Digital Disruption: An Australian Context of Managing Disruptive Change in the Energy Industry

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

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Declaration

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

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<th>Description</th>
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<tbody>
<tr>
<td>ADKAR</td>
<td>Awareness, Desire, Knowledge, Ability, and Reinforcement</td>
</tr>
<tr>
<td>AEC</td>
<td>Australian Energy Commission</td>
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<tr>
<td>AEMO</td>
<td>Australian Energy Market Operator</td>
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<tr>
<td>AER</td>
<td>Australian Energy Regulator</td>
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<tr>
<td>AI</td>
<td>Artificial Intelligence</td>
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<tr>
<td>BAU</td>
<td>Business as Usual</td>
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<tr>
<td>CSC</td>
<td>Customer Service Capability</td>
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<td>DCC</td>
<td>Disruptive Change Capability</td>
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<tr>
<td>DER</td>
<td>Distributed Energy Resources</td>
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<tr>
<td>DOE</td>
<td>Department of Energy</td>
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<tr>
<td>DNSP</td>
<td>Distribution Network Service Providers</td>
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<td>DSP</td>
<td>Demand Side Participation</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
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<td>IBM</td>
<td>International Business Machines</td>
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<tr>
<td>ICT</td>
<td>Information Communication Technology</td>
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<tr>
<td>IOT</td>
<td>Internet of Things</td>
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<td>IS</td>
<td>Information Systems</td>
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<td>IT</td>
<td>Information Technology</td>
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<td>KM</td>
<td>Knowledge Management</td>
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<tr>
<td>LCE</td>
<td>Low Carbon Economy</td>
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<tr>
<td>Micro-CHP</td>
<td>Micro-Combined Heat and Power</td>
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<tr>
<td>NEM</td>
<td>National Energy Market</td>
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<tr>
<td>NFC</td>
<td>Near Field Communication</td>
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<tr>
<td>RBV</td>
<td>Resource Based View</td>
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<tr>
<td>SEC</td>
<td>State Energy Commission</td>
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<tr>
<td>TNSP</td>
<td>Transmission Network Service Provider</td>
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<tr>
<td>USE</td>
<td>Unserved Energy</td>
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<tr>
<td>VIS</td>
<td>Vigilant Information Systems</td>
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<td>WD</td>
<td>Western Digital</td>
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Abstract

The impact of Digital disruption on the Australian energy industry is the focus of this research. It investigates disruptive changes to the industry. Digital technologies that occur at a pace and magnitude that disrupts established ways of value creation, social interactions, business and the ways in which people within the digital space and culture, socially react and innovate for them is researched. This thesis explores how decision-makers manage disruptive change with effective strategies that exploit progressive innovation. Building on existing literature on digital disruptions, the Disruptive Change Capability (DCC) Framework is analysed. This framework provides an understanding of managing digitally disruptive change in enterprise organisations and how to benefit from future digital disruptions.

The motivation for this research is to investigate how digitally mature organisations can transform themselves, rapidly respond to opportunities and manage challenges, embracing disruptive change to create value and stay relevant in the disruptive business environment. The primary research question is ‘How do enterprise decision makers understand the various aspects of digital disruption and manage disruptive change in the Australian energy industry?’ An interpretative perspective was used to research the topic and an explorative case study methodology was thus utilised.

This study collects decision-makers’ reactions, perceptions and feedback about the specific components of digital transformation. It presents a new set of organisational capabilities and learning, digital dynamic capabilities, digital business strategies, concepts, values and practices critical to the success and sustainability of the rapidly and technologically disruptive business environment in which the future enterprise will have to operate.

This research delivered five key findings; Digital Mindset, External Collaboration, Customer Focus, Constraints and Future Drivers. The relationships between the five concepts linked by their related themes constitute the major findings of the thesis and were found to have a grounding with digitalisation literature.

This research has identified the digital decision-makers’ recommendations to manage digital disruptions; an organisational mindset of shared vision, an agile, digital transformation organisational culture; a customer-focused dynamic capabilities and collaboration in building trust. Furthermore, it is essential for decision makers to encourage progressive innovation; embrace co-creation to maintain mutually beneficial relationships; retaining collective digital talents; remaining responsive, adaptive and innovative as a key strategic priority; building networks with industry ecosystems, society, businesses
and policy makers to indirectly influencing regulatory policies and investing in progressive technological innovation as future drivers that enable aspects of digitisation.

Key words:
Digital disruption, digital transformation, customer-focused, disruptive change capabilities, network ecosystems collaboration, energy policies, progressive innovation, innovative disruptive technologies, digitalisation.
Chapter One – Digital Disruption in the Energy Industry

1.0 Introduction

This thesis also explores the impact of digital disruptors in the Australian energy industry and how decision makers react to and manage disruptive change in enterprise organisations. Digital disruptions offer an opportunity to adopt and deploy digital technologies and business strategies to improve performance. The impact of digital disruptions is being felt across various industries and understanding how it impacts is vital for effective strategies to exploit the shifts (Bradley, Loucks & Macauley 2015).

This thesis is inspired by the contribution of disruptive technologies towards unprecedented opportunities to access information, shifts in the sources of value creation through digital resources and location of value capture within digital business networks and ecosystems (Bharadwaj et al. 2013). The impact of the energy supply disruption currently (2017-2019) experienced by Australians: extremely high energy prices, less reliable and less secure energy supply, further compounded by unpredictable policies and regulations governing energy generation plus the increasing rate of adoption of disruptive smart technologies is also addressed.

This thesis illustrates the concept of embracing digital transformation to manage disruptive change created by digital disruptions (Lindgren 2013) and is explored in practice through the eyes of digital practitioners in the energy industry in Australia.

Innovative technologies are driving further digitisation; transforming fundamental technology that has increased the speed and capability of machines while lowering costs at an extraordinary pace. This has occurred with the convergence of mobile and cloud technologies, big data and machine learning (Bolden & O’Regan 2016). The application of sophisticated data analytics to more than 20 billion embedded and intelligent systems, with massive amounts of device and human generated data, will lead to dramatic improvements in the capability (and safety) of knowledge workers.

A myriad of issues were also discussed such as: the efficiency of digitised machines, artificial intelligence and next generation genomics, advanced materials, energy storage, advanced oil & gas recovery, renewable energy, advanced robotics, self-driving vehicles, 3D printing, mobile internet, internet of things, cloud technology and automation of knowledge work (Bolden & O’Regan 2016) which will all have a positive and negative effect around the world and in Australia with regard to the energy sector.
Digital technologies are also enabling different forms of dynamic capabilities suitable for turbulent environments (Pavlou & El Sawy 2006, 2010), which will inevitably transform the structure of social relationships of both consumers and business with the rapid rise of social media (Susarla, Oh & Tan 2012).

Increasing digitisation offers opportunities (Weill & Woerner 2015) but the current wave of disruption will inevitably lead to job losses in other areas susceptible to automation and standardisation thus putting pressure on all businesses to be prepared to embrace and change existing legacy business models before being forced by market forces to do so (Turnbull & Kundra 2015).

Decision makers need to understand aspects of digital disruption and as functional leaders, to provide solutions to manage disruptive change (Christensen & Overdorf 2000). The key problem facing energy organisations with respect to digital disruption is people, specifically the different rates at which people, organisations and policy respond to technological advances at a time when digitalisation is an increasing part of most industries (Moller et al. 2018; Vanini 2017; Nambisan 2017).

Organisations within the energy sector that embrace the technological wave are best positioned to assert their influence and bring others into their orbits (Schmidt & Cohen 2010) by implementing digitally-enabled changes to better answer customer needs (Tan et al. 2015). This then begs the question ‘Could the understanding and knowledge of aspects of digital disruption, innovative technologies, organisational capabilities and their related theories be adapted to better manage disruptive change?’

1.1 Research Aims/Objectives

Digital disruption refers to changes enabled by digital technologies that occur at a pace or magnitude that disrupts established ways of value creation, social interactions, doing business (Johnston & Riemer 2014) and the ways people within that culture interact and innovate for themselves in the digital space (Lindgren 2013).

Active researchers in this field, Weill and Woerner (2015) define digital disruption as a process when the business world is rapidly digitising, breaking down industry barriers and creating new opportunities while destroying long-successful business models. Weill and Woerner (2015 p. 27-34) stated, ‘Given the amount of turmoil digital disruption is causing, it’s time for companies to evaluate these threats and opportunities and start creating new business options for the future, the more-connected future of digital ecosystems’.
Dealing with uncertainty and globalised connectivity, organisations at this time (2017-2019) can no longer operate as standalone entities but need to move to meta-organisations (Gulati, Puranum & Tushman 2012). Karimi and Walter (2015) suggested that interdependence of organisations across enterprise collaboration networks must be addressed in practice otherwise they pose a challenge possibly via policy incentives to ensure skills transfer and innovation maximisation. Companies have found ways to create value, such as using data available from the cloud platform as an asset, and as the Internet matures, Internet speeds get faster, and as the know how to develop systems on the Internet gets cheaper and better (Schmidt & Cohen 2010).

The first objective of this research study was to determine how decision makers currently manage disruptive change and its impacts within the energy industry. The second objective was to identify and understand the various aspects and specific factors that enable or inhibit digital disruption. The third objective was to determine if the use of the proposed framework of disruptive change capabilities (DCC) would provide competitive aspects for decision makers to manage, improve and lead disruptive change thus creating value for the enterprise organisation.

The aim of this research is to investigate how digitally mature organisations are able to transform themselves, respond rapidly to opportunities and manage challenges, embrace disruptive change to add value and stay relevant in the disruptive business environment. This research also aims to explore the disruptive change capability of the Australian energy industry, which is embracing digital disruptive technologies to manage disruptive change.

This research aims to firstly, understand how decision makers identify aspects of digital disruption and manage the social issues, challenges and opportunities of disruptive change. Secondly, to identify the capabilities of digital disruptions that transform within the enterprise. Thirdly, to determine if embracing a proposed disruptive change capability would help decision makers to manage digital disruptions efficaciously.

This research will demonstrate that a disruptive change capability framework can be analysed to assist organisations to implement progressive digitalisation strategies. Bughin and Zeebroeck (2017) highlighted that little empirical evidence has captured either the magnitude of digital disruption or how incumbents are reacting and that successful new digital entrants pull industries in new digital directions while gaining a huge head start in reaping the benefits from the new models they are creating.
Disruptive innovation takes advantage of potential opportunities to develop new enterprise IT services, products and applications from existing technologies, implementing new emerging technologies, innovating processes, procedures and educating ICT employees (Sharwood 2015). Furthermore, according to Trejo, Gutierrez and Guzman (2016), companies that are closest to the end customer have the best insights into what other things those customers desire and what services a premium will be paid for.

The Disruptive Change Capabilities (DCC) Framework is used as a lens to guide answering the research questions below. The researcher will identify the key aspects that influence Australian energy companies’ digital technology integration based on organisational learning capabilities framework (Argote & Miron-Spektor 2011). This organisational learning capability coupled with other literature culminated into a Disruptive Change Capability (DCC) Framework which will be discussed in the literature review (Ref. Section 2.8 and Section 2.9).

Given the relatively recent academic interest in studying disruptive change, the researcher, who has a professional background in the Australian energy industry and was employed within the sector during most of the thesis research period, was in a unique position to gather data, to observe and participate in this evolution.

1.2 Motivation

The emergence of new technologies related to the efficient generation, distribution, storage and use of energy can be highly disruptive to existing industries and markets. Changes in the way energy is used and managed have the potential to greatly benefit consumers, and society as a whole, by allowing for lower costs of generation, distribution and transmission, more information around access to energy at particular times, increased efficiency in the usage of energy infrastructure and improved environmental sustainability (Productivity Commission Australia 2016, p.19).

The Australian energy industry is currently (2017-2019) dealing with an energy trilemma transitioning to sources of energy that are clean, affordable and abundant (Davis 2017) compounded by complicated energy policy and increasingly disruptive technologies (Byrne 2017). Pears (2017) suggest that Australia will need a range of innovative technologies and policy options to address energy security coupled with the challenges of climate change and contribute to solving the ‘energy trilemma‘: ensuring our energy supply is affordable, secure and meets our environmental responsibilities (Mancarella 2014).
With the increasing availability of affordable and efficient renewable energy, such as solar panels and battery storage units, the nature of the Australian energy sector is in need of stable policy guidance as it is changing from a centralised, top-down, slowly changing system dominated by big businesses, governments and large investments to a chaotic, decentralised, diverse and rapidly changing disruptive environment (Byrne 2017). Decision makers must be prepared with critical management skills to deal with impacts from disruptive change including the rapidly changing technologies and changing needs of customers.

Research studies (Christensen 2008) that recommend embracing disruptive change do not define what is meant by ‘managing disruptive change’ in the Australian energy industry or ‘how to introduce digital capabilities’ Among existing studies (Moller et al. 2017), there has been little theoretical advancements regarding aspects of digital disruption understanding in the Australian energy industry including: specific definitions, impacts of disruptive change, enablers or various aspects and capabilities needed to manage disruptive change.

The motivation for this research was to study ‘how decision makers of digital enterprise organisations transform, respond and adjust its organisational capabilities necessary to manage disruptive change and create value?’

The Australian energy sector has undergone significant change with privatisation of government organisations (Nelson et al. 2014) that in many instances owned and operated the entire supply chain from power generation to statewide infrastructure for transmission and then distribution to customers small and large. From a single entity, the Australian energy sector now features multiple enterprises, both Australian and foreign owned, competing across all levels of the supply chain (Nelson et al. 2014).

There are many aspects that have motivated this research, they are as follows:

1. Australia is currently experiencing soaring power costs that are dramatically intersecting with the increasing availability of affordable and efficient renewable energy, disruptive technologies and complicated energy policy which for the past decade stalled private investment in new generation technologies resulting in a supply shortage (Mancarella 2014).
2. Securing an affordable, reliable and environmentally responsible energy sector is a huge challenge for policy makers because of retiring coal-fired power plants and rising natural gas prices. (Nelson et al. 2014)

3. Together with increasing rapid innovative technologies and changing consumer expectations, highlight a critical energy ‘trilemma’; the challenge of achieving secure and reliable energy supply while reducing carbon emissions and ensuring affordability for consumers (Mancarella 2014). Thus, in the face of rapid technological change in the energy sector, policy needs to evolve to achieve three objectives:
   - meet Australia’s Climate Change commitments under the Paris Agreement;
   - ensure reliable and stable supply of energy so the ‘lights don’t go out’;
   - Mitigate rising electricity costs, particularly for vulnerable and elderly households.

Energy customers in Australia have been confronted with significant and unpredictable price increases at a time when disruptive innovation introduced embedded energy networks whilst microgrids and smartgrids are rapidly growing (Dufour & Belanger 2014; Snow 2017). As energy policy-driven, subsidised alternatives fuel the renewable industry, customers are affecting digital disruption and investing in solar and energy storage plants to minimise costs.

Disruption is being fuelled by the growing energy-literate consumer segment concerned about the security of grid based energy supply (Dufour & Belanger 2014) and rising energy costs, combined with awareness of declining costs of micro generation technology and energy storage options that extend the use and effectiveness of renewables, smart technologies and embedded network development (Snow 2017).

The main causes of the Australian energy price hikes include huge increase in electricity network costs driven by regulation and over investment contributed to rising household power bills over the last decade and lack of competition in both generation and electricity retail markets, recent closures of coal-fired power stations and the growing cost of environmental schemes (Byrne 2017; Pears 2017).

Australia requires transparent and stable policy guidance to ensure new investments are made to replace these plants and the power they produce, while still meeting the climate commitments under the Paris Agreement 2016 and keeping the costs of electricity down and ensuring stable electricity supply. The final report of the 2018 ACCC inquiries found that there is a serious electricity affordability
problem for consumers and businesses. The report listed 56 recommendations to reset the National Electricity Market, to boost competition, reduce costs and improve consumer and business outcomes.

Potentially disruptive energy technologies that have been developed include generation technologies that facilitate energy creation and enabling technologies that support the storage, distribution or use of energy. Many of these technologies promote the decentralisation of energy generation, by allowing electricity to be created and stored on-mass at a smaller-scale in each location, and in a manner that is relatively cheap and proximate to users (Productivity Commission Australia 2016, p. 195).

Disruptive technologies such as mobile technology, off-platform and crowdsourcing are fundamentally reshaping business models and business strategies as modular, distributed, cross-functional global business processes enable work to be carried out across boundaries of time, distance and function (Banker et al. 2006; Ettlie & Pavlou 2006; Rai et al. 2012.) Scholars, including Bharadwaj et al. (2013) and Pagani (2013), focus on how digital business strategies impact business models, competitive advantage and improved performances, given that the rapid rise in digital technologies has facilitated better informed consumers who impact the current value proposition and market position of a company.

Furthermore, the power of the individual and empowered customers has disrupted every industry; as digitisation has grown, shared and transformed the role of individuals who consume and provide data to social networks (Tan et al. 2015).

In this customer-centric age, enterprises who master the flow of relevant data, have access to customers’ data patterns, knowledge of and engagement with customers improving customer relations with social communication technologies or ‘social software’ (Johannessen, Olaisen & Olsen 2001), will have the edge (Bernoff et al. 2013) and sustainable competitive advantage. Van Veelen (2018) highlighted the growing signs of a global energy transitioning and the role of social, economic and political power in energy transitions with renewable sources gradually replacing fossil fuels (Weis, Becker & Naumann 2015).

According to the Global Opportunity 2017 report ‘Business of Power’, decentralised energy systems are capable of disconnecting from the traditional energy supply grid and operating autonomously to provide more resilience in the energy supply. With products that encompass solar panels, smart meters, and other smart devices using software to manage energy flows and thus ensure flexibility. The decentralised energy opportunity space provides new services that include solar storage community platforms, cloud
platforms that enable energy sharing, and software to manage transactions. These new business products and services are increasingly embedded with digital technologies and significant digital platforms enable cross-boundary industry disruptions, thus inducing new forms of digital business strategies (Burgelman & Grove 2007). In addition, theoretical structures for strategy making in nonlinear, dynamic and turbulent environments are also emerging (Meyer & Calwell 2005; Davis 2017, Eisenhardt & Bingham 2009; Pavlou & El Sawy 2010).

As energy policy-driven, subsidised alternatives fuel the renewable industry, customers are affecting digital disruption and investing in solar and energy storage plants to minimise costs. Disruption is being fuelled by the growing energy-literate consumer segment concerned about the security of grid-based energy supply and rising energy costs, combined with declining costs of micro generation technology and energy storage options that extend the use and effectiveness of renewables and embedded network development (Snow 2017).

Thus, there is pressure on decision makers to find a solution. One widely reported solution (Thomas 2017) was the installation, of a 100-megawatt lithium ion battery to provide stability for the South Australian energy grid by powering up to 30,000 homes for one hour and prevent load shedding. This was promised by Tesla CEO, Elon Musk to be completed in 100 days (by late 2017) and in 2018, the Australian Energy Market Operator (AEMO) reported that within 6 months the world’s biggest lithium-ion battery installation has responded very quickly to different types of conditions and generated profits and knock on effect gains for the South Australian government.

Snow (2017) highlighted the Australian national and individual states’ involvement in the massive disruption as energy policies drive and play a significant part in energy price, supply infrastructure and reliability of the disrupted energy environment. This influences how enterprises manage disruptive change by fostering innovation to meet consumer demand and speed to continually adapt to the changing environmental dynamics (Dibrell, Down & Bull 2007). The market responded with competitive new businesses, disruptors established to offer sustainable and competitive options leading to a new challenge for the energy supply system and serious concerns about the security of grid-based supply at peak times, from the potential for gas shortages through to the impacts of the renewables free-riding on the existing supply infrastructure (Snow 2017). Feed-in tariffs and Australia’s Renewable Energy Target have assisted renewable energy commercialisation and have contributed to the expansion of the Australian renewable energy sector (Productivity Commission Australia 2016). The inability of an energy enterprise’s sense-and-respond swiftly to meet that demand is due to the absence of agile
transformational strategies according to Stank et al. (2013). Digital disruption occurs when new start-ups produce something cheaper and further develop it into something superior and of more value to the end customer, because they understand the customer better (Karimi & Walter 2015). For example, Apple builds its own semiconductor chips and Tesla builds its own batteries which will eventually be a more lucrative product than its cars.

Against a background that is dynamic and uncertain with competitive forces that are asymmetric, Australian energy enterprises also face the velocity of change. Schmidt and Cohen (2010) argue that the digital economy is changing with such great velocity, causing uncertain and challenging times for traditional and large organisations as most companies are caught up in daily operations rather than reviewing what the future might hold.

Weill and Woerner (2015) stated that companies face challenging times as the speed, volume and complexity of change intensifies, digital innovation is shaking the core of every industry and incumbents are struggling to respond.

According to McAfee and Brynjolfsson (2012) big data provides the knowledge for decision makers to understand and measure using organisational capabilities and directly translate that knowledge into improved decision making and performance. A measure of success for a digitally mature and disruptor organisation is its ability to focus on the needs of its customers to be competitive by adding IT value (Davern & Kauffman 2000).

The proposed Disruptive Change Capabilities Framework is developed and evaluated during this research study, provided a means of explanation, focus for discussion, basis for analysis and design, will provide competitive advantage and improved performance (Guimaraes et al. 2017).

The goals of this research study are to evaluate:

- How does Australian energy organisations’ decision makers better understand the aspects and respond to disruptive change?
- How does Australian energy organisations operate in disruptive environment and what organisational and disruptive change capabilities can be analysed and introduced to manage disruptive change?
- How using the potential systematic integration of Disruptive Change Capabilities (DCC) framework by decision makers may help better manage digital disruptive and disruptive change in the Australian energy enterprise organisation.
In identifying the problem, the researcher’s principal purpose was to understand how successful digital disruptors identify and use digital technologies within Australian energy organisations when managing disruptive business environments. Introducing enterprise organisation Disruptive Change Capability (DCC) framework into the enterprise organisations should be to leverage opportunities that come from digital disruption and disruptive changes.

1.3 Research Questions

This research will examine the literature, which is discussed in Chapter two, and the resulting conceptual framework will guide the analysis of data. The objectives are all incorporated into the research question for this study. The following primary research question was framed for this research:

‘How do enterprise decision makers understand the various aspects of digital disruption and disruptive change in the Australian energy industry?’

The following two sub-research question were used to help answer the main research question:

How do decision makers in the Australian energy industry identify the relevant capabilities needed to manage digital disruption and disruptive change?

How could the use of Disruptive Change Capabilities (DCC) framework by decision makers to manage disruptive change and create value to the organisation?

The author has identified specific characteristics and attributes of Digital business Strategies involving dynamic capabilities (Karimi & Walter 2015), organisational learning (knowledge, experience and active context), resource based view (RBV) capabilities (Newbert 2008; Bohnenkamp 2013; Lopez-Cabarcos et al. 2015; Stadtler & Lin 2017) and its aspects (Value Capability, Rareness Capability, Competitive Advantage). These are all attributes that decision makers could deploy within the digital enterprise organisation to improve the management of disruptive change.

In 2018, a dynamic business environment is defined by massive connectivity and the increasing digitisation and interconnections among business processes, products and services (Bharadwaj et al. 2013). Digital disruptors innovate rapidly and then use their innovations to gain market share and scale far faster than challengers still clinging to predominantly physical business models (Bradley et al. 2015).
Digital disruptors are able to rapidly build groups of followers and users. They are agile enough to convert and build a large number of these users into their business models that threaten incumbents in multiple markets (Bradley et al. 2015).

Confronted with the spectrum of such disruption, companies must understand the nature of the competitive change it represents, which technologies and business models will be most disruptive, and how they can address the disruption and functional leaders are expected to provide solutions and applications that manage change in competitive environments (Riemer et al. 2014). Furthermore, digital disruption offers a fundamentally better alternative relative to the present approach in digitisation of an existing business model or service or product replacement to solve a customer problem. This is being conducted in a cheaper, quicker and more convenient manner with technology playing a key enabling role. It is not evolutionary change, but radical in the way it changes businesses and societies (Girn 2014).

Technology plays a key enabling role in digital disruption, in which innovation breaks the ranks of status quo, redefines the norm, and changes markets and competitors. This comes through a relentless focus on the customer, offering new business models and new ways of applying technology (Girn 2014). Furthermore, global organisations require intense information sharing to allow cooperation, coordination and teamwork in partnerships and strategic alliances (Benamati & Lederer 2000; Dhillon & Hackney 2000; Santos & Fjermestad 2002; Biehl 2007). The introduction of smart meters in the energy industry in Australia 2006, for example, provides frequent large data flows that organisations need to adapt to their systems and processes to capture and analyse the data (van Gerwen, Jaarsma & Wilhite 2006).

Customers equipped with technology have found new ways to communicate, invent, consume and share. Turnbull and Kundra (2015) highlighted that decision makers must understand the impact of digital disruption as technology will be leveraged to create new jobs and services, new innovations will emerge, companies that are most susceptible to disruption will reinvent their business models as many, although not all, are doing today. As digital disruption is redefining industries, it is inevitable and imperative for companies to grasp the need for change in order to address the disruption; understanding how it works is vital for the exploitation of effective strategies (Bradley, Loucks & McAulay 2015).

Organisations have the opportunity to simplify and automate processes and create additional energy related services not previously possible (van Gerwen, Jaarsma & Wilhite 2006). Introduction of smart metering as a disruptive technology was a logical step in a world where most communication is digitalised and standardised (Internet, email, SMS, chat bots). Where costs of ‘digital intelligence’ are
still rapidly decreasing and directly contribute to customer savings the Energy enterprise are expected to increase energy efficiency, improve operational efficiency and reliability, as well as reduce labour costs (Siddiqui, Hurtado & Parmenter 2008).

Adapting to external disruption involves planning for internal business disruption, leveraging opportunities and minimising threats. It is crucial that a firm investigates and learns to develop in order to deploy faster technologies. Companies who wished to stay ahead of competition in a digitally-enabled, networked world would need to develop new customer segments, introduce new business models and redefine the value chain (Bughin & Zeebroeck 2017).

1.4 Research methodology

The research methodology employed by this study, as described in Chapter Three, consists of a literature review that provided an understanding of the context of digital disruptions in the energy industry.

This research adopts a qualitative approach, which reflects the nature of the research being performed. A qualitative research by Dillon (2012) using Strauss and Corbin’s (1998) qualitative methods highlights that it could be implemented to uncover and understand what lies behind the phenomenon. This approach was adopted as the digital disruption phenomenon can be explored in this context using a variety of data sources rather than quantifying it. A qualitative approach ensures that the issue is not explored through one lens, but rather a variety of lenses, which allow for multiple facets of the phenomenon to be revealed and understood (Baxter & Jack 2008).

The research methodology selected for this research is the case study. A case study methodology attempts to uncover why decisions were made, how they were implemented and with what result (Yin 2003). A case study method is an appropriate strategy in this research as the research questions comprises ‘how’ and ‘why’ questions (Yin 2009). Yin (2009) stated that the case study method is appropriate when the researcher has little control over the events being observed. This research involves multiple cases in order to compare the similarities and differences. The research is able to explore a broader range of contextual and complex conditions to produce reliable and valid data.

Face-to-face semi-structured interviews and document collection methods were used to collect data. Thirty (30) interviews were conducted with digital practitioners occupying operational decision making roles and strategic decision making management roles within the energy industry. The interviews were conducted until a theoretical saturation was reached.
The resulting set of coded references produced an initial set of approximately 168 elements (transcripts) that were analysed and grouped. The final broad grouping resulted in 31 themes. These themes were then grouped, based on elements, into five emerging concepts. These five concepts (comprising a group of themes), along with the relationships between them, formulated the theory used to answer the research questions and is discussed in Section 7.2.1.

1.5 Summary
This research study uses an exploratory qualitative inquiry process to understand better understand organisational, social, or human issues (Blaikie 2010; Patton 2002; Creswell 2009). In-depth qualitative interviews were conducted with digital practitioners, who are experienced in the problem domain.

The researcher believes that the findings from this exploratory qualitative research study and the written narrative make a substantial contribution to the understanding of how decision makers currently deal with digital disruptions and embrace technological change to innovate and to add value to their organisation.

The research problem and proposed solutions are summarised as follows:

- **Problem domain**: Managing digital disruption and disruptive change within the Australian energy enterprise organisation
- **Proposed solution**: Introducing disruptive change capabilities in a systematic manner into the enterprise organisation.
- **Purpose of research**: Understanding how decision makers respond to aspects of digital disruption when managing disruptive change and evaluating a proposed framework that is based on decision makers’ actual and perceived need to provide a common understanding of managing digitally disruptive changes and to determine how to achieve future digital disruption benefits.
- **Research method**: Conducting a qualitative research Case Study using in-depth interviewing with decision makers and digital practitioners of energy enterprises within Australia

This study:

- Identifies approaches of digital decision makers to managing digital disruptions and disruptive change to stay innovative and competitive in dynamic environments.
Develops a clearer understanding of the social issues, the role and impact of different activities within the organisation that are enablers and disablers affecting aspects of organisational learning and dynamic capabilities in digital transformation.

Determines how each aspect of organisational learning and dynamic capabilities improve the organisation’s ability to successfully embrace digital transformation to maximise opportunities as well as deal with challenges.

Collects reactions of decision makers, strategies and feedback about the specific components of digital transformation. Understanding that the positive digital disruptive organisation will be innovative and lead the next generation of technological change.

This thesis will examine a period (2015-2018) of dynamic change in the Australian energy sector. The reactions, perceptions and impact of key decision makers on enterprise organisations thus provide a unique view and contribute significantly to this field of academic research.

1.6 Outline of the thesis

The structure of this thesis is outlined below. The thesis follows the structure recommended by social and business research (Bruno 2011; Peszynski 2005; Neumann 2005; Zikmund 2002) and comprises seven chapters as follows:

Chapter One

This Chapter is an introduction that provides a background to the study to be performed, the motivation for the research, the aim of the research, and its scope. The Chapter concludes by providing an overview of the outlining of chapters for the thesis.

Chapter Two

The literature review covers the definition of digital disruption, enterprise organisation theories and models, disruptive change, organisational learning and dynamic capabilities theories. In addition, it presents definitions and discussions of various factors, for example: digital capabilities, digital disruption challenges and opportunities, issues embracing digital disruption, digital disruption enablers and disablers and digital disruption success factors. The literature review forms the basis of this research to enfold the literature is discussed in Chapter Six.

Chapter Three
In this chapter the research question and subsidiary questions are presented. The research process and methodology used in this study. Limitations of the research with attention to research bias are discussed. Participant recruitment and sample size considerations are highlighted. The method of open-ended interview questions used are described and discussed. The methodological tools used for analysis and the software tool used to support the analysis are presented.

Chapter Four

This chapter includes a description of research findings based on the analysis of transcripts from the interviews. Through focus on the resultant sets of elements, themes and concepts that emerged, a basis is formed for generation of the theory in Chapter Five.

Chapter Five

The concepts presented in the previous chapter are examined and grouped into themes. Relationships are identified to aid in the grouping of concepts into themes and significant relationship concepts are identified between the themes. The theories that emerged, described the impacts, challenges and opportunities of the digital disruption are discussed.

Chapter Six

The literature comparison and contrast were performed to enfold the current literature with the theory developed in the previous chapter. This will outline the emergent theory with existing literature and highlights the contribution to knowledge.

Chapter Seven

This chapter provides the answers to the research questions. Limitations of the study are also presented whilst highlighting areas in which further research can be undertaken to extend this study.
Chapter Two – Literature Review

2.1 Introduction

This chapter assesses the literature across the various areas that underpin the theory generated by this thesis. As will be discussed in the research design and methodology chapter (Chapter Three), this literature provides a secondary source of data. It provides the basis for comparison to enfold the theory generated from the findings (Chapter Four) and the resulting analysis (Chapter Five) with the literature (Chapter Six).

This chapter will identify extant literature in the areas of digital disruption, the Australian energy industry, disruptive innovation, managing disruptive change and the digital domain. The process undertaken is adapted from Webster and Watson (2002) and Boell and Cecez-Kecmanovic (2014). This review was undertaken by creating a concept-centric search for all relevant research papers including peer-reviewed materials. This process emphasised continuous engagement with and gradual development of a body of literature during which increased understanding and insights were developed (Boell & Cecez-Kecmanovic 2014).

This chapter provides a review of the literature on digital disruption including the terminology and perspectives that exist. The literature review is part of the research process (Eisenhardt 1989; Peszynski 2005; Cerotti 2009; Blaikie 2010; Bruno 2011) described in chapter three providing secondary data source that is used to compare and contrast the findings of this thesis. From a research process perspective, this secondary data will be used to validate and improve the rigour of the theory generated.

This chapter is structured as follows:

- Introduction
- What is Digital disruption?
- Why is Digital Disruption important?
- Digital Disruption Impacting the Australian Energy Utility Industry
- Defining digital disruption attributes, drivers, process and activities
- Managing Disruptive and Innovative Change
- Digital Organisational Capabilities, Performance and Outcomes
- Conceptualised Enterprise Organisation Disruptive Change Capabilities (DCC) Framework
• Enterprise Organisation Disruptive Change Capability (DCC) Framework Research Model
• Summary

The focus of the literature review is to provide an overview of the digital disruption literature that impacts the disruptive change outcome of the Australian energy industry. It also provides background of the various parts of the research question and sub-questions that are being answered by this thesis and the research question and sub-questions are as follows:

• How do enterprise decision makers understand the various aspects of digital disruption and disruptive change in the Australian energy industry?
• How do decision makers in the Australian energy industry identify the various aspects needed to manage of digital disruption and disruptive change?
• How do decision makers use Disruptive Change Capabilities (DCC) to manage disruptive change and create value to the organisation?

This research will examine the theories and models of enterprise organisation strategies, organisational learning, dynamic capabilities and organisational systems structures in order to provide a critique of that literature. Fundamentally, this chapter will investigate the impacts of disruptive technologies and identify gaps in the light of other theoretical traditions.

The researcher will discuss how embracing disruptive technologies presents organisational change issues, opportunities and challenges, which form integral parts of the disruptive organisational systems implementation process, which requires strategic change management. This viewpoint has not been well discussed or examined in the literature.

This chapter aims to demonstrate that the traditional views of managing organisational systems performance are inadequate to understand digital disruption processes, influences on organisational system selection and digital business strategies, before providing the conceptual lens to be used in p chapter proposes a research model and a series of exploratory research questions to study the potential contributions of a systematic definition of digital enterprise organisational change capability. It also discusses the potential benefits of integrating digital enterprise organisational change capability in dynamic environments in answering the main research question and the sub-questions of this research.
2.2 What is Digital Disruption

While organisations have always been subject to change, the focus of this thesis and, in turn, this literature review is centred on the dramatic change wrought by digital disruption, its impact on whole industries; or as Schmidt & Cohen (2010) describe it, the ways in which businesses operate across industries and borders, public services are used and innovations are built. However, unlike previous change, this 21st century phenomenon sees most industries facing further disruption as accelerating convergent technologies are enabled by digital platforms, communities and digital services (Moller et al. 2017).

In reviewing and analysing the literature it is important to define digital disruption, which in broad terms describes fast-paced change to which organisations can either react or be acted upon. Those agile enough to react have the opportunity to develop innovative outcomes, while those who resist can risk falling victim to dynamic, fast-paced and unpredictable change. More specifically, Reimer, Gal, Hamann, Gilchriest and Teixeira (2015) defines digital disruption as advancements in digital technologies that occur at a pace and magnitude that disrupt established ways of creating value within and across markets, social interactions, and more generally, our understanding and thinking.

Lindgren (2013) defines digital disruption as ways in which people within the digital space and culture socially react and innovate for themselves, whilst Moller et al. (2017) discussed the characteristics of digital disruption as a special category of disruptive innovation.

Drawing from these definitions, the concept of digital disruption emanates from disruptive innovation in the digital domain (Moller et al. 2017) and has mainly been explored in a broader societal scale (Latzer 2009; Schmidt & Cohen 2010), or as an integrated part of disruptive innovation (Menon 2011; Elie-Dit-Cosaque & Straub 2011; Mohan et al. 2012). To better understand the concept of digital disruption, it is necessary to examine the existing literature, to understand the current body of knowledge to inform the research, identify gaps, frame research questions and derive theory. Moller et al. (2017) argues for development of specialised theory rooted in the disruptive innovation theory (Christensen 1993; Christensen & Bower 1996; Christensen, Suarez, & Utterbak, 1998; Christensen & Raynor 2003; Christensen 2006, Johnson et al. 2008, Christensen, Horn & Staker 2013). The original concept was based on tangible products, then progressed with a broader meaning (competition, market, and business model) to better align with the contemporary business discourse (Christensen & Raynor 2003) that defines a disruptive innovation as a new product or service typically launched by a smaller company with
a lower and/or different performance targeted at a low-end segment of the market and then incrementally improved until the point where it dominates (disrupts) companies in the mainstream market (and makes the incumbents of that market obsolete).

Digital technologies have moved from a life enhancing phenomenon to one essentially turning the physical world into a virtual one, genuinely disruptive, shifting global markets impacting the destinies of large companies and undermining the most powerful of institutions and industries (Bolden & O’Regan 2016). Nevertheless, the current Australian energy industry leaders face pressures to manage rising energy prices, changing regulatory policies (Nelson et al. 2014) as well as fierce competition by entrepreneurs with powerful digital tools and ubiquitous access serving newly empowered generation of informed individuals with a lot more choice of who their energy suppliers should be.

What is apparent is that the digital technologies are disrupting industry through the emergence of enabling technologies. Seba (2018) defines technology-based disruption as a convergence of technologies enabling entrepreneurs or companies to create new products and services that create new markets, which essentially either destroy or radically transform existing industries. The word ‘disruption’ is based on the substitution of the existing (Vanini 2017) with the two main characteristics of digital disruption being data and connectivity, where cost reductions and scalability are the drivers (Nelson et al. 2013).

Existing research on digital disruption is scattered and lacking targeted structure (Moller et al. 2017) although there are several studies on disruptive innovations from different perspectives (Henderson 2006, Sood & Tellis 2011, Schmidt & Druehl 2008). Bharadwaj et al. (2010) suggest embracing digital transformation and digital business strategy, an organisational strategy formulated and executed by leveraging digital resources to create differential value as a solution to managing disruptive change in dynamic environments. Furthermore, digital disruption is not only driving change within the enterprise, for a growing number of companies like it is contributing radically in different ways to buy, sell and interact (Weill & Woerner 2015). Molla, Cooper and Karpathiou (2015) gave examples where such companies utilise real-time and personalised experience analysis for business practices due to digital disruptions on an industrial level to redefine norms through innovation. Beath et al. (2012) discusses how IBM has been involved in an innovation role and has served as a centre of innovation where it adjusted its objectives and evolved as either service and/or value centres.
Recent literature focuses on digital co-creation and collaboration (Abrell et al. 2016; Akram & Åkesson 2011; Galbraith 2012; Karimi & Walter 2015; Rai et al. 2012) in disruptive change activities to improve digital disruption outcomes for the digital enterprise in order to stay relevant in the future. Inevitably, to survive and thrive in disruptive environments, organisations are pressured to respond and to take more risks in an ever more crowded global competitive landscape with increasing sophistication of consumers (Taylor & Raden 2007).

Recognising the dynamic nature of disruption, Raden (2012) noted the importance of disruptive innovations that are continuously changing the landscape through and by exploring new sources of information, which alters perceptions and outlooks, highlighting their importance in the face of dynamic environments. Taylor and Raden (2007) argue that new digital business strategies, collaboration and digitally mature organisational capability are effective responses to the increasingly complex business environment. When a disruption occurs in enterprise organisations from rapid changes in external disruptive environments, technology-enabled changes occur such as the misalignment in the internal business processes of value creation, social interactions and digitally-enabled mechanisms (Molla, Cooper & Karpathiou 2015). Digital Technologies and embedded networks bring an everexpanding set of opportunities to companies. But ‘digitisation’ is not a single project providing one time benefits. It is an ongoing process of creative destruction with innovators using both new and established technologies to make deep changes at the level of the task, the job, the process and even the organisation itself (Kimball, Fernald & Basu 2006). With the advances in computing, networks, digital devices and their capabilities, digital disruption is dramatically changing the ways that businesses operate, public services are used and innovations are built (Tan, Tan & Land 2015).

