills, knowledge and experience needed to create disruptive technology.

Another significant matter that should be investigated in the future is gaining further understanding of how innovators create coping mechanisms to persevere through very stressful and challenging situations, which could highlight past events or experiences that allow people to be perseverant in the development of disruptive technology. The researcher believes that analysing these factors could provide a better understanding of the process of managing disruptive technology. The researcher has limited knowledge in the areas of psychology, therefore cannot make any inferences, and highlights this as potential research for psychologists.

One point that was raised during the “phenomenological nod” (van Manen, 1990, p. 27), which occurred when the researcher met a few participants to provide another layer of trustworthiness in the results, was that participants were not sure of how to sustain the process of managing disruptive technology. In other words, the findings from this research presented initial support for how to sustain these businesses, which can be further investigated. Although this was not the purpose of this research, it is evidenced that this can be done through cycles of continual improvement, but further research could gain a better understanding of this process, by investigating successful small to medium disruptive technology businesses.

5.9. Conclusion

This chapter has discussed the findings through reflection between the themes presented in Chapter 4 and the literature review presented in Chapter 2, starting with a discussion of how normative re-educative OD provides understanding of the collaboration required to manage the process of creating disruptive technology. Systems thinking, continual improvement, action learning, and the GFM were then discussed in relation to the findings to provide more detail into how the GFM lens helps understand and manage disruptive technology. Disruptive technology strategies were then discussed against the findings. The primary and secondary research question were then answered followed by further discussion of how this research improved thinking, the learning outcomes, the application of the findings, how the results add value to the OD side of disruptive technology, and future research directions.

The findings provide a better understanding of how to manage disruptive technology. The discussion presented in this chapter explains how developing disruptive technology requires an understanding of the significance of creating an environment of diversity, trust and collaboration. The process of managing disruptive technology is not linear, but a process that requires understanding the needs of people to build relationships, which creates an environment of openness and collaboration. People are encouraged to test new ideas within an environment of joint control of tasks, which leads to continual improvement and learning. Managing disruptive technology requires creating an environment of collaboration with a balance between structure and consideration, where people are creative and share ideas for the development of the products.

Chapter 6: Conclusion

This thesis has investigated the human dynamic soft systems component of successful Australian disruptive technology businesses. The literature shows disruptive technology contributes significantly to business management success (Gobble, 2016; Holweg, 2018), yet there is insufficient research of how to manage the soft systems operation within this process (Christensen et al., 2013). Existing disruptive technology research has a strong process and resource focus with strategies aligned to financial and resource metrics management such as business unit spin-offs and acquisition strategies (Christensen et al., 2001b; Lund & Puijk, 2012). The resource and process focus found within disruptive technology research lacks depth in relation to soft systems management. This gap has been investigated by using normative re-educative OD, through which the collaboration, cooperation and participation required to manage disruptive technology was understood. Within normative re-educative OD, systems thinking linked to the relevance of learning at a group level through collaboration and trust. The Gapp-Fisher Model (GFM), actioned normative re-educative OD to create a better understanding of how environments of diversity and trust allows people to collaboratively execute ideas through joint control of tasks and free informed choice (Argyris, 1976, 1995). Within the GFM, the Discover-Invent-Produce-Generalise, Deming's (1982b) Plan-Do-Study-Act cycle (PDSA) and action learning (Dick, 2009, 2019) provided a lens to understand the processes of continual improvement, collaboration and learning required for the attainment of disruptive technology businesses (Bulkley & McCotter, 2017; Stewart & Gapp, 2018) and answer the research question:

'How in OD terms is the role of people understood in managing disruptive technology?'

In seeking understanding of the collaboration within disruptive technology businesses, hermeneutic phenomenology, following interpretivism, was chosen as it creates understanding of the essence of the phenomenon through immersion and reflection into the participants stories (Baxter & Jack, 2008; Cypress, 2018). Case study provided a framework to delimitate the boundaries for this research (Yin, 2017) and a framework to collect data through semi-structured interviews and observations. Semi-structured interviews were the primary source of data and observations added further insight into the emotions and other non-verbal information which gave more richness

and depth. Transcripts of the semi-structured interviews and observations were analysed using coding and thematic analysis following the hermeneutic cycle (van Manen, 2016) to gain a conceptual schema of how participants interpret their reality (Yin, 2017) through their stories. Analysis of data demonstrated that managing disruptive technology requires creating an environment of openness and collaboration. Within this context, eight themes were discovered to explain how to manage disruptive technology through openness and collaboration.

Participants explained that managing disruptive technology is a challenging process, which requires dedication and a passionate group of people. From the onset, innovators need to be capable of creating a positive purpose which limits the problem the company wants to solve and inspires passion through a positive purpose. Through a positive purpose, participants can bring a diverse group of people, who provide deeper understanding of the problem through multiple angles. As these businesses start small, relationships can be built which increases collaboration, trust and openness. Within this context, there needs to be a balance between structure and consideration, where consideration explains the significance of understanding people's needs, and structure, the relevance of timeliness and open discussion which allow continual technological development. Managing disruptive technology is challenging, and team needs to be capable of taking risks and being perseverant in the process of continual learning and development. Internally, people need to be creative while constantly bringing new ideas that challenge the vision of the company and help the company attain its goal in a more efficient or faster way. To enable learning, there needs to be a mentality of continual improvement, which is created by understanding that mistakes are a path to success and where failure is seen as a learning opportunity. Finally, these businesses run based on collaborative decision making, were everyone is involved and focused on solving the same problem.

6.1. Conclusions on Disruptive Technology

As discussed in Chapter 2, disruptive technology presents strategies with a strong focus on managing the processes and resources (Christensen, 2001a; Christensen et al., 2013). Business unit spin-off and acquisition strategies do not address the soft systems new value development that disruptive technology requires (Lund & Puijk, 2012). Investigating small to medium businesses provided an opportunity to understand the values from a soft systems perspective. Small to medium businesses are flexible and

adaptive when compared to large organisations (Abernathy & Utterback, 1978; Christensen et al., 2015).

As evidenced by normative re-educative OD, managing disruptive technology is a process of continual development and learning through collaboration, cooperation and participation. This development requires passion, perseverance, consideration, building relationships, taking risks, collaboration, diversity, structure, innovation, learning, focus, and engagement. This process is not a linear, but a complex process which requires a balance between structure and consideration. Disruptive technology is a process of continual improvement, where execution of ideas can lead into failure, however this failure leads into learning and development. Financial metrics do not consider the learning required for the development of the products, and often inhibit learning. Focusing on financial metrics decreases the ability to innovate, whereas focusing on trust and collaboration accelerates learning and innovation. Therefore, managing this complex process requires creating an environment of openness, trust and collaboration which creates learning and technological development.

Allocating resources (Bower & Christensen, 1996) does not assure technological development. Innovation is a process of learning and development, which is achieved within an environment of openness, trust and collaboration. Within this context, technological development is not only dependant on the availability of resources, but in the ability to innovate. In other words, disruptive technology is achieved only through an environment that allows continual learning and innovation. Participants provide evidence that managing disruptive technology should not just focus on the resource dependence principle. It must include the soft systems of collaboration and perseverance. This is explained in the themes *achievement through collaboration* and *stress adverse*, which leads into an environment of continual development. Resources are necessary for the development of the product, however, without the ability to explore, trust and collaborate in the team, resources alone cannot guarantee innovation. Managing disruptive technology requires an environment of openness and trust, where people can provide test new ideas and provide honest feedback, which creates dissonance at a personal and group level, leading to the development of the products and re-education of the people in the team. Resources are available on a frequent basis within large organisations, however, small to medium disruptive technology businesses are not as capable of accessing a similar resource base. This was evidenced in the theme *engaged synthesis* which emphasised that when resources are limited, creativity is

increased as the success of the organisation is strongly linked to the involvement of the individuals.

The research literature demonstrates that business unit spin-offs and acquisition strategies do not guarantee disruptive technology (Christensen & Overdorf, 2000). These strategies follow the incorrect assumptions that creating disruptive technology is a linear process, and providing the necessary resources leads to technological development. Values need to be nurtured by building the relationships and creating an environment of openness, trust, and collaboration, which leads to constant improvement (Gapp & Fisher, 2007). Trust and openness can only be gained within an independent group of people who can execute ideas, have a joint control of tasks and collaborative decision making. Large organisations have policies and procedures which hinder the testing of new ideas (often delayed for months), which limits learning, development, growth, and therefore, innovation.

By understanding the significance of continual learning in the development of disruptive technology, the strategies to manage disruptive technology can be discussed from a normative re-educative OD position (Christensen & Raynor, 2003; Yu & Hang, 2010; Dotsika & Watkins, 2017). When large organisations spin-off a business unit or acquire an emerging business, a new business unit is created with a small group of people, similar to small disruptive technology businesses, that has some of the collaboration present in small to medium businesses. These business units still have the DNA of the large organisation including policies and other performance measurements which are imposed into these business units, which decrease freedom, trust and collaboration preventing innovation. Business unit spin-off and acquisition strategies will fail when the culture of the larger organisation infiltrates the culture of the new business unit.

The two strategies: (i) understand the needs of small groups of the market to generates new ideas for the development of disruptive technology (Hart & Sharma, 2004) and (ii) partnering with other businesses (Baaken & Teczke, 2014) are in line with the themes *diverse wisdom* and *achievement through collaboration*. Participants explain the relevance of understanding the problem from different angles, e.g. partnering with other businesses, and engaging mentors and investors to gain a better understanding of the problem. This assists in identifying new technologies, and ideas to solve the problem. The findings identified that the process of creating disruptive

technology is not limited to a small group of people, but expands to stakeholders who can provide ideas and knowledge into the development of the technology.

Having a small group of people creates an environment where relationships are built, and collaboration enabled (*achievement through collaboration*). Trust is built through authenticity and both way loyalty (*structure and consideration*). The theme *innovative mindset* adds that the people who join these businesses need to have a mindset of obsolescence, and participants highlights that recent graduates and young people are often more creative. As explained by participants, large organisations' policies and procedures decrease their ability to be creative and innovative. Within this context, the ability of large organisations to develop disruptive technology in the long term is restricted by their own environment which has been shaped to prioritise return on investments and other financial metrics as a guide to measure performance (Christensen, 1997a; Benner & Tushman, 2003; Lewis, 2004; Henderson, 2006), which limit the vision for new opportunities and innovation while denying the potential of technological advancements (Deming, 1982a, 1993; Christensen et al., 2008; Christensen & Euchner, 2011).

Managing disruptive technology, therefore, is a process of continual learning which is achieved within an environment that has (i) a positive purpose, to bring passionate people, (ii) diversity, to bring ideas from different fields, (iii) perseverance, which allows continual learning and development through challenging times, (iv) learning, which is achieved by understanding that failures and mistakes generate learning, and (v) from engagement, which is the ability to understand that the organisation is holistic, and development is dependant on all its parts. By creating an environment with these five characteristics, continual improvement is achieved through diversity, joint control of tasks, the ability to learn from mistakes and engaged synthesis.

6.2. Conclusions on Normative Re-educative OD

Normative re-educative OD provided the grounds to investigate the collaboration, cooperation and participation required to manage and create disruptive technology. The discussions evidenced how participants used education to align the values and beliefs of their team, and created a positive purpose through caring, building relationships, authenticity and collaboration (French et al., 2005; Gapp, 2006). Within normative re-educative OD, systems thinking and action science explained the

significance of learning at a group level through collaboration and trust, the GFM provided understanding of how participants achieved environments that have joint control of tasks and free informed choice (Argyris, 1976); Argyris (1995) to promote learning. As evidenced from the discussion, normative re-educative OD strategies can be used as an intervention strategy to help in the disruptive technology process by focusing on creating (i) a positive purpose, to bring passionate people, (ii) diversity, to gain understanding of the problem, (iii) keeping small and nimble, to build relationships, (iv) authenticity, to build trust, (v) perseverance, to endure through challenges, (vi) taking risks, to create learning opportunities, (vii) encourage innovation, (viii) fail fast, (ix) focus, (x) and build consensus.

6.2.1. Conclusions on systems thinking.

Systems thinking and action science explains learning at a group level through a holistic understanding of the system and a synthesis of how all of its parts are interconnected (Senge, 1990; Jambekar, 2000; Flood & Romm, 2018; Örtenblad, 2018). These approaches highlighted the importance of collaboration and cooperation which links to the theme *achievement through collaboration*. Learning organisations are enabled by gathering perspectives into a problem and prioritising these problems (Flood & Romm, 2018). The theme *engaged synthesis* support the idea of focus highlighting the relevance of consensus and focus. The findings present the characteristics of learning organisations, where groups of people engage and co-create meaning (Romm, 2015) which improve group dynamics, and therefore, employee's ability to innovate (Namada, 2018). Systems thinking evidenced that disruptive technology is a process that requires understanding the team as a learning organisation. Managing this process, therefore, requires creating a collaborative environment that aims to solve a mutual goal within an environment of openness, collaboration, trust and cooperation.

6.2.2. Conclusions on continual Improvement.

Continual improvement creates learning and innovation through ongoing cycles of improvement (Deming, 1982a). The PDSA cycle provides an understanding of continual learning inside disruptive technology businesses (Deming, 1982b), which evidenced the relevance of creating environments that promote learning. Creating processes of continual improvement requires building the relationships of people within the organisation, to increase the collaboration and trust. Through these environment,

people are then capable of exploring new ideas, which brings learning opportunities and creates technological developments. Repetitive cycles of improvement create technological development, which links into the attainment of the purpose of the organisation⁴.

Argyris (1976, 1995) Discover-Invent-Produce-Generalise explains that learning occurs through a process that starts by becoming aware of a problem, ideating, production and generalisation of results. This learning process links to the way in which participants manage the disruptive technology process. Applied to disruptive technology, this model helps understand that by focusing on one problem, during the discover and invent phase, an opportunity is created to bring together the knowledge of multiple stakeholders to solve a problem. Then, during the produce, multiple ideas are executed, from which the team can learn, which leads into the generalise, where people provide new improvements to start another cycle through the learning Discover-Invent-Produce-Generalise cycle.