The aim of this chapter is thus to conduct an academic study of the existing literature to allow the researcher to form a relevant, current definition of digital disruption, to identify its impact on the Australian energy industry and how decision makers react to and manage change. Thus, this section will explore and discuss literature from the perspective of i) disruptive innovation ii) digital innovation and iii) impacts of digitalisation.

2.2.1. Disruptive Innovation

Disruption was discussed by Christensen et al. (2015) in their seminal work on disruptive innovation theory, which explained that traditional disruption was where small enterprise targeted an overlooked customer segment with a novel but modest offering that then gradually moved upmarket to challenge the industry leaders (Christensen et al. 2015; Chiaroni et al. 2016).
Many researchers have attempted to refine the initial definition of disruptive innovation. For example, Feloni (2015) investigated how to manage waves of disruptive innovation, Chiaironi et al. (2016) differentiated the concept of ‘disruption’ in different typologies and Danneels (2004) looked at technological, radical product and business models (Markides 2006). However, as highlighted by Wessel et al. (2016), most scholars today agree in considering an innovation as disruptive when it is cheaper from a customer perspective; is more accessible from a distribution perspective; and it uses a business model with structural cost advantages, relative to existing solutions. The essential point, however, is the fact that incumbents are not adopting new offerings due to a heavy focus on current customers, rendering them trapped with the legacy of their current competences and investments.

Bolden and O’Regan (2016) highlighted that information is a resource that is increasing in volume, velocity and variability. This change has negligible marginal cost and is a genuine threat to pricing theory, whilst the web and social media have democratised participation giving consumers a voice. That subsequently confers disproportionate power to protesting voices of customers’ needs and network technologies enable the power of the crowd on energy transition participation (Chilvers & Pallett 2015) to influence supply with demand as well as bypassing regulatory controls and intermediating institutions. Furthermore, open source technologies with low cost processing and storage allow scores of start-ups to occasionally succeed in the disruption of old business models, thus leaders of incumbents need to adapt, transform and shape their organisations in attitudes and approaches (Bolden & O’Regan 2016).

An example of the rapid rise in disruptive innovation is mobile commerce (m-commerce). Here digital disruptor applications and digital platforms enabled cross-boundary industry disruptions, thus inducing new forms of business strategy (Burgelman & Grove 2007). The authors compared case studies of Apple’s impact on the music industry and the mobile telephone market, citing these as cross-boundary and inter-industry disruptors. In addition, theoretical structures for strategy making in nonlinear dynamic and turbulent environments are also emerging (Davis, Eisenhardt & Bingham 2009; Meyer et al. 2005; Pavlou & El Sawy 2010). Christensen (2008) argued that disruptive change has its benefits, though challenging, pervasive and radical (Lyytinen, Yoo & Boland Jr 2016; Lyytinen & Rose 2006), which forces or threatens a traditional business model (Lucas & Goh 2009) and technological ideas that dramatically change work processes (Elie-Dit-Cosaque & Straub 2011; Sherif et al. 2006).

Examples of disruptive innovation cited in the literature include digital platforms (Barrett, Faraj & Faik 2017), smart technologies and smart grids (Depuru, Wang & Devabhaktuni 2011), cloud computing
(Schmidt et al. 2015; Sultan & van de Bunt 2012), the ability to analyse complex data sets, social media, Blockchain to modernise the grid (Basden & Cottrell 2017) and online services (Faraj & Johnson 2011). These and other tools make it possible to ‘digitise’ business processes that have evolved from the computing and online advances of the past few decades (Faraj & Johnson 2011; Lyttinen, Yoo & Boland Jr 2016). Furthermore, big data analytics has been proved to dominate traditional methods such as business intelligence in many fields and connectivity is not a unique feature of digital disruption but an open, random network that empowers customers on one hand, but also creates an increasing tension since there is no comparable increase in empowerment of individuals (Vanini 2017). Blockchain, a computing service which provides a digital ledger for online transactions is also considered a potential facilitator of digital innovation particularly in the financial sector (Collomb & Sok 2016). Many businesses, similar to a newly emerged entrepreneurial venture (start-up), experience the upside of digital technology in many ways when delivering goods or services online e.g. network online-communities (Faraj & Johnson 2011).

Essentially, disruptive technologies are driving disruptive change in services and product offerings. This is due, in part, to the pervasive connectivity, personalisation and affordability of mobile devices and applications that engage employees or customers to change behaviours, to develop skills and drive innovation (Gartner 2014).

2.2.2. Digital Innovation

As products and services are increasingly embedded with digital technologies, such as big data analytics offering real-time information, it is becoming more difficult to disentangle the digital products and services from their underlying IT infrastructures (El Sawy 2003; Orlikowski 2009) and to focus on co-creation and collaboration (Abrell et al. 2016; Akram & Åkesson 2011; Galbraith 2012; Karimi & Walter 2015; Rai et al 2012). Digital innovation combines both digital and physical (analogue) elements in new product and service solutions. Baiyere & Salmela (2013) describes digital innovation as IT innovations that are characterised by the utility of new combinations of digital and physical elements to produce novel outputs (Yoo, Henfridsson & Lyytinen 2010b). These innovations are usually distinguished by the associated encoding of analogue data elements to digital formats (Yoo 2010). One such example is the ‘smart meter ‘that captures and measures electricity usage providing data and frequent digitised large data flow and where organisations are able to adapt systems to process and analyse the data (van Gerwen, Jaarsma & Wilhite 2006).
The smart meter in turn provides the data that can be reengineered into new products and services. The accelerating pace (Yoo et al 2010b) of digital innovation and improving digital tools enables various functionalities and activities at an increased level of performance, efficiency or value (Yoo et al. 2012). Although digitally-enabled innovation illuminates organisational tensions and challenges, it also potentially provides solutions as direct market pressure has historically driven product differentiation and innovation that may result in new ideas (Brandellero & Kloosterman 2010).

Nambisan et al. 2017 suggests that for digital innovation outcomes, digital platforms and open standards enable collectives (of organisations or individuals) to pursue innovation collaboratively (Boudreau 2010; Bresnahan & Greenstein 2014; Gawer & Cusumano 2014; Parker et al. 2016; Tiwana et al. 2010). Whereas for digital innovation processes, collaboration among collectives is enabled by such digital infrastructural capabilities as knowledge sharing and work execution platforms (e.g. GitHub), crowdsourcing (e.g. Top Coder), crowdfunding (e.g. Kickstarter), virtual worlds (e.g. Second Life), digital makerspaces, and dedicated social media (e.g. OpenStack). The scope, functionality, and other characteristics of these enabling digital technologies fundamentally shape the scope, content, and direction of the digital innovation concept (Chandra and Leenders 2012; Majchrzak and Malhotra 2013; Smith et al. 2013; Tan et al. 2016; Susarla, Oh & Tan 2012). Thus, in managing digital disruption, decision makers are increasingly under pressure to manage the operational challenges and to capitalise on the opportunities to deliver services in today’s disruptive market for the diverse players and innovators. Digital innovations are often novel and interesting contributions. They can impact the individual, organisation or societal level (Fichman et al. 2014; Henfridsson et al. 2009), they enable individual or group creativity to unleash unique accomplishments that were otherwise, not conceivable (Adomavicius et al. 2008).

The potential value due to digitalisation and the innovations emerging from it has further driven the push to create more digital innovations (Yoo et al. 2010b), increasing the chance that some of these innovations could also be disruptive innovations that could transform existing traditional innovations (Svahn et al. 2009). A continuum of change and convergence of technologies accompanies the exponential growth of computing technology (Kurzweil 2006; Bruno 2011). This causes organisations to further explore and revise their organisational structure to leverage accelerating exponential technologies and a shifting global business mindset (Ismail, S, Malone, M & Van Geest, Y 2014). It is this convergence of technologies combined with business model innovations that Seba (2018) suggests enables further disruptions.
One of the main challenges of digital innovation can be derived from the ongoing convergence and digital materiality that accompanies these innovations (Yoo et al. 2010a). Well established organisations in traditional industries are potentially impacted by convergence with existing systems and structures being eroded (Seba 2018; Yoo et al. 2010a, 2010b) and such established organisations suddenly face disruptive threats from digitalisation (Baiyere & Salmela 2015). In essence, while digital innovation holds the promise of creative solutions to different issues in the society, it also seems to have the facility to embody a degree of change in long held traditions, which introduces uncertainties and complexities that are proving to be challenging. In conceptualising digital innovations, Yoo et al. (2010b) highlighted three unique characteristics of a digital innovation: re-programmability, homogenisation of data and self-reference. Re-programmability describes the capacity of digital innovations to be amenable to perform a vast array of functions; homogenization of data allows the combination of heterogeneous data to create and deliver various services, thereby ‘dissolving’ organisational and product borders; self-reference characterises the propensity of digital innovations to leverage existing digital technologies that further accelerate and reinforce the emergence of more digital innovations. These identified characteristics provide useful explanatory power to understand the evolution and impact potential of emerging digital innovations (Baiyere 2016), and this discussion offer a broader foundation and better understanding to reflect upon the implications of digital disruption for digital innovation management (Nambisan et al. 2016).

2.2.3. Digitalisation

Replacement and disruption occur by digitalisation that is different from the former automation since innovation is a dominant factor (Vanini 2017). Innovation empowers customers, leads to extreme automation impacting labour markets (Degryse 2016) and allows redistribution of ownership of the value chains (Greenstein et al. 2013) and rapid decline in the cost of storage, computation and transmission of data (Goldfarb et al. 2015). Vanini (2017) argues that the root of disruption is replacement and currently successful goods and services are replaced by digitalisation, and the root of digitalisation is caused by the binary numbers. Digitalisation differs from automation where in big data innovation the technology is able to integrate unstructured data sets and then apply new analytical methods for decision making, machine learning and artificial intelligence (Michalski 2013; Vanini 2017). Hilbert and Lopez (2011) estimated in 2007 that 94% of the world's technological capacity to store, communicate and compute information was digital, and all tangible services and products can be digitised encompassing digitised products (software), digitised services (consulting) and information services (communication), all of which are abstract goods. Thus, digitisation means not only that parts of the
former value chain are replaced by digital processes but by using digitisation new benefits are created or even entirely new products and services are possible (Vanini 2017).

Girn (2014) highlights that it is a mistake to see the digital revolution as a function of technology, rather than one of business evolution as extensions of existing technologies. These innovations are powerful, pervasive and have multiple indirect impacts. El Sawy et al. (2010) contends that when there is simultaneous increase in environmental turbulence, the requisite speed of organisational change and the intensified pervasiveness of digital technologies spawns a messy, complex and chaotic phenomenon termed ‘digital eco-dynamics’ (p. 836). Managers and decision makers need to recognise that organisational change is inevitable and awareness of digitisation (Berghaus & Back 2016) is a priority amongst management and employees of organisations that support digital transformation initiatives, disruptive change management (Hamel 2008) and innovation management (Broer 2013).

Digital disruptions are fundamentally reshaping business models and business strategies. In analysing the potential impact of digital disruption on decision makers, for many incumbents, it will be explosive and immediate as a force that rocks the foundations of their business. Whilst others experience less vulnerability to digital trends, the changes will be slower, more subtle and for some, digital innovation will be the cornerstone for future value creation.

As modular, distributed, cross-functional global business processes, digital disruptions enable work to be carried out across boundaries of time, distance and function (Richter 2012; Rai et al. 2012; Banker et al. 2006; Ettlie & Pavlou 2006). Digital platforms enable cross-boundary industry disruptions, and thus induce new forms of business strategy (Burgelman & Grove 2007). In addition, theoretical structures for strategy-making in nonlinear dynamic and turbulent environments are also emerging (Davis, Eisenhardt & Bingham 2009; Meyer, Gaba & Calwell 2005; Pavlou & El Sawy 2010). In this new digital ecosystem (El Sawy et al. 2010) the urgency to understand how disruptive technology develops and creates value (Hagiu 2007) for their customers is a priority in order to efficiently manage change. Ramaswamy and Gouillart (2010) emphasise a better understanding of digital disruption, its impact and how service providers extract business value from digital technologies to formulate new breakthrough strategies, design compelling new products and services and transform management processes.

Digital disruption has evolved and is more than the various definitions proposed by researchers. The importance of digital disruption, its attributes and activities impacting the Australian energy industry will be discussed in the following section.
2.3 Why is Digital Disruption Important?

Today’s digital business landscape with rapidly changing disruptive technologies poses a significant threat that requires new paradigms of leadership to address (Bolden & O’Regan 2016) to deploy new technologies and to manage the impact of disruption impacts on existing infrastructure (Tallon & Pinsonneault 2011). Digitisation is transforming lives, which is determined by shifts in fundamental technologies that are increasing in speed and capability while lowering costs at an extraordinary pace (Bolden & O’Regan 2016). If the disruptive business environment (Biehl 2007) is managed and the enterprise digital business strategy is in alignment (Tallon & Pinsonneault 2011), transformation occurs delivering the potential business benefits of digital disruption.

In the context of the energy industry, with customers producing more of their own energy from solar panels (PV Photo-Voltaic) consumption of purchased energy is dropping, the retail element of energy supply has been deregulated, while competition has also increased (Coughlin 2016). Coughlin (2016) highlighted that developments in disruptive technology and data are giving rise to a more complex energy ecosystem, one that is increasingly attracting the attention of outside players and streams of value must be sought from the data that is created and collected through energy transactions. Data tools, connectivity, dynamic capabilities and ecosystems platforms can support business decisions and drive new models (Coughlin 2016). Thus, new disruptive technologies such as smart meters, smart grid, real-time analytics and big data (Gosavi 2017) are adopted across more complex networks or enterprise ecosystems, employing process models to manage disruptive change, as in the case of the competitive Australian energy utility industry value chains.

The exponential growth of technologies (Ismail et al. 2014) together with the convergence of multiple technologies is driving the next phase of digital disruption according to Seba (2018). The divide between the past, present and future of technological disruptions is argued to grow exponentially larger in shorter time periods when viewed in terms of emerging technologies (Ismail et al. 2014; Kurzweil, 2005; Friedman 2008; Laszlo 2008). Essentially when several technologies, each one improving at a different rate, converge at a certain point in time, it becomes possible for disruptive products or services to be developed (Seba 2018).

As mentioned in section 2.2, many researchers have attempted to define digital disruptions (Moller et al. 2017; Reimer et al. 2015; Baiyere & Salmela 2013; Latzer 2009; Schmidt & Cohen 2010) highlighting
the important aspects and perspectives that need to be taken into consideration when working with digital disruption compared to disruptive innovation (Moller et al. 2017) and the digitisation of innovation (Nambisan et al. 2017). Moller et al. (2017) highlighted that development in the digital domain presents possibilities of enterprises being further disrupted by digital platforms, communities and digital services.

Rapid and pervasive digitisation of innovation processes and outcomes (Nambisan et al. 2017) has radically changed the nature and structure of new products and services; spawned novel value creation and value appropriation pathways; enabled innovation collectives that involve dynamic sets of diverse goals and capabilities; produced new breeds of innovation processes and transformed entire industries (Boudreau & Lakhani 2013; Hui 2014; Iansiti & Lakhani 2014; Porter & Heppelmann 2014, 2015). The ability to be innovative and embrace new technologies in new ways also highlights the importance of being able to digitally disrupt.

Hence, this section will examine the attributes, features and outcomes of digital disruption on digital organisation and innovation management, digital platforms, products and services, ecosystem disruptive technologies and digital innovations, customer centricity, regulatory policies, energy infrastructure and environment (Daly 2016; Bharadwaj et al. 2013; Tilson et al. 2010; Tiwana et al. 2010; Yoo et al. 2012; Yoo et al. 2010).

2.3.1. Organisation and innovation management

Organisation and innovation management need to embrace digital disruption. Leidner, Lo and Preston (2011) suggests that among existing studies, there has been little theoretical advancement regarding aspects of enterprise digital transformation and digital disruptions including specific definitions, impacts on the organisation, specific factors that are enablers or inhibitors of digital disruption and opportunities and challenges of digital disruptions. Strategic decision makers typically have imperfect information and limited foresight on the optimal level of engagement in any digital strategy. This is due to the underlying complexities of digitally enabled business processes and inherent uncertainties regarding IT strategy. Under conditions of complexity and uncertainty, managers look to industry peers for frames of reference in determining firm strategy (Mol & Birkinshaw 2009; Mithas, Tafti & Mitchell 2013). Consumers equipped with new tools and dissatisfied with the existing choices are currently impacting every part of the business system and will continue to influence and participate in the co-creation of value with the
organisation. Interaction is the basis of a new system of co-creation of the unique value (Prahalad & Krishnan, 2008; Prahalad & Ramaswamy, 2000; Prahalad & Ramaswamy, 2004).

Incumbents that succeed in the face of disruptive innovation do exist (Danneels, 2004, Bergek et al., 2013), and these successful organisations are mostly managed with development of dedicated strategic and organisational approaches (Chiaroni et al. 2016), open innovation (Chesbrough, 2005; West &Gallagher, 2006a, 2006b; Lichtenthaler 2008), creation of an ambidextrous organisation (Rotemberg & Saloner, 2000; O’Reilly & Tushman, 2004; Birkinshaw & Gibson, 2004), or the establishment of a spin off as solution to incubate disruptive innovation opportunities (Yu & Hang 2010). The above literature shows that it is possible to manage disruptive change to be more innovative, disrupt within by embracing digitalisation.

At a critical juncture in the history of information systems (Evans & Donellan 2015), organisations can no longer act autonomously, design products, develop manufacturing processes, determine pricing, create marketing messages and control the distribution channels without the input of the consumers (Rakic & Rakic 2014). From the aspect of organisations, key challenges in the field of customer behaviour in the digital environment are; abundance, possibilities to connect with other customers, greater awareness, mobility and influence on organisations’ operations (Rakic & Rakic 2014). The traditional business model and approaches will not work with continuous disruption and exponential growth of innovative technologies.

Adaptation to disruptions rests on the capacity of the organisation to rapidly transcend the familiar, foreign and past or present dichotomies and to metamorphose into a more evolved and agile form (Utesheva 2016; Laszlo 2008; Kurzweil 2005; Gilbert 2005). However, many firms today exploit digitalisation to accelerate the development of disruptive products or services to reach global markets in record times (Kohler et al. 2009; Yoo et al. 2012; Hylving 2014) when established socio-technical congruence is being challenged, to embrace new experimental learning processes in the era of digitalisation (Hylving 2015).

Disruptions are made possible by the convergence of technologies, product architecture innovations and business model innovations enabled by these technologies (Seba 2018) further driving the next phase of digital disruption at an exponential growth rate (Ismail et al. 2014). This transformative era during which the paradoxes and dilemmas that digitisation creates for organisations to develop, deploy and manage digital innovation (Bresnahan & Greenstein 2014; Kallinikos et al. 2013; Lytyinen et al.
enhances their innovation outcomes and processes in the digital world (Nambisan 2017).

2.3.2. Digital platform, digital products and services

A multitude of business, administration, communication and other processes are digitalised thus placing them in a huge network, organisations need a system which would enable analysing people’s opinion and finding the best solution regarding the development of new products and services (Norvaišas et al. 2011 p. 7). The evolution of connected platforms, products and services in digital ecosystems means multiple firms can collaborate to share data and services providing unprecedented customer value. But this goes beyond rapidly increasing convergence and connectivity between people and technology. As Vanini (2007) suggests, the business model today is the digital business model.

A connected enterprise on ecosystem platforms (e.g. GoGet) is able to seize new digital-centric business models to launch innovative services at scale and at a profit (Tan et al. 2015). Incumbents are confronted with waves of disruptive innovations (Chiaroni et al. 2016; Urbinati et al. 2017; Vanini 2017) that cyclically take place along the lifecycle of an industry (Moreau 2013). Furthermore, technology adoption will converge at the tipping point driven by cost reductions and scalability, growing exponentially according to technology cost curves, which show the rate at which a given technology improves over time (Ismail et al. 2014; Kurzweil 2006). The concept that technologies get adopted as an s-curve is not only that it is exponential, but it is getting even steeper, which means disruptions will happen at an even quicker rate (Ismail et al. 2014). Technology is essential in connected ecosystems.

Business model innovations where business models include the core business logic (Cheah & Wang 2017) enable strategic choices to create and capture value within a value network using robust infrastructure that seamlessly integrates internet of things, front-end customer systems and back-end production systems is pivotal for companies. An example is a convenient crowdsourcing platform to provide feedback, co-create (Hakanen & Jaakkola 2012) and witness their suggestions being implemented; users are more likely to share insights about their use experience (Cheah & Wang 2017). Thus, platform economies are ecosystems that could realise better returns from the optimal combination of investments in digital skills, digital technologies and digital accelerators (Parker, Van Alystyne & Choudary 2016).
Technological change challenges organisational structures and organisational identity, as highlighted by Tripsas (2009), Simpson (2014b), Simpson et al. (2013), and Stein et al. (2012) where the growth of customisation and personalisation of systems, as well as the increasing prevalence of devices such as smartphones and tablets that blur the boundary between corporate and personal. With accelerating digitisation and advanced big data analytics, harnessing quality data to design and deliver state-of-the-art services will enable innovative business models and management approaches to yield an array of competitive advantages (Boyd & Crawford 2012; Brynjolfsson & McAfee 2012).

Social technologies allow people to connect at a different scale and create a unified, powerful voice as consumer groups or communities can significantly impact the ways in which dialogues are shaped and policy is made (Bughin, Byers & Chui 2011). The advent and power of connection technologies and digital tools that connect people to vast amounts of information and to one another unleash creative forces among users of social technologies. Skaržauskiene et al. (2013) demonstrated that social interaction via technologies is a powerful way to efficiently organise knowledge and the same effect is valid in regard to culture, economics and political power. As a medium of interaction, new relationships and group dynamics have effectively changed communication dynamics (De Gennaro 2010) setting the stage for the explosive growth of social technologies (Chui et al. 2012) that connect across geographies, time zones and multiplying influencers beyond the number of people it could otherwise reach (Bughin et al. 2011).

The literature above highlights the importance of understanding the impacts of digital disruption and the innovation of business models in the digital platforms, communities and digital services.

2.3.3. Disruptive technologies and digital innovations

The convergence of inexpensive digital information goods and computing and communication devices is changing many businesses and society through five digital forces, namely: globalisation, millenialisation, prosumerisation, business virtualisation, and platformisation (Westerman, Bonnet & McAfee 2012) and the diffusion of Internet, personal computers, digital mobility and broadband connections (Moreau 2013; Lamont 2013; Brustein 2014; Dredge 2014; Cookson 2015; Witt 2015; Gapper 2015; Garrahan & Bradshaw 2015; Bradshaw and Bond 2015; Bradshaw and Garrahan, 2015; Richter, 2015; Dredge 2015; Gauthier-Villars 2015, Karp 2016).
Digitisation of innovation processes helps to break down the boundaries between different innovation phases, is less bounded and brings a greater level of unpredictability and overlap in their time horizons (Nambisan et al. 2017). New digital infrastructures (3D printing, digital makerspaces) enable product ideas to be quickly formed, enacted, modified and re-enacted through repeated cycles of experimentation and implementation (Ries 2011), making it less clear when a particular innovation process phase starts and ends. Similarly, digital infrastructures (cloud computing) facilitate rapid scaling up (or down) of product implementation plans creating a new level of fluidity in innovation processes, allowing them to unfold in a nonlinear fashion across time and space (Hanseth & Lyytinen 2010; Lyytinen et al. 2016).

Due to the accelerated pace of change and the rate of innovation, digital disruption is rewriting every part of our lives. No sector or industry will be immune to the dramatic shifts that innovation will deliver now and in the future. Evans (2011, p. 4) highlights this ‘With a trillion sensors embedded in the environment, all connected by computing systems, software and services, impacting human interaction across the globe as profound as the Internet has revolutionised communication’. Moreover, the opportunities for data collection outside of operational systems have increased substantially. Mobile phones, vehicles, factory automation systems, and other devices are routinely instrumented to generate streams of data on their activities, making possible an emerging field of ‘reality mining’ (Pentland 2008; Gimpel & Westerman 2012; Ayres 2008; Davenport & Harris 2007; Loveman 2003).

Machines are already encroaching on fields once thought the domain of the human mind with the creation of, and the response to, waves of disruption. The next waves of technology, globalisation and demographics and their interactions will give rise to fundamental, long term shifts in the global economy (Australian Financial Review 2016). Furthermore, Ismail et al. (2014) highlighted the importance of the concept of ‘exponential organisations’ as features of digital disruption where exponentially growing organisations are highly digitalised with external properties (staff on demand, community & crowd, algorithms, leveraged assets, and end user engagement) and internal properties (interfaces, dashboards, experimentation, employee autonomy, and social technologies).

This further fuel the argument that the development of converging technologies and exponential growth in disruptive innovation are important aspects of innovation management and managing disruptive change.
2.3.4. Customer Centricity

The world is going through massive digital transformation as every aspect of customers and equipment becomes connected (Kenney, Rouvinen & Zysman 2015), however technology changes faster than individuals can adopt it, individuals adapt more quickly to that change than organisations can, and organisations adjust more quickly than legal and societal institutions. The broad-based adoption of information technology (IT) and, in particular, the advent of cloud-based capabilities has levelled the playing field for enterprise around the world. Market incumbents are increasingly pressured by disruptive innovators and non-traditional rivals attacking revenue franchises and value chains (Arino & Reuer 2004; Gulati, 2007) to gain market share through the innovative application of disruptive technology (Bradley et al. 2013). Kane (2017) highlighted the key problem facing organisations with respect to digital disruption is people, specifically the different rates at which people, organisations and policy respond to technological advances at a time when digitalisation is an increasing part of most industries (Moller et al. 2018; Vanini 2017; Nambisan 2017).

With the increasing use of digital technologies by people to interact socially, to create, enhance and exchange content (Derksen, Vikkelso & Beaulieu 2012), large numbers of digitally mature smart consumers who have little loyalty and no patience (Schmidt & Cohen 2010), can influence, challenge and increasingly become a collaborative enterprise between the traditional business organisations and themselves. This connected world creates a digital imperative for companies that must succeed in creating transformation through technology or face loss of market share to competitors that do (Westerman, Bonnet & McAfee 2012; Fitzgerald et al. 2013) as every aspect of customers and equipment are connected, providing distributed rights and access to create, add, modify and consume content and communications (Bugin et al. 2011). Essentially, to survive and thrive in disruptive environments, organisations are taking more risks regarding decisions in an increasingly crowded global competitive landscape and growing consumer sophistication (Popescu 2012; Taylor & Raden 2007).

In an era when the power of the individual and empowered customers are disrupting every industry; competitive barriers, such as manufacturing strength, distribution power and information mastery no longer create competitive advantage and the enterprises who master the flow of relevant data, having access to customers’ data patterns and improve customer relations will have the edge (Bernoff et al. 2013). In this customer-centric age with social communication technologies or ‘social software’ (Johannessen, Olaisen & Olsen 2001), the only sustainable competitive advantage is knowledge of and engagement with customers. Enterprise and organisations that ride the technological wave will clearly be best positioned to assert their influence and bring others into their orbits (Schmidt & Cohen 2010)
and where the implementation of digitally-enabled changes better answer customer needs (Tan et al. 2015). Digitisation has not only enlarged the amount of individual info that can be shared but also transformed the roles of individuals, who can both consume and provide data to social networks. Digital trails of personal and professional activities allow the internet to integrate and personalise data for all types of human behaviour. These collected data have an economic and political value. Individuals can be precisely targeted with services; new companies are founded and new markets emerge (Vanini 2017; Hilbert & Lopez 2011). Chiaroni et al. (2016) suggests that business newcomers are usually disruptors, while incumbents are often unable or unwilling to invest in disruptive innovations and promptly respond to their threat.

2.3.5. Policy and Environment

Digital disruption presents challenges and opportunities to organisations across all industries but the different rates at which people, organisations, and policy makers respond to technological advances (Kane 2017) and adapt to changes accordingly will dictate its digital disruption outcome. As an example of an industry that require significant adaptations of existing resources, processes and values towards disruptive change is the current energy sector in Australia which is heavily influenced by government policies (Nelson et al. 2014) as discussed in detail in Section 2.4.1.

Converging disruptions of innovative technologies (Seba 2018; Ismail et al. 2014), uncontrollable cost increases in energy supply, evolving consumer needs and changing regulatory framework in the energy ecosystem, such as micro-grids, Blockchain technology and smart grids, demand response devices and regional market developments (Oslo 2017) and require significant adaptations of existing resources, processes and values towards disruptive change. Research studies by Stank et al. (2013) involving incremental change to a transformational agile strategy suggests that firms lack an agile transformational strategy and highlights the importance of agility, accessibility and alertness as the essence of an ‘agile’ strategy. Leidner, Lo and Preston (2011) also supports this concept where enterprise organisations should digitally transform, stay flexible and agile whilst adopting efficient, accurate, fast and comprehensive digital business systems as a high priority.

Data and connectivity, as features of the next wave of digital disruption, have changed to an open random network that empowers customers but also creates an increasing tension related to data protection, cyber risks and privacy concerns (Vanini 2017). Risk is affected by digitisation namely cyber risks, operational risks and systemic risks impacting regulations and policies in many industries (Grossman 2016; Goldfarb et al. 2015; Rifkin 2014). The difference between digital disruption and
traditional competitive dynamics is the velocity of change and the high stakes involved. Social technologies and collaboration tools allow people to communicate within and across borders, forming virtual communities that empower citizens at the expense of governments and business that still maintain legacy business models and information systems (Schmidt & Cohen 2010).

The digital environments differ in fundamental ways that have profound implications for decision makers to create a culture that fosters digital innovation in enterprise organisations. Giri (2014) suggests that just surviving with a status quo mindset for an enterprise organisation is insufficient when disruptor business models are thriving. Firstly, the digital environment has greater interconnectedness and interdependencies catalysed by information technology that makes static business analysis difficult and strategic business positioning short-lived (Grover & Kohli 2013; Bharadwaj et al. 2013). Secondly, the source of competitive advantage is shifting away from large, proprietary systems and toward ‘micro-applications’ that reside on digitally interconnected platforms (Grover & Kohli 2013). Furthermore, dynamic environment enterprises are increasingly adopting varied digital technologies in their customer-side operations in response to customer need, to capitalise on opportunities, drive competitive advantage and create differential value by leveraging digital resources (Setia et al. 2013). Policy makers and decision makers must deal with the impacts from internal and external digital disruptions, the rapidly changing demands of digitally mature customers and fast changing innovative technologies. This shows there is a lack of understanding of the impacts and importance of digital disruption on regulatory and environment aspects, consequences and the benefits it can provide.

Turnbull and Kundra (2015) argue that the Australia of the future has to become a nation that is agile, innovative and creative, by recognising digital disruption as technology-driven volatility and turning disruptive change to opportunity. Digital disruption can be seen as both a threat and an opportunity: Information-and-communication-technology (ICT) induces change in the way humans communicate with a pace and scale that impacts existing business practice in disruptive ways, threatening and invalidating existing business models (Turnbull & Kundra 2015). This can be specified as pressure on prices and margins, increased competition and a winner-takes-all dynamic (Hirt & Willmott 2014). While Digital technologies offer new opportunities for the creation of innovative business models for entrepreneurs to compete with established business practices in a wide range of industries (Turnbull & Kundra 2015).

Thus, regulatory policies and environment factors can be both a disabler and an enabler of digital disruption that may challenge and impact disruptive changes outcome of an organisation.
Digital disruption has evolved and is more than the various definitions proposed by researchers. The importance of digital disruption, its attributes and activities impacting the Australian energy industry will be discussed in the following section.

2.4 Digital Disruption Impacting the Australian Energy Utility Industry

The Australian electricity industry faces unprecedented revolutionary change due to digital disruption and emerging drivers including climate change, distributed energy technologies, energy efficiency, smart technologies management and growing customer engagement undermining the industry’s existing centralised generation, large grids and the business models they supported (Smith & McGill 2016). Furthermore, Australia is facing serious the electricity affordability issues due to heavy concentration of wholesale and retail markets, regulation and poorly designed policy added significant costs to rising electricity bills and confusing billing structures confuses consumers and have left many consumers on excessively high ‘standing’ offers according to the latest ACCC 2018 final report.

Driven by a steep experience curve and economies of scale, the cost of renewable energy has fallen precipitously (Goodall 2016; International Energy Agency 2015) and after incremental technological developments, the energy industry is again being transformed by new distributed energy technologies, disruptive innovations, empowered customers and a global focus on reducing anthropogenic greenhouse gas emissions (Nillesen & Pollitt 2016). Furthermore, as digital disruption presents challenges to organisations across all industries, the different rates at which people, organisations, and policy makers respond to technological advances (Kane 2017) pose as one of the key challenges.

Kane (2017) concludes that technology changes faster than individuals can adopt, individuals adopt quicker to that change than organisations can, and organisations adjust more quickly than legal and societal institutions. The differing rates of response to disruptive innovations are referred to respectively as adoption, adaptation and adjustment overlayed with diffusion of innovations (Rogers 2003) will be discussed in this section.

Hence, the literature discussion examines the digital disruption development, outcomes and disruptive change activities within the energy utilities industry, categorised as follows:

- Societal Institutions/ Australian Regulatory Policies
- Technological /New Business Model/Products and Services Innovations
- Consumers/People
- Organisations (Incumbents)
2.4.1. Societal Institutions/ Australian Regulatory Policies

*Australia is one of the sunniest continents in the world. Given a stable policy environment, there is massive potential for solar PV to make a significant contribution to electricity generation in Australia over the coming decades.* (Clean Energy Council 2018)

According to Kaal and Vermeulen (2017), disruptive innovation is often associated with the emergence of completely new technologies, new combinations and applications of existing technologies, and the application of new technologies to specific societal problem areas, each precipitating a significant paradigm shift for product technology or creating entirely new paradigms. It also presents significant regulatory challenges for policy makers as well as posing as constraints to innovations development. Kaal and Vermeulen (2017) highlighted exponential disruptive innovation has the potential to overwhelm the existing regulatory process resulting in error rulemaking, systemic constraints, and path dependencies, and is likely to expose the depth of insufficiencies and design flaws of the existing regulatory and institutional infrastructure.

Australia’s electricity industry is heavily influenced by government policy according to Nelson et al. (2014) and the electricity supply industry has historically offered a homogenous good supplied via economically regulated transmission and distribution networks. Competition was introduced into the contestable generation and retail supply chain components as part of the 1990s ‘Hilmer’ reform process (Sioshansi 2016). Energy policy is diverse and fragmented in Australia as the federal government, the eight states and territories and more than 700 local governments together with multiple departments and agencies all have a role in energy policy formulation and delivery.

The Australian energy industry policy was originally set with an expectation that new electricity demand would be met by new renewable energy capacity but recent demand has declined and is not expected to increase significantly in the immediate future as significant carbon policy uncertainty prevails in the Australian market (Nelson et al. 2014). Furthermore, the Australian national energy policy occupies a primary position, provides overall direction and it constitutes only part of a complex policy field (Anceschi & Symons 2012). The implementation of energy policies is often impacted by constraints such as the intersection of regulatory interference; financial market considerations; and market price-caps (Simshauser 2009; Simshauser & Nelson 2013; Simshauser & Ariyaratnam 2014) overlapping climate change policies contributed to significant regulatory interference (Nelson et al 2010) and various
constraints of energy prices within energy-only markets (Besser, Farr, & Tierney 2002; Oren 2003; de Vries 2003; Wen, Wu, & Ni 2004; Finon and Pignon 2008; Joskow 2008; and Simshauser 2009).

According to The Australian Government Productivity Commission Report 2016, the Australian energy industry is comprised of four distinct yet connected parts: generation, transmission, distribution and retail. Historically each of these interlinking sectors was being controlled by the state for example, SEC (State Electricity Commission) in Victoria.

Deregulation has opened some parts (in some states) to private ownership and competition in:

- **Generation** — from a range of fossil fuel and renewable sources. Electricity generators sell their output through the wholesale market. This sector is highly deregulated and open to competition and private investment.
- **Transmission** — the bulk transfer of electricity via high voltage transmission lines from generators to substations near demand centres. Each state has a single transmission network service provider (TNSP). These are heavily regulated natural monopolies and are sometimes state owned. There are six interconnectors linking the grid.
- **Distribution** — the final stage transfer of electricity from substations to end users. Distribution network service providers (DNSPs) are natural monopoly businesses. DNSPs in most of Australia are regulated by the Australian Energy Regulator (AER). Those in Western Australia are regulated by the Economic Regulation Authority.
- **Retail** — packaging of electricity purchased in the wholesale market with transmission and distribution services for sale to customers. Retailers are responsible for managing risk and hedging exposure of end users to price fluctuations. This sector is highly deregulated and competitive.

Policies and key reforms are required to manage these disruptive changes including determining the role of competition in the provision of ‘behind the meter’ energy services (Nelson et al. 2014), to prepare for change and find opportunities to be part of the transition, should a largely decentralized grid prove to be better placed to meet society’s future energy needs and integration of climate change policy (Smith & MacGill 2014).

Simshauser and Whish-Wilson (2017) highlight that climate change policy and the emergence of new technologies such as household solar PV, battery storage and home energy management systems will create further price dispersion in Australian electricity markets due to even greater product
heterogeneity. Policy makers will need to facilitate, rather than prevent, both price and tariff structure
dispersion with the objective of improving consumer outcomes (Nelson 2014). Regulation is important
to the future of Australian energy industry as it depends on what the regulators and policy makers decide
given the political nature of the electricity service that is viewed as a public property (Shioshani 2015).
Regulations and policies will continue to play a role in influencing the price of the electricity service, its
composition, how it is procured, delivered and stored as well as ensuring its quality, safety and reliability
(Nelson 2013). Regulations will also influence the directions or course of action decision makers will take
in managing disruptive change as well as the impact of digital disruption outcomes.

The operations and regulatory environment in which the Australian utilities industry is currently
operating is becoming increasingly and concurrently unpredictable, disruptive due to advancing smart
technologies and restrictive as governments’ energy policy goals progress and shift (Nelson 2014). More
specifically, in an environment of exponential disruptive innovation, relevant information for rulemaking
is less likely to materialise soon enough for traditional rulemaking to be effective, regulatory issues
become increasingly complex, and unknown future contingencies increase substantially in the
rulemaking process (Kaal & Vermeulen 2017). In short, exponential disruptive innovation has the
potential to overwhelm the existing regulatory process and impede digital transformations with the
current Australian energy policies and political landscape, but convergence of disruptive innovations
(Seba 2018) will most likely be the tipping point leading the Australian energy industry disruption, as
discussed in the following sections.

Much of the current debate about solar versus non-solar customers is centred on equity and fairness,
who is subsidising whom. As some customers move away from total dependence on the grid, those who
remain totally dependent have to bear higher costs as their numbers shrink. This has the prospect of
more inequality, not in terms of income, literacy or opportunity but also in terms of grid dependency
(Cooper 2016).

As acknowledged in the Department of Environment and Energy website accessed in 2018, Australian
regulators had, over a decade-long failure to effectively integrate energy and climate policy has created
uncertainty in the market, affecting investment decisions and therefore prices and reliability. For
regulators and policy makers, the challenge is how to regulate best in terms of reliability, security and
affordability as the energy industry is going through a digital innovation revolution.
2.4.2. Technology based Disruption

In the competitive utility industry, highlighted by Tether et al. (2002), enterprises are forced to innovate to extend their service range by offering products and services with innovative digital technologies that have digitised and impacted the energy utility industry.