6.2.3. Conclusions on action learning.

Action learning helps understand raising awareness creates change. In the process of managing disruptive technology, participants explain that education is achieved through collaboration within an environment of openness and trust, where people are capable of sharing ideas through honest feedback. Transformation requires sharing knowledge to coming conscious of the gap between the theory-in-use and espoused-theory (Argyris et al., 1985). Building the relationships of the team in an environment of openness, trust and collaboration allows the discussion of ideas from multiple stakeholders coming from diverse background, which create dissonance. Through awareness, the team can change their values, beliefs and attitude, which is when double-loop learning takes place; when errors are recognised and corrected by questioning and challenging the underlying assumptions through education of goals, frames, assumption, values and standards for performance (Argyris, 2002; Peek & Stam, 2019). An environment of participatory decision making, honest feedback and collaboration allow continual learning which creates double-loop learning.

6.2.4. Conclusions on GFM.

The GFM models provided a lens to understand how to transform an idea into a reality, through a learning process that brings together the previously discussed theories including systems thinking, continual improvement, and action learning.

The first stage in the GFM is evidenced through involvement, diversity, knowledge, collaboration, trust, perseverance, experience, and consensus where groups of people work collaboratively towards monitoring and evaluating the internal and external environment. These characteristics create an environment where valid information and joint control of tasks allows continual improvement (Argyris & Schön, 1978; Micic, 2015; Ranta, 2018), which in turn allows the team to better understand the problem through a process of continual improvement within an environment of openness, valid information and collaboration (Argyris, 1977a; Revans, 1982; Brook et al., 2012).

The invent phase of the GFM is linked to the significance of gaining deep understanding of the problem and synthesise these ideas through collaboration and diversity. Through trust and collaboration, different ways in which the development is understood can be discussed between the team members which creates dissonance. Through dissonance, a gap can be found between what the team think they are achieving, and what they are actually doing, which leads into the following phase of the GFM where ideas become reality; the transformation zone.

The transformation zone is linked to the relevance of creating a collaborative environment with a diverse group of people which are continuously learning. Through a single focus, the diversity within the organisation can be synthesised towards continually learning new ways to approach the problem through multiple technologies and strategies. Through testing of different ideas and technology, with a clear focus, the business can create new ideas, leading to the next phase of the GFM.

In the disruptive technology process, the generalise phase explains that taking risks and understanding that mistakes occur leads into new cycles of improvement. Accepting failure is critical in this process, where people need to acknowledge that failure is key to success. Involving everyone in the organisation brings new ideas to create new tactics and strategies by focusing on a single problem and learning from the outcomes to improve.

Generalise is the final phase within the GFM where the process is internalised and operationalised (Gapp et al., 2005; Holten et al., 2015). The process of creating disruptive technology is not easy and presents multiple challenges. The GFM is a cycle that requires multiple iterations for the development not only of the product, but the people, who learn through each iteration of the cycle. Through honest feedback, re-education is enabled which creates the ability to internalise and operationalise the new norms. Continual learning is achieved by understanding failure as essential for the development of the disruptive technology, and learning to learn from failure, which also leads into the future execution of new ideas.

6.3. Limitations

The researcher implemented different strategies to increase rigor in the study. Despite these efforts, there were three areas of limitation noted by the researcher: methodological, geographical and interpretation. Methodologically, this research justified an interpretivism approach to follow hermeneutic phenomenology to understand the collaboration within a diverse group of Australian small to medium disruptive technology businesses. Although the research was substantive, following an exploratory research means there is no assertion that the results can be generalised. Despite this, a diverse range of industries were included in the data collection process to increase richness.

Geographically, the researcher targeted disruptive technology businesses were participants details were found online and through a referral technique, which limited the physical scope of the research to participants who were in close proximity. Additionally, participants included CEOs and Founders, therefore limiting the richness of data in terms of understanding how other people in the team understand this process. Despite these limitations, a substantial amount of data was produced, where all data was considered. Additionally, CEOs and Founders have a better understanding of the disruptive technology process, which meant that richer understanding was gained through their participation.

The researcher's past experiences can create biases in the way the findings are interpreted. To decrease the researcher's bias, the "phenomenological nod" (van Manen, 1990, p. 27) and multiple cycles through transcriptions and themes helped the researcher understand the participants reality as they see it.

6.4. Future Research

Further understanding of how to manage disruptive technology can be gained through an explanatory approach using quantitative methodologies, which would explain different aspects including how to manage the balance between structure and consideration. Additionally, a quantitative research could further investigate disruptive technology to understand the level of skills, knowledge and experience needed to create a disruptive technology. Further understanding of how innovators create coping mechanisms to persevere through stressful and challenging situations could highlight past experiences that allow people to be perseverant in the development of disruptive technology. The researcher has limited knowledge in the areas of psychology, therefore cannot make any inferences, and just give this as a potential research for psychologists.

The findings from this research presented initial support for how to sustain disruptive technology businesses in the long term. Although this was not the purpose of this research, it is evidenced that this can be done through cycles of continual improvement, but further research could gain a better understanding of this process, by investigating successful small to medium disruptive technology businesses. The presented model can be used in the future to further understand this process where the balance between creating and environment of collaboration, cooperation, and cooperation creates an environment of continual improvement. This model can be further developed by better understanding each of the elements of the model. For example, how to create better relationships within the organisation, or how to improve the diversity within the development of specific products. The presented model can be used by practitioners by implementing each of the concepts and understanding that developing disruptive technologies is not a linear process, but one that requires the involvement and collaboration of a diverse range of people in a process of continual improvement.

Following the limitations of this research, following the case study framework, a positivist survey research can be conducted to generalise the findings from the discussion presented in this thesis. In terms of the participants limitation, which were limited to small to medium businesses, a research can be conducted to understand how to manage disruptive technology inside large organisations. Finally, a research can be conducted to compare these findings with how innovators manage disruptive technology in other countries.

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Appendix A: Interview Questions

Semi-structured interview

You have developed a unique and fascinating business; can you tell us your story (the reason you did this)? And how all began?

Many people have great ideas, only few achieve them. What are the important factors of taking an idea and turning it into a reality?

The outcomes and lines of inquiry:

1. Innovation is often led by small and dynamic businesses like yours. How do you manage the dynamics when you are small and growing rapidly?
2. Besides yourself, who else makes up the team? How did these people become your team?
3. How important are the people inside your business in developing the innovations you have achieved?
4. Innovation is a moving feast, how are the people working towards your journey able to keep up with this changing environment?
5. How did you get where you are today, (what is the story of this journey)? What would be your advice to others who are inventing unique concepts like those demonstrated here?
6. How do you keep improving the ideas essential for such an innovative business (learning is critical, how do you manage this?).
7. Given all we have discussed about managing creative and innovative business, what question should we have asked that we didn't?

Definitions:

Definition	
<i>Innovation</i>	A revolutionary product.
<i>Organisation Development</i>	The way in which you create a supportive environment inside an organisation.
<i>Participation</i>	The collaborative process between people to achieve something.
<i>Disruptive Innovation</i>	A business idea that changes the way the world behaves.

Appendix B: Ethical Clearance

Jose Medina Noel

From: RIMS Griffith
Sent: Thursday, 30 November 2017 3:43 PM
To: Rod Gapp; Jose Medina Noel; Heather Stewart
Cc: research-ethics@griffith.edu.au; Gary Allen
Subject: Full Research Ethics Clearance 2017/948 (provisional to full approval)

Importance: High

GRIFFITH UNIVERSITY HUMAN RESEARCH ETHICS REVIEW

Dear Dr Rod Gapp

I write further to the additional information provided in relation to the provisional approval granted to your application for ethical clearance for your project "NR: The learning and adaptive processes required to manage Disruptive Innovation from a normative re-educative organisational development perspective" (GU Ref No: 2017/948).

This is to confirm that this response has addressed the comments and concerns of the HREC.

The ethics reviewers resolved to grant your application a clearance status of "Fully Approved".

Consequently, you are authorised to immediately commence this research on this basis.

Regards

Dr Gary Allen
Senior Policy Officer
Office for Research
Bray Centre, Nathan Campus
Griffith University
ph: 3735 5585
fax: 5552 9058
email: g.allen@griffith.edu.au

PRIVILEGED, PRIVATE AND CONFIDENTIAL

This email and any files transmitted with it are intended solely for the use of the addressee(s) and may contain information which is confidential or privileged. If you receive this email and you are not the addressee(s) [or responsible for delivery of the email to the addressee(s)], please disregard the contents of the email, delete the email and notify the author immediately

Appendix C: Generic Email

Dear XXX,

I am seeking your assistance in trying to understand the human side of innovation. Given the uniqueness of both XXXX and the way that you have developed it from concept to reality, I believe your business is one of the Australian success stories essential to this research. The outcome of this research will be a number of things including the completion of my PhD, publications on what is occurring in Australia, and most importantly access to these findings for you and your business. We would also like to develop a mutually supportive ongoing relationship with you and your organisation as a result from this research. Below is the University requirements to describe and discuss the requirements of the study with you. Please feel free to contact at any time.

I look forward to working with you through this research. This will only entail a 45 minute interview when best suits you.

Jose Medina
Department of Business Strategy and Innovation
Griffith Business School – Gold Coast Campus
Griffith University
GU Ref No: 2017/948

Appendix D: Information Sheet

The learning and adaptive processes required to manage Disruptive Innovation from a Normative Re-educative Organisation Development perspective

Research Team

Chief Investigator: Dr. Rod Gapp

Griffith Business School

Phone: (07) 5552 8767

Student researcher: Jose Medina

PhD Candidate

Phone: 0499 000 806

Email: j.medinanoel@griffith.edu.au

Co-investigator: Dr. Heather Stewart

Griffith Business School

Phone: (07) 5552 7930

This study is conducted by a PhD student. The area of study is of interest of both the Chief Investigator, co-investigator and more importantly, the research student. Any matter or concern regarding the research can be raised with any of the investigators.

Description: This research aims to understand how owners of creative businesses are capable of turning them into a reality. This will be analysed by understanding how they manage their people and how they overcome day to day issues whilst still focusing on their concept development.

What will I be asked to do?

Owners or General Managers of different businesses that have demonstrated their ability to create disruptive innovations will be chosen to participate in a semi-structured interview. These interviews will be face-to-face in a location that is comfortable and convenient for the participants. Each interviewed will last approximately 45 minutes. The participant will be able to quit the study at any time. The participant will need to sign the consent form to be part of this study. With the participant's consent, interviews will be audio recorder for later analysis and coding.

Researchers qualifications:

Dr. Rod Gapp:

- PhD

Dr. Heather Stewart

- PhD

Jose Luis Medina Noel:

- BBus with Honours Class I

Who can participate?

We want the participation of people involved in the decision making and those who were actively involved in the development of a product or service that changes the way the world behave.

Recruitment Method

In order to contact the Founders or CEOs, the student researcher will locate innovative businesses online, through their websites. Then make arrangement through calling their secretary and/or will personally go to the businesses and contact them directly and arrange a meeting. If they have a secretary, the researcher will proceed to make the necessary arrangements with that person.

How are the results of this research going to be reported?

This research is part of Jose Luis Medina Noel PhD program. This research will be reported as a thesis for Griffith University International Business and Asian Studies department, PhD Program. Further dissemination of the information includes conference papers, journal articles and other academic publications.

The expected benefits of this research: This research aims to create an understanding of how to create revolutionary product or service that changes people's lives. Specifically, how to create business ideas that challenges the way the world behave and how to turn these innovative ideas into reality while understanding the process of managing teams inside the organization to achieve these outcomes.

Risk to the participant: Participants will not be involved into any risk as any information they provide will be closely guarded, as explained below. Further, the researcher will not disclose the location or name of the dealership used for the interviews.

Participation is voluntary: Participation is completely voluntary. The researcher will not force to respond every probe unless the participant wishes to do so. The participant will be free to withdraw from the study at any given time without penalty. If a participant does so, all the information gathered from that participant will be cleared.

Participant's confidentiality: The supervisors and the researcher have solely access to all information. The identity of each participant will be protected, as interviews will be coded with a number to identify each participant. Interview recording will be erased once the transcription has been finalised. These transcriptions will be stored in a secured system and will be solely accessible by the researcher. In all cases, the researcher will not allow anyone who is not involved with the research project to access any of the participants' personal details. Participant will not be identified in any reports or publications resulting from this research.

The ethical conduct for this research: Griffith University conducts research in accordance with the National Statement on Ethical Conduct in Research Involving Humans.

Feedback to you: Results from this research and the final report can be obtained from the researcher.

Thank you for participating in this study

Appendix E: Consent Form

The learning and adaptive processes required to manage Disruptive Innovation from a Normative Re-educative Organisation Development perspective

Research Team

Chief Investigator: Dr. Rod Gapp
Griffith Business School
Phone: (07) 5552 8767

Student researcher: Jose Medina
PhD Candidate
Phone: 0499 000 806
Email: jose.medinanoel@griffith.edu.au

Co-investigator: Dr. Heather Stewart
Griffith Business School
Phone: (07) 5552 7930

I have read the information sheet and the consent form and understand that:

- I can email the Student Researcher to get a summary of the results once they are finalised on jose.medinanoel@griffithuni.edu.au
- I will participate in a face to face interview.
- This interview will take approximately 45 minutes.
- I am participating voluntarily, and I can decide to stop participating from this research at any time without penalty or explanation.
- My personal details will be kept confidential.
- I will not receive any type of direct benefit from participating in this research.
- All data emerged from this research will be kept confidential at all times and will remain in a locked filing cabinet inside the Chief Investigator's office for 5 years before being destroyed.
- The researcher will voice record the interview, and once the transcription has been done, the recording will be deleted.
- This research is a component of the Doctor of Philosophy Program undertaken by the student Jose Medina in Griffith Business School - Gold Coast.
- Any additional questions can be asked by contacting the research team.
- If I have any concerns about the ethical conduct of this project, I can contact the Manager of Research Ethics at Griffith University Human Research Ethics Committee on (07) 3735 2069 or research-ethics@griffith.edu.au.
- The information acquired from this research may be used in the writing of the student's PhD Thesis, publications, grants or in other instances by the researcher but will only be reported in general terms.