Against a background of falling peak demand and energy usage, this section explores the electricity grid’s place in the hierarchy of needs, when faced with the coexistence, competition and cooperation, sharing of multiple energy sources and emerging technologies.

This section will describe the various advancing disruptive technologies (Kane 2017) that have impacted the energy utility industry in Australia. According to van Gerwen, Jaarsma and Wilhite (2006) the introduction of smart meter technology in Australia has paved the way for other disruptive innovations to be launched. Important developments and outcomes of digital disruption like data generated from smart meters being used to generate information on consumers, digitised connectivity as well as infrastructure such as smart grids adding pressures on the utility organisations to embrace similar innovative technologies and change accordingly. That includes changing business models (Smith & McGill 2016) leading to digital platforms and industry ecosystem collaborations (Bharadwaj et al. 2013) and other converging disruptive innovations that will define the Australian energy transition for the future.

2.4.2.1. Smart Meters

Importantly, digital smart meters were the pivotal disruptive technology in Australia and its introduction to customers was originally seen as a mechanism to link wholesale to retail markets and to manage electricity demand peaks (Depuru, Wang & Devabhaktuni 2011) that transformed and destabilised the established passive roles of centralised energy distribution into decentralised networks. With the introduction of smart meters, frequent large data flow, adapted systems and processes that capture and analyse the data (van Gerwen, Jaarsma & Wilhite 2006) enabled organisations to simplify, automate processes and create additional energy related services not previously possible (van Gerwen, Jaarsma & Wilhite 2006). The transmission sector provides secure and reliable transmission of generated energy, control systems ensure fault monitoring and communication devices, such as protocol gateways, coordinate data and control signals between the devices in the communication network (Depuru, Wang & Devabhaktuni 2011) shown in Fig. 2.1 below.
Smart Meters as a Pivotal Disruptive Technology

![Diagram of conventional and smart meter data process](image)

Figure 2.1: Difference between the conventional and the smart meter data process (van Gerwen, Jaarsma & Wilhite 2006)

The information generated from smart meters, together with real-time analytics, and big data (Gosavi 2017) have paved the way for new companies who are innovative and possess the technological capability to disrupt the energy utilities industry. That was a logical step in a world where nearly all communication is digitised and standardised (Internet, email, SMS, chat boxes) and where the cost of ‘digital intelligence’ is still rapidly decreasing. Based on continuous smart-meter readings, electric utilities can implement demand response programs, offering electricity prices sensitive to changes in consumer demand, rather than the flat rates common to most energy utilities (Krishnamurti et al. 2012).

Specifically, smart meters are expected to increase energy efficiency, improve operational efficiency and reliability as well as reduce labour costs (Gerstlberger et al. 2016; Siddiqui et al. 2008), all of which would accrue savings to the utility that may be passed on to consumers. Additionally, indirect benefits may arise if consumers purchase or are provided with enabling technologies that respond to smart meter signals, for example, central air control, direct load control, in-home displays (Glasgo, Hendrickson & Azevedo 2017). Siddiqui et al. (2008) estimated that between 2010 and 2015, smart meter-enabled communication infrastructure and devices could decrease Carbon (CO2) emissions (Gans, Alberini & Longo 2011) efficiency and greenhouse gas emissions (Nillesen & Pollitt 2016).
2.4.2.2. Smart Grid Technology

The Smart Grid, an intelligent energy network of digital technologies will transform the energy industry into a new era of reliability, affordability; carbon emission efficiency and optimisation of energy consumption that will help ensure for example, electricity recovery strategically after emergency blackouts (Faisal et al. 2015). In addition, the smart meters can improve the operational efficiency of the grid and allow for proactive maintenance such as availability of data reads every thirty minutes, thus enabling quicker response to faults, customer planning of power usage and energisation requirements. Mohassel et al. (2014) argues that Advanced Metering Infrastructure (AMI) technology or advanced metering infrastructure of integrated system of smart meters, communications networks, and data management systems that enables two-way communication between utilities and customers, is the foundation of Smart Grid that is responsible for collecting all the data and information from loads and consumers and for implementing control signals and commands to perform necessary control actions of Demand Side Management (DSM).

Research conducted highlighted the complexities of smart grids in power generation timeframes (e.g. load scheduling and power balance), communications issues, understanding customer behaviour, large-area protection, and distribution control as some aspects of the challenge of making power grids more robust and more intelligent and managing the potential complexities (e.g. natural disasters) involved (Dufour & Belanger 2014). Smart grids allow for variable energy charges based upon supply and demand at the time and, in theory, will incentivise consumers to shift their heavy electricity usage to periods of low demand (Amin 2011) to allow energy utilities to manage reliable and efficient energy supply and to charge more during those peak-demand periods that are offset by lower charges during offpeak hours. Essentially, the smart grid is conceived of as an electric grid that uses digital communications technology to deliver electricity in a controlled, smart way from points of generation to active consumers (Siano 2014). Conversely, digital technology would allow utilities to decrease prices in order to increase demand during high supply periods (Geoscience 2013). Fan Kulkarni, Gormus, Efthymiou, Kalogridis, Sooriyabandara & Zhu (2013) in discussing the challenges and opportunities of smart grid, defines it as an intelligent energy network that is based on grid-integrated, near-real-time communications between various grid elements in generation, transmission, distribution and loads to ensure power supply is reliable and that any interruptions of power is reported real time see Fig. 2.2 below.
For consumers, the benefits of this improvement might be realised through the reduction of such adverse events as blackouts as well as reliability, affordability and security of power supply. Siano (2014) highlighted the importance of demand response (DR), by promoting the interaction and responsiveness of the customers, offering a broad range of potential benefits on system operation and expansion, on market efficiency by improving the reliability of the power system and, in the long term, lowering peak demand. Furthermore, demand response (DR) reduces overall plant and capital cost investments and postpones the need for network upgrades (Siano 2014). According to Pratt et al. (2010), digitisation enabled smart meters to reduce blackout times from hours to seconds by identifying faults and compensating remotely. Indeed, without smart meters, customers must notify their utility about outages, whereas smart meters allow for immediate outage detection. This confirms that smart meter is the pivotal disruptive innovation that enabled other digital innovations of data, connectivity (Baiyere & Salmela 2015) and long-range wireless technologies such as IoTs and mobile communication technologies that offer inter-channel interference, connectivity, scalability, energy-efficiency and compatibility with legacy networks (Mitra & Argawal 2015).

According to Amin (2011), the ultimate goal of smart grid is for the end-to-end electric power system (from fuel source, to generation, transmission, distribution, and end user) of the future to:

- Allow secure and real-time two-way power and information flows
- Enable integration of intermittent renewable energy sources and help decarbonise power systems
- Enable effective demand management, customer choice, secure and efficient operation of the grid
- Enable the secure collection and communication of detailed data regarding energy usage to help reduce demand and increase efficiency

The local generation of electricity in a smart grid involves a combination of different disruptive innovations in areas of engineering, communication and management that offers the possibility to realise a virtual power plant (Mohassel et al. 2014).

2.4.2.3. Micro-grid and Distributed Energy Resources (DER)

The current energy supply of a centralised grid, command-and-control, extraction-resource-based energy sources (e.g. oil, gas, coal and nuclear) is navigating rapid disruptive change into independent micro-grids and distributed energy sources. This is made possible because these energy sources, the business models they employ, and the products that sustain them will be disrupted by superior technologies, product architectures, platforms and business model innovation (Downes & Nunes 2013) giving way to an information technology, knowledge-based energy supply (Seba 2018). The disruptive innovations of bit-based digital technologies (data-based technologies) that have disrupted atom-based (resource-based e.g. coal fired) industries is now digitalising electron-based clean energy technologies that will further disrupt the resource-based energy industries to smart energy of renewables, independent micro-grids and distributed energy resources (Seba 2018).

The future is potentially moving towards a decentralised, distributed energy with many consumers/prosumers operating in grid-assisted or potentially off-grid mode where individuals or groups will live in a zero-net energy environment with distributed generation, storage and/or reliance on semi-autonomous micro-grids according to Marnay (2016). And according to Gellings (2016) the future of distributed energy resources (DER) is integrated for a public subgroup of customers including universities, hospitals, shopping malls, office complexes, military installations, remote areas and communities too far from an existing grid where the value of an integrated grid will increase. According to Soshinskaya, Crijns-Graus, Guerrero, JM & Vasquez (2014), micro-grids are recognised for their multitude of benefits to improve power reliability, security and sustainability by decreasing power costs
for the consumers and depending on location, components and optimisation goals, which cause them to experience different types of challenges and barriers.

There are various barriers that impact disruptive innovations and Soshinskaya et al. (2014) highlighted the most common barriers identified as technical, regulatory, financial, and stakeholder, based on the literature and overlying patterns recognised. They include problems with technology components, dual-mode switching from grid-connected to island mode, power quality and control and protection issues. Regulatory barriers exist due to interconnection rules with the main grid, the prohibition of bi-directional power flow and local power trading between micro grid and the main network. The barrier experienced most often has only recently been addressed, so solutions need further research, but the main financial barrier is the burden of high investment and replacement costs of the micro-grid which may be resolved with proper market support in the short term and might naturally resolve itself through learning over the long run. Lastly, stakeholder barriers include issues with conflicting self-interest, trust and operational management expertise.

This confirms the argument presented by Vanini (2017) that digital disruption is based on data and connectivity, where cost reductions and scalability are the drivers. Furthermore, Seba (2018) emphasised disruption takes place when there is a convergence of technologies enabling entrepreneurs to create new products, services and new markets go on to create value essentially by radically transforming existing industries. Further digital innovations in their turn, caused a change in the culture of information from a centralised to a participatory model enabling the consumer to participate in the decision making on how and when energy is consumed. In the end, the shift from centralised to distributed energy generation has added a new dimension with innovative and disruptive, information technologies that has changed everything about the energy industry; it even changed society at large (Seba 2018). Nevertheless, the smart meter as a pivotal disruptive innovation is one of the positive outcomes of digital disruption impacting not only the consumers but the whole Australian energy industry.

2.4.2.4. Energy Storage Technologies

Energy storage technologies absorb electrical energy, convert it into a form that can be stored for a period of time, converted back to electrical energy, and later released when there is demand. New storage technologies have the potential to fundamentally disrupt the way electricity has been previously generated and delivered (Productivity Commission Australia 2016). Seba (2018) highlighted the different
sets of innovative products serving different markets, but their symbiosis complemented and accelerated one another’s adoption in the marketplace creating smaller, more powerful, modular energy-efficient microprocessors, graphics processors, data storage, and connectivity. The second wave of digital disruption is taking place as empowered consumers with access to data and connectivity start adopting digital energy storage and intelligent energy-management devices. Electricity storage companies have learned business model innovation (Smith & McGill 2016) from solar providers and the convergence of technologies, digital business models, digital infrastructure and a cultural shift.

With applications in a diverse range of fields, potential benefits and corresponding disruption may therefore be experienced in a variety of sectors and on a large scale. Off-grid systems allow for energy provision through standalone power systems (such as solar PV panels combined with battery storage) or mini-grids, which are centralised electricity generation systems for a local area and often reliant on renewable or hybrid sources and energy storage technologies. Electricity users may go off-grid for a variety of reasons, including relative power costs, privacy concerns related to information collected by smart meters, energy independence and security of supply (Productivity Commission Australia 2016), the economic viability and the challenges in integration of energy storage (Brinsmead et al. 2015).

According to the Clean Energy Council 2018 report, virtual power plants and other battery storage initiatives by various state governments are helping to drive demand at the consumer level, improving ROI on battery unit prices as costs fall. The Clean Energy Council (2018) Report showed that energy storage took a considerable leap forward in 2017, with the construction and commissioning of the world’s biggest lithium-ion battery in South Australia and the announcement of the Snowy 2.0 pumped hydro expansion. In 2018, it is predicted that 300 MWh of distributed systems will be built across 33,000 installations, along with 136 MWh of projects. This would more than double the number of storage systems currently installed (Clean Energy Council 2018).

The clean disruption (Seba 2018) of energy is inevitable as the exponential cost improvement of disrupting technologies; the creation of new business models; the democratisation of generation, finance, and access; and the exponential market growth as the key to the disruption of energy lies in the exponential cost and performance improvement of technologies that convert, manage, store, and share clean energy. The first wave of energy disruption has already begun with distributed solar and wind generation.
2.4.2.5. Data, Connectivity, Network and Platforms

Organisations today collect enormous amounts of data to be analysed, insights garnered and used to make better decisions for the organisation. Cloud computing and machine-learning algorithms have fuelled the jump in Artificial Intelligence (AI) (Ismail et al. 2014) which is used to help applications interpret an ever-growing mountain of data while keeping costs in check. Kelleher MacNamee, D’Arcy (2015) defines machine learning as an automated process that extracts patterns from data, to build models of predictive data analytics applications to be used as supervised machine learning. Diamantoulakis, Kapinas and Karagiannidis (2015) describes the importance of data in the energy industry and advantage of the users’ participation in order to reduce the cost of power. This highlights the role of data analytics, intelligent methods and solutions for the real-time exploitation of large volumes of data generated by the vast number of smart meters in the energy industry. Hence, robust data analytics, high performance computing, efficient data network management, and cloud computing techniques are critical towards the optimised operation of the smart electricity grid. That enables a two-way flow of power and data between suppliers and consumers facilitating the power flow optimisation in terms of economic efficiency, reliability and sustainability (Diamantoulakis et al. 2015).

Data, connectivity and platform are major factors of disruptive innovation instrumental in bridging the ‘connectivity gap’. Technologies such as low-cost-sensors (e.g. IoT connected thermostats) and long-range wireless technology (e.g. Mobile networks) are powered by intelligent machines and provide the foundation for next generation disruptive innovations (Nambisan et al. 2017). The Internet of Things (IoT) is a good example of consumer-based technology that will combine the potential of low-cost sensors and big data with wide-scale internet connectivity (Tarkoma & Katasonov 2011). Lu, Sookoor, Srinivasan, Gao, Holben, Stankovic, Field & Whitehouse (2010) highlighted that heating, ventilation and cooling (HVAC) is the largest source of residential energy consumption and an opportunity for disruptive innovations.

To minimize energy usage, the thermostat adjusts the temperature when the user leaves for work. An app that runs on smartphones makes it possible for the user to tell the thermostat to remotely turn the heater or air conditioner on or off. Using sensors, a ‘learning thermostat’ (e.g. the NEST thermostat) knows when a user is home and uses artificial intelligence to adjust temperatures accordingly. It also has the capability to communicate with the utility to learn electricity prices, and to switch the heater and air conditioner on and off to save money while keeping temperatures within user comfort ranges (Seba 2018). Another positive outcome of digital disruptions is that IoT (Evans 2011; 2015) could
ultimately prove to be the most transformative and disruptive innovation applied with industrial applications in industries of mining, oil and gas, infrastructure, aviation, locomotives, cities, farming, manufacturing, and power generation in Section 2.4.2.6.

Similarly, the conventional power utilities industry is being disrupted by networks of sensors, machine learning and connected devices that allow for the distributed generation of power and customer-centric energy management. The impact of all these technologies is: lowering of clearing price of wholesale competitive markets; flattening of the peak premium pricing in retail markets; lowering demand because of increased end user self-generation; and critical mass of customers going zero-net-energy.

Greater adoption of Artificial Intelligence (AI) as a disruptive force will add another layer of change to the disruptors, as the business models of companies evolve to adapt, and software applications evolve to further embed AI. The convergence of technologies and disruptive innovation have shaped and reshaped industries throughout history and is characterised by disruptive innovations that change existing technological product paradigms and provide the foundation for more competitive new technologies and products to emerge (Kaal & Vermeulen 2017).

2.4.2.6. Power generation and infrastructure

Desjardins (2016) defines ‘Smart Energy’ as power generation improved by combining sensors, big data and connectivity that detects slight mechanical adjustments to capitalise on the small changes in wind velocity or direction of wind capturing data for analysis (Desjardins 2016) where solar and wind power changes the energy generation equation. Hence, utility scale solar and wind also change the equation in competitive wholesale electricity markets. Zero marginal costs are already disrupting utilities and solar (PV) energy generation is on its way to disrupting all forms of conventional energy. Furthermore, technology companies have an unparalleled record of lowering costs exponentially while increasing quality exponentially and in the renewables or clean energy field, the disruptors (solar, wind turbines and electric vehicles) complement and accelerate one another’s adoption. Solar photovoltaic (PV) companies have decreased their costs by a factor of 154, a classic technology cost curve.

AMI (advanced metering infrastructure) another disruptive innovation providing the foundation for more competitive new technologies (Kaal & Vermeulen 2017) offers more than just reading, controlling smart meters (Mohassel et al. 2014). It is responsible for collecting, measuring and analysing energy usage data, transmitting information from smart meter to data concentrator and then to a headend
system in the utility side in the deployment of smart grid (Faisal et al. 2015). It can be seen as a dedicated gateway to the customer’s home, offering additional energy related services where it can be used both for demand response and demand side management, part of an intelligent grid configured infrastructure that integrates a number of technologies to achieve its goals (Mohassel et al. 2014).

The clean renewable energy disruption driven by technology cost curves, business model innovation as well as product innovation (Seba 2018) will create a new energy architecture that is distributed, mobile, intelligent and participatory, replacing the existing energy architecture, which is centralised, command-and-control oriented, secretive, and extractive. The existing energy business model is based on scarcity, depletion, and command-and-control monopolies. According to Mohassel et al. (2014), the new technology-based infrastructure and a set of products and services governed by the economics of market disruption over the last generation will disrupt energy industries that have barely evolved. Households, businesses and industries have long been dependent energy consumers without control over the reliability, efficiency and affordability of their energy supply. Reliant on secure supply from massive, capital intensive electricity networks, consumers empowered with knowledge of their usage history and choices are progressing towards an era where they can store the excess energy generated and even become energy providers themselves.

Stadler et al. (2011) recommended further optimal DER technology investment and energy management innovations to achieve zero-net-energy and in doing so is likely to undermine the traditional centralised generation model, accelerate the uptake of renewable energy, to relieve networks from inefficient ‘peak’ based investments. Furthermore, it will minimise energy usage (e.g. as a result of less wastage) through cutting-edge, energy-efficiency technologies and meet their remaining energy needs through on-site renewable energy generation (Stadler et al. 2011) but Dufour and Belanger (2014) caution the potential complexity of such smart grids requires careful study and analysis before actual realisation as there are major aspects of challenges of making power grids more robust and more intelligent has yet to reach maturity.

As technology providers continue their search for the optimal storage device, incumbents, regulators and governments are working to create the environment that energy storage systems will ultimately inhabit. The complicated Australian energy industry environment is likely to be shaped with answers to three fundamental questions: who are the optimal owners of energy storage devices; who are the optimal operators of such devices; and what is the optimal revenue and regulatory model that underpins
the viability of the devices as energy storage will dramatically transform and bring about new disruptions to the way the world uses energy in the near future?

2.4.3. Consumers/People

The Australian energy utility industry is being disrupted by changing customer options including self-generation, energy efficiency, ‘enabled’ smart appliances, local energy storage, and electric vehicles (Smith & MacGill 2017).

Moreover, according to ACCC Chair Rod Sims (Sims, 2018) the Australian National Electricity Market is ‘largely broken’. He purports that previous approaches to policy, regulatory design and competition over (at least) the past decade has resulted in a serious electricity affordability problem for consumers and businesses. This section will review the impacts of digitisation of the energy industry and its outcomes, the importance of customer centricity, considerations on what electricity customers want, the digitised choices consumers will face, and how these choices will shape the utility of the future (Smith & MacGill 2016).

Significant technological changes, mostly on the customer end of the supply chain where consumers manage and control their own power usage, are increasingly better at meeting some of their own consumption through distributed self-generation. DER or distributed energy resources turn customers into prosumers (Vogt, Weiss, Speiss & Karduck 2010).

Prosumers are defined as consumers who become involved with designing or customising products for their own needs, as active participants in the market, rather than passive consumers of bulk kilowatt hours from the energy grid. Within a short span of time, the growing number of prosumers in high retail regions of the world could generate some, or virtually all, of their energy needs at prices on par or cheaper than buying from the grid (Peevey 2016; Sioshansi 2016). Smith and MacGill (2017) also highlighted that DER is now driving a great rebalancing, rattling the value chain and refocusing the energy sector on costs and benefits behind the meter where most assets are and the consumer surplus from energy services is almost certainly the largest segment of the value chain.

2.4.3.1. Key sources of customers’ power

The disruptive information technologies revolution was not only brought about by miniaturisation of technologies but a transition from a supplier-centric, centralised information model to a consumer-centric, participatory information model.
‘Service on demand’ means organisations stay in constant contact with all customers via emails, messaging, mobile apps, phone calls, mail or Internet chatbots. The result is a great potential of informed and connected digital consumers and the key sources of customer power are:

- The large number of digitalised consumers that could coordinate mass collaboration (Tapscott & Williams 2010).
- Digital technologies that allow consumers to communicate through social media (social networks, blogs etc.) (Bowen 2013)
- consumers who find information quickly, easily and can follow up actual events (‘livestream’), compare information and make better decisions
- Wireless and mobile devices that create mobile consumers i.e. enable a consumer to be available constantly and everywhere increasingly smarter features and inbuilt intelligence, becoming essential workplace tools (Deloitte 2017).

The most important digital innovation outcome for a consumer is the impact of disruptive innovations and development in the field of information, mobility and connectivity that empowered and enhanced the overall market power of consumers. Equipped in an environment of numerous, connected, informed, educated and interested in influence, consumers can have greater power compared to organisations.

2.4.3.2. Collaboration and Co-create value

Consumers are moving towards influencing and having greater impacts on every part of the business system, processes, indirect price determination, digital-marketing messages and control over the distribution channels. As a result of digitisation, trained with new tools and dissatisfied with the existing choices, consumers want to influence and participate in the co-creation of value with the organisation. Interaction is the basis of a new system to co-create unique value (Prahalad & Krishnan 2008; Prahalad & Ramaswamy 2000; Prahalad & Ramaswamy 2004). Digital technologies and media give power to customers and the development of digital innovation influences the changes in customer behaviour. From the aspect of organisations, key challenges in the field of customer behaviour in the digital environment are abundance, possibilities to connect with other customers, greater awareness, mobility and influence on participating organisations (Rakic & Rakic 2014).

Consumers have more choices that eventually contribute to lower satisfaction (e.g. price comparisons and choice awareness) as top management has more strategic options that contribute to a lower value and rising competition. What is stated encourages reconsideration of the traditional value system. Leaders need new frames of reference for value creation. The solution is a concept of co-creating a
unique value with customers. Thanks to the Internet, consumers can connect and engage in active
dialogue with manufacturers of products/services. Instead of producers exercising control, consumers
initiate and control the dialogue with producers. The market becomes a forum where consumers play
an active role in creating the value. An important feature of the new market is that consumers are
becoming a new source of competence for the organisation and individual-centric conception of social
learning processes and that social learning can add value bringing together expertise, aspirations and
local knowledge (Wiek & Iwaniec 2014; Sheppard, Shaw, Flanders, Burch, Wiek, Carmichael & Cohen
2011). Competence of consumers depends on their knowledge and skills, willingness to learn and
experiment, and the ability to participate in an active dialogue. Given the new role of consumers,
competence is a function of the collective knowledge available in the entire system (i.e., expanded
network comprising consumers, the traditional suppliers, manufacturers, investors and other business
partners).

The role of consumers is changing, and organisations can no longer act autonomously to design, develop,
manufacture and market products or services. The future is bifurcated, and the future of energy market
is become increasingly divided amongst the consumer side haves and the have-nots, with affordability,
growing disparity of services needs and grid dependency. Another positive digital disruption outcome is
that empowered consumers are connected, fast acting, and unafraid to adopt the new technologies that
can quickly impact their lives for the better.

Utility executives are already beginning to devise strategies e.g. collaboration and customer engagement
and one of the critical drivers of change is the emergence of platforms and technologies that support
their rapid spread, enhance the growing number of smart meters, smart devices, home energy
management systems, wireless sensing, automation and artificial intelligence (Cooper 2016). Consumers
can get better information on who offers what services in a given area. There is possibility of
‘Aggregation’ of consumer loads to identify performance metrics capable to properly capture costs and
benefits that are relating to various types of multi-energy-system to respond to prices or incentives
(Mancarella 2014). Through Aggregation both household and business consumers can respond better
to prices, pool together to bid in wholesale markets like other large industrial customers can manage
today as the increasing consumer power through digital innovations is impacting the energy industry in
the foreseeable future.

Australia is experiencing falling electricity demand, as forecast by AEMO e.g. Nelson, McNiell &
Simshauser (2014) with a combination of factors responsible for the decline, including rising retail tariffs,
depressed industrial demand, energy efficiency gains and the recent uptake of solar PVs, a pronounced
phenomenon in the past few years. With the convergence of energy efficiency gains and distributed generation, demand growth falls.

Prosumers, a combined role of producer and consumer according to seminal work of Vogt et al. (2010) is also defined as a consumer who becomes involved with designing or customising products for their own needs as the ever-changing digital landscape gives consumers more autonomy to shape their brand interactions. With the rise of the co-creation, it is more important than ever for brands to focus on converting consumers to prosumers if they are to stay relevant and profitable in future.

Utility executives around the world are facing difficult times, where demand growth is tepid, retail tariffs are rising, and a growing number of prosumers are consuming less due to energy efficiency while producing more through small scale distributed generation. They must decide whether to fight off the uptake of PVs or join in the competition to assist consumers to become prosumers as a number of utilities decided to do.

For regulators the challenge is how to regulate best as the industry is going through a revolution. For prosumers the future is full of new and exciting opportunities that empower them to do things that were unimaginable a decade ago and at the same time the possibility to generate clean sustainable non-polluting solar power on the rooftop, at prices that meet, in some cases beat, the grid-supplied power. Prosumers have more options to control their consumption and to manage their usage through technologies. If the cost of energy storage falls as rapidly as the cost of solar PVs, connection to the grid is purely for backup, reliability and load balancing. It will no longer be necessary to buy large amounts of power from generators or pay distributors for delivery of electrons. Rapid proliferation of renewables that have zero marginal cost electrons will become cheaper over time after costing towards zero in the near future (Sioshansi 2016) with capital costs of solar and storage being amortised much quicker. Wholesale electricity prices frequently drop to extreme levels when there is too much generation relative to load or over generation. Prosumers will continue doing what is best for them, circumventing both utilities and the regulations if they get in the way of what is technologically possible and economically advantageous. Incumbent stakeholders and regulators will have to respond to these changes (Gimon 2016; Smith & MacGill 2016) and some may survive the disruption and possibly thrive if they respond well. Many will be too slow to change or handicapped by the same regulations that have shielded them from competition for so long. The speed and sheer magnitude of change is unprecedented due to convergence of technologies with incumbents in US and Europe experiencing loss and decrease in revenues.
Following in the footsteps of Information disruption, the energy disruption is quickly moving towards a participatory energy model (Seba 2018) with a collaborative visioning of local energy systems that can enhance social learning based on Reed et al. (2010) and social capital of communities (Krzywoszynska et al. 2017). Collaboration consequently facilitates the creation of joint ownership of issues and emergence of new networks (Rodela 2011; Reeves et al. 2014; Krzywoszynska et al. 2017).

The energy industry is headed toward a distributed architecture of energy production and usage, made possible by software, sensors, artificial intelligence, robotics, smartphones, mobile Internet, big data, analytics, satellites, nanotechnology, electricity storage, material science and other exponentially improving technologies. The rate at which newly commercialised technologies get adopted by consumers is also getting faster through increased connectivity, instant communication and established infrastructure systems, enabling new ideas and products to quickly get into the hands of consumers. Solar is causing energy production to be pushed to the edges (customer site) from the centre. Large, centralised hub-and-spoke power plant nodes are getting smaller, more modular, more connected and more intelligent.

The participatory energy ecosystem means every end user will be able to contribute to the financing, generation, storage, management and trading of energy due to the distributed nature of solar energy production and the open accessibility of information about energy choices. The mobility and connectivity of electric vehicles will turn these vehicles into intelligent energy generation, storage and management devices. Soon individuals will help decide which vendors provide energy and who will manage its efficient usage.

The literature confirms that a number of the energy industry’s dimensions are rapidly changing including generation, transmission, distribution and, most importantly, its customer relationships. The fastest and most pronounced transformation is taking place in distributed energy resources or DERs — which include both energy efficiency improvements and distributed generation. The former allows consumers to use less; the latter allows them to generate more of what they need. In combination, they are turning an increasing number of consumers into prosumers, eroding utility revenues and threatening the historical business model, which has been based on fixed tariffs applied to volumetric consumption. Furthermore, the ramifications of these developments and their implications for the power sector (Sioshansi 2016) and regulatory obligations of delivering reliable, affordable and secure energy is pressuring energy organisations or incumbents to respond with new business strategies to manage digital disruptions outcomes.
2.4.4. Energy Organisations (Incumbents)

‘For consumers the economic and environmental benefit that can be created from a modern grid is to be active participants in an increasingly dynamic and transactive power system dominated by zero-cost energy resources that are made reliable and efficient by a smart, dynamic distribution network’ Audrey Zibelman, CEO, Australian Energy Market Operator (AEMO) and Former chair, New York Public Service Commission, 2015

As highlighted in previous sections, Australian energy organisations or incumbents are confronted with massive challenges threatening their historical business model as they navigate through waves of disruptive innovations that build upon each disruptive change which cyclically occur along the lifecycle of an industry (Moreau 2013; Chiaroni et al. 2016).

Acting on the National Electricity Market (NEM) chief scientist, Dr Alan Finkel’s recommendations, the Australian Government is implementing a new National Energy Guarantee (2018) (NEG). This National policy will dictate to industry in regard to the energy ‘trilemma – affordability, reliability and emissions’. It identifies the challenge of achieving secure and reliable energy supply while reducing carbon emissions and ensuring affordability for consumers. According to the National Energy website, the National Energy Guarantee (2018) will be made up of two parts requiring energy retailers and some large users across the National Energy Market to deliver reliability guarantee and the emissions guarantee to lower emissions energy generation each year.

The NEG as a policy mechanism is technology neutral. It will impose a reliability guarantee and an emissions reduction target on energy retailers, a framework that will allow the market to determine the optimal energy mix to deliver reliable power with emissions trending downwards. Essentially energy organisations and retail incumbents are required to deliver solutions to address the ‘energy trilemma’. Furthermore, energy and utility companies are facing unprecedented challenges in managing the energy transition, disruptive growth of new markets and competitors driving changing business models, while at the same time, experiencing higher power costs (Tippett 2018; Mancarella 2014) that intersect with the increasing availability of affordable and efficient renewable energy.

While the challenges to the energy industry is a worldwide issue, the focus of this research will concentrate on digital disruption within the energy industry ecosystem in Australia as shown in figure 2.3 below.
Chiaroni et al. (2016) concluded that with each wave of disruptive innovation, incumbents implemented alternative business strategies, with the following sequence:

1. Exploitation of internal managerial practices, such as aligning dynamic resources, acquiring innovative technologies capabilities and the creation of ambidextrous agile organisations
2. the creation of partnerships and collaboration such consumer engagement and as the establishment of relationships with specific actors operating in the same supply chain
3. Implementation of acquisitions in order to absorb external knowledge capital and innovative technology solutions.

Faced with a constant rapid-change disruptive environment and bound by operational constraints mentioned above, organisations today will have to strategically review their business models, embrace digital innovations, evolve and ‘disrupt themselves’ by changing the organisational capabilities and operations, transforming their organisational culture and revenue model in fundamental ways to stay relevant (Hermsen et al. 2016). Nambisan et al. (2017) suggests new digital infrastructures (and their associated capabilities) can critically complement a firm’s practices related to distributed innovation agency (for example, collaboration with customers or a broader ecosystem of external partners) and thus advance firm innovation. Managing digital disruption and disruptive innovations creates a challenging situation for some, but it also creates a situation where a non-existent entity or company can rise from obscurity to dominance in a business domain (Baiyere & Salmela 2013: Baiyere 2016).

Baiyere (2016) highlighted the importance of IS capability, its connection to disruptive innovation and the innovativeness of an organisation (Ravichandran & Lertwongsatien 2005; Tarafdar, Tu, Ragu-Nathan & Ragu-Nathan 2007) and increasingly, organisations are turning to their IS capability for answers and opportunities that can be leveraged to create new businesses, identify business models and create new products (Pavlou et al. 2006; Ravichandran & Lertwongsatien 2005; Tarafdar et al. 2007). Evidently, it
has become essential for organisations to seek avenues to swiftly reconfigure and reposition their business in order to be both proactive and responsive in a fast-changing business world (Salmela Tapanainen, Baiyere, Hallanoro, & Galliers 2015). As innovation managers across industries are increasingly engaged in exploring possibilities of digitalisation to be at the forefront of this development rather than being the ones left to be disrupted (Reimer et al. 2015), many incumbents’ decision makers are unable to make swift decisions to embrace disruptive technologies that support and develop capabilities to deal with potential threats or opportunities related to digital disruption (Moller et al. 2017).

Digital business transformation, a journey to adopt and deploy digital technologies capabilities (Kane et al. 2014) and business models to quantifiably improve performance is the first step to manage disruptive change, an imperative driven by the inevitability of digital disruption. In accordance with the theorising of Faraj et al. (2011), which led to an increased ability of the crowd to co-create solutions to problems (Malhotra & Majchrzak 2014), enablers of digital organisations include providing fast, scalable connectedness, new products and services offerings, customer engagement and customised intelligent information on demand.

Processes and activities of a digital organisation are increased interaction with customers, fast learning while co-creating value of new business models, including network platforms, digital communities and ecosystems collaboration. Furthermore, Rifkin (2016) emphasises the nature of digitalisation is in its ability to reduce communications, visual, auditory, physical, and biological systems, to pure information that can then be reorganised into vast interactive networks that operate much like complex industry ecosystems. Thus, with the rise of the co-creation, it is more important than ever for energy company brands to focus on investing in organisational capabilities and innovative technologies, converting consumers to prosumers if they are to stay relevant and profitable in future (Rifkin 2016). As collaboration, co-creation and personalisation increases, industries are beginning to adopt a bottom-up approach to community-led development and market impact. As a process, service design thinking has filtered down to transformation and innovation strategy where co-creation is therefore, delivery of innovative retail strategy focused on converting consumers to prosumers that cannot be done without some level of organisational change.

Various literature on disruptive innovation outcomes (Nambisan et al. 2017) highlight that digital platforms and open standards enable collectives (of organisations or individuals) to pursue innovation collaboratively (e.g. Boudreau 2010; Bresnahan and Greenstein 2014; Gawer and Cusumano 2014; Parker et al. 2016; Tiwana et al. 2010). For disruptive innovation processes, collaboration among
collectives is enabled by such digital infrastructural capabilities as knowledge sharing and work execution platforms (e.g. GitHub), crowdsourcing (e.g. Top Coder), crowdfunding (e.g. Kickstarter), virtual worlds (e.g. Second Life), digital makerspaces, and dedicated social media (e.g. OpenStack). The scope, functionality, and other characteristics of these enabling digital technologies fundamentally shape the scope, content and direction of the distributed innovation agency (e.g. Chandra & Leenders 2012; Majchrzak & Malhotra 2013; Smith et al. 2013; Nambisan et al. 2017) This highlights the growing significance of incorporating the features of digital technology into theories about innovation management (Nambisan 2017).

In fostering innovation with broader context of strategic management and new business model entrepreneurship (Müller & Becker 2013; Nambisan & Zahra 2016) that inform on the possibilities of the future innovation (Nambisan 2017) by providing the foundation for next generation of disruptive innovations to emerge within the energy industry, Bistline and Blanford (2016) highlights that incumbents’ business strategies and solutions to include a broad research, development, and deployment portfolio across supply and demand-side technologies is the best way to ensure a safe, reliable, affordable, and environmentally responsible future energy system.

In the context of the complex Australian energy market, in addressing the energy ‘trilemma’ in the midst of policy changes, incumbent energy organisations face limited options but to implement alternative business strategies to manage disruptive changes attributes, which can be anticipated and predictable with digital business transformation and disruptive innovation (Chiaroni et al. 2016). Many analyses have found that the most feasible route to a low-carbon energy future is one that adopts a diverse portfolio of technologies.

In contrast, analysis conducted by Jacobson et al. (2015; 2018) considered the future primary energy sources could be narrowed to exclusively wind, solar, and hydroelectric power and suggest that this can be done at ‘low cost’ in a way that supplies all power with a probability of loss of load that exceeds electric-utility-industry standards for reliability. This recommendation that a 100% renewable energy system is technically feasible has been disputed by Clack et al. (2017) and various scholars including Bistline and Blanford (2016), who demonstrated that a broad research, development and deployment portfolio across supply and demand-side technologies is the best way to ensure a safe, reliable, affordable, and environmentally responsible future energy system (Krzywoszynska et al. 2017) as every low-carbon energy technology presents unique technical, economic and legal challenges (Kaal & Vermeulen 2017).
Mancarella (2014) highlighted that the need to fight climate change is leading to the development of low-carbon power sources such as wind and solar. However, these sources are more variable and unpredictable, requiring greater flexibility in the overall system. Furthermore, these new sources are economically displacing conventional generators powered by fossil fuels that are the traditional providers of system flexibility. Mancarella (2014) discuss how smart grid technologies, changes in system architecture and integration of multiple energy sectors could contribute to solving the ‘energy trilemma’: ensuring energy supply is affordable, secure and meets environmental responsibilities.

Clack et al. (2017) in reviewing the proposal of Jacobson et al. (2018) concluded that a proposed energy system that is technically and economically feasible will have to show, through transparent inputs, outputs, analysis and validated modelling that the required technologies have been commercially proven at scale at a cost comparable with alternatives; that the technologies can, at scale, provide adequate and reliable energy; that the deployment rate required of such technologies and their associated infrastructure is plausible and commensurate with other historical examples in the energy sector; and that the deployment and operation of the technologies do not violate environmental regulations.

Importantly, Clack et al. (2017) states that there are no electric storage systems available today in 2018, that can affordably and dependably store the vast amounts of energy needed over weeks to reliably satisfy demand using expanded wind and solar power generation alone, although most energy retailers agree that the transition to renewable energy was inevitable but it would not be simple or cheap. While the energy storage systems technologies are going through product innovation iterations, in transition, they are not cost effective and commercially viable investment for stakeholders in Australia energy market context. Furthermore, Svahn et al. (2009) argues incumbent firms face four competing concerns; capability (existing versus requisite), focus (product versus process), collaboration (internal versus external), and governance (control versus flexibility) and these concerns are systemically interrelated therefore, are to manage these concerns cohesively by continuously balancing new opportunities and established practices.

In addition to the findings of Chiaroni et al. (2016) on alternative digital business strategies that incumbents implemented to manage waves of disruptive innovations, Australia energy organisations will have to navigate managing disruptive change with external collaboration, deeper customer engagement, improved organisational capabilities, embracing digital innovations according to the Australian energy policies responsibilities.
Sioshansi (2016) suggests that regulators cannot dictate innovation, only create a hospitable environment for it to strive to avoid stifling it, Biber and Ruhl (2017) concludes regulators should be neutral between incumbents and innovators and to debate the relative merits of a centralised versus distributed business paradigm (Gellings et al. 2016; Sioshansi 2016). The integrated grid of the future should enable these two paradigms to not only co-exist but to complement each other until the costs of storage falls to a level where the grid is no longer critical, which will take time. The incumbents, who have made heavy investments in good faith on previous energy infrastructure, will be given regulatory clarity on energy transition directions.

Meanwhile, to address challenges, incumbents and regulators may need to engage through collaboration and the exchange of views with all stakeholders (Peevey 2016; Sioshansi 2016).

Many features of digital disruptive organisation are enabled by bringing several big developments in computing synergistically together, such as the basics: computer and internet, cloud computing, smart phones, internet of sensors, wearable computers, big data, internet of things, artificial intelligence. Ubiquitous computing all linked and opens for many combinatory innovations can provide fast connectedness and customised intelligent information on demand. Furthermore, digital innovations enable organisations to easily share, scale assets without boundaries (e.g. renting sharing, leveraging assets) called Collaborative Consumption (Botsman 2015; Ramchurn, Vytelingum, Rogers & Jennings 2012) where benefits allow scalable products, lowers marginal costs of supply, removes having to manage assets and increase agility. This is an essential foundation for many digital disruptions and at the core of the differences.

Intangibility of offering, interaction and fast learning while co-creating value together, fast diffusing/scaling of the business, as well as the use of new business models, including platform-based ones seem to provide particularly important distinctions of digital disruption outcomes. Organisations have to adopt solutions of energy network management (e.g. devices for keeping the lights on), distributed resource enablement (which provides a market with dispatch-able resources), settlements (which previously consisted simply of bills, but in the future will also include demand response) and underlying these the IT and technology platform which integrates all the processes in the system.

Furthermore, stakeholders are aware that the digitalisation of communication, energy and transportation also raises risks and challenges, not the least of which are guaranteeing network neutrality, preventing the creation of new corporate monopolies, protecting personal privacy, ensuring data security, and thwarting cyber-crime and cyber-terrorism (Rifkin 2016).
Gellings et al. (2016) suggests that the integrated grid leverages the optimal combination of local generation, energy storage, energy efficiency and new use of electricity integrated with central generation and storage, in order to provide society with reliable, affordable and sustainable electricity. It requires a modernised grid, characterised by connectivity, rules enabling interconnection and innovative rate structures that enhance the value of the power system to all consumers. One technology configuration related to the integrated grid which will enable enhanced distribution operations is the Micro-grid (Marnay 2016).

Micro-grids are defined as ‘as group of interconnected loads and DER within clearly defined electrical boundaries that act as a single controllable entity with respect to the grid. A micro-grid can connect and disconnect from the grid to enable it to operate in both grid-connected and island mode (Ton 2011). According to Gellings et al. (2016), incorporating distributed energy storage into utility planning and operations can increase reliability and flexibility it can be used for grid control, reliability and resiliency, thereby creating additional value for the consumer. Furthermore, a key potential benefit of local generation is the ability to improve the reliability of the power system by providing emergency power during interruptions of the power system (Marnay 2016). This integrated grid energy transition model requires collaboration across the whole energy industry ecosystem and is being considered by Australian energy regulators for the future energy landscape across the country.

By mid-2018, the Australian Energy Market Operator, supported by transmission network service providers and relevant stakeholders, should develop an integrated grid plan to facilitate the efficient development and connection of renewable energy zones across the National Electricity Market. The Finkel Review-National Electricity Market.

The energy industry can choose to either be victims of change or orchestrators of their future (Callahan 2016). By their very nature, utilities are cautious and conservative but disruption, both in technology and new business models alone may be insufficient. As energy supply chains develop to sustainability and a zero-carbon future, the industry ecosystems has a large part to play in encouraging utilities to proactively adopt, adapt and ‘disrupt’ themselves from a business strategy point of view especially, when it comes to the uptake of innovative technology since this will only improve their sustainability and viability in a highly competitive environment.

As technologies converge (Seba (2018) and intersect (e.g. Using deep-learning AI algorithms), the pace of innovation accelerates even further (Ismail et al. 2014). Utilities need to digitalise and embrace disruptive change in order to really take advantage of the business opportunities arising from the transformation taking place in the energy industry.
2.5 Defining digital disruption attributes, drivers, process and activities

This section will focus on various literature reviews that examine the attributes, processes and activities of digital disruption and managing disruptive change activities. It will then look at discussing the concepts and themes, highlighting the various outcomes discussed and provided in the literature, and then provide a broad definition to assist in conceptualising a framework for this thesis. This section examines various approaches to incorporating disruptive change activities, challenges, enablers, issues impacting performance and capability models that look to provide levels of maturity to manage disruptive change process outcomes.

In the context of the Australian energy industry, as discussed in Section 2.4., consideration needs to be given to the requirement to provide safe, reliable, low cost and sustainable energy whilst the underlying core structure of the current utility model shifting radically, that is, not within the control of decision makers and digital practitioners of organisations. As discussed earlier, various scholars’ definitions of digital disruption highlighted different sets of attributes, characteristics, processes and outcomes recommending various activities for managing disruptive change. Digital disruption attributes need to be identified in order to manage disruptive change as the digital practitioners and decision makers need to:

- know current expectations of targeted customers
- analyse the tasks and activities involved
- improve organisational capabilities
- promote digitalisation culture and mindset
- understand the potential and limitations of the latest disruptive innovations
- consider the environment in which the disruptive change activities will be conducted to achieve the most desirable digital disruption outcome.

Digital disruption has the potential to overturn incumbents and reshape markets faster than perhaps any force in history. By identifying digital disruption influential factors, attributes, processes and activities provides the first steps for selecting the digital business strategies (Batras et al. 2016) that can be applied to modify organisational mindset, culture, capabilities and managing disruptive change efforts (Green 2000; Lee et al. 2014). Furthermore, successful change can be encouraged by decision makers in continual reviews to motivate and facilitate change processes and activities towards the desired direction in managing digital disruption (Bharadwaj et al. 2013; Lavalle et al. 2010; Mithas et al. 2013; Bradley et al. 2015; Mollick 2012; Westerman, Bonnet & McAfee 2012).
A summary of digital disruption attributes showing digital disruption outcomes and activities compared with traditional competitive dynamics and the respective literature review is shown below in a series of tables (2.1-2.5) adapted from Moller et al. (2017). This review provides a better understanding and contribution to adapting and/or building theory of disruption in the digital domain.

2.5.1 The Organisational Mind-set Attributes

According to Bolden and O’Regan (2016), unprecedented changes in the nature and prevalence of digital technologies and impacts of digital disruptions have significant implications for leadership theory, practice and development that, yet, largely remained unexplored in mainstream academic literature. Beyond the introduction of managing digital disruption, begins by considering the role and nature of leadership in an era of social and technological disruptive change. An examination of relevant research reveals the need for leadership readiness and mindset, to develop an understanding of digitalisation, to create an environment for complementary innovations, business process changes and organisational shifts facilitating new tranche of technologies possible to benefit from the opportunities of digitalisation (Bolden & O’Regan 2016).

Investigating existing literature on digital disruption attributes and activities highlighted that the characteristics of organisational growth mindset (Dweck 2017), is an important factor for a positive disruptive change outcome. The researcher found that the issue of not having the right mindset in organisations is crucial for change and had attracted the interest of a number of more recent academic studies. For example, Dweck (2017) explained why it is not just abilities and talent that brings success but the approach towards change with a differencce between a fixed mindset or growth mindset.

Dweck (2017) defines growth mindset as characteristics based on the belief that basic qualities are things can be cultivated through efforts, strategies and help from others and although people may differ from their initial talents and aptitudes, interests or temperaments that everyone can change and grow through application and experience. According to Ganguly (2016), the mindset is an important driving force for organisations seeking to create competitiveness, sustainability and growth. In response to digital disruption, organisational learning (Argote 2013), organisational knowledge (Prungkriat, Pratoom & Raksonag 2015) and dynamic capabilities (Styhre 2002; Targett 2016) are important aspects that adapt organisations to match the threats and challenges of digital disruption. The literature discusses the need for leaders and decision makers to promote disruptive change competencies, improve organisational
capabilities and invest in agile skill sets for the researcher’s contention that a critical factor in managing disruptive change is for an organisation to develop and maintain a digital disruption growth mindset among leaders, change managers and the organisation itself. The literature covers: disruptive business models; the benefits of external supply chain and customer collaboration, where enterprises may need to be ‘disruptors’ en route to digital maturity; developing products, processes and systems that reform the legacy businesses; influencing changes in business models, organisations, processes, systems and culture (Herrmann, Sangalli & Teece 2017).

As industries move toward the centre of the digital revolution, physical components that inhibit competitive advantage are automated and digitised and along with digitalisation processes, organisational capabilities and internet computing platforms (Carlo et al. 2011) result in further pervasive and radical innovations. According to Dweck (2017), the importance of digital growth mindset across the organisation is crucial to achieve a positive change outcome and a growth mindset embraces change, passion for learning and thrives on challenges.

The components of digital value are combined as disruptive business models, together with various capabilities and business processes strategically outsourced to deliver customer value in new ways (Gulati & Kletter 2004; Srikanth & Puranam 2010). According to Bradley et al. (2015), the most successful disruptors employ ‘combinatorial disruption’, in which multiple sources of value, cost, experience and platforms are fused to create disruptive new business models and exponential gains. Business process innovations of production and distribution are increasingly becoming interrelated (Brandellero & Kloosterman 2010) with social media increasingly used both for product marketing and for ongoing dissemination of creative content. New business models and organisational capability to innovate their business models (Chesbrough 2010) are intimately connected to the dynamic evolution of underlying digital platforms (Barrett, Oborn & Orlikowski 2016) and can have far-reaching implications for economy and society. Below is a table (2.1) of outcomes and activities and changes from traditional competitive dynamics in the context of digital disruption attributes.

Table 2.1: Mindset – Digital Disruption Attributes Outcomes and activities adapted from Moller et al. (2017)

<table>
<thead>
<tr>
<th>Attributes of Digital Disruption</th>
<th>Digital Disruption Outcomes and Activities</th>
<th>Changes from Traditional Competitive Dynamics</th>
<th>Literature Reference</th>
</tr>
</thead>
</table>
As any organisation operating as a system involves operational processes, technologies, people and policies and rules, digital enterprise organisations should be studied as a socio-technical system (Patten, Fjermestad & Whitworth 2009; Whitworth, Fjermestad & Mahinda 2006; Whitworth & Zaic 2003, Alter 1999). Furthermore, it is argued that organisational systems are immensely affected by the external environment (Sommerville 2004) and socio-technical systems are dependent on the systems components and the relationships between those components (Patten, Fjermestad & Whitworth 2009). Patten, Fjermestad and Whitworth (2009) argue that since the performance of a system’s properties must be evaluated as a whole, the organisational objectives of a socio-technical system must consider all aspects and relationships among the three major components of the system, namely:

- **IT governance** – includes a description of how the organisation is structured based on specific decision rights and accountability framework for IT-related behaviours (Luftman et al. 2010; Luftman, Kempaiah & Nash 2006; Weill & Ross 2005; Devaraj & Kohli 2003; Sledgianowski, Luftman & Reilly 2004; Reich & Nelson 2003; Agarwal & Sambamurthy 2002; Luftman & Kempaiah 2007; Luftman 2000).
- **IT personnel** – includes the knowledge, capabilities (Teece 2018), and skills of enterprise IT personnel and their relationships with peers, customers, vendors, and partners (Lyttinen & Rose 2006; Byrd, Lewis & Turner 2004; Reich & Nelson 2003).
- **IT infrastructure** – includes the technology architecture, networks, hardware and software (Chanopas, Kairit, & Khang 2006; Lindstrom et al. 2006; Ross 2003; Weill, Subramani & Broadbent 2002; Byrd & Turner 2001; Broadbent, Weill & St. Clair 1999), as well as the technology services, products, and applications provided within the enterprise and externally to the enterprise’s customers (Hirschheim, Schwarz & Todd 2006).
2.5.1.1. Digital Strategies

Increasing digitisation of business processes, products, and services makes it imperative to develop a clearer understanding of digital strategies. Digital strategies are major elements of overall business strategy, sometimes allowing firms to differentiate from competitors and at other times creating demands to conform and align with competitive norms (Han & Mithas 2013; Tafti et al. 2013; Mithas, Bardham & Goh 2012; Mithas & Lucas 2010, 2014; Pavlou & El Sawy 2010; Kohli & Grover 2008; Saraf, Langdon & Gosain 2007; Rai, Patnayakuni & Seth 2006; Sambamurthy Bharadwaj & Grover 2003; Kulatilaka & Venkatraman 2001). Digital Strategies has been defined as organisational strategy formulated and executed by leveraging digital resources to create differential value (Mithas et al. 2013). This definition highlights IT strategy as a function within firms and recognises the pervasiveness of digital resources beyond systems and technologies as well as explicitly linking digital business strategy to creating differential business value. Strategic agility has been defined as ‘the ability to quickly recognise and seize opportunities, change direction, and avoid collisions’ (Tikkanen 2014; McCann 2004, p. 47) as the ability to ‘produce the right products at the right place at the right time at the right price’ (Roth 1996, p. 30), or as ‘moving quickly, decisively, and effectively in anticipating, initiating and taking advantage of change’ (Jamrog, Vickers & Bear 2006, p. 5).

Data, connectivity and networks bring an ever-expanding set of opportunities to companies; digital disruption is not a single project providing one-time benefits, but an ongoing process of creative destruction with innovators using both new and established technologies to make deep changes at the level of the task, the job, the process and even the organisation itself (Basu, Fernald & Liu 2012). Furthermore, dynamic environment enterprises are increasingly adopting varied digital technologies to sense-and-respond to customer’s needs, to capitalise on opportunities, drive competitive advantage and create differential value by leveraging digital resources (Gilbert 2015; Setia, Venkatesh & Joglekar 2013), while managers look to industry peers for frames of reference in determining firm strategy (Mithas et al. 2013; Birkinshaw & Gibson 2009).

According to Mithas et al. (2013), the competitive industry environment shapes the way that digital strategic posture (firm’s engagement in digital business practices relative to industry norm) influences firms’ realised digital strategy. Researchers have argued that investments in digital technologies, IT infrastructure and IS applications are necessary to develop operational, dynamic and improvisational capabilities (El Sawy & Pavlou 2008; Bharadwaj et al. 2013) and for firm’s improved performance.
This implies digital strategy is a dynamic synchronisation between business and digital resources to gain competitive advantage (Mithas et al. 2012) allowing firms to differentiate from competitors and at other times creating demands to conform with competitors (Pavlou & El Sawy 2010; Kohli & Grover 2008; Saraf, Langdon & Gosain 2007; Rai, Patnayakuni & Seth 2006; Sambamurthy, Bharadwaj & Grover 2003; Kulatilaka & Venkatraman 2001).

These studies showed that disruptive environments requires enterprise IT professionals and decision making management to develop different or new organisational skillsets and competencies with new business strategies as digital technologies are increasingly transforming the structure of social relationships (media and networking) in both the consumer and the enterprise space (Susarla & Tan 2012). Bolden and O'Regan (2016) recommends that digital strategic plans need to be founded on the ability to sense in real time what signals are emerging as time unfolds, building of capabilities that are suited to future not past challenges; and the willingness to take prudent risks, failing fast, moving on and learning as a way of developing in disruptive environment.

2.5.1.2. Digital Organisational Capabilities

In the turbulent times of digital disruption, Agility is seen as an essential attribute and well supported by the literature. For example, Bradley et al. (2015) recommended that winners of digital disruption will be organisations agile enough to innovate rapidly and unbridle their capacity to create cost value, experience value, or platform value for their customers. There is increasing interest in the topic of organisational digitisation triggered by a range of digitalisation challenges such as agility (Doz & Kosonen 2008), resilience (Gulati 2010), customer-centricity (Galbraith 2012), social responsiveness (Kanter 2009), balancing innovation and efficiency (Gulati & Puranam 2009), and environmental sensitivity (Henderson & Newell 2011). Capabilities such as asset orchestration and market creation (or co-creation) are vital to profitable resource management (Pitelis & Teece 2010) that in part, arise from learning from combined resources (Teece 2018).

The decision making digital practitioners may use various techniques predominantly requiring an understanding of the value of disruptive change and improving the level of digital organisational capabilities. Moreover, Karimi and Walter (2015) suggest that first-order dynamic capabilities that are created by changing, extending, or adapting a firm’s existing resources, processes and values are
positively associated with building digital platform capabilities and that these capabilities impact the performance of response to digital disruption.

Digital technologies and digital analytics impact on the ability of a decision maker to manage cognitive resilience or maintain the first dimension of resilience capacity. This concept is defined as an organisational capability that enables a firm to notice shifts, interpret unfamiliar situations, analyse options before taking robust and transformative actions. Resilience capacity as another form of strategic agility assesses how to respond to conditions that are disruptive, uncertain, surprising and potentially jeopardise the organisation’s long-term survival (Lengnick-Hall & Beck 2005). Strategic agility, described as a complex, varied construct that can take multiple forms but captures an organisation’s ability to develop and quickly apply flexible, nimble, and dynamic capabilities. Together it helps firms navigate and respond effectively to changing disruptive conditions and assists the information-intensive organisations with acquisition, transformation and delivery of resources to the customer (Papageorgiou & De Bruyn 2010; Tallon & Pinsonneault 2011).

Decentralised decision rights or worker composition of a digitalised organisation have been demonstrated to significantly influence the returns on innovative technologies’ investments (Brynjolfsson, Hitt & Kim 2011). Others showed that actual usage is a key variable to explain an increased performance (Devaraj & Kohli 2003). Studies by Tambe, Hitt and Brynjolfson (2012) have suggested that the ability of a firm to access and utilise external information is also an important complement to organisational restructuring and technological investments. Closely related to these studies is the emerging literature on the value of enterprise organisational systems, which have shown that investments in digital technologies systems (Hitt, Wu & Zhou 2002; Anderson, Camaget & Eubanks 2003) and combinations of organisational systems with other complementary innovative technologies is associated with significantly greater firm value (Newbert 2008) and significant driver of productivity for firms (Kohli & Devaraj 2004), industry (Melville, Gurbaxani & Kraemer 2007; Jorgenson & Stiroh 2000) and economy level (Oliner & Sichel 2000; Jorgenson & Stiroh 2000). Possible explanations for this relationship (Melville, Kraemer & Gurbaxani 2004) are the role of organisational capabilities to collect and process information, agility, and collaboration as mainstays of new business models implemented to disrupt markets for competitive advantage.

2.5.1.3. Organisational Learning
To remaining responsive, adaptable and innovative requires decision makers and organisations to tap into the knowledge, expertise and creativity of all resources, encouraging, supporting, contribute actively engaging in teams, projects, organisations and facilitating collaborations (Bolden & O’Regan 2017; Bolden 2011; Gronn 2002). In the research literature, Bharadwaj et al. (2013) highlighted organisational learning as one of the key factors for digital disruption success among organisations operating in dynamic environments. Organisational learning is defined as a change in the organisation’s knowledge that occurs as a function of experience (Flores et al. 2012) whilst Pentland (2008) describes organisational knowledge as the capacity of an organisation to act competently. This knowledge includes declarative knowledge, procedural knowledge and routines (Argote & Miron-Spektor 2011) without a corresponding change in behaviour (Argote 2013). While Huff and Jenkins (2002) measure the cognitions of organisational members, Gherardi (2006) uses a behavioural approach, which focuses on knowledge-embedded practices and views changes in them as reflective of changes in knowledge.

CIOs spend excessive time discussing budgets rather than their contributions to the organisation (Westerman & Hunter 2009) when the frontier for using data to make decisions has shifted dramatically (Davenport & Harris 2007). However, the value of organisational learning capability is explained by examining organisational profiles rather than direct assessment of it as a part of the planning process (Grover & Segars 2005). Deliberate learning is seen as a critical dimension of dynamic capabilities (Pavlou & El Sawy 2010; Zollo & Winter 2002).

Peszynski (2005) highlights that soft system methodology in adopting new technologies and technical implementation (Corbitt 1997) does not acknowledge the dynamics and complexity of social relations in the implementation process and through processes of modelling, iteration, reflection and negotiation it draws together different perceptions, assumptions and points of view of different people who are involved in a problem situation in a cycle of learning (Barry & Fourie 2001).

In bridging the behavioural and cognitive approaches to the organisational learning phenomenon, according to Zollo and Winter (2002) the experience accumulation process and cognitive processes involving the articulation and codification of knowledge derived from reflection upon past experiences are of great importance. The three mechanisms focal to this analysis described by Zollo and Winter
Teece (2018) argues that firms differentiate themselves through learning, entrepreneurship, innovation and astute decision making, suggesting firms are to decide, to innovate and to change.

Capabilities such as asset orchestration and market creation (or co-creation) are vital to profitable resource management (Pitelis & Teece 2010) as capabilities arise, in part, from learning, from combining resources and from exploiting complementary assets. Many capabilities become embedded in routines and some reside with the top management team whilst organisational capabilities comprise two interconnected (but analytically separable) categories: ordinary capabilities and dynamic capabilities. Ordinary capabilities are operational whereas dynamic capabilities are generally strategic in nature (Teece 2018).

In order to be effective, digital strategies must embrace disruptive technologies then exploit and reconfigure the digital resources to add value (Bharadwaj et al. 2013; Mentzas 1997), for example process (domain knowledge), technical and personal resources (Chan, Sabherwal & Thatcher 2006; Kearns & Lederer 2003; Newkirk & Lederer 2007). Organisational learning can be seen as a dynamic capability, where its firm-specific nature makes it difficult to imitate and therefore, valuable in competitive environments (Bhatt & Grover 2005). This perspective is focused mainly on the acquisition and transfer of external knowledge, much like the concept of absorptive capacity (Zahra & George 2002). Instead, this study adopts the process view of organisational learning capability as a high-order construct made up of several process components (Tippins & Sohi 2003). If change is not only rapid but also unpredictable and variable in direction, dynamic capabilities and even the higher-order learning approaches will themselves need to be updated repeatedly. Failure to do so turns core competencies into core rigidities (Boxall & Purcell 2011). The researcher believes, the literature does not contain any attempt at a straightforward answer to the question of how routines, much less dynamic capabilities, are generated and evolve. Argote and Miron-Spektor (2011) highlights organisational learning as that portrays an ongoing cycle through which task performance experience is converted into knowledge through organisational learning processes. In addition, it is consistent with the traditional view of organisational learning as skill building based on repeated execution of similar tasks that is implicit in much of the empirical literature on learning curves (e.g. Argote 2013).
2.5.1.4. Strategic management Characteristics

Strategic management must balance innovation with efficiency in today’s disruptive and, competitive world. It must also be responsible for making difficult technology choices based on changing user needs, negotiating conflicting technology budgets and using technologies that are rapidly changing (Crisp & Jarvenpaa 2013; Asemi & Safari 2011). Strategic management perspective, on the other hand, focuses on the viewpoint of organisational knowledge as the ‘core competencies’ that define the value of the organisation for key stakeholders (Prahalad & Hamel 2006). These core competencies determine the organisation’s capability to compete in the transformative open market environment. Faraj and Johnson (2011) propose that these ‘core competencies’ include the ability of organisations and members to effectively deal with dynamic environments through learning to acquire and use dynamic capacity for retrieval and knowledge. Evans and Easterby-Smith (2011) identify two concepts of organisational knowledge: the structural theories of organisation behaviour, which recognises a systemic level of knowledge that is embedded in routines; and the strategic management perspective, which emphasises the embedded core competencies that determine an organisation’s capability. Strategic management is related to change management where the ADKAR model (Prosci 2007; Hiatt 2006) describes five aspects of goal-oriented change management in businesses: awareness, desire, knowledge, ability and reinforcement. These aspects relate to a firm’s dynamic capabilities and how they manage change unlike the Kotter model which specifically targets the role of senior leadership in implementing change and the Lewis model which focuses on knowledge management in facilitating change (Calder 2013). Similarly, the ‘Engage and Learn Model’ proposed by Worley & Mohrman 2014 shows how change management occurs in adapting and developing organisations through four routines: monitoring, awareness, tailoring and design in as discussed above.

Managing change during digital disruption poses challenges when an organisation and its systems are disconnected, when there is pressure on the strategic decision makers to respond and find a quick solution. Business process innovations of production and distribution are increasingly becoming interrelated combining and linking digital technology and marketing innovation across the organisation (Brandellero & Kloosterman 2010). Furthermore, social media, as a community, is increasingly being used both for collaborative product marketing and as a distribution mechanism for on-going dissemination of creative content over an extended period. This ultimately confirms Preston, Kerr and Cawley’s (2009) findings that strategic management can promote a culture of a diverse mix of knowledge and learning of disruptive technologies that is crucial to progressive innovation as well as the importance of engaging trust, ethics and authenticity for brand loyalty (Bolden & O’Regan 2017).
2.5.1.5. Stakeholders Collaborative Approach

Stakeholders’ collaborative approach and engagement within industry ecosystem to facilitate collaboration and co-creation is essential as organisational routines determine how the organisation is designed based on rules, beliefs and frameworks. Windeknecht and Delahaye (2004) define stakeholders’ leadership of the collaborative approach as the organisations preserve knowledge, behaviours and values over time. The collaboration of stakeholders, ecosystems, customers across various platforms bring together virtual communities offer individuals the possibility to become the focal representatives of their organisations due to their strong support in improving knowledge management (KM) techniques (Alberghini et al. 2010) and working towards a common goal and mindset.

2.5.2 Constraints, Challenges and Issues

This literature review highlights various aspects of organisational characteristics that may pose as constraints, which could impact disruptive change management as well as external factors posing as constraints. This section focuses on capabilities regarding communication, risk aversion and strategic aspects of digital organisational capabilities, change capabilities in time and activities, organisational people constraints include organisational experience accumulation as well as external constraints like regulatory policies that may impact on disruptive change activities outcomes and literature relevant to digital disruptions constraints as shown in Table 2.2 below.

Table 2.2. Constraints – Digital Disruption Attributes Outcomes and activities adapted from Moeller et al. (2017)

<table>
<thead>
<tr>
<th>Attributes of Digital Disruption</th>
<th>Digital Disruption Outcomes and Activities</th>
<th>Changes from Traditional Competitive Dynamics</th>
<th>Literature Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role of Policies &amp; Regulations</td>
<td>Involve Supply Chain, regulators &amp; ecosystem in co-creating.</td>
<td>Government Sets Policy &amp; Regulations</td>
<td>Tan et al. (2016); Abrell et al. (2016); Karimi &amp; Walter (2015)</td>
</tr>
<tr>
<td>Physical assets/tech. systems</td>
<td>Few assets and common use of ‘rented/leased’ assets. Cloud/infrastructure</td>
<td>Often many proprietary assets. Legacy systems</td>
<td>Warren (2013); (Yoo et al. 2012); Schmidt et al. (2015); Sultan &amp; van de Bunt (2012)</td>
</tr>
</tbody>
</table>

2.5.2.1. Organisational People Constraints
According to Pindek and Spector (2016), the work environment organisational constraints that inhibit or interfere with an individual's performance of job tasks are: significant relationships with behavioural (counterproductive work behaviour), physical (somatic symptoms), and psychological (e.g. emotions and job dissatisfaction) strains and with wellbeing variables (Pindek & Spector 2016). In many organisations, the learning paradox is less apparent because improvement is increased through learning that is not connected to formal learning efforts, but through learning that emerges informally from the social context of work and emotional intelligence of organisational environment (Drory & Meisler 2016).

2.5.2.2. Technological Constraints

Despite the increasing acknowledgement of digital disruptions, many companies struggle to obtain the business benefits following digital disruption (Fitzgerald et al. 2013). Emerging technologies such as social media, analytics and embedded devices require different mindsets and skill sets than previous technology. Organisational disruptive innovation is a reaction to disruptive changes in markets and the enterprise’s operating conditions (Miles & Green 2008). Drivers, such as increased volatility in the demand environment of digital disruption, are categorised as prompts for organisational structure change for innovation, including exploitation of new digital technologies. Direct market pressure has historically driven product differentiation and innovation (Brandellero & Kloosterman 2010). To Fitzgerald et al. (2013) the lack of urgency is the highest contributor to digital disruption disablers among respondents in organisations; organisations with long histories of success are also susceptible to complacency and institutional challenges such as legacy technology, are also among disablers of digital technologies.

2.5.2.3. Regulatory and Policies Constraints

Energy policy is one of the most pressing issues faced by the Australian energy sector during this current energy transition period; the environmental and economic stakes for getting policy right are substantial according to Byrne (2017). Faced with rapid technological disruptions, securing an affordable, reliable and environmentally responsible energy sector highlights a critical energy trilemma and achieving these objectives is a huge challenge for Australian policy makers (Byrne 2017).

Research into policy related limitations showed that the following constraints were significant: the intersection of regulatory interference; financial market considerations; market price caps (Simshauser 2009; Nelson, Nelson & Simshauser 2014; Simshauser & Ariyaratnam 2014); overlapping climate change policies contributed to significant regulatory interference (Nelson et al. 2010) and various constraints of
energy prices within energy-only markets (Besser et al. 2002; Oren 2003; de Vries 2003; Wen et al. 2004; Finon & Pignon 2008; Joskow 2008; Simshauser 2009). In navigating the uncertainties, the energy organisations’ decision makers will have to proactively respond with innovative business strategies that are within their control at the same time, regulations need to be proactive and dynamically responsive to data and trends (Kaal & Vermeulen 2017).

2.5.2.4. Change Capabilities and Decision making Capabilities Constraints

The literature discussed above highlighted the importance of the organisation’s management in responding to disruptive technology through dynamic capabilities, change activities and core rigidities such as improving the capacity of the organisation to change. Targett (2016) supports this by emphasising the importance of organisational flexibility and agility, which are components of dynamic capability.

Benamati and Lederer (2001, 2000) in respect to changes management purport that decision makers must create and lead a new type of digitalised organisation that acts as a change agent for flexibility and adaptability (Gottschalk & Taylor 2000; Drucker 1974). Changing technologies and economic conditions lead to unanticipated needs or new employee skills, user training, the reallocation of personnel and resources, and the need to merge old technology, all of which impact carefully prepared plans and budgets (Patten, Fjermestad & Whitworth 2009; Byrd et al. 2004; Reich & Nelson 2003). Lee and Krayer (2004) concluded that organisations that drive change are more successful than organisations that only react to change. Instead of reacting to change, decision making management must create and lead a new type of IT organisation that acts as a change agent and sets an example for digital business strategy and adaptability (Asemi & Safari 2011; Gottschalk & Taylor 2000; Rockart, Earl & Ross 1996; Drucker 1974).

Zeleny (2008) in his seminal work describes the essential dynamics of decision making as a process comprising of criteria, gradual, impartial and objective evaluation activities and measures characterised by a performance score or a range of scores that is most preferred by a decision maker. Most difficult to measure is when most preferred scores are infeasible when there are explicit or implicit constraints preventing achievement of an ‘optimal’ performance. To be competitive, decision makers cannot wait for others to fail before taking action or make incremental changes to embrace digital technologies for rapid change. It requires senior management to understand the benefits of smarter and timelier decision making (White 2011). As Digital disruption has major impacts on decision making and its digital capabilities (Srivastava & Shaines 2015), embracing digital maturity will significantly depend on the
extent to which an organisation is able to effectively reconfigure its digital assets for dynamic environments (Bhatt & Grover 2005) and knowledge sharing for dynamic capabilities (Sabherwal, Hirschheim & Goles 2004).

Decision speed, allocation of time and digital resources for change activities will allow fast, low-cost action to exploit and overcome a changing list of opportunities and threats (Bryson 2012). The contribution of Digital resources to organisational capabilities leads in part to positive impact on customer service capability (CSC) that will determine the performance of a firm (Mollick 2012). Westerman, Bonnet and McAfee (2012) and Gimpel and Westerman (2012) recommended decision makers embrace digital maturity to create processes that combine innovative technology with human insight to allow humans to be creative and use technology to test their ideas and leverage digital technologies. To achieve major transformative effects from new technology, to enable new forms of human collaboration and commerce networks, executives need to lead the process and make sure they’re managing and coordinating across the company (Westerman, Bonnet & McAfee 2012; Brynjolfson & McAfee 2012).

2.5.3. Disruptive innovation – the Drivers of the future

Seba (2018) describes the disruptive innovations that are changing the atom-based energy industries as bit and electron-based technologies embedded within digitalisation releasing substantial disruptive potential across industries (Panetta 2016) impacting the future of the energy industry. These include AI deep learning, machine learning, neural networks, natural language processing and advanced systems that adapt, learn predict and operate autonomously (Kulkarni & Padmanabham 2016; Kaplan 2017). Henfridsson, Mathiassen and Svahn (2014) highlight the importance of embracing new technologies progressively for the future as renewable energy continues to lower costs from solar cells that is further disrupting the future of the energy industry (Lejumaan 2012). A good understanding of the attributes, activities and outcomes of digital disruption is essential for incumbents in business strategies for the future against a backdrop of rapid adoption of smart technologies, energy policy changes, and consumer choices. (Smith & MacGill 2016). Table 2.3 below shows digital disruption attributes activities and outcomes with literature and a comparison to traditional dynamics.

2.5.3.1. The advancement of disruptive technologies
The evolution of organisations since the foundational theories of organisational design were first postulated means organisations can no longer operate as standalone companies but must move to meta-organisations (Gulati, Puranum & Tushman 2012), particularly in dealing with uncertainty and globalised connectivity.

Organisations evolved and entered into collaborative relationships, network firms, business ecosystems and inter-organisational relationships that span geographies, industries and value chains to form meta-organisations (Gulati, Puranum & Tushman 2012). Today, enterprise organisations have evolved and involve multiple organisations, communities of non-contractually linked individuals to collaborate as a complex organisation called a meta-organisation (Galbraith 2012). This increased interest in organisational design is triggered by a range of disruptive challenges such as agility (Doz & Kosonen 2008), resilience (Gulati 2010), customer-centricity (Galbraith 2012), social responsiveness (Kanter 2009), balancing innovation and efficiency (Tushman & O’Reilly 1997; Brown & Eisenhardt, 1997; Gulati & Puranam, 2009) and environmental sensitivity (Henderson & Newell, 2011). The rise of strategic outsourcing more broadly and business process outsourcing more particularly, is another indicator of the strength of this phenomenon.

A second manifestation is that the Internet and related technologies have become tools of both knowledge production and dissemination that hasten the recognition that actors outside the traditional boundaries of the firm possess unique knowledge that may be applicable within the enterprise (Jeppesen & Lakhani 2010; von Hippel 2005; Benkler 2006; Vanhaverbeke 2006; Chesbrough 2003). The growing capacity for geographic work dispersion facilitated by communication and information technologies is an important determinant of multi-dimensional organisations (Galbraith 2012). Furthermore, catalysed by new digital technologies and falling communication costs, many organisations have developed sophisticated practices that enabled division of labour and the reintegration of efforts across borders in ways that were inconceivable a few decades ago.

Table 2.3: Future Drivers – Digital Disruption Attributes Outcomes and activities adapted from Moeller et al. (2017)

<table>
<thead>
<tr>
<th>Attributes of Digital Disruption</th>
<th>Digital Disruption Outcomes and Activities</th>
<th>Traditional Competitive Dynamics</th>
<th>Literature Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enablers of disruption</td>
<td>Use of digital platforms by Start-Ups or established organisations.</td>
<td>Technology based Start-Ups.</td>
<td>(Berkovsky, Freyne &amp; Coombe 2012)</td>
</tr>
<tr>
<td>Organisational structure of disruptor</td>
<td>Agile virtual organisational structure, close collaborative networks. Co-creation process &amp; collaborative ecosystem leads to establishment and growth.</td>
<td>Independent organisations competing against each other</td>
<td>Tan et al. (2016); Rohrbeck et al. (2013)</td>
</tr>
</tbody>
</table>
Role of network and digital platforms

Digital Platform allows others to create, scale digital services & processes, create cost value.

New Product categories the traditional focus.

Bradley et al. (2015)

Role of invention.

Recombine / reshuffle / automate / outsource existing processes.

Use of technology drives innovation / technology advancement

Gulati & Kletter (2004); Srikanth & Puranam (2010)

Value creation

Value distributed across network fusing multiple sources of value, cost, experience, and platform.

The disruptor benefits most from the disruption

Bradley et al. (2015)

Big data

Artificial Intelligence & Automation

Opportunity to harness big data as a disruptive strategy.

Big data usage not a priority and not easily used.

Lawrence, Suddaby & Leca (2009); Barrett et al. (2015); Kaplan (2017)

Digital Network Economy

Connectedness allow potential better use of resources e.g. in sharing economy concepts.

Not concerned with sustainability, drives performance and costs.

Tan et al. (2016); Gulati, Puranum & Tushman (2012)

Innovative Products and Services

Often services or large part of service (intangible). Functions created by software/ electronic devices. Engaging users/customers.

Involves some technological invention/innovation.

Kenney, Rouvinen and Zysman (2015); Evans (2011)

Speed of Scalability

Fast building or penetration of market (scaling). Exploiting digital channels. Speed of downsizing

Slow market penetration, logistics restrains downsizing

Morrison & Potts (2008)

Role of Technology

Innovation driven technology, competitive advantage customer involvement and new business models.

High technology investment, high risks

Henfridsson, Mathiassen & Svahn (2014); Panetta (2016); Kulkarni & Padmanabham (2016); Ji & Zhang (2016); Lawrence, Suddaby & Leca (2009); Barrett et al. (2015); El Sawy & Pavlou (2008); Bharadwaj et al. (2013)

2.5.3.2. Evolution of Computing and Automation

The science of computing began as the study of hardware in the 1950s and 1960s, progressed to commercial information processors in the 1970s, to personal computers in the 1980s, and then to computers as social communication tools in the 1990s (Yates & Van Maanen 2001). The 2000s have become the decade of social computing, where software serves not just people but social groups with systems such as email, chat rooms, and bulletin boards. Today’s digital era has seen disruptive technologies (Malone, Laubacher & Dellarocas 2009), digitised tools that evolved from computing (Faraj & Johnson 2011; Lytinen, Yoo & Boland Jr 2016), progressing to microblogging platforms like Twitter that have consistently been appropriated for use during mass disruption events by those affected (Messina 2007), digital volunteers (Starbird & Palen 2011), and emergency response organisations (Sarcevic et al. 2012).

Exponential advancements in the price/performance capability of computing, storage, bandwidth, and software applications driving the next generation of digital technologies delivered through cloud computing are increasingly adding pressure on customer service delivery (Setia, Venkatesh & Joglekar...
In researching a case of disruptive innovation in cloud computing, Sultan and van de Bunt (2012) identified the importance of embracing new innovations such as cloud computing, which enables organisations to view their resources and prepare for future disruptive innovation. Innovations, in the form of disruptive innovation or sustaining innovations, may or may not prove to be beneficial to an organisation (Sultan & van de Bunt 2012). It is crucial for firms to reassess their digitalisation strategy, from that of a functional-level strategy subordinate to business strategy, to a fusion of IT strategy and business strategy.

An impact of digital disruption is that successful disruptors are able to use innovative technologies (e.g. data analytics, machine learning and artificial intelligence) in collaborative filtering of information of individuals and collective actions of a large number of people within an interaction platform or space to further process information produced by that same group (Malone, Laubacher & Dellarocas 2009). Mendoza et al. (2010) provided evidence that the social media community collaboratively acts to identify and filter bad information. Kwak et al. (2010) assert that social context, which consists of social interactions within social media (friend relationships, group membership, lists), can work as a collaborative filter to identify the value of information, such as Twitter being used as a mechanism for communication during crisis events (Starbird & Palen 2010). According to Skarzuaskiene, Tamosiuandaite & Zaleniene (2013), social technologies such as Twitter, Facebook and LinkedIn have revolutionised the concept of knowledge sharing and improved decision making. The evolution of computing has resulted in many different technologies, some of which are capable of conveying data-information-knowledge while others are better suited for convergence-related tasks such as decision making (Skarzuaskiene, Tamosiuandaite & Zaleniene 2013).