By signing this form I acknowledge that I have read the information sheet and the consent form. I agree to participate as an interviewee in this study and that I am doing it freely. I understand that the interviews will be carried out as described in the information sheet, a copy of which I have retained. I accept that is my willing to participate and that I am not forced to do so in any way. I also understand that I can withdraw this study at any moment without giving any explanation, and that all information will be deleted if I wish so. All previous bullet points have been answered to my satisfaction.

Signature (participant):
Name:
Date:

Signature (student researcher):
Name:
Date:

Appendix F: Holistic Collective

Holistic Collective		
P1	Solve a problem	These all are real things that people were dying from or being killed by during these programs. I mean, luckily on us, we were incident and injury free, but there were several stories that people went down across the development of a big project on an off sea shelf, that was terrible how they left. So, looking to do something differently.
P2	Positive purpose	That obviously is a strong motivating force for people to help, to feel that they're helping children who need loads of surgery. So that sort of recruits people. So, what we're doing had a very positive impact. That's the most important thing, that people thought they were doing something useful. I think that motivated people the most is that we were helping children and people with quite severe problems.
P3	Find a problem	You need to find a problem in the world that technology would help.
P4	Passion	Yes. I enjoy it. I like coming to work. I come to work on weekends, I come to work after work. Work is fun.
P5	Solve a problem	Could help them solve problems. And the problems that we are talking about, that are happening in construction sites can be once, cost a site a million dollars to fix.
P6	Positive purpose	You doing a service or product, or whatever, as long as they help society, net positive impact.
P7	Positive purpose	It is very important to show the ultimate mission to the team. Because they can help you get there.
P8	Solve a problem	En el 2003, 2004, cuando hubo una necesidad de hacer algo así. Pero, se vio la primera parte, fue en Chile, fue una falla de una tubería.
P9	Solve a problem	There really wasn't a solution in the market, we spent four months looking for something that was available. And nothing would really give you the value, so we started to build the solution.
P10	Positive purpose	So it has to have an end to it, there has to be a massive upside, a transformative upside at the end of the day.
P11	Solve a problem	The moment I see a better way, I find it really hard to do the way I'm doing. Which was that labour-intensive long process.
P12	Positive purpose	you have to have a clear statement of what you are doing, beyond the elevator pitch. And then you've got to truly believe it.
P13	Passion	I just wanna build cool stuff for cool people.
P14	Positive purpose	Clearly articulate what the problem is, to ensure that that problem is large enough and worth solving.
P15	Solve a problem	It's all it's all about fixing things faster and cheaper.
P16	Positive purpose	I mean we actually have a purpose as well, that inspires passion. So, that helps us in what we're doing because we have generally had people in our business who are keen to improve patient outcome and improve the business of healthcare.
P17	Find a problem	Understand the value concept in that and have a look at that value differently to everyone else looking at it.
P18	Passion	Observation: demonstrated through deep knowledge and ability to explain every detail of the problem being solved.
P19	Solve a problem	I think that the aim is solving a problem that hasn't been solved before, and solving it in such a way that your solutions is so much better than other competitors will have trouble crossing.

Appendix G: Diverse Wisdom

P1	Bring experts	I surrounded myself with people who can do what they do brilliantly. And it may be that the only one may not be my favourite people to work with, but they were excellent at what they did, and we got together and worked together as a team.
P2	Share knowledge	The philosophy of the company is to try and share information and share our knowledge to help people.
P3	Diversity	Founder D is a blockchain developer and Founder B is an energy person, Founder C is an energy person and there's another guy called Founder E who's a blockchain person.
P4	Choose right people	Remember this game is why we chose you over the other applicant. She showed all the other skills, you showed gift.
P5	Bring experts	We were lucky enough also for me to take Founder C, he is an executive out of a large gaming company in Hong Kong.
P6	Find right tool	So, I always tell people, use the right tool for the right task. You know, not just because you now learn about neural networks, everything new you find you want to solve with neural networks.
P7	Share knowledge	Large Org. D started to step up and just do a lot of almost quick per quo collaboration where we don't have to pay them money, we can send someone down for three months to work with them, and leave them alone.
P8	Choose right people	Es mejor eliminar toda cosa que te cause falta de, como se llama, de capacidad de crecimiento.
P9	Choose right people	We never hire a person just because they've got the skills. Someone that has got a bad culture is toxic. We made mistakes where we hired some people where we thought they have the right culture fit, and as it turns out they don't, and I have really had an impact on the business.
P10	Problem focused	The foolish entrepreneurs are the ones who do a sort of superficial understanding of the problem and they go off to build and raise capital to launch and pitch and all that sort of.
P11	Find sources of knowledge	I, and it's interesting when to let go control, like I always think I'm a limiting factor and that somebody else could do some of the things I am doing a lot better than me but finding those people and getting them into place is actually quite a challenge.
P12	Find sources of knowledge	You just go and start talking to people, and bit by bit you learn, and it's almost like there's these different dots that you start picking up. And after a while, the dots start to form a pattern, but that takes time, and you just got to keep accumulating knowledge in that particular area of expertise, and it's like gathering connection, and you start to see, this person knows this, that person knows that, and maybe this person can help me in this area, and sometimes they will do it as a friend and sometimes you take them, hire them for a short engagement, sometimes you take them as a casual employee. It really depends, and you start forming a team.
P13	Find sources of knowledge	So he's a director, investor, advisor. He's excellent but doesn't work everyday in the company. He's from New Zealand actually. I met him funny enough in Austria last year on holidays. A wild story how I met him, but as soon as I did he just became an investor and he's a very, very smart man.
P14	Diversity	We want to look at a problem from all different angles, and to come at the solution from these different perspectives, and to work out how to synthesize these different perspectives. So I think diversity, as a beginning proposition, just makes sense, because we get a variety of perspectives, and we get to kind of choose or mold the best answer as a result. I also think that there is more support for. We have a very diverse customer base, right? So when we're looking at supporting our customers, if we are diverse internally, that helps us understand what we're actually dealing with externally. So I think that diversity, as an organisational principle, makes sense. As an intellectual principle, makes sense.
P15	Diversity	It comes down to having a range of skills in the core group.
P16	Diversity	Stepping outside of the logical space, because you're only gonna be really successful because you pulled in something from so far left field that none had even thought to look in that field.
P17	Diversity	You get answers from divergent mindset, not from concurrents of popular fiction. That's what the experts play with so, that's what I'm trying to do is just get that. Divergent thinking.
P18	Build connections	The other things about India is always a road all the way through. Everybody knows everybody or are related to everybody, so you have to know how these things work.
P19	Problem focused	Here's a problem that we can solve, what are the volume of a whole host of technologies that I can implement to do this?