Today’s cutting-edge technology currently allows businesses not only to look at their historical data, but also to predict behaviour or outcomes in the future (Pyle & San Jose 2015). The future of machine learning, ushering in a new era of human–machine collaboration, will require enormous change in the way work and interactions will be conducted. Pyle and San Jose (2015) highlights that access to troves of useful and reliable data is required for effective machine learning, and while the machine identifies patterns, the responsibility of the human translator will be to interpret them for different microsegments and to recommend a course of action or decision making. Advances in artificial intelligence (AI) (e.g. robotics) will have substantial social consequences and transform modern life by reshaping industries such as transportation, health, science, finance, and the military (Stone et al. 2016; Domingos 2015; Bostrom 2014). Self-driving technology might replace millions of driving jobs over the coming decade. In addition to possible unemployment, the transition will bring new challenges, such as
rebuilding infrastructure, protecting vehicle cyber-security, and adapting laws and regulations (Calo 2015). New challenges, both for AI developers and policy makers, will also arise from applications in law enforcement, military technology, and marketing (Jiang et al. 2015). Preparation for and awareness of these challenges, adaptation of public policies, and accurate forecasting of transformative AI will be invaluable (Brynjolfsson & McAfee, 2012; Calo 2015).

Leaders have to manage and be aware of the trends and timing in computing hardware (Nordhaus 2007), task performance (Grace 2013), the automation of labour (Brynjolfsson & McAfee, 2012) as well as the social and ethical impacts of Artificial Intelligence.

2.5.3.3. Innovative Technologies

In 2018 disruptive technologies have created a technological landscape of greater intensity of uncertainty. Glasgo, Hendriksen and Azevedo (2017) suggests that digital disruption brought about rapid innovations, and service innovations (Miles & Green 2007), with technical changes of social computing, cloud computing creating cheaper, self-managed free applications within the connectivity platform of networks (Morrison & Potts 2008) and embedded systems like the recently termed ‘Internet of Things’ (IoT) that has led to rapid digitalisation of products and services. This is supported by research by Kenney, Rouvinen and Zysman (2015) and Evans (2011) who suggest that enterprises should examine the accelerating growth of the Internet of Things (IoT) as devices proliferate, enabling the cloud to connect with and sense the ambient world in order to make intelligent real-time decisions. Companies have the opportunity to capture additional value by delivering intelligent sensors that create a more efficient system by transmitting not just raw sensor data, but rather information and context to the cloud (Gerstberger et al. 2016; Kenney, Rouvinen & Zysman 2015).

The power industry has been interested in the use of Blockchain technology as a database for digital cryptocurrency where utilities and consumers could produce and sell electricity (Basden & Cottrell 2017). Due to its transparency and shared nature, the blockchain is a trustworthy source of information and has great potential to be used outside the finance industry (Collomb & Sok 2016). Basden and Cottrell (2017) suggest that Blockchain will become a solution to improving centralised legacy systems of large power plants and microgrids powered by distributed energy resources such as solar power. New technologies e.g. Smart Grid advancements apply digital technologies to the grid and enable real-time coordination of information from generation supply resources, demand resources and distributed energy resources (DER) and battery energy systems have the ability to shift the time at which energy produced from renewable sources is consumed.
According to recent research by CSIRO for the Australian Energy Market Commission, energy storage holds great potential to benefit the Australian electricity system and will significantly affect system operation as well as the experiences of all stakeholders. Cavanagh et al. (2015) believe that this will occur by using smart energy storage technologies that are most likely to see mass uptake over the coming years.

Evans (2011) suggest that disruptive technologies have great impacts via the Internet affecting all aspects of education, communication, business, science, government and humanity. This disruptive technology entails disruptive innovation, which can be pervasive and radical (Lyttinen & Rose 2006), that threatens a traditional business model (Lucas & Goh 2009), technological ideas that dramatically change work processes (Sherif et al. 2006; Elie-Dit-Cosaque & Straub 2011) and digital service innovation that transforms value networks (Akram & Åkesson 2011). The Internet, a network connected with added security, analytics and management capabilities (Faraj & Johnson 2011) together with the web providing an interface that makes the information flowing across the Internet usable (Evans 2011) offering the opportunity to develop capabilities and innovate new business models (Chesbrough 2010) to leverage strong customer relationships. Thus, this confirms data, connectivity and digital platforms play an important role in driving the next phase of innovative technologies and disruptive change.

2.5.4 External Collaboration Activities

Digitalised organisations and institutions enable the coordination, collaboration and cooperation of external collaborators in the value creation process that are critical to managing disruptive change and to engage in work to maintain, disrupt and create institutions (Lawrence, Suddaby & Leca 2009), which is a vital part of innovation.

External collaborations range from modification of ‘value-in-use’ (Chandler & Vargo, 2011) and its amplifications to include ‘value-in-context’ (Edvardsson et al. 2011), to the exploration and further explication of the co-creation of value (Payne et al. 2008), value propositions (Chandler & Lusch 2015), and brands (e.g. Merz et al. 2009; Payne et al. 2009). Other external collaborations range from exploring the implications of a broader ecosystems perspective (Vargo & Lusch 2011), to the use of S-D logic as a foundation for service science (Spohrer & Maglio 2008), and its application in logistics (Randall et al. 2010), information technology (Yan et al. 2010), and hospitality management (Shaw et al. 2011) among endless other elaborations, applications and amplifications, come together as ecosystems to create
value. Table 2.4 shows the relevant digital disruption attributes activities and outcomes for ecosystem collaboration concepts and themes adapted from Moeller et al. (2017).

Table 2.4: External Collaboration – Digital Disruption Attributes Outcomes and activities adapted from Moeller et al. (2017)

<table>
<thead>
<tr>
<th>Attributes of Digital Disruption</th>
<th>Digital Disruption Outcomes and Activities</th>
<th>Changes from Traditional Competitive Dynamics</th>
<th>Literature Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role of disruptor in the value Chain/network.</td>
<td>Uses technology to reorganise existing value chain/network connecting supplies with customers. Value chains to form meta-organisations.</td>
<td>Creates a new value chain/network</td>
<td>Amit &amp; Zott (2001); Hedman &amp; Kalling (2002); Laaksonen &amp; Peltoniemi (2016); Gulati, Puranum &amp; Tushman (2012); Arino &amp; Reuer (2004); Gulati (2007); Mendoza et al. (2010)</td>
</tr>
<tr>
<td>Connected Network EcoSystem</td>
<td>Every aspect of customers, firms and equipment becomes connected.</td>
<td>Competitors do not connect with others</td>
<td>Kenney, Rouvinen &amp; Zysman (2015).</td>
</tr>
<tr>
<td>Role of Collaboration / Social Media</td>
<td>Involvement of Service providers, Supply Chain, Customers regulators &amp; ecosystem in co-creating through the ability to manipulate data.</td>
<td>Non-sharing competition</td>
<td>Tan et al. (2016); Abrell et al. (2016); Karimi &amp; Walter (2015); Lawrence, Suddaby &amp; Lea (2009); Barrett et al. (2015); Barrett, Faraj &amp; Faik (2017); Warren (2013); McGrath (2010); Skaržauskiene, Tamosiunaite &amp; Zaleniene (2013)</td>
</tr>
</tbody>
</table>

2.5.4.1. Digital Network Economy Collaborations

With the rise of digitisation and emphasis on data and connectivity, the use of digital technology in collaboration allows for a vastly broader network of participants who can accomplish much more via digital network collaboration or peer-to-peer sharing than as individuals (Tan et al. 2016). The introduction of the internet and associated communicative infrastructure enables the collaborative consumption initiative to become more widely accessible (Sawhney et al. 2005) and as a consequence, enable rapid growth of the existing ecosystem (Tan et al. 2016). This advancement has significantly altered the nature of online community building, collaboration and organisation, enabling geographically dispersed individuals to successfully co-create value for business, social support, or a combination of both (Barrett, Faraj & Faik 2017).

Employing a service-dominant (S-D) theorising approach Tan et al. (2016) demonstrate value co-creation via the empowerment of online marketplace participants in multi-sided digital platforms. Their discussion on collaborative consumption provides discourse on network ecosystems and economy, establishing a shared vision, customer involvement in new technologies and involvement of agencies/service providers/supply chain (Tan et al. 2016).
The involvement of digitalised organisations is integral in the management of digitally disruptive change by providing the building blocks for increasingly complex and interrelated resource-integration and service-exchange activities (Ostrom 2005). The effects of digital collaboration, while vastly beneficial to consumers, also heavily impact the institutionalised supply chain model (Boyaci & Gallego 2004), reshape core business models and affects employment amongst knowledge workers (Loebbecke & Picot 2015).

Botsman (2015) noted four key elements in order for collaborations to occur, which are: critical mass, idling capacity, belief in the commons, and trust between strangers. A review of collaborative economy start-ups found that many have failed due to their inability to satisfy these conditions (Tan et al. 2016). Further, there are significant issues that arise along with the rapid growth of digitalised collaboration, most notably: data security and privacy risks, technical risks, and operational risks (Barrett, Faraj & Faik 2017). While governments introduce regulations for the implementation of IT governance, Barrett, Faraj and Faik (2017) stated that a single organisation, operating globally, ‘is often subject to a variety of IT-related regulations that span multiple country boundaries’.

2.5.4.2. New Business Model: Ecosystems Collaboration – Government agencies/services providers/supply chain (full stack)

Digital technologies allow organisations to work collaboratively as a platform for market research, design and product testing to manufacture sales and delivery (Productivity Commission Australia 2016). Understanding the collaborative approach is important because, in many ways, stakeholders and collaborators continually influence one another due to technology and globalisation. The digital disruption environment creates an innovative and unorthodox collaboration where numerous multi-scale businesses come together for the duration of a single project and form new partnerships for the next project (Warren 2013). The involvement of digitalised organisations in enabling coordination and cooperation in the creation of value is critical in managing disruptive change (Lawrence, Suddaby & Leca 2009). Stakeholder involvement and collaboration enables organisations to share access to resources and obtain competitive advantages (Tan et al. 2016), giving rise to many new business models and improving the relevance of Resource based View (EBV) theory for organisations undergoing disruptive change (Newbert 2008). Value co-creation through customers is also an important aspect of collaboration as customers give critical importance to the value-creating process as co-creators of value (Shaw et al 2011).
Nested and overlapping ecosystems organised around the resource of shared purposes are continually assembled and reassembled to provide the structural properties we understand as social context (Chandler & Vargo 2011; Edvardsson et al. 2011), properties that are fundamental to the value co-creation processes. Some of the resulting ecosystems represent markets (Lusch & Vargo 2014) especially in the digitised world. These are often made up of diverse subsystems, including submarkets, coming together in ways never imagined by most of the digital practitioners to comprise the network economy. Sustainability innovations are characterised by a systemic nature and require that multiple organisations act in an orchestrated fashion to jointly identify opportunities, plan sustainability innovations, new methods and approaches (Rohrbeck et al. 2013). Rohrbeck et al. (2013) highlighted that collaborative business modelling creates a powerful platform for jointly identifying economic and societal value, defining value creation/value capture systems, and planning of complex and uncertain future markets.

2.5.4.3. Customer Involvement Co-creation of new technologies

‘Digital technology is increasingly important in achieving business goals, and its pervasive effects have resulted in the radical restructuring of entire industries’ (Nylen & Holmstrom 2015). According to Barett et al. (2015), there has been a focus on the service side coupled with information and communication technologies, improvements in living standards, expectations and demand for personal services in areas such as healthcare, education and entertainment. These intra and inter organisational structure value networks create new demands by customers for higher quality services.

Nylen and Holmstrom (2015) propose a framework for improving digital products and services through improvement of three key dimensions: Product, Environment and Organisation. These key dimensions aim to improve key areas of customer experience, to better explain the value proposition, identify opportunities from emerging digital technologies and establish new skills through continuous improvisation of digital technology learning (Nylen & Holmstrom 2015). Similarly, Tax, McCutcheon and Wilkinson (2013) propose the ‘service delivery network’ to improve the services towards customer involvement. This concept involves two or more organisations that, from the perspective of the customer, collaborate to provide a connected overall service experience to co-create value (Tax, McCutcheon & Wilkinson 2013; Brodie et al. 2011). Customer behaviour outcomes are generated by customer interactions and value co-creative experiences with other organisations and stakeholders (Yan et al. 2010; Shaw et al. 2011).
Research by Brodie et al. (2011) identified five propositions of customer engagement from a service dominant logic, which show that interactive experience and value creation represent an important concept for service management and marketing. On the other hand, Markham et al. (2010) focuses on new product development to match changing customer demand brought about by digital disruption. However, the process where organisations convert technology concepts into products is not seamless and presents many challenges in commercialising the technology. Hoffman and Novak (2016) describe how consumer Internet of Things are able to revolutionise consumer experience as consumers can actively interact with smart objects, which, in turn, provides a fuller understanding of customer behaviour. In essence, the literature confirms the importance of the role of customer involvement in value creation of new services and products that are critical in managing disruptive change.

2.5.5. Customer Focus as attribute of Digitisation

The rapid rise in digital technologies creates a growth in smarter and more well-informed consumers who require firms to continually adapt to the changing environmental dynamics (Dibrell, Down & Bull 2007; Galliers 2007). Many firms continue to delay internal digital organisational shifts to align with their key external digital trend of customer-centricity, thus limiting their benefits from opportunities to use digital technologies as a fundamental driver for business value creation and capture (Bharadwaj et al. 2013). As Sutcliffe and Vogus (2003) explain, resilient organisations are able to maintain positive adjustments under disruptive conditions. Customer focus is an approach to achieving organisational success by aligning systems, processes and activities around a common purpose. The customer centric organisation facilitates organisational learning and dynamic capabilities to engage with, to provide improved customer experience and to enable value co-creation with customers (Bettencourt, Lusch & Vargo 2014). There is an urgent need for change in customer focus in digital business strategies as new converging perspectives have emerged of focus on customer experience as intangible resources, the co-creation of value and ecosystems relationships (Vargo & Lusch 2011). Table 2.5 shows the attributes, outcomes, activities and literature adapted from Moeller et al. (2017).

<table>
<thead>
<tr>
<th>Attributes of Digital Disruption</th>
<th>Digital Disruption Outcomes and Activities</th>
<th>Traditional Competitive Dynamics</th>
<th>Literature Reference</th>
</tr>
</thead>
</table>
### Role of Collaboration/co-create/Social Media

<table>
<thead>
<tr>
<th>Involvement of Service providers, Supply Chain, Customers regulators &amp; ecosystem in co-creating through the ability to manipulate data and co-create.</th>
<th>Non-sharing competition</th>
<th>Tan et al. (2016); Abrell et al. (2016); Karimi &amp; Walter (2015); Lawrence, Suddaby &amp; Lea (2009); Barrett et al. (2015); Barrett, Faraj &amp; Faik (2017); Warren (2013); McGrath (2010); Lusch &amp; Vargo (2014) Skaržauskiene, Tamosiunaite &amp; Zaleniene (2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>social communication technologies</td>
<td>Competitive advantage is knowledge/engagement with customers/digitally-enabled tools better answer customer needs</td>
<td>After sales services</td>
</tr>
</tbody>
</table>

Yoo et al. (2012) supports this view by recognising the importance of customer-focused services that have personalised interactions and are demand-driven whilst Bernoff (2013) describes how the only sustainable competitive advantage and key drivers (Lukas et al. 2007) in the age of the customer centrality is the knowledge of and engagement with real-time customer intelligence.

Latyshova et al. (2015) highlighted the four contributing elements that change customer interactions orientation (Ramani & Kumar 2008) as firms increasingly customise products and services according to the expectations and demands of customers:

1. **The changing role and behaviour of consumers due to the digitalisation of businesses due to smart disruptive technologies (Prevett 2016).** This includes well-informed consumers and consumer differentiation in digital economy with increasing demands for commodities to meet their higher expectations and requirements for personal fulfilment and satisfaction (Vargo & Lusch 2011). There are increases in consumer opportunities to actively interact with the manufacturers and firms directly or indirectly, for example, through online communities, feedback sites, by co-creation with the producer or with the help of consumer rights organizations (Latyshova et al. 2015). The dynamic connection of people, processes and services through technology platforms, facilitates the customer experience in organisations (Panetta 2016). The analysis by Brodie et al. (2011) revealed that involvement and participation were crucial in facilitating the customer experiences as the role of consumer is changing and the role of organisational digital practitioners is thus recognised as pivotal in achieving customer centrity.

2. **The development of Internet and mobile telephony enables global collaboration, exchange of information and network-based knowledge.** This opens access to information via Internet
browsing and online shopping and to a lot more of other data on consumer’s behaviour (e.g. Google processes tens terabyte of information, producing knowledge related to consumer behaviour on the Internet (Latyshova et al. 2015). Barrett et al. (2015) highlighted the four dimensions of service innovation in a digitalised industry as service concept, client interface, service delivery and technology. These dimensions, similar to the five key areas in the framework by Nylen and Holmstrom (2015) that include customer-focused and develop client interactions through new spheres of knowledge relevant to customised services (Barrett et al. 2015). Lusch and Nambisan (2015) emphasised the importance of service innovation where actor-to-actor networks, resource liquefaction, density creation and resource creation are important aspects to focus on from a service-dominant (S-D) logic.

3. Special digital tools and services such as Google Analytics paves the way to monitor consumer behaviour, evaluate communication effectiveness of websites, and real-time information e.g. Traffic conditions, exchange rates as well as in-depth studies of consumer interactions providing data for machine learning. Day and Hubbard (2003) identified how customer relationships are digitalised as a result of the Internet of Things and that the internet offers opportunities to reduce customer service costs while encouraging customer contact, forging close customer relationships and enabling personalisation of communications (Day & Hubbard 2003). The research from Day and Hubbard (2013) has also found that the internet will complement existing customer channels. Markham et al. (2010) and Christensen (2008) suggests that a digitalisation leader or ‘champion’ is needed in organisational digital transformation to communicate the unique capabilities and many digitally mature firms will leverage the internet to stretch their lead in customer-focus practices. Hoffman and Novak (2016) describe how the ‘consumer Internet of Things’ has the potential to revolutionise the experience of the consumer through the extension and expansion experience from digitalised objects. The framework proposed by Hoffman and Novak (2016) develops a conceptualisation of consumer-object experiences which lead to understanding the nature of customers.

4. Advancing innovative technologies of knowledge-based analytics tools, data mining, machine learning and decision support systems empower companies with opportunities to accumulate abundant information on clients, their actions, shopping preferences, sociodemographic and other characteristics. This knowledge on consumer behaviour enables better decision making, co-creation and altered consumer behaviour (Latyshova et al. 2015). Data analytics is another tool by which the customer experience may be impacted positively but also opened up the
possibilities of lower customer satisfaction. Kiernan (2017) studied one of the platforms in data analytics utilised by energy wholesaler Powercor where customer experience is improved through identification and resolution of potential network reliability issues. The advanced metering infrastructure platform used by Powercor allowed the company to leverage compute-on-demand (e.g. data-analytics platform Vibrato) and led to better customer experience through determining better solutions for their consumers (Kiernan 2017). However, research by Barrett et al. (2015) indicates that the over reliance on self service automation may lower customer satisfaction.

Thus, the age of mass marketing is declining, as product effectiveness maximisation is being replaced by the maximisation of consumer profitability (Latyshova et al. 2015; Rust et al. 2000). Digitalised companies are capable of providing clients with unique value-added services due to the data on their behaviour, individual characteristics and specific requirements. Spencer (2016) also describes the rise of the consumer ‘experience’ economy where products are no longer the centre of capitalism and customer experiences are a key element in products and services. The customer experience capability of self-service and human service channels in organisations (Scherer et al. 2015) is also widely covered in the literature. In the co-creating of customer experience and value, Brodie et al. (2011) describes the importance of dynamic and interactive customer as potential power of consumers is great, and computer-communications technology offers the means to help realise that potential engagement (Rakic & Rakic 2015).

Lush and Nambisan (2015) highlights the importance of focusing on customers as confirmed by Tax, McCutcheon and Wilkinson (2013) to derive further insights for customer service innovation, namely:

- service ecosystems where actors create and recreate through their effectual actions offering an organizing logic for the actors to exchange service and co-create value
- service platforms which enhance the efficiency and effectiveness of service exchange by liquefying resources and increasing resource density facilitate access to appropriate resource bundles and serve as the venue for innovation
- Value co-creation which views value as co-created by the service provider and the service beneficiary (e.g. customer) through resource integration and indicates the need for mechanisms to support the underlying roles and processes.

The literature captures the essence of customer focus concept, that as the rapid growth of global communications network advances, more disruptive innovation will be intangible, digitally-enabled, and
created or co-created around social phenomena (Lyytinen, Yoo & Boland Jr 2016; Lusch & Nambisan 2015). Furthermore, value creation by companies offer a better customer service value chain, as well aligned interactive platform in delivering seamless customer experiences to customer demands and market needs.

2.6 Managing Disruptive and Innovative Change

In the context of digital disruption, the disruptive change function within a disruptive change activity is often discussed where a service-dominant (S-D) theorising approach is adopted. This is because understanding organisations, markets and society, which can work together through development of a service ecosystem, platform and value co-creation, can improve digital disruption outcomes (Tan et al. 2016). An important factor considered in the discussion by Tan et al. (2016, p. 6) is ‘how IT enables the co-creation process in a collaborative ecosystem which leads to establishment and growth’. Treating an organisation as a system means that if the parts of the systems are studied independently, they lose their essential properties. Therefore, it is important to consider 'synthetic thinking' or a way of explaining the role of each particular section as function of the whole organisational unit in order to explain systems behaviour (Washington et al. 2014; Allio 2003, p. 19).

When evaluating the impacts of digital disruptions, all changes to any of the organisational components have to be considered and evaluated given that the organisation is a socio-technical system including the interactions of human and technology (Alter 2004; Whitworth, Fjermestad & Mahinda 2006; Whitworth & Zaic 2003). So, if the technological component of the system and the organisational design has evolved then the social component has to change (Patten, Fjermestad & Whitworth 2009). Patten, Fjermestad and Whitworth (2009) argues that whenever any changes are made within any of the components of the enterprise IT organisation, consideration should also be given to understanding and modifying as necessary both the technical aspects and the business processes within the social context of the organisation.

When digital disruption is introduced into a social system such as an organisation, specific outcomes depend on a number of situational factors. This can be adjusted by balancing business strategies, human resources and digital technologies by either changing the social components (Grover & Kettinger 2000) or the technological components and modifying both the technical aspects and business processes within the social context of the organisation. Managing disruptive change in enterprise organisational systems poses various challenges and according to Peszynski (2005), the people-oriented and
organisation-oriented methodologies start adopting a social perspective on systems implementation, recognising that there are social and organisation factors involved with new systems implementation (Gilbert 2015).

The following sections review the influencing factors and environments that may impact digital disruption outcomes in managing disruptive change.

2.6.1. Challenges

Products and services are increasingly embedded with digital technologies, and it is becoming more difficult to disentangle the digital products and services from their underlying IT infrastructures (El Sawy 2003; Orlikowski 2009), it is inevitable that understanding the challenges faced by incumbents is one of the activities to manage disruptive change. Digital platforms enable cross-boundary industry disruptions and thus induce new forms of business strategy (Burgelman & Grove 2007). In addition, theoretical structures for strategy making in nonlinear dynamic and turbulent environments are also emerging (Davis, Eisenhardt & Bingham 2009; Meyer et al. 2005; Pavlou & El Sawy 2010). Essentially, to survive and thrive in dynamic environments, organisations have to take more risks in an ever more crowded global competitive landscape and increasing sophistication of consumers (Taylor & Raden 2007). This has raised the importance of identifying and redesigning processes within the dynamic environment in order to mitigate the risks (Harmon 2015) as one of the digital disruption activities in managing change.

Successful digital disruptors are rapidly changing the landscape of business strategies with finely targeted marketing required for quick response to customer demand and effective response to the increasingly complex business environment (Taylor & Raden 2007). Karimi and Walter (2015) suggested that the interdependence of firms across new embedded networks for collaboration must be addressed in practice otherwise it will pose challenges. Thus, the need to capitalise on emerging disruptive technology motivates enterprises to adapt via generation of novel ideas (Eisenhardt & Martin 2000) as well as differentiated products and service extended through additional content and community interaction.

2.6.2 Opportunities

Digital disruption offers opportunities that entail disruptive innovation, which can be pervasive and radical (Lyytinen & Rose 2006), that threatens a traditional business model (Lucas & Goh 2009), and technological ideas that dramatically change work processes (Sherif et al. 2006; Elie-Dit-Cosaque &
Straub 2011). Girn (2014) suggested that digital disruption is an opportunity with increasing digitisation allowing leverage of strong customer relationships and increased cross-selling within industries, such as the utilities industry, although many incumbents and decision makers realise that digital disruption could bring about threats both real and immediate. In Christensen’s approach (Christensen, Johnson & Rigby 2002; Christensen & Overdorf 2000), digital disruption focuses on the displacement of existing technology. However, according to Mcquivey (2013), digital disruption means finding a better way to meet a fundamental customer need. Not just replacing an existing process or outcome with something similar but replacing it with something better. Digital disruption is different from traditional disruption in that disruptive goals are achieved through the use of cheap and ubiquitous technology, rather than through physical things like assembly lines (Mcquivey 2013).

The current global business landscape is moving to a digitally disruptive economy, a world in which everyone has the tools to bring their ideas to the market, test them, refine them, and eventually disrupt some other technology (Hermsen et al. 2015; Mcquivey 2013). This is fuelled by a massive growth of mobile applications development and user uptake (Rivera & Van De Meulen 2013) that is driven by the demand for entertainment, personalised particular service, informational purposes (Xu et al. 2011) and digital-enabled innovations like Global Positioning System (GPS) and Near Field Communication (NFC). Entrepreneurs who induce change to existing value propositions in goods and services can reap a variety of benefits such as improving capabilities (Lucas & Goh 2009) or achieving competitive advantage (Nault & Vandenbosch 2000). This would happen if they successfully implement such technologies, and assuming that the organisation and its users are able to adapt to these changes (Elie-Dit-Cosaque & Straub 2011). The concept of sharing goods, services and ideas by different people and organisations allows industry ecosystem to participate in the collaborative building of value (Bandyopadhyay et al. 2016). Dreiling and Recker (2013) highlights the importance of organisational, technological, individual and process capabilities required to manage the organisational innovation process that would provide firms with a major source of competitive advantage in times of unpredictability and dynamism, disruptive technological and societal changes.

For enterprise organisations today, being prepared for digital disruption essentially requires that an enterprise is equipped to deal with unforeseen adversity, and it is ready to capitalise on unexpected opportunities. It has been suggested that disruption encourages differentiation by embracing complexities and exploiting disruptive technology to extract business value, rendering disruption an enabler (Gharajedaghi 2011). El Sawy et al. (2010) highlighted the contribution of global connectivity and ecosystem’s seamless collaboration (Hamel 2008) knowledge share and user experience that are
transforming organisations, creating value and growing via digital means to new levels of collaboration within the industries to create more opportunities (Franklin et al. 2013).

2.6.3. Enablers

The collective force of technology that’s gradually being integrated and aggregated is creating momentum, enabling disruptions for successful and digitally mature enterprises. Starbird and Palen (2011) suggests that super computers allow combining Big Data, processing data in real-time, simulating environments, and predicting outcomes, to create a huge impact for every industry as well as in sharing information. Starbird and Palen (2011) emphasised the importance of crisis informatics, which is the study of the social, technical and informational concerns of large-scale emergency response, the interactions and concerns of formal responders as well as members of the public (Palen et al. 2010), as disruptive innovations that forms part of citizen journalism (Gillmor 2004). These innovations create ways to seek information about the status of people (Qu et al. 2011) or property (Shklovski, Palen & Sutton 2008), to gather and synthesise information (Qu et al. 2011), to seek or offer assistance (Palen & Liu 2007; Vieweg et al. 2010; Starbird & Palen 2011; Mark et al. 2012), and to coordinate action (Qu et al. 2011; Sarcevic et al. 2012) offering huge opportunities for the future. Fundamentally, disruptive technologies are rapidly evolving from digital to mobile, from open systems to off-platform and from global economy to personalised economy (Riemer et al. 2014).

Enablers can be simulated and forecast with cloud adoption and further commoditising technology services causing the speed of deployment of knowledge and information (Mark et al. 2012; Qu et al. 2011) to increase significantly. In turn, this creates new technological services, speed in integration and empowers enterprises with choices and cloud services on new scales. Services will become smarter, more efficient, and very importantly, more secure by developing disruptive enablers to enhance a broad range of business processes (Srivastava & Shaines 2015; Deterding et al. 2011) for competitive advantage (Werbach & Hunter 2012), to influence users (Charles et al. 2011), motivate (Berkovsky, Freyne & Coombe 2012) and engage users (Barrett, Osborn & Orlikowski 2016). Digital disruption, with multiple service options, is gradually giving way to seamless integration of services as disruptive technology becomes a digital enabler. Businesses become smarter, learning to differentiate faster, and the flexibility will preserve the business value of a digitally mature enterprise.
2.7 Digital Organisational Capabilities, Performance and Outcomes

The discussion in this section highlights various organisational capabilities that need to be considered when looking at characteristics of competitive advantage and performance that can impact digital disruption outcomes. A number of researchers (Teece 2018; Guimaraes et al. 2017), state that the articulation of the attributes that impact digital performance outcomes is essential to help identify relevant strategic resource features for managing digital disruption. They are included in conceptualising the Disruptive Change Capability framework.

Digital strategy is a necessary but insufficient ingredient of success in disruptive environments. A successful digital business strategy includes competitive advantage, better performance and better results (Bolden & O’Regan 2016). Getting results is a crucial step and in these disrupted times that often require profound changes to current business strategies. This takes time whilst relying on the current business to fund the new business development. Margins are likely to be under pressure from new digital technologies’ competitive forces; but are also important to inform critical strategies in new dynamic ventures.

Collins and Clark (2017) highlighted the relationship between the human resources practices and firm performance (sales growth and stock growth) that were mediated through the social networks of their senior decision makers and leaders in creating organisational competitive advantage. Lavalle et al. (2010) reported that organisations using business information and analytics to differentiate themselves within their industry are twice as likely to be top performers. Davenport and Harris (2007) linked digital technologies to economic performance. Westerman, Bonnet & McAfee (2012) applied a standard econometric method to a survey and analysing the financials of a firm’s performance to understand the relationship between the uptake of digital technologies and performance. Thus, decision makers need to continuously monitor their investment in innovative technologies and make suitable adjustments in light of emerging opportunities and threats (Mithas et al. 2013).

Guimaraes et al. (2017) highlighted the fundamental attributes for organizations to achieve positive economic consequences and that sustainable competitive advantage is an important factor in the perception of value of goods and services, considered as elements of competitive differentiation. Thus, the resource-based view of the firm (RBV) recommends that resources should have specific attributes that promote the differentiation of the organization facing disruptive competition yet obtaining a sustainable competitive advantage (Guimaraes et al. 2017). RBV assumes that resources, or ‘stocks of
available factors that are owned or controlled by the firm’ (Amit & Schoemaker 1993, p. 35), and
capabilities (Teece 2018), or the ‘firm’s capacity to deploy resources’ are both heterogeneously
distributed or having widely dissimilar elements amongst firms and imperfectly mobile in character.
These assumptions allow not only for the existence of differences in firm resource endowments that
forms the organisational capability, but also for these differences to persist over time (Stadtler 2015).

Based on these assumptions, RBV scholars hypothesise that: (1) if a firm possesses and exploits
resources and capabilities that are both valuable and rare, it will attain a competitive advantage; (2) if
these resources and capabilities are also both inimitable and non-substitutable, the firm will sustain this
advantage; and (3) the attainment of such advantage will enable the firm to improve its short-term and
long-term performance (Teece 2018; Stadtler 2015; Peteraf & Barney 2003; Eisenhardt & Martin 2000;
Powell 2001; Teece, Pisano, & Shuen 2003) as shown in Fig. 2.4 below

![Figure 2.4: Adapted Conceptual Model of Resource Based View (Newbert 2008)](image)

2.7.1. Resource Capabilities – combination of Value and Rareness

According to Stadtler (2015), if a resource or capability potentially enables a firm to reduce costs and/or
respond to environmental opportunities and threats, it is valuable, and if that firm is able to effectively
deploy such a resource or capability, it will attain a competitive advantage.

Given this argument, it follows that the magnitude of a firm’s competitive advantage will be a function
of the value of its resources and capabilities. In other words, firms whose resources and capabilities are
of marginal value will, at best, attain only minor competitive advantages. On the other hand, firms whose
resources and capabilities are of great value will likely attain sizeable competitive advantages
(Guimaraes et al. 2017). While such logic is straightforward, it nevertheless assumes that the firm is
actually capable of exploiting its resources and capabilities; for, only when potentially valuable resources
and capabilities are effectively deployed can a firm attain whatever competitive advantages those
resources may potentially promise.
A resource (or capability) may have tremendous potential value, but its value can only be realised when combined with a corresponding capability (or resource). Given that resources and capabilities are essentially unproductive in isolation, the key to attaining a competitive advantage is not simply the exploitation of a valuable resource or a valuable capability, but rather the exploitation of a valuable resource-capability combination.

In the process of organisational knowledge creation, the idea of tacit and explicit knowledge is closely related according to Evans and Easterby-Smith (2001). Thus, organisational knowledge creation is a process that amplifies the knowledge created by individuals and develops it as part of the knowledge network of the organisation (Evans & Easterby-Smith 2001). Castaneda and Rios (2007), support this view and provide enhancements of the amplification process. Zollo and Winter (2002) describe organisational knowledge creation as dependent on individuals and groups to accumulate experience, share the knowledge and codify the knowledge to be retained as organisational memory. As such, both individual and group knowledge are separate, distinct and of equal importance as are tacit and explicit forms of knowledge and value resource capability, a component of RBV discussed above.

An examination of the different perspectives regarding the process of organisational knowledge creation is closely tied to the previous discussion of tacit and explicit knowledge; however, it also brings to light a fundamental ontological difference. This difference centres on the role of individuals and groups or collectives in the process of knowledge creation.

These models (e.g. RBV) tend to view knowledge creation as a cycle or spiral similar in many respects to an organisational learning cycle. The most popular approach in existing models of knowledge types in organisations is to treat organisational knowledge as a single category that comprises knowledge embedded primarily in routines as discussed previously (e.g. Castaneda & Rios 2007; Bontis, Crossan & Hulland 2002; Windeknecht & Delahaye 2004; Prungkiat, Pratoom & Raksong 2015). In the few cases where knowledge types are differentiated, these tend to either focus on the individual or to be a mix of individual, group and organisation knowledge types. In contrast, Evans and Easterby-Smith’s (2001) research indicates that it is possible to identify and study three distinct types of organisational knowledge: systemic, socio-political and strategic.

According to Robey, Boudreau and Rose (2000), knowledge learned through experience will guide future action. Older knowledge may be irrelevant to contemporary problems and may create a barrier to the acquisition of more relevant knowledge based on more recent experience. Robey, Boudreau and Rose
(2000) identified that experience plays an important role in change implementation success; learning is accomplished through both formal training and participation in practice; organisational knowledge can be achieved by learning from other organisations; and that learning new technologies is a dynamic process characterised by relatively narrow windows of opportunity. Furthermore, learning is enhanced through systems that support communication and discourse; and that information technologies have the potential to both enable and disable organisational learning (Robey et al. 2000; Chiva, Ghauri, & Alegre 2014, p. 689).

As noted above, to attain a competitive advantage, firms must achieve a cost level, exploit a market opportunity, and/or neutralise a threat that their competitors cannot. Given the novelty associated with such accomplishments, Stadtler (2015) reasons that firms are unlikely to achieve these ends if the resources and capabilities they exploit are widely available. Instead, competitive advantage likely derives from the exploitation of resources and capabilities that are rare or possessed by some number of firms in an industry that is small enough to prohibit perfect competition (Stadtler 2015).

Firms need not necessarily possess rare resources and rare capabilities in order to attain a competitive advantage. If, for example, a firm possesses a capability that no other firm does (such as a patented chemical process), it is not necessary for it to possess equally rare resources in order to translate the latent value capability into a competitive advantage. If the resource-capability combination that a firm exploit is rare, then it ought to attain a competitive advantage (Guimaraes et al. 2017). Moreover, the rarer these combinations are, the greater the firm’s advantages will be.

2.7.2. Competitive Advantage Capabilities and Performance

Though the terms competitive advantage and performance are often used interchangeably, the two constructs are acknowledged to be conceptually distinct (Powell 2001) and an important factor in the perception of goods and services value (Guimaraes et al. 2017). Whereas a competitive advantage is generally conceptualised as the implementation of a strategy not currently being applied by other firms that facilitates the reduction of costs, the exploitation of market opportunities, and/or the neutralisation of competitive threats (Stadtler 2015). Performance is generally conceptualised as the rents a firm accrues as a result of the implementation of its strategies (Chesbrough 2010; Pisano 2007). According to Peteraf and Barney (2003), a firm that has attained a competitive advantage has created more economic value (the difference between the perceived benefits of a resource-capability combination and the economic cost to exploit them) than its competitors where competitive advantage is defined by
Guimaraes et al. (2017) as a constant pursuit of enterprises, because being in a privileged position, presenting unique features of services and/or products raises and maintains this position considering the enterprise's relationships with other peers.

It is suggested that economic value is generally created as superior benefits tend to enhance customer loyalty and perceived quality (Zou, Fang & Zhao 2003), then a firm that can exploit its resource-capability combinations to effectively attain a differentiation-based competitive advantage. Furthermore, because a superior cost structure enables greater pricing flexibility as well as the ability to increase available surplus (Barua et al. 2004; Porter & Millar 1985; Zou et al. 2003), a firm that can exploit its resource-capability combinations to effectively attain an efficiency-based competitive advantage should be able to improve its performance compared to competitors.

In summary, while it is expected that competitive advantage and performance will be correlated, the two constructs are clearly theoretically and empirically distinct. Whereas competitive advantage refers to the economic value that has been created from the exploitation of a firm's resource capability combinations, performance refers to the economic value that the firm has captured from their commercialisation. Capabilities that are valuable, rare and costly to imitate or are nonsubstitutable are core competencies for performance that can lead to competitive advantages for the enterprise over its rivals (Gaziulusoy & Twomey 2014).

2.7.3. Dynamic Capabilities

The seminal work of Teece, Pisano and Shuen (1997, p. 516) defined the concept of ‘dynamic capabilities’ as ‘the firm’s ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments’ and that business models, dynamic capabilities and strategy are interdependent (Teece 2018). While this suggests something of what dynamic capabilities are for and how they work, it leaves open the question of where they come from. Zollo and Winter (2002) propose an alternative definition where a dynamic capability is a learned and stable pattern of collective activity through which the organisation systematically generates and modifies its operating routines in pursuit of improved effectiveness.

Although Hoffman and Novak (2016) suggests that organisations are able to meet changing consumer behaviour resulting from digital disruption through flexibility, Teece (2018) concluded that the strength of a firm’s dynamic capabilities determines the speed and degree (and associated cost) of aligning the
firm’s resources including its business model, with customer needs and aspirations. To achieve this, organisations must be able to continuously sense and seize opportunities, and to periodically transform aspects of the organisation and culture so as to be able to proactively reposition to address threats and opportunities as they arise (Teece 2018). Dynamic capability is exemplified by an organisation that adapts its operating processes through a relatively stable activity dedicated to process improvements. Dynamic capabilities arise from learning; whereby organisational resources are able to unlearn and relearn as they constitute the systematic methods of the firm for modifying operating routines. Lucas and Goh (2009) described the importance of dynamic capabilities in their framework where disruptive technologies have damaged the photographic film company, Kodak.

Another component of strong dynamic capabilities involves leaders recognising their ability to shape the environment to their advantage through innovation, social and political action (Herrmann, Sangalli & Teece 2017). The ability to influence attitudes and government action through communication and information to a firm’s advantage adds a new dimension to dynamic capability as well as the ability to visualise the future. Thus, being a disruptor of an industry itself; using innovative technologies tools such as data analytics, machine learning, Artificial Intelligence in order to have comprehensive insights, being in the right networks, and having the knowledge of an imminent environment is conducive to a business success (Teece, Peteraf & Leih, 2016).