Appendix H: Achievement through Collaboration

Achievement through collaboration		
P1	Light team	You need to make sure you have a new super light team that you can trust.
P2	Collaboration	Initially it was just me, and once we set up the business, then I employed someone to do it. And then gradually over the years, we've added more people. So it was sort of an organic process really.
P3	Collaboration	Yeah, internally we just kind of share up the work that was based on what needed to be done and it was not so structured, it was very informal.
P4	Have fun	I suppose we make lots and lots and lots of things because we like making things; that's fun.
P5	Collaboration	This environment is far more collaborative. This for me previously was very, a dictatorial and master – servant style relationships. Here is very collaborative, and everyone has got a say in what we have got to get to, and deliver and what have you. To a degree. And, yes. So far different.
P6	Collaboration	The problem with corporations, why it's not sustainable is, because the answer to the shareholder
P7	Collaboration	I get benefited from getting the three of us thinking about it. Then we talk about it, and then we come to some sort of joined decision or at least listen to what you have to say. So I encourage that in the team.
P8	Collaboration	En las empresas a veces existen grupos de poder, y existen feudalismos, me entiendes, entonces hay señores que se creen señores feudales, y eso no funciona, para que la cosa funcione la gente tiene que trabajar como grupo, tiene que estar en investigación, tiene que hacer un montón de cosas.
P9	People are key	It's always about the people, because the people, if you don't have the people, then you never get to those important clients.
P10	Collaboration	A lot of entrepreneurs fail, they fail because they become almost narcissistic in their focus.
P11	People are key	And I'm still am getting used to working with people, is a big deal. I still find it challenging.
P12	Light team	I think the culture will be hard to hold together as we grow, and there is no doubt about it.
P13	Build relationship	The choice of people that you surround yourself, I think, is the most important first step and then from there understanding them, knowing who they are.
P14	Collaboration	And we try and work that out, at the outset, what kind of decision needs to be made here? Is it a leadership call, or is it a consensus approach, where we've got time to discuss and come to the view as a team. And I think they're both equally valid, depending upon the context.
P15	Collaboration	Organised in their little pots, all the folks that work together.
P16	Have fun	That's what I was saying about making sure you celebrate things together, making sure you know each other, you have fun together.
P17	Build relationship	Because I found people and liked them we just had, we'd worked well together. Probably because, "Founder B" is one of the founders here. I employed him when he graduated from (University), he's worked with every startup and he's usually working consult to someone.
P18	Build relationship	If you look after people, these guys essentially, they look after you.
P19:	Light team	Larger firms will always fail because. Well, not always fail but will fail more often because it's very difficult for them to change how they operate. The speed that you have is real when you're smaller, and you have the ability of moving much more quickly towards a solution. Which is why a lot of times larger firms will acquire smaller firms or will take investments, strategic investments in smaller firms as a means of hedging their risk-averse position.

Appendix I: Structure and Consideration

Structure and consideration		
P1	Invest in people	Allow people to be the best of what they best are.
P2	Motivate people	I think you just got to be positive and motivate people and look to problem solving
P3	Regular meetings	We just regularly were meeting, we were working from home for probably the first eight or nine months and just meeting up periodically.
P4	Challenge people	Eventually however, she wants to go into making games herself, so she must do her hard duties before she is set free to make some things for herself.
P5	Both way loyalty	We have had at one stage, one of our early clients with the VR, we thought we had it under control in inverted commas, with the hardware, and it was back when the Occulus was the first Oculus came to market and we bought, I think we bought 9 units or something, and, which is what the client asked for at the time, and then they wanted more, immediately. And then our guys had some at home, and they just donated theirs.
P6	Invest in people	People, you should always invest in the people, because they can, people they can change if you invest in the idea, and if the idea is disrupted, by new technology, you are finished. Right? Then your whole technology is gone but if you invest in the people, the people can say, oh, wow we can see this new thing coming, maybe we should change.
P7	Play to people's strengths	He is been in the company two years, he is one of our seniors on propulsion now. He's learnt a lot in two years. Right, so we do a lot of trial and error stuff, and a lot of testing's, so two years later you are pretty good.
P8	Both way loyalty	Se tiene con ellos es que existe una dependencia de uno hacia ellos y de ellos hacia uno.
P9	Invest in people	You have to care about them. Like, I bring every person in my business, and my goal is to make them grow. And, if I help them grow, and I help them learn, then obviously they are more excited about what they do at "Company Name". And that adds more value.
P10	Manage expectations	One of the skills they need to have is the ability to enthuse other people and to enlist participation by other people, including investors, so at some point, that's part of the entrepreneurial characteristics, traits.
P11	Authenticity	The challenges are lack of clarity, people melting down over lack of clarity, misunderstanding, over assumptions, people getting unhappy about all sorts of things.
P12	Acceptance	We stuff up, we forget things, we lose things, we don't get things done on time you know. You can either make a culture that supports people, or a culture that tears people down. I want to enjoy where I'm working, and enjoy working with the people, so I try and have a good team spirit. I'm sure I fall far short of my goal but at least is an aim.
P13	Motivate people	Knowing where peoples trigger points are for, not happiness as such, but excitement. I think is a really big thing because particularly in startups it's a hard slot, it's difficult and it really sucks. It ruins your life essentially, but there has to be something that excites you about it to allow you to ruin your life to do it.
P14	Authenticity	We're very transparent around what our targets are, on an annual basis and beyond. We try to communicate as much as we can, and I think you can always do even more than what we do, but we have quarterly town halls, we have weekly all hands meetings, we do try to do a lot of communication with the team to make sure everybody is as informed as possible. Because I think if they have that information, and they understand where we're all trying to get to, they'll start coming up with really good ideas.
P15	Trust	Generally it's only possible if you have worked together before you know each other well and there is a degree of trust and also get the track record of success if people have seen them before.
P16	Play to people's strengths	They key difference is we all know each other, and we know each other's strengths and weaknesses, and I know the names of everybody in my organization, I know their personalities.
P17	Trust	I think to me business is largely about trust. That's just my perception or feeling, trust the people who work with you, for you, the people you supply to, the people you're partnering with, it's all about that and you can trust people. I trust nothing else. I sure as hell don't trust companies, I don't trust money, I don't trust anything else. Very, very little do I trust anything else.
P18	Authenticity	None of this was in the non-disclosure agreement, or security passes, or anything.
P19	Manage expectations	You have to manage people's expectations and make sure that they understand the broader scene, because a lot of people who haven't been in start-ups see the wave up and think it's incredible and we'll make a billion dollars and then the wave down, oh my god we're about to die, and not seeing beyond the next wave.