The literature have highlighted that the development of strong dynamic capabilities irrespective of whether in a family business, a start up, or a tech giant comes down to the ability of management to astutely build, select and orchestrate assets, using the sense the market sentiments, seize the opportunities and transform the digital maturity mantra (Herrmann, Sangalli & Teece 2017) as an opportunity to capitalise on digital disruption performance outcome. Dynamic capabilities require that companies stay entrepreneurial as they scale, constantly scanning the periphery of their ecosystems and their marketplaces to identify emerging threats and opportunities. This unique knowledge of markets trends and regulatory developments, consumer behaviour and the opportunities of technological and business models, requires networking, connections within the industry ecosystems as well as academia and government. Thus, it is important for leaders to venture out, connect across boundaries, organisational and geographic, to gather information and ideas from the outside to augment the dynamic capabilities of the firm (Herrmann, Sangalli & Teece 2017).

The literature shows firms with higher returns also adopt complementary organisational practices that produce productivity and performance premiums (Aral & Weill 2007; Caroli & Van Reenen 2001). Ideally these firms would have a highly skilled workforce with digitisation knowledge, increased organisational...
learning, agile, digitally innovative and empowered with more decision rights (Caroli & Van Reenen 2001). Kautz, Johansen & Uldahl, (2014) demonstrated that positive impact of agile management where individual and collective mindfulness are key characteristics of agile practice (Matook & Kautz 2008) is critical in dynamic environments.

Changing technologies and economic conditions require new employee skills, user training, reallocation of personnel and resources, and the need to merge older embedded technologies with new technologies, which impacts budgets (Byrd et al. 2004; Reich & Nelson 2003). Other researchers, such as Laaksonen and Peltoniemi (2016), discussed the need for change and dynamic capabilities for a firm performance. They proposed the use of four types of operationalisations: manager’s evaluations, financial data, company’s experience/actions/performace and manager or employee’s experience, actions and performance (Laaksonen & Peltoniemi 2016), which, when refined, improve the performance and understanding of managing change within firms to promote change goals.

The role of dynamic capabilities in creating value in a digitalised disruptive environment is also stressed by other researchers (Amit & Zott 2001; Hedman & Kalling 2002). The perspectives from these researchers include the value chain analysis, innovation theory, transaction cost theory and strategic process approaches to understand the digital disruption mindset of firms from an active context in attaining organisational competence (Amit & Zott 2001; Hedman & Kalling 2002; Laaksonen & Peltoniemi 2016). The idea of disruptive innovation theory discussed by Teoh et al. (2016) and Karimi and Walter (2015) focuses on how change in an organisation is important in responding to disruptive innovations. The disruptive innovation theory is closely related to change management in organisations where changing, extending and adapting a firm’s existing resources, processes and values are key in determining the performance in response to digital disruption (Karimi & Walter 2015).

A new enterprise organisational model would require decision makers to balance disruptive innovation with efficiency while dealing with the turbulence and uncertainties in today’s disruptive and competitive ecosystems.

2.8 Conceptualised Enterprise Organisation Disruptive Change Capabilities (DCC) Framework

The literature review identifies the potential benefits and contribution of organisational learning (in Section 2.5.1.3.) to competitive advantage in digitally disruptive business environments. The literature
also questions if disruptive change capability can be analysed and introduced systematically within the
digital enterprise organisation. The author has identified specific characteristics and attributes of Digital
business Strategies involving dynamic capabilities (Karimi & Walter 2015), organisational learning
(knowledge, experience and active context), resource based view (RBV) capabilities (Newbert 2008;
Bohnenkamp 2013; Lopez-Cabarcos et al. 2015; Stadtler & Lin 2017) and its aspects (Value Capability,
Rariness Capability, Competitive Advantage). These are all attributes that decision makers could deploy
within the digital enterprise organisation to improve the management of disruptive change. The
literature review also identified gaps in various concepts as indicated in the table 2.1, through to table
2.5 as adapted according to Moller et al. (2017). The literature review also highlighted the importance
of customer centricity, new agile business models and ecosystems collaboration within digital business
strategies in managing disruptive change.

Various combinations of the specific aspects of Resource Based View (RBV) capabilities of Value
Capability, Rareness Capability, Organisational Learning Active Context, Knowledge and Experience have
been shown to benefit the enterprise in the form of ambidextrous organisations (O’Reilly & Tushman
2013; Lee et al. 2006; Birkenshaw & Gibson 2004; Gibson & Birkenshaw 2004) together with the ‘Push
and Grow’ change management model (Sugarman 2001) and the 'Triple-A' form of management (Lee &
Krayer 2004).

The literature demonstrates how organisational learning can be a strategic asset to manage enterprise
disruptive change including digital resources, digital capabilities and broad strategic schemas, while also
facilitating entrepreneurial activities and innovations (Volberda 1999). ‘Dynamic Contingency Theory’
considers the potential of the organisation to maintain a 'dynamic fit' between the organisation and its
environment. On the other hand, ‘Organisational Learning Theory' describes how an organisation needs
to be reflective and develop an organisational learning system that maintains a dynamic balance
between single-loop and double-loop learning. One form of organisational learning results from
detecting when something goes wrong, correcting it, and then adapting to prevent future problems
(Carlsson & El Sawy 2008; El Sawy et al. 2010; Argyris & Schon 1978). The above concepts demonstrate
how these aspects of Digital Strategies, Organisational Learning, RBV and management theories can
focus on dealing with digitally disruptive and unexpected change (Whitworth & Zaic 2003). Therefore,
influential variables such as network ecosystems collaboration, progressive innovation, customer focus
aspects and strategic context of change, are omitted or ignored. Within this context, and in order to
cover this gap in academic literature, this study aims at creating a theoretical framework which covers
the various attributes mentioned in the above literature.
A framework is defined as a set of assumptions, concepts, values and practices that constitute a way of viewing reality (Whitman et al. 2001). A framework is useful to provide a means of explanation, focus for discussion, basis for analysis and design, and a baseline for process improvement (Whitman et al. 2001). The Disruptive Change Capability framework is a similar approach, which can be used to provide a common understanding of managing enterprise organisations’ digitally disruptive changes and to determine how to achieve future digital disruption benefits and create value for the enterprise.

Since digitally disruptive changes are continuous, most decision makers agree that organisational learning, ecosystems collaboration and digital transformation (Riemer et al. 2014) will provide competitive advantage and improved performance (Guimaraes et al. 2017). Therefore, the enterprise organisation is digitally disruptive and digitally mature when the organisation is able:

- To anticipate both digital disruption and disruptive changes, allowing time to prepare for Digital strategies involving dynamic capabilities, internal and external disruptions through progressive digital innovations (Active Context) and strategic disruptive technologies and resources planning (Active context)
- To implement digital innovation plans effecting quick response to future disruptive changes whilst managing current ongoing business operations or being a disruptor of the industry itself (Rareness Capability)
- To identify opportunities and enablers from the disruptive changes that can be leveraged or to react quickly to potential challenges and to capitalise on digital enablers for enhanced performance (Value capability).
- To learn from previous experiences and improve the disruptive change capability to innovate and be ambidextrous in the future (Competitive Advantage)
- To collaborate with industry ecosystems in co-creating value and alleviating risks and sharing resources
- To adopt digital strategies that is customer-focused and facilitates progressive innovative technologies and activities

As a result of this discussion, this researcher proposes that organisational learning, digital business strategies involving customer-centricity, ecosystems collaboration, digitally innovative technologies and RBV capabilities can be systematically analysed and introduced within enterprise organisations. However, combinations of all three distinct aspects RBV and Organisational Learning Capabilities should
be incorporated into the enterprise organisations to become more digitally mature. The researcher proposes that these aspects of RBV capabilities (Newbert 2008; Lopez-Cabarcos 2015) be combined into enterprise Organisational Learning (Argote & Miron-Spektor 2011; Teece 2018), and agile digital business strategies as a Conceptual Disruptive Change Capability Framework shown in Figure 2.5. Thus, enterprise organisation Disruptive Change Capability (DCC) framework includes components of the enterprise digital business strategies, RBV capabilities, organisational learning theoretical framework – its Latent Context/Organisation and Active Context (members and tools), experience (Task and Performance) and knowledge, customer focus and ecosystems collaboration shown below (Figure 2.5).

Building on the concept that enterprise organisational learning theoretical framework includes Digital Disruption Strategies involving dynamic capabilities, active context, experience and knowledge; connected ecosystems collaboration that emphasises the importance of customer centricity, a framework will be developed to be systematically introduced into the digital enterprise organisations. This conceptual 'enterprise organisational Disruptive Change Capability framework (DCC)' combines the three distinct RBV capabilities of Value Capability, Rareness Capability and competitive advantage capability with the four major components of the organisational learning theoretical framework including its active context, latent context, experiences and knowledge.

![Conceptualised Enterprise Organisation Disruptive Change Capability (DCC) Framework](image)

**Figure 2.5: Conceptualised Enterprise Organisation Disruptive Change Capability (DCC) Framework**
One goal of introducing enterprise organisation Disruptive Change Capability (DCC) framework into the enterprise organisations should be to create value and leverage opportunities that come from digital disruption and disruptive changes, while at the same time, minimising the possible challenges. Leveraging opportunities requires the capability to recognise opportunities and to creatively or innovatively initiate change. Minimising challenges requires the capability to assess risks and develop alternatives where both require immediate action.

Bolden and O’Regan (2017) concludes that disruptive digital technologies not only potentially providing a springboard for a new, sustainable phase of economic growth but also fundamentally altering the ways in which people in the world relate to information, themselves, each other, and power. Organisations and leaders will need to remain responsive, adaptable and innovative as transitioning from the information to the knowledge era (Staron, Jasinski & Weatherley 2006). Emphasising the ability to effectively engage, develop, deploy and retain the collective talents, not only of the direct workforce but also the external networks, will be a key strategic priority.

2.9 Enterprise Organisation Disruptive Change Capability (DCC) Framework Research Model

This study proposed that enterprise organisation disruptive change capability could be defined, analysed, and systematically integrated into the digital enterprise organisation.

Turbulent external and internal digital disruptions (Moller 2017) contribute to unexpected disruptive changes, which impact the enterprise organisation. Although this research studies the impacts of digital disruption, it will primarily focus on managing digitally disruptive change in enterprise organisations. Linking the RBV capabilities (Newbert 2008; Lopez-Cabarcos 2015) of Value Capability, Rareness Capability for Competitive Advantage to components of Organisational Learning Capabilities (Argote 2011; Teece 2018), digital business strategies, customer-focused and connected ecosystems collaboration forms the enterprise organisation ‘Disruptive Change Capability’ as shown above in Figure 2.5, which is activated by disruptive environmental changes. This study evaluated the resulting conceptual enterprise organisation Disruptive Change Capability (DCC) framework in managing disruptive change. This conceptual framework was used to evaluate its effectiveness on the digital enterprise organisation operating in disruptive environments, new organisational structures or meta-organisations (Galbraith 2012) and the digital ecosystem (El Sawy 2010).
Based on the assumption that organisation Disruptive Change capability (DCC) is necessary in turbulent and digitally disruptive environments and that it can be introduced systematically into an enterprise organisation, this research will focus on the following research questions:

‘How do enterprise decision makers understand the various aspects of digital disruption and disruptive change in the Australian energy industry?’

How do decision makers in the Australian energy industry identify the relevant capabilities needed to manage digital disruption and disruptive change?

How could the use of Disruptive Change Capabilities (DCC) framework by decision makers to manage disruptive change and create value to the organisation?

2.10 Summary

This literature review has illustrated various aspects from the digital disruption literature that impact digital disruption outcomes. There is still much to be investigated in this area, much of the research has involved limited case studies that often do not necessarily represent the population being explored. The literature has provided an extensive discussion on many areas of digital disruption research currently under investigation however the way in which digital disruption is achieved is still relatively understudied. This literature review provides a point from which a comparison is made with the findings of this thesis (see Chapter 6).

Chapter Three will discuss the research process and methodology used by the researcher in answering the research question. Limitations of the research, with particular attention on research bias, will be discussed. Interview participant recruitment and sample size considerations are highlighted. Open ended interview questions used will be described and discussed. The methodological tools used for analysis and software tools used to support analysis will be presented.
Chapter Three – Research Design and Methodology

3.1 Introduction

This chapter provides a discussion of the methodology used by the researcher in answering the research question and a detailed discussion of the activities completed and the sequence in which they were done, in order to emphasize the rigour and validity of the research. This chapter will discuss the reasons behind the methods chosen and examine the process by which the data was elicited, analysed and then formulated to arrive at the findings. Ultimately, this chapter describes the research journey and justifies the path taken to generate the theory for a given phenomenon.

The aim of this research was to examine the understanding of how decision makers manage digital disruption outcomes in the Australian energy industry. The aim was to understand the experiences of digital disruption and the perspective of decision makers in the context of the energy industry. The research utilised theories and frameworks, enfolding literature, data collection and analysis to explore the research topic and to answer the research questions. This chapter covers the research approach, which discusses the characteristics of research design, why the researcher selected a qualitative research approach followed by research perspectives and the type of research method that was used in this study.

The analysis and theory development is discussed in Chapter Five and linked to the literature in Chapter Six. The final theory that answers these research questions has been presented in the conclusion chapter (Chapter Seven).

This chapter is structured as follows:

- discussion of the research question (Section 3.2)
- description of the research process that was used (Section 3.3)
- research journey taken in this thesis (Section 3.4)
- limitations and researcher bias (Section 3.5)
- discussion on the participants recruited as part of this research (Section 3.6)
- discussion on research analysis, sample sizes & theoretical sampling (Section 3.7)
- discussion about the tool used to aide in the analysis (Section 3.8)
- discussion on the instrument used (qualitative interviews (Section 3.9)

Section 3.10 summarises this chapter.
3.2 Research Question

This research study has answered the following research question:

“How do enterprise decision makers understand the various aspects of digital disruption and disruptive change in the Australian energy industry?”

Other subsidiary questions linked to the main question that were addressed by this research are:

How do decision makers in the Australian energy industry identify the various capabilities needed to manage of digital disruption and disruptive change?

How do decision makers use Disruptive Change Capabilities (DCC) to manage disruptive change and create value to the organisation?

3.3 Research Design

The research methodology considered for this thesis research included qualitative case study (Denzin & Lincoln 2005. The case study methodology provides tools for researchers to study complex phenomena within their contexts. The approach is applied to achieve a valuable framework for managing digital disruption and disruptive change, to develop theory, evaluate and develop interventions.

There are four major components to this qualitative research: firstly, the data collected from interviewing digital practitioners; secondly, the analytical process used to arrive at the research findings; third, the enfolding of the findings with related literature; and finally, the written reports on all or specific aspects of the findings.

The data collected through qualitative interviews has used open ended questions, which is discussed in more detail in Section 3.9. The reason for leaving all questions open was to reduce leading any of the interviewees in a particular direction. This allows each participant to describe their stories in their own words, without a slant or bias from the researcher. This is the primary data source for this research.
One-on-one interviews (Denzin & Lincoln 2005) provided the opportunity for a more in-depth data collection. The access to the participants targeted by this research is readily available. The type of data collected would allow the best opportunity to answer the research question. The key balance that needed to be achieved, for this research, was which method provides a greater depth of data, rather than a breadth of data, in order to ascertain the various aspects that impact on the research question. Therefore, interviews of digital practitioners have been performed with an interpretive philosophy, an induction approach, a qualitative case study approach utilising cross-case and within-case and ultimately a thematic analysis augmented with the DCC framework in analysing the data.

This section discusses the ‘Onion model’ by Saunders, Lewis and Thornhill (2009) used as a guide in creating the design and methodology for this research. The research methodology, design and generation were based on the work of Saunders et al. (2009) as presented in figure 3.1. This model offered an efficient pathway to reach the primary research aim as considered above.

![Layers of study diagram (Saunders, Lewis & Thornhill 2009)](image)

3.3.1 Interpretive Perspective

Although other paradigms were investigated, Interpretivism is the logical philosophical basis for this research. This highlights its use in studies where the meaning of the phenomenon is created through participants and their perception of the world. Adopting an Interpretivist methodological approach precludes the quantitative research approach.
In order to evaluate qualitative research, it is therefore important to know what philosophical assumptions relate to the underlying epistemology guiding the research. Epistemology refers to the assumptions about knowledge and how it can be obtained (Hirschheim & Klein 1994). Orlikowski and Baroudi (1991), following Chua (1986), suggest three categories based on the underlying research epistemology: positivist, interpretive and critical.

If a study is qualitative, it does not necessarily follow that an interpretive perspective is automatically adopted (Orlikowski & Baroudi 1991). Klein and Myers (1999) explicitly state that the word ‘qualitative’ is not a synonym for ‘interpretive’ and that the perspective of the researcher depends upon the underlying philosophical assumptions of the researcher.

Interpretive research as related to this research focuses on the complexity of human sense making as a situation emerges. It attempts to understand phenomena through the meanings that people assign to them (Walsham 1995). Managing disruptive change research can be classified as interpretive if it is assumed that our knowledge of reality is gained only through social constructions such as language, shared meanings, documents, and other artefacts. The interpretive epistemology became more accessible in the late 1990s with work by Myers and Young (1997) and Romm and Pliskin (1998).

Myers and Young (1997) states that case study research can be positivist, interpretive, or critical, depending upon the underlying philosophical assumptions of the researcher. In this study, the interpretive perspective is used in the context of the aspects of digital disruptions research consists of digital practitioners and their perception of managing change thus, can be classified as interpretive if it is assumed that our knowledge of reality is gained only through social constructions such as language, shared meanings, documents, and other artefacts (Orlikowski & Baroudi 1991). Interpretive research focuses on the complexity of human sense making as the situation emerges. It attempts to understand phenomena through the meanings that people assign to them (Walsham 1995). The goal of interpretive sociology is to understand the meaning behind actions in a social context through a consideration of a subject's unique point of view (Cranford 2015).

3.3.2 Inductive approach

According to Blaikie (2010), the main aim of inductive research is to explain patterns through generalisation and occurs through the accumulation of observations or data. This is arguably the most
appropriate way to carry out this current study as the inductive approach is more concerned towards creating theory; whereas the deductive approach is more towards testing theory (Davison 2012). Baikie (2009) has also highlighted that inductive research should not be restricted to a specific theory and that the goal is to produce a generalisation that will further explain the phenomenon.

In the case of this research, the reality being explored, (where the induction from the data collected must fit with the domain of managing digital disruption and disruptive change within the energy industry), is that it must be understood by the people involved in the study (interviewees) as well as all other digital practitioners.

The topic of managing digital disruption in the context of energy industries is a process of generating theory and improving frameworks. These theories are developed from the narratives of decision makers and the conclusions drawn from their interviews. These were reduced to selected aspects relevant to the study during the data reduction process. This allowed for data to be generalised, which highlighted in what way their experiences differed and how themes were connected to essentially develop new theory.

3.3.3 Case study methodology

The essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented, and with what result. (Yin 2003, p. 13)

The definition above broadly describes the case study methodology and cites the topic of ‘decisions’ as the major focus of case studies (Yin 2014). Cunliffe (2010) suggests that the actual suitability of a research method derives from the nature of the social phenomena to be explored. According to Benbasat, Goldstein and Mead (1987, p. 370) updated by Yin (2014), a case study is an examination of ‘a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities’. Yin (2014) further added that the case study method is an appropriate strategy when the research aims to answer ‘how?’ or ‘why?’ questions; and, the researcher has little control over the events being observed, and when the object is a contemporary phenomenon within a real-life context. However, the advantage of a case study is that there is no specified data collection and analysis method, rather a variety of collection and analysis methods that can be used in conjunction with one another to provide triangulation and rigour which will be applied to this research. Yin (2009) notes three categories of case study designs, namely exploratory, descriptive and
explanatory. In short, the research outlined in this thesis is qualitative and exploratory in nature (Creswell 2014).

A major feature of the case study methodology is that different methods are combined with the purpose of illuminating a case from different angles: to triangulate by combining methodologies. According to case study researchers (Stake 1995, 1998; Miles, Huberman & Saldana, 2013; Yin 2014), a case study is expected to capture complexities within a single case and the case study should have a ‘case’ which is an object of study (Johansson 2005) where it should:

- be a complex functioning unit,
- be investigated in its natural context with a multitude of methods and
- be contemporary

Case study research assumes that examining the context and other complex conditions related to the case being studied are integral to understanding the case (Yin 2014). The in-depth focus on the case, as well as the desire to cover a broader range of contextual and other complex conditions, produce a wide range of topics to be covered by any given case study. In this sense, case study research goes beyond the study of isolated variables (Yin 2014). As a by-product, and as a final feature in appreciating case study research, the relevant case study data are likely to come from multiple and not singular sources of evidence (Yin 2014).

There are different strategies of inquiry in qualitative research for example, ethnography, grounded-theory phenomenological research, narrative research and case studies (Creswell 2009).

*Case studies are a strategy of inquiry in which the researcher explores in depth a program, event, activity, process, or one or more individuals’ and ‘Cases are bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures over a sustained period of time’ (Creswell 2009, p. 13).*

The ‘case’ can be some event or entity other than a single individual (Yin 2009). Consequently, Yin (2014) highlighted that there are four types of case study design which include single-case study, multiple-case study, holistic (single-unit of analysis), and embedded (multiple units of analyses).

Consequently, this research used a multiple case study design. This research focuses on a selection of appropriately sized case studies in the Australian energy industry to enable a sufficiently complex environment to be measured. This will be based on the various aspects of disruptive change impact variables, concentrating on digital disruption perceptions and managing disruptive change outcomes. This would also narrow the scope of the data collection.

One-on-one interviews (Stake 1998) were conducted with thirty (30) digital practitioners with decision making roles within the Australian energy industry. This provided an opportunity for greater in-depth
data collection. Each of the thirty (30) interviewees forms one case, creating multiple cases to be analysed.

Access to the participants was readily available. The type of data collected via interviews would allow the best opportunity to answer the research question until saturation in order to compare and contrast similarities and differences of data.

There is an increasing population of the interconnected network community with access to the Internet, regardless of living standard or nationality, with a voice and the power to effect change. Consequently this poses new, difficult challenges for businesses and governments the world over as there is a time lag for business strategies and government policies to be implemented to effect change. Business process innovations of production and distribution are increasingly becoming interrelated (Brandellero & Kloosterman 2010) and social media is being used more prevalently for both product marketing and as a distribution mechanism. Each of these allows for on-going dissemination of creative content over an extended period. The best-informed and most active providers and users of technology are required to constantly innovate to offer new devices and services. New business models are intimately connected to the dynamic evolution of the underlying digital platforms (Barrett, Oborn & Orlikowski 2016) and can have far-reaching implications for economy and society as consumers.

Therefore, studying these contributing factors of the digitally disruptive change environment using a qualitative research adds rich exploratory data and nuance that illustrates the existing knowledge of the phenomenon being explored (Ronnback & Eriksson 2012). The phenomenon in this case is how does our understanding of organisational capabilities and learning, resource-based view capabilities and disruptive, innovative, environmental factors lead to successful digital disruption outcomes.

3.3.4 Qualitative Approach

This research adopts a qualitative approach. Strauss and Corbin (1998) claim that qualitative methods can be used to uncover and understand what lies behind any phenomenon. A qualitative approach allows for new viewpoints on phenomenon, about which quite a bit may be already known. This is emphasised by Kvale and Brinkmann (2009) who highlight the main aim for a qualitative approach is to achieve a deeper understanding of a phenomenon. Qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena allowing for new viewpoints on phenomenon, about which quite a bit may be already known including observations of
the researcher’s impressions and reactions (Myers 2009). Kaplan and Maxwell (2005) argue that the goal of understanding a phenomenon from the point of view of the participants and its particular social and institutional context is largely lost when textual data are quantified.

Therefore, a qualitative approach was adopted, as digital disruption is a phenomenon that is better explored within its context using a variety of data sources rather than by quantifying it. A qualitative approach ensures that the issue is not explored through one lens, but rather a variety of lenses, which allows for multiple facets of the phenomenon to be revealed and understood (Baxter & Jack 2008; Leedy 1997; Orlikowski & Baroudi 1991). In qualitative research, what people say is captured and interpreted to understand the participants’ point-of-view of a particular event or phenomenon (Burns 2000). Studies on digital disruptions can involve many variables such as high complexity of the interactions, many variations of digital disruption terminology and a large number of activities and processes. The complex problem could not be examined quantitatively, because of the number of possibilities that would need to be considered for a quantitative study of this sort. Therefore, in qualitative research, the researcher is more interactive with the participants than in quantitative research (Bouma & Ling 2004). Daymon and Holloway (2011) highlighted particular characteristics of qualitative research, claiming that such research is appropriate if:

- The concept is ‘immature’ due to lack of theory and previous research
- Available theory may be incorrect or inaccurate
- There is a need to explore and describe the phenomenon to develop theory
- The nature of the phenomenon is not suited to quantitative measure

3.4 Methodology

This section describes the key elements of the research journey taken in this thesis. It provides the key elements and processes used to facilitate the research, data collection and analysis and deliver rigour and validity to the research outcome of this thesis. Research design is the ‘science (and art) of planning procedures for conducting studies so as to get the most valid findings’ (Vogt 1993). As Yin (1994) simply put it, ‘a research design is an action plan for getting from here to there, where here may be defined as the initial set of questions to be answered, and there is some set of conclusions (answers) about those questions.’

This section provided an understanding of the research plan. A high-level conceptual research model is discussed (Figure 3.2), showing the key elements and methods being employed to get from here to
there. This will then be followed with a more detailed discussion of the process plan and the various analytical methods used (Figure 3.3) to get from here to there.

Figure 3.2: A conceptual view of the research process showing: major inputs, methods and outcomes, based on Eisenhardt (1989)

Analysis of the literature led the researcher to a better understanding of managing disruptive change and the various activities performed by digital practitioners and decision makers. This enabled better engagement with the digital practitioners interviewed in this research. The literature analysis was also a catalyst for stimulating new ideas for this research (Neuman 2005) and framed the initial research questions.

The literature review for this thesis included the following goals (Neuman 2005): to demonstrate a familiarity with a body of knowledge and establish credibility with the digital practitioners interviewed; show the path of prior research in the Australian energy industry and how this thesis is linked to it; integrate and summarise what is known in the digitally disruptive environment; and to learn from others and stimulate new ideas. The final point is the most important for this thesis research. Learning from the literature allowed better communication with participants of this research (interviewees) and it shaped and focused the direction taken by the research.

The interview data in this research came from thirty digital practitioner interviews. While this is not a large sample size in respect to quantitative studies, it is in relation to a qualitative study. This number of interviews created a large amount of data, but it is not just the number, but the richness and depth of the data obtained that makes it appropriate for this study. Mintzberg (1979) supported small sample sizes suggesting that in certain situations a smaller sample size can yield more useful research results.
than a large sample (Section 3.6 discusses this further). For the purpose of theory building, there is a need for depth and richness from the research data source, which is what is gained through interviews (Section 3.9 discusses this further).

This research has ensured a constant comparison of the analysis of each interview with previous interviews. Each interview provided data from each practitioner’s perspective, in varying disruptive change activities and situations, different contexts where digitalisation activities have been applied. These aspects were examined in detail with each interview. Each individual brings a different set of experiences, and different set of stories to describe having worked in different organisational structures, i.e. consultancy or organisationally based. The disruptive change activities vary and these activities are not the sole focus of why disruptive change and digital transformation outcome was a success or not. The reflective aspect of the methodology used is a key part of understanding and making links (relationships) in the data, concepts and themes coded. It was important to regularly reflect on what has been done throughout the various iterations performed by the researcher of this thesis during the research plan.

In order to increase the validity and reliability of the outcomes of this research a plan was developed. The research plan used was based on the research process described by Eisenhardt (1989), on the building of theory from case study research and Braun and Clarke (2006) on phases of thematic analysis. The process included the following steps:

1. Getting started by defining the research question (at least in broad terms). This provided the research with a focus, which helped examine the large volume of data to be collected. Defining the question and research focus is discussed in more detail in Section 3.2.

2. Selecting cases from the population is the research sample from which participants have been drawn. This helped reduce variation and defined the limits for generalising the findings. The cases for this research have been limited to digital practitioners with a minimum of five years management and decision making experience in the Australian energy industry. See section 3.5 for further discussion.

3. Crafting Instruments and protocols describes the mechanism for gathering data. This research performed interviews that included a set of open questions that generated a large volume of qualitative data. This is discussed in more detail in Section 3.8.

4. Entering the field, is when the data was gathered, coded and analysed as a key feature of building theory from case studies. Along with the transcription of these interviews, there are notes taken at the time of the interviews.
5. *Analysing data* was an important part of bridging the gap between data collected and the findings of the research. Key thematic analysis steps augmented within case, cross case analysis was performed, see section 3.7 for a discussion.

6. *Searching/naming/review/define of themes*, from the interview analysis, and various cross-interview analysis tactics and overall impressions, tentative elements, themes, concepts, and possible relationships between concepts began to emerge. In shaping the concepts, a highly iterative process is entered to compare systematically the emergent theory with the evidence in each interview guided by and augmented with the attributes of the DCC framework. A close fit of the theory with most of the interviews provided higher empirical validity of the theory generated.

7. *Enfolding literature* is an essential part of theory building. It required a comparison of the emergent concepts and theory found in the current literature. This requires reviewing similar theories that support or contradict the emergent theory of this research and postulate why it supports or contradicts it. This research considered a broad range of reviewed literature. This enhances the internal validity, generalisability and the theoretical level of the theory built. Enfolding the literature is crucial, because the number of interviews performed is of a limited number.

8. *Reaching Closure* involved deciding when to stop adding interviews and when to stop iterating between theory and data in the generation of theory. This involved theoretical saturation that was combined with pragmatic considerations such as time and money, in dictating when this process ends.

The iterative loops (shown in Figure 3.3) are key elements to the research process. The iterative parts of the research process are shown using dotted ellipses. The figure shows three iterative loops (a), (b) and (c).
First iteration (a) occurred with the data collection, where interviews were held in the field, transcribed, and then analysed within case and cross case analysis (Open Coding). Second iteration (b) was performed after within-case and cross-case analysis of the first iterative loop (a), during this iteration the searching and reviewing of themes was considered (c). The third iteration described further thematic analysis of defining and naming themes guided by and augmented with DCC framework attributes (Selective Coding). The process therefore allows performance of iterative cycles (a), (b) and (c), which included research design steps four through to six to be iteratively performed.

Theoretical saturation occurred after looping through one of the iterative loops described (a, b or c). When the each of the initial iterations (a) yielded similar concepts, this signalled moving onto the second iteration (b) allows the examination of the initial analysis across data collected. This similar scenario occurred when moving from iteration (b) to (c), but once the analysis was exhausted further interviews were performed so the initial iteration (a) is recommenced. The final saturation point reached through iterative loop (c) led to the final steps seven and eight, reaching closure, of the research process. The number of interviews performed was dependent on reaching this final saturation point. Reaching theoretical saturation is discussed in more detail in Section 3.6.
The enfolding of literature allowed the researcher, once saturation was reached in the analysis process, to draw on the literature to either confirm or contradict findings, and/or show where the literature stands in relation to the findings (Strauss & Corbin 1998).

Figure 3.4: Transformation of data from raw collected data to theory (Bruno 2011)

Figure 3.4 illustrates the way the research process enabled large amounts of raw data to be transformed and broken up into concepts, refined into themes and then reconstructed into categories and ultimately a theory. The research process allowed the researcher to be systematic, while at the same time being creative in the analysis. The process allowed the identification, development and the relation of concepts and themes that provided the building blocks for constructing a theory.

A consistent approach was used to begin coding the data in a disciplined way. Creswell (2014) described a systematic process for coding data in which specific statements were analysed and categorised into themes that represent the phenomenon of interest. Initially the conceptual framework was utilised to develop broad, higher order codes to help organize the data. These deductive codes formed the main themes, some of which matched an interview question, and were represented as parent nodes in NVivo (QSRInternational 2011). Both NVivo and printed copies of the coded data were used within each theme to subsequently develop subthemes, if required. Sub-themes were formed inductively without trying to fit it into a pre-existing coding framework, often represented as child nodes in NVivo.
3.5 Identity limitations – Researcher Bias

During the research phase of this thesis the principal investigator was employed in an enterprise that was part of the energy industry in Australia. This provided the principal investigator an unparalleled opportunity to observe and to fully understand the challenges facing this industry from an insider’s perspective. It also enabled the element of ‘snowball sampling’ (Noy 2008) to identify and approach volunteers and relevant participants for the case study from among peers and consultants to the energy sector. The principal investigator worked within the industry thus knowing the terminologies and business processes has entered the field with an open and will not be biased with findings. At no stage was the principal investigator in any executive or decision making position and worked diligently to ensure the independence of the research and neither explicitly nor implicitly allowed any influence from an employer or strategic management.

The literature review and other readings in relation to digital disruption has provided the researcher with the vocabulary needed to interact and understand discussions with digital practitioners during the data collection (interviews). As discussed by Trauth (1997), using a qualitative method may lead to getting to know interviewees and this closer engagement provides an opportunity for personal growth that helps question and challenge preconceived assumptions. It was expected by the principal investigator that learning about the digitalisation of the energy industry would be done through the interviews. What was not expected was the additional learning about research methodology and about one’s self and the reflection required to produce theory.

The principal investigator does have an extensive background of working within a digitalisation team, as primarily a systems testing analyst. This experience has obscured the initial analysis by hiding important digital technologies developmental issues. These issues relate to the managing disruptive change roles that can have an impact on digitalisation outcome. The principal investigator has had to re-examine the digital technologies development area, especially when it was highlighted by two of the later interviewees, who were digital strategy decision makers. This caused another iteration of open coding that required a revisit of all previous interviews, with this concept front of mind. With these research biases in mind the research analysis was performed as discussed in section 3.7.

3.6 Participant Recruitment and Sample Size
The initial group of study participants were employed within the energy industry in Australia. Because the sample population is an important part of the research process (Smith, Evans & Westerbeek 2005), the remaining participants were selected using ‘purposeful sampling’ for the identification and selection of information-rich cases related to the phenomenon of interest. This insured a broad representation of demographics and ‘case-selection’ procedures (Seawright & Gerring 2008; Palinkas et al. 2015). Purposeful sampling assumes that once no new categories are discovered from the participants, then no additional useful information would be collected from additional participants. Purposeful sampling is used in multi-case qualitative studies where it can highlight differences in settings and individuals. A more complete description of these profiles follows in the next subsections.

This is to specifically select study participants who represented a diverse group of digital practitioners, roles in organisations, decision maker’s education and experience, and with managing disruptive change capabilities characteristics. Selecting the population is an important part of the process (Smith et al. 2005). Digital practitioners who were also decision makers had to be involved in performing managing disruptive change activities. These participants were approached as per ethics application and recruited using various means. This research started with an email to a recommended Australian energy company; which provided many participants as well as ‘snowball sampling’ (Noy 2008). Various locally based Australian energy companies were also contacted. The practitioners interviewed also provided further digital practitioner contacts. This research continued to perform interviews until saturation of data was attained, i.e. when no significantly new concepts were appearing in the analysis.

Based on the analysis, future interview participants were selected through ‘theoretical-sampling’, 'purposeful sampling' (Gulati, Puranam & Tushman 2012; LeCompte & Schensul 1999) or ‘snowball sampling’ (Noy 2008). These sampling techniques increased the diversity of the participant population by the following process:

- Sample was collected using 'searches' for different properties and characteristics
- ‘Core categories’ and new 'linked categories' were identified
- All 'categories' were sorted until saturated when the identification of new categories was unlikely.

Participants in this study represent the Australian energy industry digital practitioners who are (strategic and operational) decision makers in their respective roles as shown in Table 3.1 and Table 3.2 in Section 3.9. (please refer pages 130-131). The key demographics of participants used in this study for the comparative analysis included formal education, number of digital practitioners and role of decision
makers, the group size managed and number of locations supported. There was also an element of ‘snowball sampling’ with the strategic decision makers who were able to identify other digital practitioners within the energy industry.

The key data sources for this research were the stories elicited from digital practitioners and decision makers who have worked in the Australian energy industry for a minimum of 5 years. These stories describe their participation in managing disruptive change where they were employed or contracted to perform digitalisation activities within an organisation or as a consultant for an organisation.

The total number of participants interviewed in this research was thirty. Mintzberg (1979) highlights that research ‘should not preclude the small sample, which has often proved superior’. This small sample size is often characteristic of qualitative research that involves in-depth interview data. The data in this study required continual analysis, with multiple iterations and the small sample size enabled the emergent theory to be more manageable in the researcher’s mind during all stages of the research (Crouch & McKenzie 2006). Comparison between quantitative and qualitative research often states large or small sample size respectively (Thompson, CB & Walker 1998). An increase in sample size may improve reliability of results but does not significantly improve the generalisations of a sample to its population (Lee, AS & Baskerville 2003).

This research started with the idea of interviewing digital practitioners, not knowing how many would be interviewed. The interviews continue, i.e. data collection, until the researcher achieves theoretical saturation, which is the point where no additional data will add to the emerging concepts being developed and examined (Eisenhardt 1989; Strauss & Corbin 1998; Taylor & Bogdan 1998). Therefore, the number of digital practitioners interviewed by this research stopped at thirty interviews, after no significantly new concepts were emerging from the data collected.
3.7 Research Analysis

The research methodology being used to analyse this rich source of data is Case Study Analysis within case and cross-case analysis augmented with thematic analysis aided with the DCC framework described in the literature review (i.e. Section 2.8., Figure 2.5.), shown here in Figure 3.5.

The whole analysis phase of this thesis was guided by the DCC framework. This methodology provided a mechanism to iteratively gather and analyse data and build a set of concepts. The process assumes no prior knowledge in the topic area. Therefore, the analysis focused on anything of interest that emerges from the raw data, which can be described as an interpretive-inductive process.

![Figure 3.5. Disruptive Change Capability Framework](image)

3.7.1. Thematic Analysis

Thematic analysis is a qualitative research method that can be widely used across a range of epistemologies and research questions. It is a method for identifying, analysing, organizing, describing, and reporting themes found within a data set (Braun & Clarke, 2013). It allows the researcher to compare concepts, determine relationships between them (Alhojailan 2012) and allows linkage of possible concepts and opinions and compares these with the data gathered in the project (Alhojailan 2012).
In this research methodology, thematic analysis processes include data reduction of data gathered from interviews. The data were organised according to the digital disruption attributes and disruptive change capabilities captured from literature review. Then within-case analysis was conducted followed by cross-case analysis as described in detail in the following sections (Section 3.7.1.2 and 3.7.1.3). The thematic analysis process of data display and data drawing/verifying involves results from data reduction that was used to create the DCC framework of this thesis as shown in the sections (Section 3.7.1.5. and 3.7.1.6)

Thematic analysis is theoretically flexible (Braun & Clarke, 2006) and is suited to a wide range of research interests and theoretical perspectives, and is useful as a ‘basic’ method because: a) it works with a wide range of research questions, from those about people’s experiences to those about the representation and construction of particular phenomena in particular contexts; b) it can be used to analyse different types of data, from secondary sources such as media to transcripts of focus groups or interviews; c) it works with large or small data-sets; and d) it can be applied to produce data-driven or theory-driven analyses.