Appendix J: Stress Adverse

P1	Takes time	It took us 9 months to get all the health and safety organised, so flight emission, safety permits.
P2	Resilience	I think you have to have a lot of perseverance and resilience. You can't give up, you got to keep going, you got to believe in what you're doing. And constantly bouncing back, really, and keep going as best you can. But resilience, you get set back and you just have to pick yourself up and keep going.
P3	Perseverance	We are now in this kind of constant development phase of different products.
P4	Perseverance	Very simply, quite often the best advice in all things when you're saying, how do I get to success, is do not give up.
P5	Perseverance	It was extraordinary stressful, because then you run into, you have to make the decision up to whether you are going to, how many people you keep in the business, do you keep everyone, do you try and cover that gap with loans, if you are a small business the Banks don't like giving you money, particularly if you are a technology business, so how do you beg, borrow and steal the money that keeps you through the next couple of months.
P6	Timely execution	Idea is cheap, execution is not.
P7	Perseverance	It's the no fear of failure
P8	Timely decisions	Si no se toman decisiones a tiempo a veces, puede ser un problema, y muchas veces te duermes dentro de tu capacidad de tomar decisiones por mantener el status quo.
P9	Challenging	The first 5 years I didn't get any holidays at all.
P10	Challenging	They didn't have secure finance,
P11	Challenging	That's very challenging and certainly not a comfortable space, I remember saying to somebody my last 10 difficult conversations, and if he was for a while, and it was a great learning for me through that, being able to be comfortable we had difficult conversations. Certainly I have been a people pleaser all my life and to have people upset is the worst thing in the world, but now I've gotten comfortable with it. Which is, an interesting place to come to, you can't work with 40 people and have them all completely happy.
P12	Perseverance	You have to have that determination, that's why doing something you think is big and significant and important helps.
P13	Challenging	The hardest thing is getting people to believe. I suppose I would probably add that to the whole challenges bucket.
P14	Timely execution	Yeah. I think I need to be prepared to do both. Sometimes leaders need to make calls, and they need to make calls really quickly, and so it's very important that I'm informed enough to be able to make those calls if we need to.
P15	Perseverance	So, it was a little bit challenging until the Global Financial Crisis when all of a sudden, they became cost sensitive. I think that have us sort of a boost.
P16	Challenging	You got to engender trust in the people that are buying from you, but if it's something where you're putting something forward, where there's real patient lives at risk, then the trust level you have to seek is greater than were you disrupting the taxi industry.
P17	Challenging	Doing that in Australia, from Australia was just too hard.
P18	Challenging	Well I thought was simple, but paranoia took over, and from that point on there was an absolute war. So anyway, we got through a few problems.
P19	Resilience	Until you've been three or four times within 48 hours of a company going t**s up and people losing everything, obviously having money that you could wind up and not have people lose their entitlements, but I mean not having been that close, it's hard to gain perspective. The level of stress that that causes people breaks people.

Appendix K: Innovative Mindset

P1	Creative environment	Convincing people in big organisations the value of innovation or even changing things is actually quite painful sometimes if you are not in the correct culture.
P3:	Constant improvement	We are kind of just approaching that phase at the moment and we need to kind of. We are now in this kind of constant development phase of different products but regardless if we just had one, decide on one area of focus we would still be developing and refining that particular product.
P4	Obsolescence	A person who does not set a very high standard. I see some of my artists who torture themselves, oh the dinosaur doesn't look good enough, it's terrible, destroy it, burn it, take it away. It's a failure. And I go, that is why that artist is good. They are torturing themselves until they are the absolute best.
P5	Constant improvement	We have got two guys who sit across, literally doing that. Trying to make sure that, so Team Member is sort on that full time, and then look helps him a bit, but trying to make sure that what we are doing is one step ahead.
P6	Passionate	Do something that you like, something the world needs, something you get paid for, and something that you have skills for.
P7	Freedom to innovate	Well, but there's always, I'm always going to have a core team of innovators. Like we want to do a lot more technology beyond the next launch vehicle. So, I'm always going to have a team of 50-100 people in the long run that are just looking at advance projects. So, these guys can be in that team in the long run. In the advance project team.
P8:	Knowledge hungry people	Cuando es un ministerio, y el otro es un centro de investigación. Entonces dentro del mismo local, se pueden dar y con sus excepciones que confirman la regla, por que hay gente muy innovadora que conforman Business B, pero no son todos, no es como tu dijiste, como haces un environment, entonces el environment es por diferencia. ¿En el caso de Business B, mas es por default en Business A. Entiendes? I: Si, si te entiendo, pero, o sea cuando dices que es por default, se da de por sí, o es por la gente que tienes, o es por las.
P9:	Creative environment	In the ideal world you want inspire people, to do that when it's necessary, and then reward them because you need to there are periods of times when we made ends worth, but then there are periods of time where you need to recharge.
P10	Obsolescence	They tend to get emotional satisfaction through creativity.
P11	Freedom to innovate	Yeah, my dad's parenting model I guess is get out of the way, and let them let them learn their own lesson. To work it out that meant for doing some dangerous things up-childing was doing whatever we liked. And then he would just be supportive for us to do that. It just got to the point where I was the one saying dad, what you are doing is very dangerous. You cannot leave live 40 bolts sitting there. With somebody to put their hand on it, that's just not good. And, so him being that relaxed about danger, letting us learn our own lessons was certainly, equipped me with an attitude of being able to do, be confident to play around, and have a go.
P12	Constant improvement	Exactly, always, always. And it's continuous. But it's a starting points at least knowing that you should be improving, and what did I stuff up on this month, you know. What can I be doing better, how can I fix that? And I have to be.
P13	Learning environment	A fixable problem is not a problem. As long as it's fixable, it's cool. If it's not fixable then we're stuffed. But so far, we haven't come across a non-fixable problem.
P14	Learning environment	Be curious and open about the technology and willing to learn, and to say that there's lots of things that we don't know
P16	Freedom to innovate	I think that you need to give people the opportunity to do things, and to encourage.
P17	Freedom to innovate	We have got more thinking outside the dots from the start, how do we create
P19	Constant improvement	Constantly iterating, constantly improving. And you get there. And even when you start getting to where it's sellable, it's still not there.

Appendix L: Learning from Mistakes

Learning from mistakes		
P1	Explain technology	We were able to verify the data that way we had a way to compare different data sets, which is key. You can't just switch to a new methodology, you have got to make sure you validate that methodology before you switch completely.
P2	Development through learning	To create a sustainable business from nothing is extremely difficult. And that's why start-ups have such a high failure rate.
P3	Development through learning	Well, I don't think anything was ever everything done, we are constantly developing the product and the technology and adapting it for different uses then seen how it can be standardised, so it's not finished at all, still today.
P4	Deal with problems	When a person loves what they're doing, it will be done if they are an intelligent person, but no matter how intelligent the person is, if they do not love what they are doing, it will never be done. I can take the best programmers, I can explain everything on a whiteboard, and then my next thing is to look at them and say, do they go "Wow, I really love this, I'm hungry to do this." Then it will be done. But if they go, "Okay, I'll do it," then it will not be done. So one of the things is, how much does a person really, really want to do something.
P5	Explain technology	If I went to meet with a CEO of a large organisation, they would still some of them have never tried VR, if they have tried it, it's been to watch 360 films, or at a scenic kid using it at an entertainment arcade. They often, being felt a bit nauseous from using it as well, so there are like, oh, no we don't want VR. So there has been some negative impact as well. And then, so they have already got a pre conceived notion of what it is, and then they have a current, their current business model is allows the traditional face to face training, when you go to a classroom, you put a power point, you teach blah blah blah. And here comes this company that wants to change, or put people in VR headsets to do that training, and they are like... that's a little bit of a leap too far.
P6	Development through learning	Nobody cares about the fundamentals. Fundamentals is the after effect. Then you go, oh yeah, this is why it moved.
P7	Tolerance to failure	Well, it's also, after you put is that way, it's the no fear of failure.
P8	Explain technology	Eh, la idea es, tienes que entrenar al cliente, sobre la necesidad para que el cliente vea que existe la necesidad. Pero todas tienen una cierta vida como tu dices y también son copiadas por lo cual a la larga mueren.
P9	Failure key to success	They are always making mistakes, right? That's the nature of learning, you need a culture that supports people when they make mistakes. And a culture that is very, we do a lot of work compliance, and that is designed to get people from what works and what they can do better definitively takes time, so we then never judge people when they make mistakes. That's a very important pattern within our business culture.
P10	Deal with problems	Company A Digital not being able to deliver on the big ideas that they came up with.
P11	Honest feedback	For us, that early video footage was important to find our way. And then we can refine it and refine it and have a video that was really compelling all the way through, which I am sure you watched.
P12	Development through learning	As I said, I'm sure we get it wrong. There's no such thing as a perfect company or perfect boss, or perfect employee. We all have our bad days, and we have to go back home to our lives conflicting priorities. You just have to roll with that as well.
P13	Deal with problems	That was a very eye opening experience. So the co-founder and I, "Founder B", we left it just about a year to determine just how much equity we both have in the company and as it turns out the number that I intended for him to have was very different than the number he intended for him to have and it made it very different.
P14	Tolerance to failure	But of course, leaders are human, and we all make mistakes, and I make as many mistakes as anybody else does. And so recognizing that and still being a leader anyway is probably my personal challenge.
P15	Deal with problems	We've learnt from I guess we didn't have the bandwidth to put a lot of effort into market research and figuring out what was going to work before we did it or not. So we often just throw stuff out there and wait and see what happened.
P16	Failure key to success	And there's a lot of good management books that you should learn more from failure than from success.
P17	Failure key to success	You should learn more from failure than from success.
P19	Development through learning	You're learning all the way along