3.7.1.1. Thematic data analysis process

Thirty (30) semi-structured interviews were conducted with digital practitioners who were strategic decision makers and operational decision makers within the energy companies. Each interview lasted from forty-five (45) to ninety (90) mins and was scheduled at the convenience of each participant. Based on the results of the first stage interviews, the semi-structured interview script (see Appendix B) and demographics survey research (see Appendix C) instruments was refined. In this case it asked how decision makers manage digital disruption outcomes and disruptive change in Australian enterprise organisations. From the two types of interviews, namely face-to-face interviews and focus group interviews, (Easterby-Smith, Thorpe & Jackson 2012), face-to-face interviews are used as it gives an individual interviewee freedom to express their answers privately and openly (Alhawas 2014), obtain rich data (Neumann 2000; Easterby-Smith et al. 2012) and answer the research questions.

An audio tape recorder was used in each interview. After each interview, transcription of the interview was made. Notes were also made during the interview, including reflective notes and demographic information such as the time, date and location of the interview. These helped provide an audit trail if such a study were to be replicated.
As a result, the semi-structured questions were modified slightly for each interview. This method was used as it allows the researcher to probe further on issues identified in interviews conducted with members of the digital disruption team. However, most interviews were in the form of, and used derivatives of, the following questions: ‘Could you please tell me the story of the week in your work place and the experience you encounter as a digital practitioner in managing disruptive change?’; ‘What type of role did you play in the digital enterprise organisation?’; and ‘Were there any obstacles in your way, in your position (strategic/operational decision maker) in managing the disruptive change process?’ The questions changed to reflect the observations were made in regard to managing disruptive change in the energy enterprise organisation and the final interview schedules were attached. Each interview lasted between fifty and sixty minutes. Once the interview was conducted, a transcript of the interview was written and sorted into categories for analysis using NVivo.

Data analysis involves three steps: data reduction, data display and conclusion drawing (Miles, Huberman & Saldana 2013). The data reduction process discards all irrelevant information and organises the data collected through writing summaries and coding (Miles, Huberman & Saldana 2013). Thematic coding through Nvivo is done in order to classify the data under one of the sub themes obtained from the transcripts.

The analysis began with detailed line-by-line analysis necessary at the beginning of a study of high volumes of data (Eisenhardt & Graebner 2007). This generated initial categories (with their concepts and themes) and suggested relationships among categories. The transcribed interviews were analysed line-by-line and any concepts of interest were identified and coded. This initial step provided a base set of concepts. During this coding, the researcher created memos, to record thoughts and ideas.

The initial set of concepts were then analysed individually, and each of the interview quotes (data) were compared with each other, certifying that they belonged to the concept. Then each of the concepts were broken up and analysed across the various questions asked during each interview (see section 3.8 for interview questions). Each element was then examined and further broken up into themes and concepts.

3.7.1.2. Data Reduction

The first stage of qualitative analysis is data reduction (Miles, Huberman & Saldana 2013). This process reduced the mass of qualitative data collected from the interviews, document analysis and observations
through discarding irrelevant data, writing summaries and coding. Coding for each interview followed after the main and sub themes are transcribed from the interview. This involves labelling portions of data with a short description, which belonged to one of the sub themes (Alhawas 2014). This include examining within concept data or as within-case analysis (Section 3.7.1.3.) and then looking at the difference between interviews or cross-case patterns allowing comparison across each interview using various techniques as cross-case analysis (Section 3.7.1.4.) Each of the initial concepts (Appendix G) examined individually and memo created describing its meaning across the interviews as shown in Fig. 3.5.

### 3.7.1.3. Within Case Analysis

A primary goal of within-case analysis is to describe, understand, and explain what has happened in a single, bounded context as the ‘case’ or site. One advantage of studying cross-case or multiple cases is to increase generalisability, so that the events and processes in one well-described setting are not wholly distinctive. At a deeper level, the purpose is to see processes and outcomes across many cases, and to understand how they are qualified by local conditions, and thus to develop more sophisticated descriptions and explanations. Within case analysis, each interview was examined individually and concepts coded, so producing the initial set of coded references, see Appendix G. Analysing data is an important part of bridging the gap between the collected data and the findings of the research. Yin (2003) highlights a key feature known as ‘within-case analysis’ which is driven by one of the features of case study research, a high volume of data. Within-case analysis uses detailed case study write-ups (Amaratunga & Baldry 2012) to cope with the problem of high volumes of data (Eisenhardt & Graebner 2007). Eisenhardt and Graebner (2007) suggests that the overall idea of the within-case analysis is to become intimately familiar with each case as a stand-alone entity, which then allows the formation of unique patterns before the researcher generalises patterns across cases. Thus, it gives a familiarity with each case and accelerates the cross-case comparison (Amaratunga & Baldry 2012).

### 3.7.1.4. Cross Case Analysis

After within-case analysis, cross-case studies are undertaken, as shown in Figure 3.6, generating explanations and systematically testing the results (Miles, Huberman & Saldana 2013). The use of cross-case sampling adds to the validity and integration of the findings (Ayres et al. 2003) through replication logic or pattern matching (Yin, 1994). Cross-case analysis is conducted by comparing pairs of interviews to show relationships between interviews, and then coded concepts are compared to match correlations between them. This was primarily done using the matrix comparison query tool in NVivo.
(QSRInternational 2011), which enabled the comparison of a row of coded concepts with a column of coded concepts that matched a condition (i.e. predominantly when an utterance was found to be coded with both concepts).

The within-site analysis combined with cross-case tactics brings out tentative themes, concepts and relationships between variables (Eisenhardt & Graebner 2007). Eisenhardt and Graebner (2007) describes the next step of this process as an iterative process that compares the emergent theory (Amaratunga & Baldry 2012) with the evidence from each case to assess how well it fits with the case data. The idea is that theory and data iteration are constantly compared (Eisenhardt 1989) towards a theory which closely fits the data. Good theory can be formed from a close fit as it takes advantage of new insights possible from the data and produces an empirically-valid theory. This research will use a procedure by Miles, Huberman and Saldana (2013) in analysing qualitative data.

The initial findings of high-level elements, as shown in tables in Appendix 4, were further analysed into themes and then into concepts. These are discussed in the following chapters. Analysis of the categories will lead to the development of sub-areas to explore during the interviews (Gulati 2011). In summary, the outputs of each set of interviews (data) were the transcribed interviews and the extensive ‘field notes’. Each set of interview data was coded and then compared with each interview within the set and then to previous interviews. The coded concepts are compared with each other and by comparing the common utterances of coded concepts across cases. This comparison led to emergent theories, which were then further compared to the interview data. Also, the comparison led to new categories and related category properties or subcategories.
3.7.1.5. Data Display

The second stage data display draws conclusions from the mass of data analysed (Miles & Huberman 1994). This process was done in tables, charts and networks that are in the form of a continual process rather than just one step to be carried out at the end of data collection. Charts, tables and other graphical forms assist in the drawing of conclusion (Miles & Huberman 1994). Analysis allowed conclusions to be developed and these conclusions were verified through further data collection from participants as per the ethics application (Miles, Huberman & Saldana 2013). Theoretical comparisons were undertaken to compare incidents to other data at a conceptual level, comparing comments to improve, consider and to discover similarities and differences in properties and dimensions. The memos created from the initial concepts provided a conceptual level set of codes (Appendix F) that enabled comparison between higher levels of concepts to be generated and enfolded with literature.

3.7.1.6. Drawing/Verifying Data

The final step involved a decision on when to stop adding interviews and when to stop iterating between theory and data in the generation of theory. This involved theoretical saturation that is combined with pragmatic considerations. Eisenhardt and Graebner (2007) states that theoretical saturation often combines with pragmatic considerations such as time and money to dictate when case collection ends. Theoretical saturation is when there are no new significant concepts, ideas and themes appearing in the analysis of the data; to the point at which incremental learning is minimal because the researchers are observing phenomena seen before (Glaser & Strauss 1967). Planning such as this was necessary due to the limitations of resources and time constraints that forces researchers to develop similar cases where saturation point is reached.

The subsequent step included drawing of conclusion at saturation, enfolding with literature, whereby concepts and themes are compared with literature to discover similarities and differences regarding the study (Miles & Huberman 1994). Conflicting findings can force the probing of both the evidence (Eisenhardt 1989) and conflicting research to discover several gaps in theories (Bruno 2011; Amaratunga & Baldry 2012). An underlying similarity in the apparently dissimilar situations was found. This reconciliation integrates the conflicting findings into a single theoretical perspective and raises the theoretical level and generalisability (Amaratunga & Baldry 2012) of the results. Literature discussing similar findings was also important as it ties together underlying similarities in phenomena normally not
associated with each other. The result is often a theory with stronger internal validity, wider
generalisability, and higher conceptual level.

Enfolding literature described in Chapter 6 allows for theoretical comparisons. An incident is compared
to something else at a conceptual level to discover for similarities and differences. Memos created from
the initial concepts provided a conceptual level set of codes (Appendix F) that enabled comparison
between a higher-level of concepts to be generated.

3.7.1.7. Data validity and reliability

The reliability in the field of digital disruptions depends on a researcher’s insight, suspicion and questions
(Neuman 2000). The reliability of this qualitative research is dependent on the answers from the
respondents, which makes the respondent’s credibility part of the reliability (Alhawas 2014). Reliability
is important to minimise the error and biases in the study, which ensures a later researcher would arrive
at the same findings if the same case study were conducted (Yin 2003). The subjectivity and context will
also be considered (Neumann 2000) as human behaviour is never static (Merriam 1995). The internal
and external validity are identified to be important criteria that will determine the quality of the research
design (Yin 2003). Internal validity is concerned with establishing causal relationships whereby certain
conditions are shown to lead to other conditions, and external validity is establishing the domain to
which a study’s findings can be generalised (Yin 2003).

The internal validity of a study will be dependent on researcher bias (Bromley 1986) and would be
present in this case study as a causal relationship (Trochim 2000) will be established from interviews.
The internal validity of the study is affected by the interaction with the respondents, which determines
the credibility and whether the story fits into a coherent picture (Peszynski 2005). Thus, if the researcher
has incorrectly established a causal relationship without understanding that another cause might have
been the real cause, the research design has failed to deal with the internal validity problem (Yin 2003).

External validity is also difficult to measure. In the case of digital disruptions, it is difficult to generalise
findings to different settings as phenomenon and context are necessarily interdependent on each other
(Amaratunga & Baldry 2012). An issue to consider would be the need for high quality data (Neuman
2000) which will be determined by whether the data gathered is complete and unbiased (Conn et al.
importance of authenticity since trustworthiness is not sufficient as a measure of quality for study.
Authenticity involves an assessment of the meaningfulness and usefulness of interactive inquiry processes and the social change that results from these processes (Shannon & Hambacher 2014).

Thus, ‘member checking’, a technique used by Agostinho (2006), was conducted informally during the data collection and formally after the data collection was completed. Trustworthiness can also be improved through data triangulation (Holloway & Wheeler 2010). In this study, the findings from the interviews and document collection were combined with the analysis of the data. Member validation or checking may involve engaging those being investigated in order to ask them to critically comment upon the adequacy of the findings (Holloway & Wheeler 2010). Triangulation combines the analysis with the findings from the semi structured interviews and document collection in order to demonstrate trustworthiness (Holloway & Wheeler 2010). The audit trail ensures the reliability of the research by displaying the process through which the research has been conducted and the key decisions that influenced the research process. The critical reflection process is when results are critically assessed by the researcher to demonstrate how they influenced the findings.

3.8. Qualitative Research Tool

In order to handle the large quantity of rich data gathered from the practitioner interviews, a tool was purchased and used. This tool is NVivo, a program developed and provided by QSR International (2011). The QSR International website promotes NVivo as a tool to be used by anyone who wants to examine or make sense of information. It was designed for use by researchers, academics and scientists.

The computer can assist in the analytical process of a qualitative analysis method because of its capacity to store, sort, match, and link data. It can provide invaluable assistance to the researcher in answering the research questions from the data, without losing access to the source data. NVivo supports analysis of qualitative data by (Bazeley 2007):

- managing data
- managing ideas
- querying data
- graphic modelling
- reporting from the data
Using this tool does not ensure rigour in qualitative research. The case study augmented with thematic analytical process, described in this chapter, is the key part of rigour and validity in producing good theory. This tool allowed the analysis of the collected data to be organised more, systematically; and provided additional opportunities to engage with the data, concepts and themes developed. The efficiency obtained by using such a tool enabled better analysis to be performed, providing flexibility when analysis needed recoding or reexamination. Analysis of the data in NVivo improved the research understanding of the emerging concepts.

The literature has a mixed response on the usefulness of using a tool such as NVivo for the analysis of qualitative data versus doing it manually. It allows interrogation and analysis of data at a particular level, allowing engagement with the data, and the derivation of impressions and concepts from it. The searching tools in NVivo allow the researcher to interrogate the data at a particular level; which in turn improves the rigour of the analysis process by validating (or not) some of the researcher's own impressions of the data (Welsh 2002).

In the early stages of analysis, a computer-aided tool can help make sense of the huge amount of data collected, and the complexity of analysing it. ‘It was shown how patterns in the data were identified and ‘took shape’ in the early, ‘coarse’, stages of analysis (Thompson, R 2002).

The tool itself does not replace immersion in the data, reflection and analysis by the researcher. It simply facilitates organising and sifting the data to enable the researcher to perform the inductive analysis, using the research interpretation of the data. ‘The intellectual work of actually conceptualizing can only be done by the brain of the researcher. The computer may be able to assist, but there is a risk of becoming so concerned with the technical aspects that this interferes with the ‘artistic’ aspects’ (Webb 1999). Given the technical skills of the researcher this was not an issue.

It is suggested that the first time that a novice researcher does a qualitative analysis that they perform it manually, but on a small set of data (Thompson, R 2002; Webb 1999). On the other hand, the expertise the research brings to the tool usage has an impact. This researcher is highly computer literate and found using the tools for the open coding very beneficial, because of comfort, skill and experience with computers (Webb 1999). To develop the themes and relationships for emerging theory, data (and summary data) was exported from NVivo into Excel for further comparison and analysis. NVivo’s function set provided some reporting tools that helped compare and contrast data and enabled discovery of relationships within the data. It was not adequate enough to allow for some comparative analysis that this researcher wished to perform, including comparison of summary data that was
produced from multiple NVivo reports. In addition to supporting the analysis process, Excel was used to help format the data into tables that were inserted into the thesis appendices (i.e. Appendix D, E, F and G).

3.9. Qualitative Interviews

Interviews were conducted on a confidential basis using prepared semi-structured interview scripts to maintain consistency in the interviews, to identify other important issues raised by the participants and allow for exploratory discussions and probing with open ended questions. Confidentiality is important to encourage participants to speak freely about their experiences, about their understanding of the impact of digital disruption in the energy industry and the potential use of disruptive technologies in managing disruptive environments, digital business strategies, energy industry ecosystems and customer experience.

Participants were also encouraged to speak freely on their perceptions of disruptive technologies, future drivers, managing capabilities within current business models, disruptive change capabilities framework, and about recommendations for further research on managing disruptive change and the future of innovative technologies impacting the energy industry.

Each interview lasted from forty five (45) to ninety (90) minutes and was scheduled at the convenience of each participant, generally at the participant’s office. One interview, that was initially to be conducted in person, was completed by telephone at a later date because a work emergency interrupted the interview. All participants signed the RMIT Consent Form (shown in Appendix A), which was required as part of the RMIT HDR Ethics regulations. The consent form explained the conditions of the interview and verified that each of the participants volunteered to be in the study. Also, it allowed the participants to withdraw from the study at any time for any reason. At the beginning of each interview, the researcher asked a series of demographic questions based on a short interview form (also shown in Appendix A and discussed in Chapter 5).

These questions sought information about the decision maker’s role in the energy industry, their daily work routine, their perceptions of the topic, and the decision maker’s personal characteristics and experience. The demographic questions also gave the researcher the opportunity to build rapport with each participant while collecting data used to analyse and compare the findings. The initial set of open ended interview questions were:
• Describe a typical day of work as a digital business strategist and digital technologies professional?
• Describe the best experience embracing digital technologies and using digital resources for enhanced performance?
• Describe the worst experience implementing disruptive technologies in your firm?
• What, in your opinion, is/are the key aspects to the success of embracing digital technologies and managing disruptive change within the energy industry?
• What should strategic decision making management know and implement in managing disruptive change, value creation and staying relevant for the future within the energy industry?

For this research, the targeted population included strategic-decision makers and digital practitioners who were key decision makers and had roles of authority and responsibility. The selected participants were also selected using 'case-selection' procedures to determine sampling categories (Minichiello, Aroni, Timewill, & Alexander 1995). The first set of participants was asked about the categories that were prominent and identified during the review of the literature. The second set was asked about categories 'discovered' through data collection in the first set. The goal was to seek evidence from research data about 'variables' that mitigate the 'perceptions' and 'practices' of digital practitioners. The highlighted variables were then included in a 'theoretical sampling frame' or 'purposeful sampling frame'.

In this study, the demographics of the interviewees presented as 'purposeful selection of participants' that a 'comparative analysis' was conducted are listed as follows:

Table 3.1: Practitioner roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Number of practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Strategic Decision makers</td>
<td>12</td>
</tr>
<tr>
<td>Digital Operational Decision makers</td>
<td>18</td>
</tr>
</tbody>
</table>
Table 3.2: Demographics of stakeholder participants interviewed

<table>
<thead>
<tr>
<th>No. of people in each category interviewed</th>
<th>Stakeholder Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Digital Practitioners – customer facing – Operational</td>
</tr>
<tr>
<td>10</td>
<td>Decision making digital practitioners – Operational</td>
</tr>
<tr>
<td>6</td>
<td>Decisions making digital practitioners – Strategic</td>
</tr>
<tr>
<td>4</td>
<td>Strategic Decision makers</td>
</tr>
<tr>
<td>2</td>
<td>Enterprise Board of Directors (Strategic)</td>
</tr>
</tbody>
</table>

3.10 Summary

Qualitative research does provide a richer data set. Because of this richness, the meaning and more detailed understanding of the context of the situation can be ascertained. In this research the interpretation provided offers an explanation for the conclusions and the researcher’s interpretation of the rich data set obtained. The meaning placed on text has been done with the inherent bias the researcher brings to the research which also limits research plan.

The research process/design is a key part of the activity of research. It provides the foundation on which the various sections of this thesis are built and provides a research outcome that contributes to the body of knowledge. The process provides the rigour and validity needed in research work.

In summary, qualitative case study enters the fieldwork phase of a research without hypotheses. The researcher describes what is happening, and provides explanations for why events occurred (McMurray, Pace & Scott 2004). This research does not try to identify all the disruptive change management processes that should be performed to enhance the outcomes of managing disruptive change activities. This research does try to present the influencing factors that impact on managing digital disruption outcomes from a digital practitioner’s point of view.

This chapter outlined the research methodology utilised in this study based on the model by Saunders, Lewis and Thornhill (2009). Considering the research question, an interpretive philosophy, and inductive strategy and a qualitative case study methodology is suitable to be used and has been outlined in this
Chapter. The approach towards the case study was qualitative using an interpretive epistemology. The research design, data analysis, data collection and the limitations of the research are also explained in this chapter. To this end the methodology provides a clear and rigorous process to reach the conclusions of the research.

Chapter Four described the findings for this research, which mainly included open coding concepts and related themes. Also included is the frequency data of how many interviewees discussed the concept/themes, along with the number of utterances for each concept/theme, discussion about utterances made during the interview (which questions) and the weight some comments carry due to the experience of the interviewee. These themes are later analysed (Chapter 5) to develop the theory, compare the findings with the literature (Chapter 6) and then answer the research question for this research in the conclusion (Chapter 7).
Chapter Four – Findings

4.1 Findings – Digital practitioner Interviews

This chapter will present and discuss the data gathered from the 30 interviews with digital practitioners. As discussed in chapter 3, the researcher has conducted a qualitative study, based on data obtained through open ended questions during digital practitioner interviews. The interviews consisted of various open questions (as described in Section 3.8) with some additional questions added following a number of initial interviews, which were analysed for richer data. The questions also identified the perceptions of the practitioners, indicating the ‘good day encountered in relation to their aspects of work during the week’ and a ‘bad day encountered during the week’ regarding their experiences at work with each element, theme and concept within the digital disruption context.

The analysis process, aided by a software tool, NVivo (QSRInternational 2011), enabled a structured and comprehensive analysis (as described in Section 3.6). The elements forming common themes are derived from the interviews and supporting statements made by practitioners are presented to provide the basis from which the key concepts were extrapolated. These concepts have been analysed (Chapter 5) and compared with current literature (Chapter 6).

In order to succinctly describe the results of the analysis performed by this research, the practitioners interviewed have been described, detailing various aspects of their background and experience. Then, each of the five final key concepts have been used to group and present the final set of themes along with samples of supporting interview data. The five key broad concepts include:

- Digital Disruption Mindset
- External Collaboration
- Future Drivers
- Constraints
- Customer Focus

The initial coding produced thirty-one categories called themes with one hundred and forty eight (148) broad subcategories called elements within its own categories (see Appendix E). These initial coding categories were used to search and analyse the interview transcripts. These initial categories called themes were reanalysed to generate a more narrow set of categories called concepts that reflect various themes within the initially coded elements. All the initial elements were coded under the closest themes,
which were compared, contrasted and synthesised in the analysis (Chapter 5). The five key concepts generated (see Appendix E) from theme categories grouped from across initial elements results as follows: Mindset, External Collaboration, Constraints, Future Drivers and Customer focus.

The five key concepts generated (see Appendix E) from theme categories grouped from across initial elements results as follows: Mindset, External Collaboration, Constraints, Future Drivers and Customer focus.

The resulting elements, themes and concepts (see Appendix F) were examined individually, with the set of coded references (interview data) being re-examined. From this analysis memos were created to describe the essence of each element and then each theme. These themes have been broadly derived from more detailed elements (see Appendix G) that were found within the initial set of open coding. The memos and a cross-concept matrix query (generated using NVivo), allowed similar (in perspective) elements to be grouped into a final set of thirty-one themes. The various elements, themes and concepts were then cross-examined and charted against one another in NVivo for the frequencies of most mentioned and coded. The concepts and themes generated were then analysed and the inter-concepts and themes relationships examined and categorised according to their strengths as shown in Table 4.1. Appendix F shows this derived grouping of elements for each of the thirty-one final themes and five concepts.

In presenting the themes in this chapter this research, Table 4.1 describes the strength of a theme. In the following discussions the strength is used to help describe the strength of the theme which this research has based on number of sources.
Table 4.1: Inter-theme relationship strength legend, based on number of interviewees (30 sources)

<table>
<thead>
<tr>
<th>Strength</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Strong</td>
<td>16-30</td>
</tr>
<tr>
<td>Strong</td>
<td>10-15</td>
</tr>
<tr>
<td>Moderate</td>
<td>5-9</td>
</tr>
<tr>
<td>Weak</td>
<td>1-4</td>
</tr>
</tbody>
</table>

This chapter will first discuss various attributes of the digital practitioners interviewed, used in the analysis in Chapter 5. Next, the final set of thirty-one themes are discussed, grouped within the five concepts (identified during the analysis). Each theme is also examined across the various practitioner attributes and across the interview questions from which it was coded (see Appendix D for summary). The presentation of each theme in this chapter includes a general discussion of its essence with supporting quotes from the interview data, a summary of its relationship to the practitioner attributes, along with a summary of how it contributes to the theme.

4.1.1 Digital Practitioner Attributes

The practitioner summary table (Table 7.2 in Appendix C) provides a snapshot of the digital practitioners interviewed as part of this research. These and other practitioner attributes have been discussed in more detail in this section.

The following section describes various characteristics of the digital practitioners interviewed. Some of these characteristics were used in the analysis of the interview data. As can be seen from the demographic data presented in this section, the interviewed digital practitioners are a very diverse group of professionals.

Table 4.2 Practitioner Gender

<table>
<thead>
<tr>
<th>Sex</th>
<th>Number of practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>20</td>
</tr>
<tr>
<td>Female</td>
<td>10</td>
</tr>
</tbody>
</table>

Gender is shown in Table 4.2, showing slightly more male practitioners were interviewed. This is discussed briefly later (Section 5.3.1) in the analysis chapter.

The context in which digital practitioners performed digital disruption activities was an important characteristic to examine. Understanding the different issues impacting on organisational based...
backend decision makers, digital practitioners and customer experience front end digital practitioners have produced some interesting results. Table 4.3 provides a summary of the practitioners interviewed from the context of practice. The ‘Mixed’ practitioners had worked in both an organisational back-end environment and in a customer experience front-end environment.

<table>
<thead>
<tr>
<th>Context of Practice</th>
<th>Number of practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer facing decision maker</td>
<td>8</td>
</tr>
<tr>
<td>Organisational decision maker</td>
<td>7</td>
</tr>
<tr>
<td>Mixed</td>
<td>15</td>
</tr>
</tbody>
</table>

The digital practitioners who are also decision makers interviewed had two different roles within the digital disruption area. They had either a digital disruption management role over a digital disruption team or a digital practitioner role. Table 4.4 provides an overview of this distinction in the participants.

<table>
<thead>
<tr>
<th>Role</th>
<th>Number of practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Strategic Decision Makers</td>
<td>12</td>
</tr>
<tr>
<td>Digital Operational Decision Makers</td>
<td>18</td>
</tr>
</tbody>
</table>

The diversity of the various academic backgrounds, in Table 4.5 and Table 4.6, not only indicates the multi-disciplinary nature of digital practitioners, but also agrees with the idea that the discipline of digital disruption within educational institutions is in its infancy. Many practitioners commented on wanting to do an academic program that focused on disruptive technologies ICT and innovation, human factors and renewable technologies. One practitioner described it as ‘An amazing diversity of people’. Working with this diversity provides an opportunity for practitioners to enhance their skills. One of the interviewed digital practitioners expressed this, ‘The skillsets that they [digital disruption team] brought along, I was able to work with many different people from PhD backgrounds through people who have been [company workers]’. The literature agrees with these statements of diversity in digital practitioner backgrounds (Gobert et al. 2002).
Table 4.5: Academic Undergraduate degree

<table>
<thead>
<tr>
<th>Undergraduate Program</th>
<th>Number of practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>5</td>
</tr>
<tr>
<td>Psychology</td>
<td>2</td>
</tr>
<tr>
<td>Commerce/Arts</td>
<td>1</td>
</tr>
<tr>
<td>Multimedia/Graphic Design</td>
<td>6</td>
</tr>
<tr>
<td>Industrial/Mechanical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>Information Technology and Information Systems</td>
<td>9</td>
</tr>
<tr>
<td>Economics</td>
<td>2</td>
</tr>
<tr>
<td>Accounting</td>
<td>1</td>
</tr>
<tr>
<td>Others unknown</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.6: Graduate Diplomas, Masters and PhDs

<table>
<thead>
<tr>
<th>Graduate Program</th>
<th>Number of practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate Diploma Applied Information Systems</td>
<td>1</td>
</tr>
<tr>
<td>Master of Science, Business and Information Technology</td>
<td>2</td>
</tr>
<tr>
<td>Graduate Diploma in Commerce</td>
<td>1</td>
</tr>
<tr>
<td>Graduate Certificate in Business</td>
<td>1</td>
</tr>
</tbody>
</table>

Not all interviewed practitioners had done academic study. Some had started their working careers within an organisation, having been subject matter experts (users), and moved into a digital disruption role through opportunities within the organisation. Some of the practitioners expressed an interest in doing graduate diploma studies within this area, but there was nothing on offer that focuses on this area. The broad age range of the digital practitioners interviewed can be seen in Table 4.7.

Table 4.7: Broad Age brackets of practitioners

<table>
<thead>
<tr>
<th>Age Brackets</th>
<th>Number of practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 30</td>
<td>6</td>
</tr>
<tr>
<td>Between 30 and 50</td>
<td>16</td>
</tr>
<tr>
<td>Over 50</td>
<td>8</td>
</tr>
</tbody>
</table>

All the digital practitioners have worked for more than five years in the digital disruption area and all are currently working in Australia. Digital practitioners interviewed were located in Sydney (three) and mainly Melbourne. The experience of a practitioner, shown in Table 4.8, has been broken up into those with 10 or more years of experience and the other with less than 10 years’ experience. In the analysis chapter the significance of this issue has been discussed.
The interview sessions were predominantly performed at the interviewee’s workplaces and were between forty-five (45) to ninety (90) minutes in duration. The interview sessions were recorded, audio only, and then transcribed into text. The above data was predominantly drawn from interviews, but where gaps were found they were filled by examining the digital practitioner’s ‘LinkedIn’ page, a professional’s online resume website. Each of the digital practitioners interviewed either requested to link to this researcher or this researcher requested a link to them, before or after interview sessions. This provided additional information about the digital practitioner’s experience and background.

4.1.2 Stakeholders (Strategic/Operational Digital Decision Makers)

The term ‘stakeholders’ has been used in the discussion of the various actors involved in enterprise senior decision making roles to describe various themes presented in chapter 4 and chapter 5. An analysis was done of the interview data to discover the various decision makers involved in the performance of, and affected by, digital disruption activities and outcome. During the analysis of this data the following stakeholder groups were identified:

Digital Practitioners – Operational Organisational digital practitioners that interact with customers.

As part of the digital delivery team we oversee and ensure everything regarding all accounts, changes, sales campaigns and all the front line customer experience in relation with development of customer future products and services that will be delivered online. We lead analysts and consultants are the digital disruption champion of the enterprise. # 009

Decision making digital practitioners Operational

So my role in WFO is Real-Time Analyst and Planner. So what my job is, is to look at the day-to-day activities of vulnerability, which is one of the departments that we have here and basically manage the day in terms of looking at needs of staff, looking at what people are doing at what time, making sure that they’re following their schedule, making sure that we have enough people to cover the call demand patterns. # 010

Table 4.8: Digital disruption Experience of practitioners

<table>
<thead>
<tr>
<th>Band</th>
<th>Year of Experience bracket</th>
<th>Number of practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Between 5 and 9 years</td>
<td>8</td>
</tr>
<tr>
<td>High</td>
<td>10 years and over</td>
<td>22</td>
</tr>
</tbody>
</table>
Decision making digital practitioners of the enterprise – Strategic

*We in senior management roles implement digital business strategies for managing disruptive change – it’s more about new features, new platforms, new partners using innovative technologies the way we operate to capitalise on digital disruption and disruptive innovations.* #004

Strategic Decision makers – CIOs, Digital Directors and Heads of Departments

*We had a really good well defined working relationship with the whole digital team and with various digital practitioners across the whole organisation in embracing digital technologies to deliver the result and performance according to the enterprise digital strategies.* #010

Enterprise Board of Directors – Chairman, CEO, CFO, shareholders and Directors

*Decisions to embrace technology has to come from the top and as a senior decisionmaker, to sponsor the project and someone who has some clout in the organisation to drive the vision in the uptake and acceptance of the disruptive change throughout the enterprise.* #010

There were interesting comments made about digital practitioners as liaisons or bridges between departments in an organisation. Digital practitioners become communicators or enable communication of the shared digital disruption vision. Digital disruption activities provide an opportunity for involvement, collaboration internally and externally within the industry ecosystems in disruptive change management and enable communication between various stakeholders’ groups.

*Digital technologies paved the way for better communication using the internal Link live chat group helping and live meetings log in via laptops and iPads in real time between staff and help them talk to each other.* #010

*People in different divisions will buy in, especially in financial institutions, after trainings to break down barriers between the divisions.* #017

In summary, the Digital Disruption research has allocated enterprise stakeholders into five distinct groups: first, the Strategic decision making management, second, the Board of Directors organisational stakeholders and third, the primary Operational decision makers of the digital enterprise and fourth, the operational digital practitioners front end customer experience involved in varying capacities performing digital technologies activity in enterprise systems to digitally interact with and improve customer experience. A summary of these distinct enterprise stakeholder groups has been shown in Table 4.9.
Table 4.9: Demographics of Enterprise Stakeholders participants interviewed

<table>
<thead>
<tr>
<th>No. of people in each category interviewed</th>
<th>Stakeholder Group</th>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 8</td>
<td>Digital Practitioners – customer facing – Operational</td>
<td>Operational Organisational digital practitioners that interact with customers</td>
</tr>
<tr>
<td>10 10</td>
<td>Decision making digital practitioners - Operational</td>
<td>Actual digital practitioners who are decision makers implementing digital technologies to make changes or are directly affected by the disruptive change.</td>
</tr>
<tr>
<td>6 6</td>
<td>Decision making digital practitioners - Strategic</td>
<td>Senior decision makers in organisation</td>
</tr>
<tr>
<td>4 4</td>
<td>Strategic Decision makers</td>
<td>CIOs, Digital Directors and Head of Departments</td>
</tr>
<tr>
<td>2 2</td>
<td>Enterprise Board of Directors (Strategic)</td>
<td>Chairman, CEOs, CFOs, shareholders and Directors</td>
</tr>
</tbody>
</table>

The outcome of this section, in relation to enterprise stakeholders, is that they are the primary resources for disruptive change activities. Stakeholders need to be taken on the disruptive change journey, to be involved in embracing digital disruption activities and given the opportunity to develop a digital disruption mindset that incorporates their domain knowledge and expertise. This is not limited to the strategic decision making team members in fact the collaborative approach applies to all enterprise stakeholders. This involvement and consideration of enterprise stakeholders in digital disruption activities will have a positive effect on the disruptive change outcome.

The initial findings of groups of elements were then grouped into themes and concepts as shown in figure 4.2.
4.2 Digital Disruption Mindset Concept

Digital practitioners discussed the impacts of innovative technology and digital disruption within personal and professional lives that continues to evolve at an exceptionally fast pace. From energy-based mobile apps and wearable devices, to the emergence of augmented and virtual reality, the digital revolution and disruption is expanding to cover every aspect of the human experience and the way businesses are being conducted.

Energy utility companies rely on advancements in technology, digitally mature organisational capabilities to provide cutting edge products, platforms and experiences that meet the growing demands of an increasingly competitive consumer market. And it is critical that companies have the organisational capability to swiftly adapt to the changing markets amidst the inevitable disruptive changes and unexpected turns, as much as having access to the tools needed to create, modify and fix things on-demand.

The following set of categories describes the importance of a digital disruption mindset in maintaining customer performance whilst managing disruptive change and achieving digital maturity. In this research, interviews were conducted with two major sets of digital practitioners, thus the key themes to emerge from a digital disruption mindset are grouped into the following themes:
4.2.1 Organisational Capability

A digital disruption organisational capability describes the different aspects of organisational capabilities within an enterprise that will contribute to the implementation of disruptive change management and organisational learning processes with a mutual understanding across various departments and within the organisation. These capabilities which include creation and evolution of change processes, once adopted as organisational culture, would allow decision makers within the organisation to provide due consideration to the digital maturity transformation concepts and goals. The digital disruption organisational capability will be nurtured by outlining and promoting digital disruption organisational capabilities, sharing the purpose and communicating the vision with stakeholders’ involvement in disruptive change management activities. Along with creating digital change requirements that have articulated a set of digital disruption goals to promote performance of digital disruption activities, strategic decision makers empower change agents and digital communities with new technical skills training to promote organisational learning and to motivate and communicate a shared vision of embracing digital change across the organisation. The set of elements that have been highlighted by the interviewees which form part of this organisational capability theme include:

**Organisational learning to improve Change Capabilities**

So, the current perception of digital disruption is that customers are so well informed and sharing information off each other online, phone-calls to companies are decreasing. The functionality of digital infrastructure will be there, but it will be more of a transition to the super-agents, who will need to be trained to have stronger technical knowledge, experience and digital capabilities. #055

**Set Goals to Motivate and Promote Change**

So there need to be milestones and checkpoints, to motivate, by measuring functionality and the end goals clearly at the start, of what are requirements, of what success was going to look like, what kinds of key performance indicators needed to make disruptive change successful and the rewards for the team. #003
Decisions embraced, communicated and shared vision across organisation

And I guess the sort of bad experience is obviously that some companies’ senior management don’t communicate the decisions made, share openly or inform the employees of their digital strategies or where they want to be in embracing digital transformation, so there’s a lot of insecurity with the staff. 

This is a strong theme that has contributions from 13 digital practitioner mentions, with 93 coded references. This theme was discussed in most of the questions asked during the interviews, but predominantly in the ‘bad story’ based on a bad experience at work from the interviews (seven practitioners) and good story based on a good day at work (six practitioners). This theme has a strong base of support from practitioners interviewed.

This theme highlights the importance and backbone that organisational capability provides to the digital disruption mindset. Organisational capabilities skillsets in the active context such as organisational learning, organisational flexibility and agility, goal setting and a shared mindset across the organisations through effective communication allows organisations to reposition themselves and contributes to the digital disruption mindset. These skill sets of Organisational Capabilities function to facilitate change towards a digital disruption mindset and ultimately improve the competitive advantages of organisations.

4.2.2 Change Management

Change Management mindset is critical to nurture understanding and goal setting to promote transformation of organisational culture and embrace digital maturity. It is abundantly clear that digital enablement will not remain a largely centralised activity but a collaborative one. Whilst internal organisational capabilities have key roles to play, the secret to digital transformation at scale is empowering change agents both internal and external change agents and involving communities with change processes to greatly assist with change management. To enable much broader digitisation, internal and external communities of change agents must be empowered with the tools, resources, know-how, and most importantly, direct support to drive success within the energy ecosystem.

We manage change very well within our current environment by involving the right resources, reviewing the impacts of disruptive change at all levels constantly and ensuring buy-in from those involved and affected. Operationally and strategically, we have different digital needs higher up in corporate and this ranges from unleashing hundreds of innovators on your data/APIs externally using developer networks and other vehicles, to working vicariously through eager digital leaders internally that want to realise change in their corner of the organisation. 

#021
The technology, the resources, the training, the readiness, the learning tools, the buy-in or uptake of gains, the planning and aligning with business goals, the customer centricity and understanding and communications so there are a lot in change management that impact digital disruption mindset which we are currently implementing. #055

This theme has contributions from 16 digital practitioners, with 42 coded references. This theme was discussed in most of the questions asked during the interviews. This theme has a very strong base of support among practitioners interviewed.

The digital disruption mindset theme has a high-level theme of change management that enables disruptive change to be implemented with a digital disruption mindset. This is the most desirable level of disruptive change management that needs to be nurtured requiring very experienced digital practitioners to incorporate technical expertise and change processes across the organisation to achieve a true digital disruption mindset. Sponsorship, buy-in, communication, readiness to change and involvement are important aspects in enabling the organisation to adapt to a more goal-oriented change management. This can include involving the right people in the implementation of the change and ensuring end users within the organisation are trained to respond to the disruptive change. Change management within organisations function to continuously extend and adapt a firm’s existing resources and processes to improve performance with the changing digital ecosystem.

4.2.3 Organisational Culture

Where digital transformation activities and goals have been integrated as part of the organisational culture and communicated across the enterprise, incentives to encourage teams to collaborate for disruptive change success will allow understanding and continuous improvement of organisational capabilities. Organisational culture motivation and fostering relationships throughout the enterprise can be achieved only through education and organisational learning. Education is a key ingredient that helps establish a digital disruption mindset and shapes the organisational culture leading to efficient decision making.

You have to understand it’s as much about organisational culture as it is about systems and processes. There is a cultural thing here. There is the governance, there is the risk aversion, effective communication, there is the big challenge with educating the team while fostering relationships and helping them co-exist culturally in a digital environment that to them feels almost unnatural to embrace disruptive change mindset across the organisation. #041 Organisational culture isn’t just myself. It’s across the whole strategic decision making team, across the whole of customer operations, in fact the whole organisation but what decisions we make have an impact on what happens in the other areas, in billings, credit, digital team, and sales and marketing. So, we have to make sure that we’re aligned in our vision for the way forward looking at future mode of operations together regarding digital disruptions working
through organisational changes and strategies, about having the same mindset being agile enough to fit in disruptive changes. #012

This theme has contributions from 12 digital practitioners, with 38 coded references. This theme was discussed in most of the questions asked during the interviews, but predominantly in the typical day discussion (seven practitioners), bad story (eight practitioners) and good story (four practitioners). This theme has a strong base of support from practitioners interviewed.