Appendix M: Engaged Synthesis

Engaged synthesis		
P1	Commitment	Surround yourself with people who are wanting to risk things and wanting to change things. Otherwise you really are in a painful situation.
P2	Test in market	Our customers are basically surgeons, so, because I'm a surgeon, I sort of understand the way they think. The business has developed to cater to surgeons and the way they think and what they want and making sure they're happy, really.
P3	Focus	Ok. Oh, I get it! so everyone is working on those eight ideas and then once you've figured it out which one is the best then you're going to go with it to scale it. P3: Yes. Yeah, it might be one or two but it's not eight.
P4	Focus	You don't want the company to shift their focus and say, we're gonna use something new now.
P5	Develop product	So those two key functions are still done internally.
P6	Focus	It's like a compass, if not you are wasting your time. It's really useful that way. So, it focuses what you need to get done, as opposed to do everything, and get nowhere.
P7	Focus	We are actually technology focused.
P8	Vision expander	Todo el mundo comienza a aportar idea, y eso hace que realmente la cosa haya mejorado no, y que hayamos logrado esta, el desarrollo de esta tecnología que fue realmente disruptiva y que todavía sigue siéndola,
P9	Test in market	And the very first we made was our brand promise, which is all about what we are promising to do to our clients. And I have always paid a lot of attention to our culture
P10	Consensus	Based on feedback from real users, evolve that product. And that I think is going to work better for them. Because the reality is, getting to launch is sort of like getting to the start of a race, not the end of the race.
P11	Consensus	Aside those two things, we bring in the bees as an icon for the environment. And the important part, as I said, we build in our bricks into ethics and values into the company were built for us, that's is something that keeps us going.
P12	Commitment	And our advice was be legally compliant stick to the rules, and you are going to have to pay tax, and you are going to have to treat it like any other commercial activity. So, there is this belief in the crypt wall that they are doing something special and unique and it sits outside the law. Which we have to constantly fight. And educate people that that is just none sense. If you are taking people's money and then you have the same responsibilities as any other business. There is nothing unique or special about cryptocurrency from that angle. So, we then said we are going to shoot to be one of the Australian's first digital currency law firm. And we did that.
P13	Commitment	Yes. By virtue of the person, I was able to quit my job and come work for free and so if I had "Partner B" do that he would have been here with you as well. But because that was just the nature of the way the business went, it was me.
P14	Develop product	We have to be able to see something, and the rest of the organization has to be able to see it, not just the people involved in the sprint. And that means that everybody across the organisation can see what's going on in a particular sprint, which means that not only do they have the ability to contribute, but they the ability to ask questions or to raise any concerns at a particular point as well. And that's been fantastic, because it's been actually really motivating for the teams, it's spread knowledge and information across the organisation, but sometimes it's also highlighted that we just got something wrong, or it doesn't quite meet a user spec, or we've changed the requirements and that wasn't well communicated, whatever it may be, and that gets picked up a lot quicker so that we can act upon it.
P15	Test in market	We get a lot of feedback these days from the sales engineers who the people who are engaged technically with customers and salespeople. You get a lot of feedback. We have to filter it a lot to customers, they will say I need this, but what they really need or something to be useful of a much wider range of customers won't be exactly the same.
P16	Test in market	But the part of that is validating as you are going along, because if you have got enough customers, and you have got enough, you are talking about real people, not just amongst yourselves, this is not the academic fantasy side of things, it's not, is actually based in consumption of tangible value. Because that is what you are trying to create.
P17	Test in market	We need to know the market better than we know the market, and we know the technology, we are technique people, we need to know the market, if you don't know the market unless you are actually playing in the market and selling products and having customers
P18	Focus	And I said to him, how much energy goes into the actual propulsion, reaction, propulsion. And he gave me some, anyway, bulk data, millions of watts of energy. And I said, the problem is that you haven't got any energy.
P19	Test in market	It's just a constant iterative process of development until you get to something that you think by testing it with a customer base can work and your strategic partner obviously, and also is solving the problem in a robust way that's replicable and scalable.

Appendix N

Finding the subthemes and themes was a process of immersion and exploration. Hermeneutic phenomenology is the study of texts, in this case interview transcripts, observations (researcher's journal), and researcher's notes. Immersion started by conducting the interviews and transcribing them. After this process, the coding helped finding codes in the texts which helped creating a first initial understanding of the transcripts.

Over 550 codes emerged from the coding of transcripts, observations and notes. These codes were then hand written, one by one, on multiple pages in multiple notepads with the intention of having similar codes organised in different pages. This process helped finding codes that had similar meaning. Not being a linear process, the data analysis required re-writing pages multiple times to accommodate new codes, bringing together multiple codes into one, and working with the codes to make sense of the data. Every time a decision was taken on a code, the researcher went back to the source (text) to compare them. For example, when a code had a similar meaning compared to another code, the two sources were compared, and if the ideas were similar in the source, these were then used as one code. During this process, an Excel document was created to register every code and the example from where these codes came from, which was later used to create Appendix F to M.

Following the large number of notepad pages, the researcher decided to use a Word document to organise the data. At this stage, there were more than 30 notepad pages, each containing between 10 to 20 codes. These were then written in a Word document, which helped visualise the ideas, and compare the codes from different pages of information. Through comparison and re-visiting the texts, these codes were reduced until a total of 51 concepts were found that described the previously found 550 codes.

From this point, data was more manageable, and with the 51 concepts, the researcher moved around concepts, compared them and immersed into their meaning, leading into the finding of 18 subthemes, and then 8 themes. In this process, the researcher used a tablet program which allowed handwriting concepts and moving them around through an engaging process. This allowed the researcher make sense of how these concepts worked together, like a puzzle, until the subthemes and themes were strong enough to explain the participants view of the world. This process required going back and forth from the notepads, Word document, tablet, observations, researcher's journal, and interview transcripts, to make sense of them all, and bring them together.

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