Transformation of an organisation’s culture to incorporate a digital disruption mindset improves the disruptive change management success of an organisation. The organisational culture with a digital disruption mind-set established and incorporated into the disruptive change management will filter down to the whole organisation. The fostering of relationships through effective communication within the organisation can improve and motivate the embracement of technology. This is imperative for increasing the awareness and involvement of digital disruption stakeholders in engaging with digital disruption to improve the organisation’s digital maturity.

4.2.4 Customer Capability

The advancement of telephony, computational capability and the Internet of Things – smart devices that every end-user now has access to – has given them power to choose the energy retailer they prefer to deal with, based on value to the person who owns those end user devices. Energy utilities is a very low-involvement product from most customer’s point of view. However, it becomes a very high-involvement and a real issue when customers’ expectations are not met. To a customer, every retailer should have that capability to deliver that requirement and service with simple, user-friendly processes. Customer capability is about offering digital applications, features, online capability, access to engage and select products and services with ease and simplicity. It is also about giving customers a sense of comfort that they’ve done the right thing, have made the right choice and definitely, that the energy service requested will be delivered without hassles. Thus, customer capability leverages agility, skillsets, utilises multi-channels and knowledge retention to focus on customer-experience as the key capability of a customer-centric enterprise.

If it is customers’ personal choice to embrace latest technology to engage with their energy retail company, most companies will be on the same train, embrace technological change immediately in response. In my area, our digital technologies can respond to change pretty much straightaway without having to go through all the bureaucratic paperwork to get things upgraded or changed over. We have the capability to respond swiftly, interactive and in real
time, we constantly provide feedback to the digital team, who provide feedback to the developers and they can get things effectively changed straightaway. #025

We certainly have the ability to compete. We have to be customer centric, embrace digital ecosystems and also invest to build, acquire and retain digital talent as customer capabilities. Customer service agents who are comfortable with the disruptive change will feel comfortable providing information because they have the knowledge and experience and this creates clear understanding with customers who then will feel empowered and educated which translates to a happy and good customer experience. #054

How engaged customers will actually be in wanting to participate in a lot of demand management and monetisation of their assets. We firmly believe that the role for energy services provider is to manage that on customers’ behalf and offer products to the customers to choose whatever that has some potential profit sharing for consumers are going to sit there with that app pressing buttons and watching responses all the time. Most digital applications popularity usage falls away in a matter of months. #006

There are 11 digital practitioners who contributed to this theme, with 25 coded references. This theme was mentioned during all questions, but predominantly in the discussion of the good story (ten practitioners). This theme has a strong base of support from practitioners interviewed.

Customer capability comprises of the ability to offer a variety of products of services across the spectrum society of energy users. In transitioning legacy customers to innovative digital platforms with digitised products and services, energy providers should be mindful of customers’ requirements as not to alienate existing customers whilst offering customers that demand new technologies and the full digital experience. In addition, customer capability assisted by innovative technology plays an important role in the knowledge retention of customers regarding products and services. This theme provides the digital disruption mindset with the key to improved disruptive change success and creation of customer centric value products and services.

4.2.5 Strategic Management

A strategic management mindset essentially should be initiated by the strategic decision making team to provide leadership and vision that is cascaded down to all levels of the organisation. This is essential
to build competitive advantage, organisational capabilities, resource based capabilities and disruptive change capabilities to lead the enterprise in embracing innovative digital maturity. Improving the strategic management mindset through involving more stakeholders can improve or demonstrate the value belief on disruptive change activities and the resulting disruptive change outcomes. This is especially important to the change agents whose main task is performing digital disruption activities at particular point in time and organisational readiness to change require strategic planning, investments into workforce for high value, new business models and embracing innovative technologies.

To manage disruptive environment senior management needs to encourage a more contemplative thinking about leadership, to share the vision to change an organisational culture of and improve competitive advantage. Certainly, as challenges emerge, and when we do get a couple of waves, we run a process that we call the strategic management process, where we go through a consultation process. That is, in order to advice stakeholders about what the imminent issues are and then identify some priorities from there, conceptualise a strategy and manage implementation. #041

Clearly, we can’t wait. You’ve all seen this before of what networks will look like from end to end when they form the ‘full stack’. We cannot dwell on this for too long, the critical thing facing us here is rapid disruptive innovation, in smart grid, smart energy storage, the convergence of our networks, our telecommunications, our information and our energy networks and ecosystem, and that will be a major disruption. #003

There are 21 sources mentioned that contributed to this theme, with 128 coded references. This theme was mentioned during all questions, but predominantly in the discussion of the good story (10 practitioners). This theme has a very strong base of support from practitioners interviewed. The essence of this theme is the importance of strategic management to lead and motivate the shared vision of digital disruption for the future of the energy industry with a mindset concept that embraces digital maturity and prioritises digital investments based on value opportunities and competencies.

Investments in the organisational capabilities of digitally-skilled, agile workforce and in innovative technologies to create new business models, in process optimisation with quality data analytics, in collaboration to pursue impact that are important and not only demonstrating value belief but also to progressively innovate to manage disruptive change.

4.2.6 Stakeholders’ Collaborative Approach

Beyond understanding the value of digital disruption and shared vision, to ensure collaboration of strategic stakeholders, senior decision makers need to further strengthen the motivation and purpose
of the digital transformation of enterprises through a collaborative approach. Digital practitioners made special mention about involving strategic decision makers and senior organisational stakeholders to provide an opportunity to establish a shared vision and foster relationships with stakeholders to embrace digital ecosystems. It is important to involve all stakeholders in the company to establish a digital organisational culture that is accepted and known across all levels of the organisation. The essence of this theme is the importance of a stakeholders’ collaborative mindset to help make better digital strategic business decisions.

Basically, involving stakeholders in change management and gaining their buy-in, on the financial results and business gains, looking at the various drivers, of reporting through to disruptive change management, how we are tracking against our other strategic plans, builds support and motivation. Generally, stakeholder collaboration involvement helps guide and provide better strategic decision making as well as some meaningful analysis together. #002

Well once again, in Australia, an energy revolution is happening in renewables, in energy storage batteries, in big data, in digital platforms and information management, in an increasingly multi-directional nature of energy. You need collaboration within the enterprise and with the support of the stakeholders to collaborate. #009

There were 13 digital practitioners who mentioned this theme. These contributions (26 coded references) were predominantly made when discussing aspects of collaborative approach theme, with some related across the other themes. It was predominantly discussed during the good story (14 digital practitioners), bad story (11 digital practitioners) and typical day (11 digital practitioners) discussion, with some discussion across all other interview questions. This theme has a strong base of support from practitioners interviewed.

The contribution of the mindset collaborative approach theme is the necessity of involvement in digital disruption activities throughout disruptive change management. Involvement is a two way activity. Digital practitioners utilise involvement to generate digital disruption findings and perceptions to improve buy-in and uptake of digital strategic decisions, but also use it to develop a shared digital disruption vision (digital disruption mindset) for the whole organisation. Collaboration by all stakeholders through involvement in digital disruption activities is one of the best ways to create and improve the value of a shared digital disruption vision. Stakeholder involvement improves digital disruption understanding and appreciation for the value of digital disruption.
4.2.7 Value Resource Capability and Rareness Capability (RBV Capability)

Digital practitioners listed the importance of this theme of unique, value resource capabilities (RBV capability of the DCC framework refer Section 2.8) for enterprises to achieve value creation, sustainable performance and competitive advantage over competitors. Decision makers need to respond to digital disruption through improving the ‘Value Capability’ and ‘Rareness Capability’ through the reconfiguration of their resources, skill sets, improvisation of processes to redefine their core business values and strategies.

The energy industry digital disruption has come through from people using digital technologies disrupting small pieces of the value chain and when we have got volume, we know we can get mass transactional interaction so we can manage to create value with this value capability and Rareness Capability. Thus, with leaner processes, leaner governance, leaner funding processes would help us get moving quicker and realising value quicker. The management is totally receptive to getting new digital platforms and infrastructure implemented in a way that makes it really simple and to interact with our customers and provide them real value, with contextual information that’s unique to them. That personalisation of customer experience is our enterprise value capability. #041

Interesting dynamics will play out clearly in the different parts of the value chain. There’s going to be an enormous amount of investment from the renewable energy aspects, Internet of Things, and the ‘blockchain concept’ in the future. A framework of Change capabilities, Value and capabilities will definitely be useful strategic decision making. Value will be created by companies that offer products and services that are unique in the value chain. #006

There were 18 digital practitioners who mentioned this theme and 72 coded references. These contributions were frequently made when discussing aspects of digital disruption mindset, with some related across the other themes. It was mainly discussed during the good story (18 digital practitioners), bad story (seven digital practitioners) and typical day (11 digital practitioners) discussion, with some discussion across all other interview questions. This theme has a very strong base of support from practitioners interviewed.

Value resource capabilities and Rareness capability (RBV capability) constitute the uniqueness in a product of services which contribute to the competitive performance in organisations. The rise of the Internet of Things digitalisation along with new platforms further emphasises the importance of the value resource capabilities in organisations in the creation of value. The Value and Rareness Resource Capability and its attributes will have a great influence in digital disruption mindset concept in managing disruptive change activities and in appreciation of the value of digital disruption in value creation for enterprise.
4.3 External Collaboration Concept

The following set of themes of external collaboration are significant as a collective power to describe the importance of a collaborative approach that involves customers, shared digital platforms, network competitors, vendors, contractors, service providers and all stakeholders external to the enterprise in the performance of digital disruption activities and in moving forward into the fast evolving digital future. Collaboration, cooperation and co-creation can have both significant costs and benefits for the customer and the enterprises within the ecosystems in resolving conflict, trust development, cooperation in new product development and communication. External Collaboration concept comprises of the following themes:

- Digital Network Ecosystems
- Customer Involvement in new Business Model
- Involvement of Government Agencies/Service Providers/Supply Chain
- Network Economy
- Establish a Shared Vision

The success factors of digital transformation from the most digitally mature organisations appear to emphasise change in distinctly different ways of not focusing much on individual technologies or overemphasise existing operations. Instead, they fundamentally create new business models by exploring opportunities and potential that the digital world enables, collaborating, creating new markets, by reinventing the core business in technology terms, employing co-creation and peer production to cost-effectively use the strengths of digital connectedness to tackle scale and innovation.

#010

4.3.1 Digital Network Ecosystems

A collaborative approach with external network ecosystems partners offers shared knowledge, resources and specialisation building a stronger platform offering customer involvement in decisions regarding the products and services offered. Collaboration within network and digital ecosystems using big data enabled capabilities and interfaces provide opportunities to build a stronger bond with the consumer even though the brand might not be the one that’s delivering the perceived service. Thus, external collaboration amongst network ecosystems will allow consistent risk spreading amongst parties, such as wholesale commodity and retail service sectors. Coordination with the whole new, emerging energy ecosystem is efficient, safe, secure and reliable.

Technology provides us capabilities exponentially, but social systems grow linearly and it’s in that gap between that exponential capability provided by technology and social systems such as peer-to-peer platforms, protocols,
regulation, accounting, law, you name it and with a lagging indicator of technological capability there’s an opportunity to strategically plan. #09SD

It adds a layer of the intermediary network company offering crucial customer services you are unable to provide only embedded network works which also forces the embedded network service provider to stay with you as an energy company, as a partner, because to change means disrupting the end consumer’s service. #041

This theme has contributions from 7 digital practitioners, with 14 coded references. This theme was discussed in most of the questions asked during the interviews, but predominantly in the good story (seven practitioners). This theme has a medium base of support from practitioners interviewed.

This theme discusses one of the key goals of the collaborative theme, which is to establish a shared digital disruption vision for digital network ecosystems to work together in providing products and services. This vision can only be established through a collaborative approach in order to incorporate the various energy supply elements goals. It’s this shared vision of collaboration that will enable better sharing of digital infrastructure, resources, risks allocation consistency and improved decision making to provide better traction on embracing digital transformation. This will add value to customer experience and services, improve relationships and communication between customers and energy providers within the networked digital ecosystems.

4.3.2 Customer Involvement in new Business model

One of the challenges with customer interactions is that customers have the ability to switch from channel to channel in their interactions with retailers, moving from websites, Google search, looking at information FAQs as well as engaging in chat sessions or automatic robotic chats or chatbots. Other means of communication such as emails, phone calls and visual interactions are streamlined to provide information on digital platforms which allows information downloads in real time to show their energy utilisation in their current premises. There are various smart technologies with different ways and means customers can use to communicate with their energy provider. In using digital platforms, chatbots where a conversation or enquiry is conducted via auditory or textual methods as well as multi-channel experiences where some customers are able to help other customers encourage co-creation of value. With that customer involvement, it is a view that customers will be so well informed to be sharing among each other as well as with the assistance of a virtual agent building a virtual community and customer experience. This functionality of innovative technologies will make it much easier to make the transition to the digital platforms using virtual super-agent that has stronger technical knowledge offering customers new solutions and more importantly, customer confidence and loyalty.
So, the moment, we’re about to launch into a phase which is about operating a business model around the customer engagement by investing in the latest smart innovative technology that allows to be actively involved. Multi-channel and super agents are there to assist and where customers collaborate to create their own community. #055

We are basing our business model on the fact that the trend will be for more consumer engagement. We think consumers will want to know more about where their power comes from and more about the ‘source’ company or companies, given that the definition of retail will be broad. #SD010

It will be in the enablement of much broader digitisation by empowering internal and external communities of customers and change agents with the tools, resources, know-how, and most importantly, direct support that drives success. This ranges from unleashing hundreds of innovators on your data/APIs externally using developer networks and other vehicles, to working vicariously through eager digital leaders internally that want to realise change in their corner of the organisation. #003A

I’m not suggesting we won’t be disrupted as an industry, but my sense is the new business model will be so simple that you have empowered the consumer to a point where it’s seamless and it’s easy and they don’t have to interact beyond, ‘I’ve signed up, everything’s set, forget.’ I think that’s where you have disruption. #001J

This theme has contributions from 5 digital practitioners, with 10 coded references. This theme was discussed in most of the questions asked during the interviews, but predominantly in the good story (seven practitioners). This theme has a medium base of support from practitioners interviewed.

This theme shows that the customer involvement in a new business model is important for the external collaboration concept in managing disruptive change. Using a new business model with a platform as a place to tap into internal and external resources where partnerships in a network digital ecosystem are able to reconfigure, manage disruptive changes and using the digital platform as a centre of solutions. The digital platform business model is probably the greatest opportunity in the coming years to co-create growth in the digital economy to provide the most value with a ‘network-effect’ to expand capacity and change capabilities to compete in the disruptive energy industry.

4.3.3 Involvement of Government Agencies/Service Providers/Supply Chain

External collaboration can offer organisations the ability to tap into capabilities, resources and capacity of service providers that they do not own using platform models creating digital ecosystems comprising of service providers, business partners, multi-sided digital platforms, government agencies and customers. New digitally enabled platform of products and services and new business models are
capturing more value in collaboration to transform every link of the value chain, gaining cost savings, customer loyalty and productivity improvements for all.

We work with our partners like service providers who does development work, to redefine the way we operate, to be able to do things rapidly. In collaboration, most vendors now are realising they have to shift towards collaboration as the way to operate. They can’t continue with heavy documentation, long processes in building infrastructure, three month lead time just to release a ‘window’. There is a lot of risk depending on where you are in the technology stacks but being at the top of the technical stack generally a rapid evolution of development features, getting new technologies happening on a faster cycle in partnership as service providers and contractors know, they either adapt or they perish. #041

In 2017, new energy service providers are coming to market almost on a daily basis with offers of renewable energy solar panels, ‘smart home’ products and energy storage battery systems. Tesla, ‘Sun Solar’ panels, retailers and energy retailers are just some of the players we see emerging in the retail and renewable energy space, forming partnerships with developers to build housing developments as embedded networks that market the cost-savings from partially getting off-grid. And government agencies will have to be part of the equation with regulations and recommendations for change. #095D

Well once again in Australia, an energy revolution is happening in renewables, in energy storage batteries, in big data and information management, in an increasingly multi-directional nature of energy and also soon in the near future, in disruptive technologies like blockchain, the technology underlying bitcoin and other cryptocurrencies. Regulations and policies need to be reviewed accordingly. #009

This theme has contributions from 12 digital practitioners, with 30 coded references. This theme was discussed in most of the questions asked during the interviews, but predominantly in the good story (eight practitioners). This theme has a strong base of support from practitioners interviewed.

This theme discusses one of the key benefits of the external collaborative theme, which is to share the benefits of collaboration among service providers, government agencies and supply chain as a network to provide a platform or ‘full-stack’ which demonstrates consumer value and cost effectiveness for consumers. The involvement of these multichannel stakeholders also creates a shared vision on the various factors affecting the collaborative approach and the co-creation of value such as regulations and policies. Innovative technologies such as blockchain, smart homes and energy storage battery systems have altered these factors which emphasises the need of collaborative consumption with these stakeholders in improving the digital disruption outcomes.

4.3.4 Network Economy

Network Economy is an economic environment arising from the digitisation of fast-growing, multi-layered, overlapping ecosystems, highly interactive, real-time, mobile connections among people,
devices, and businesses. This convergence of business and consumer network ecosystems in collaboration to create new business models and customisation of products and services, will allow digital ecosystems to flourish and provide exponential growth of opportunities for early adopters of innovative technologies.

The early success factors of digital transformation and the most digitally mature organisations, such as Apple, appear to emphasise change in a distinctly different way. They do not focus much on individual technologies or overemphasise existing operations. They fundamentally rethink, rebuild the business by exploring the fresh potential that the digital world enables, from new joint business models creating new markets to reinventing the core business in contemporary innovative technology terms. The successful companies have shown that employing co-creation, collaboration and peer production can cost effectively use the strengths of digital-connectedness to tackle scale and innovation.

The network economy that we have, the more things connected to the network, the more opportunity for the arbitrage, the more differences we’re creating in terms of its value. And the value is created in those different unique things. It’s leveraging people, businesses and devices within this emerging type of economic environment arising from the digitisation of fast-growing, multi-layered, highly interactive, real-time connections. #002A

Clearly, we can’t wait. You’ve all seen this before of what networks will look like from end to end when they form the ‘full stack’. We cannot dwell on this for too long, the critical thing facing us here is the convergence of our networks, our telecommunications, our information and our energy networks, and that will be a major disruption. #003

This theme has contributions from 8 digital practitioners, with 14 coded references discussed in most of the questions asked during the interviews, but predominantly in the good story (seven practitioners). This theme has a medium base of support from practitioners interviewed.

This theme discusses one of the key goals of the collaborative theme, which is to establish a shared role of the networks to provide cost-effective pricing, resources and risk allocation sharing. The retailer’s role is to take wholesale costs, network charges and other potential energy services such as distributed energy or energy management systems, and package them for consumers and allowing themselves to be a consumer’s agent in dealing with the rest of the value co-creation system. The digital networked economy also describes the traversing of commercial, cultural and social spheres, progressively evolving knowledge for incremental innovation. This is imperative for the collaboration of stakeholders within the ever changing digital ecosystem.
4.3.5 Establish a Shared Vision

The essence of this theme of a shared vision across the enterprise, customers and the ecosystem provide opportunities to share costs, resources and enjoy shared benefits of value creation and growth. In promoting and establishing a shared vision to embrace digital technologies need to be created across the organisation, across the various levels within the organisation and communicated to all within the ecosystem, on the sustainability and benefits to improve understanding and appreciation of the value of collaboration. The creation of this shared vision must begin with establishing the understanding of the technologies and the change activities involved and decision makers need to communicate and involve digital practitioners through regular meetings for technological adoption.

The enablement of much broader digitisation by empowering internal and external communities of change agents with the tools, resources, knowhow, and most importantly, a shared vision of direct support, drives success. This ranges from utilising innovative technologies, unleashing hundreds of innovators on your data/APIs externally using developer networks and other vehicles, to working vicariously through eager digital leaders internally that want to realise change in their corner of the organisation. #021

This theme has contributions from 20 digital practitioners, with 90 coded references and was discussed in most of the questions asked during the interviews, but predominantly in the good story (eight practitioners) that has a very strong base of support from digital practitioners interviewed.

This theme also discusses one of the key goals of the external collaborative concept, which is to establish a shared vision to embrace digital technologies to manage disruptive change. This vision can be established through a collaborative approach through innovative multi-channel experiences such as virtual agents, renewable technologies and smart technologies to incorporate the various digitisation goals. The shared vision will enable better digital strategic decision making, provide better traction on collaborative value creation findings, improve the flexibility of business models and improve relationship and communication between customers, enterprise and stakeholders within the network ecosystem.

4.4 Future Drivers Concept

The forces of digital disruptions are creating the ‘perfect storm’ in the rapid transformation of the energy industry in Australia. Fundamentally, these forces range from big data, data analytics and everything ‘Internet of Things’ to innovative technologies of smart metering, renewable energy solar and storage batteries combining with customer-driven, demand management network collaborations. Major energy utility companies are currently facing intense competition for volume, decreasing profits, increasing costs and smarter consumers with varied choices provided by big data mining, innovative technologies.
Disruptive technological ‘start-ups’ and any digitalised enterprise that stayed competitive and ultimately deliver the highest value creation and improve productivity to stay relevant will prevail in the coming years. The main shift is that technology is enabling the revolution of a new generation of smart information and communications technologies and tech-savvy consumers. It is providing consumers with options and choices and how they exercise those choices is driving the development in the energy sector. Smart technologies are also facilitating aggregation and storage capacity in the commercial energy market applications and big data is in many other ways facilitating the rate of change that is happening as battery storage costs rapidly fall.

The future is already here. It’s just not evenly distributed. Now that’s a very interesting way of talking about the Law of Disruption. The Law of Disruption, that technology provides us capabilities exponentially, but social systems grow linearly. It’s in that gap between that exponential capability provided by innovative technologies like machine learning, hologram and Augmented-Reality as well as social systems such as protocols, regulation, accounting, law, you name it, there’s a constraint and opportunity, and usually a lagging indicator of technological capability. # 002

The set of themes below are the most frequently highlighted by interviewees as drivers for the future of the energy industry, which is undergoing a seismic shift towards customer centricity, networked communities, renewable energies and innovative technologies:

- Data Analytics/Big Data Mining
- Digital Technology/Transformation/Network Economy
- New Technologies – smart grids, smart batteries
- Regulations and Policies
- Automation
- Progressive Innovation/Platform
- Understand Customer Needs

4.4.1 Data Analytics/Big Data

Big data and digital platforms will play a major role in the disruption of the energy supply industry. Whilst smart-metering is providing more personalised power usage trends and information of energy generated from solar, stored using smart batteries and shared, hyper-connectivity is creating spectacular new opportunities using disruptive innovation in the form of real-time access to information of customers to customise product offerings. Organisational decision makers will have to be clear on what platform, what roles and which data are fundamental to compete successfully in the energy industry in Australia. Big data mining remains one of the main untapped drivers with potential as a
growth multiplier in the near future. Big Data mining provides personalised customer information that paves the way to satisfy and improve customer experience and customer collaboration.

*Data from systems they have shown significant impact from grid take. But it takes profitability away. So you’re now... You’re only driving profit from grid delivered power. So as soon as you substitute that with something like smart battery storage, from solar input, then you’re destroying the revenue streams going forward. #058*

*Searching for answers, businesses and consumers will be using big data analytics, looking up and down at their business model, reviewing customers growth and services, all the way back to their supply chain, and trying to really figure out how they can operate their business to be more efficient. #010SD*

*My challenge as a leader in a rather large energy company is that we have invested in data analytics software, getting really smart with forecasting, to gain intelligence on customers instead of drowning in data. We have the capability to pull all that together to move forward into the future with data mining technologies also to potentially staying nimble to seize opportunities. #001*

The key theme of big data mining as one of the main performance drivers to the future was mentioned 12 times and referenced 50 times in the findings to deliver a seamless digital transition to innovative technologies with positive outcomes, opportunities and greater potential for the future of the energy industry.

This highlights the importance of data mining and artificial intelligence, which is, in many ways, facilitating the rate of change occurring in the disruptive digital space in the near future. This theme has a strong base of support from practitioners interviewed.

As big data analytics examines large amounts of data to uncover hidden patterns, correlations and other insights, the real time analysis of customer data will provide answers, add value and lift the quality of customer experience that otherwise would have been nearly impossible with a lack of capability and technology. Customer service has evolved the past decade and the smarter and internet-savvy consumers’ expectations of their retailers are to meet their demands and understand exactly what they need and when they need it. Big data analytics technology helps retailers gather endless amounts of data from customer loyalty programs, buying habits and other sources, in-depth understanding of their customers, predicting trends and building trust, loyalty and improved customer experience thus boosting profitability.
4.4.2 Digital Transformation/ Innovative Technology/Network Economy

The vehicles for digital transformation at scale for the energy utility industry in Australia are now many and varied. They include internal digitalised devices, digital platforms, digital incubators, lean start up approaches in product development, customer experience super-agents, open APIs, app stores, hackathons, centres of digital excellence, networks of digital enablement, collaboration, government incentives and so on. Energy organisations of the future will need to employ some of these methods to reach their digital future with relevance. By selecting techniques that most capture and channel the strengths of network collaborations, organisations can leverage new technologies to avoid dependencies on central capacity and heavy investment. Drivers of innovative technologies will support customer knowledge gathering for customer satisfaction, customer experience and performance.

As a tier one retailer, we understand the heartbeat of our customers, what, when and how they want it but at the same time need to make operational decisions based on profit margins too with product offering. So, it is decisions on who you partner with and what the future partners in network economy, are in collaboration. We do have to focus on future partnerships running over the next generation and to move beyond assets and hardware or who has got equitable or possibly better equity with consumers, who has relationships in households, how we bundle and work together in collaboration and that’ll be the new models for the future. #041

One main driver most talked about and underestimated is the transformation of data in this industry and I know there’s been a lot of discussion in data that’s available from now on, especially through smart meters, smart batteries and smart grids within the home, the big data and data analytics potential that hasn’t even been touched. The integration that is going to occur between electric vehicles, between household appliances, between energy generation assets and innovative technology is just going to be immense potential going into the future as something that just hasn’t been touched at the moment. #005

The key theme of digital technology transformation into the future as one of the main drivers was mentioned 22 times and referenced 105 times in the findings. The future of the energy industry currently transitioning and evolving with innovative technologies will revolutionise the energy industry in many ways. This highlights the importance of digital transformation and the collaborative network economy that facilitates the rate of change whilst earning customer loyalty in the ever changing digital landscape. This theme has a very strong base of support from practitioners interviewed.

Where most energy retailers are heading towards emerging technologies, the real point of focus is how to get that technology implemented in a way that makes it-easy to interact with customers, providing them with real value, contextual information that is unique and a great experience. The digital transformation in energies is mostly towards smart technologies such as smart meters, homes, grids and battery storage which are more customer-centric. With the technological improvements brought upon
by digital transformations, prices of solar and batteries may decrease and potentially disrupt the energy market. The digital transformation in organisations shows how the future drivers are an important aspect which can dictate the digital disruption outcomes.

4.4.3 Embracing New Technologies

The energy industry future lies mainly in managing big data and smart devices for knowledge of the customers, managing disruptive change and embracing innovative technologies transformation to deliver outcomes that consist of simple processes to offer new products and services. The future also includes a digitalised platform for ‘demand-response’ where customers have an opportunity to play a significant role and become involved in their choice of products and services, offering a sustainable, efficient and real time response using chatbots and web applications that can provide the real time services. A tipping point arises when a customer-led change is not facilitated by the energy retailers and companies. Then customers will take the initiative to change and disrupt the core business model. Network companies of the future will provide platforms where customers and collaborators like third party suppliers or wholesalers can create value and personalisation whilst the network companies manage the training, the learning tools, the knowledge management, the workforce planning and the business planning for customer centricity. Success comes from reaching sales by reaching out to the people on the network to create customer value for being on the network enabled by innovation. It’s a fundamental network driver for the future of the energy industry. The following list of elements frequently mentioned as essential and fundamental drivers:

- New Products and Services
- Innovative Platform
- The right technology choice
- Big Data/Analytics/ Real time response
- Super agents / virtual agents
- Demand Response/Networks
- Sustainability/Government Policies

With very high penetration of solar power generation and the innovative battery storage, electricity price will be affected, and network and related charges will encourage consumers to go off-grid and thus rely less on energy service providers. In the energy sector, historically, innovation is driven by competition. Regulated entities, including networks, would be allowed to own contestable products and services to enhance the deployment of a competitive development of a new contestable market in the retail energy services sector. #008
The superagent in place for customer service moving forward to 2020, in replacement of contact centres of now are perfectly transparent. So, with new technology, would have enabled us to provide customers with energy solutions, particular solar installation, solar equipment, energy battery storage or other tools and equipment. The knowledgeable super-agents proficient across all new technologies and problem solving skills will provide the best customer experience of the future. #055

The transition in our power generation transmission and retailing sectors has been led by technology change and consumer preference, as it is now. The technology-push and the customer-pull hide problems that has stimulated energy retailers to formulate and offer more diverse choices. #011SD

So, disruption in terms of generation of electricity, yes it will be a faster source of disruption than if a retailer entered the market with the right retail model. More consumers will be pushed off-grid to micro-grids of solar panels and the embedded networks. With economies of scale, in terms of cost effectiveness of batteries, the more they penetrate the market, the more volume the lower the cost, there will be embedded networks, off-grid communities and micro-grids who will form a more sustainable power supply’ #041

The key theme of new technology into the future as one of the main drivers was mentioned 13 times and referenced 40 times in the findings that impact the future of the energy industry in Australia transitioning and impacting the choices available for consumers. This theme has a strong base of support from practitioners interviewed.

This highlights the importance of new technologies theme in drivers for the future concept where possibly retailers may embrace innovative technologies such as blockchain in offsetting credits from solar panels in the renewables energy space in accordance with disruptive competition. Practitioners interviewed also highlighted the importance of providing customer-focused specialised services and management, multiple smart metering, DSP (demand side participation), micro-generation (small scale generation of electricity by individuals) storage, and other equipment and services. Among these new technologies, energy storage technology such as batteries can deliver stability to electricity grids and put downward pressure on the price of electricity. Retailers of the future will strive to satisfy customer energy demand with simplicity, which would make use of customer data and data analytics to deliver the optimal combination of network-delivered energy, locally-generated energy, demand management, energy efficiency in return for loyalty to its products and services.

4.4.4 Regulations and Policies

Australia has set a 2020 renewable energy target to transition away from coal, which will remain important as a declining share of the overall energy mix to renewable energy, according to Australia’s
Environment and Energy Minister, Josh Frydenberg (Lane 2017). Renewable energy with the advancement of innovative digital technologies plays a major role in this transition. Innovative technologies in the form of micro-grids, smart battery storage, smart homes, voice biometrics, artificial intelligence and virtual super-agents with multi-channels of engagement and interactions between customers and retailers. The energy industry in Australia is currently going through disruptive change and the Australian Energy Commission is undergoing increasing pressure to implement policy changes to overcome the highly regulated, highly supply-focused, distribution-based side of the energy industry. Customer and end user demand and requirements cannot be ignored or simply complied with. It requires consideration of regulations and policies while at the same time being demand-focused and customer-focused.

Regulators need to act. If we retailers agree that creating the most competitive energy services market possible is good for consumers, it follows that networks should not be able to use their financial clout, the information that gathers at network operators, the timing of their access to that information, or the processes they control to construct barriers to entry for potential competitors. #019

The plan that integrates energy policy and climate policy objectives as the energy council has determined should happen in their last communication at the December 2015 meeting. The plan enjoyed bipartisan support. That’s really critical. And it’s underpinned by a stable and bankable policy. They’re the things that have been missing for renewable energy investment in this country in the last few years. #SD010

It’s not about who are the winners but as retailers and consumers, we want regulatory frameworks that create the most efficient and commercially sensible business options in the models we’re going to transition to in the future. It’s important to stress that the market is only able to embrace the current wave of change because of the foundations made in the 1990s by the design of the wholesale energy market and more recently by the network ecosystems reforms implemented through a number of changes made by the AEMC. #009SD

The way the current energy industry is structured, we’re still trying to struggle around that and there are a lot of new digital business models for competition. But in gaining competitive advantage there has to be fair competition where all have to play by the same rules set by the AEMC, to be brought to competitive trial before implementing and roll out to the market. From our perspective as retailers, our focus for the next few years and beyond will be about markets and regulatory frameworks that are resilient, containing all the necessary protections and safeguards but are also receptive to disruptive change accommodating innovative change in energy generation, smart grids and smart homes, collaborative co-creation, whatever it may be. #001

The key theme of regulations and policies as one of the main drivers going forward was mentioned by digital practitioners 8 times and code referenced 25 times in the findings that impact the future of the energy industry. This theme has a moderate base of support from practitioners interviewed. This highlights the importance of regulations and policies as drivers enabling and facilitating disruptive change that has great impact on how the energy industry will transform and transition with disruptive
innovations. Policies and regulations will dictate and drive the momentum of digitalisation of the energy industry and innovative transformation into the future. The role of policies and regulations are important in adapting and responding to digital disruption with the rise of new business models, energy generation, smart grids and off-grids, energy storage, sustainability issues and information safeguarding.

4.4.5 Automation

Automation and incorporation of disruptive technologies activities include multi-channel contact with customers using super agents experienced across all technologies to provide value added services, new technologies supporting meters and to automate the repetitive processes with a human available to train, to help facilitate that automated part of the process. Digital platforms and smart technologies pave the way for simpler, consistent and effective human interactions and create a holistic customer experience that creates value in branding and loyalty in the energy provider. This translates to a more efficient, connected, empowered, analytically driven, automated way of working. Whilst the underlying disruptive technologies define the art of disruptive innovations of business models for an example, the micro-grid and peer-to-peer, blockchain technology with automated end points that is changing the ways business transactions will be conducted in the future. This is automation of the customer experience that organisations will have to build these capabilities, to understand and navigate, understand and advocate, to compete with that future and be successful in embracing digital transformation.

So, we’ve got big targets ahead of us. Renewable energy is obviously going to be a big part of that transition in the next few years, innovative technologies, data analytics, automation, demand response together with embedded networks have taken off at a far more rapid pace than anybody predicted, and fuel substitution is well underway in other applications. Yeah, it’s a huge investment risk as well. So there’s a tipping point where you either have to do something first or someone else will do it for us. And it could be customers that just say, ‘Enough is enough.’

This smart meter roll-out or smart meters sold as a value added service reform paves the way for the competitive provision of advanced metering services to residential and small business customers. This approach is guided by the principle that competition is more likely to drive innovation, facilitate deployment of advanced meters and services to consumers, at the lowest possible cost to give them a strong value proposition as to why they want to buy into it.

The theme findings for Future Drivers concept show the automation theme was mentioned by digital practitioners 7 times and code referenced 12 times in the findings that impact the future of the energy industry. This highlights the importance of automation drivers for the future enabling and facilitating disruptive change that has a great impact on how the energy industry will transform and transition with
disruptive innovations. Automation will dictate the momentum of transformation in a very big way. This theme has a medium base of support from practitioners interviewed.

This theme findings for the Future Drivers show automation and incorporation of disruptive technologies activities include multi-channel contact, with customers using super agents experienced across all technologies to provide value added services, new technologies supporting meters and automation of repetitive processes with a human there to train and to help facilitate that automation as the underlying technologies drives and defines the future drivers. Technologies which operate autonomously are highly disruptive in many industries and highlight the importance of embracing disruptive technologies in organisations to stay relevant in the changing ecosystem.

4.4.6 Progressive Innovation Driven

From an overall view of where the energy industry is heading, renewable energy is the ‘elephant in the room’. This impending issue has to be addressed along with technological changes and digital disruptions before being priced out of the competition. The current coal generation in Australia’s energy supply will eventually be phased out. Even though currently it is cost effective for the investment, it will not be sustainable in future. With the carbon offset requirements emissions schemes gaining traction globally, energy generation from coal will not be able to survive in that current state. Moving to a new environment like green energy is an option although some countries have embarked on it and proven it is not necessarily a profitable market without economies of scale and high infrastructure investment. Thus, innovative technologies, progressive innovation to co-create, other cost effective methods of management and collaboration between all parties in the industry ecosystem will play a big part in the whole business model equation of end-to-end renewable energy generation, supplied at a reasonable price to the consumers in the future.

*The most digitally mature organisations appear to emphasise change in a distinctly different way: One, they don’t focus much on individual technologies or over emphasise existing operations. Instead, they fundamentally rethink the business by exploring the fresh potential that the digital world enables, from new business models and joining/creating new markets, new platforms to reinventing the core business in contemporary technology terms. This might be, for example, employing co-creation and peer production to cost-effectively use the strengths of digital connectedness tackle scale and innovation. #009*

*From 1st July 2017, energy networks in Australia will have to structure their pricing to better reflect the consumption choices of individual consumers. For the networks, this means tariff reform. That is, structuring prices to reflect the costs associated with providing a particular service to a particular consumer. #011SD*
The model will be so simple that you have empowered the consumer to a point where it’s seamless and it’s easy and they don’t have to interact beyond, ‘I’ve signed up, everything’s set, forget’. I think that’s where you have disruption to the industry. #001

We could pool consumption. Parents could have surplus energy on their home or their holiday home and make it available to their children by combining energy – the net energy in those meters. This will be the future energy market’s global innovation. #010SD

Progressive innovation and technology is going to benefit all customers as quickly as possible as there isn’t time to wait for the trickle down benefits. How fast the disruptive technology we’re talking about, whether it’s solar or smart devices or battery storage integrated into new affordable housing, how that works to control energy bills for consumers and creates value. #007

What makes energy battery storage interesting today is its potential to perform a number of functions, possibly generating multiple power streams and complementing the intermittent supply from renewal generation is one of the drivers behind storage facilities participating in the wholesale market. This is an exciting development as we seek to successfully transform the electricity sector to result in a less carbon-intensive future. #012

So you can certainly see by just focusing on the core, you can deliver tens of millions of dollars’ worth of extra value. That’s one thing. Then while that’s happening, how do you make sure you’ve got a series of incubation and innovation projects working that might be the disruptors of the future – how do you make sure you’ve got those things lined up ready to go? And that to me is one of those things, it’s the nexus we’re faced with right now. We aren’t doing enough of that, because we’re stuck in this gravitation around the core business. #041

The key theme of innovation/platform of the Future Drivers concept was mentioned by digital practitioners 10 times and code referenced 23 times in the findings that impact the future of the energy industry. This theme has a strong base of support from practitioners interviewed. The essence of this theme paints a picture of totally new business models, different innovative technologies, network economy, across embedded networks, smart-metering (sub-metering) and renewable energies facilitating value creation, simplicity, greatly impacting performance of energy enterprises in the future. Innovative technologies in the energy industry such as smart grids, battery technology and new platforms can be leveraged by organisations to create value and improve competitive advantage. These innovations promote the rareness capability and encourage collaborations within the digital ecosystem. Thus, the rise of innovative technologies can contribute to branding in companies, network collaboration and knowledge sharing which may render companies which fail to adapt obsolete.
4.4.7 Understand Customer Needs

Customers today are armed with multiple choices and lack of time, would like to communicate with retailers through any channel that is suitable for them, at any time of day, via a mechanism that is very simple and easy to use. Customers’ expectations of energy retailers is having all their information on hand any time they require a response, which means integrating that data into a singular platform in order to discuss with customers any of their needs. Thus, business models are required to have real-time access to all of the customer’s information as they interact and communicate. So it’s a singular view of the customer and with technologies like blockchain technology to offer a personalised service and in real time to effectively understanding customer needs with maximum transparency.

This is what I learnt from all these years’ experience. Customers, no matter where they’re from, no matter their level of income, are all price-sensitive. But what actually makes them price-sensitive is not because of the price. It’s because of the service they receive and knowing what makes them tick. #017

One of our latest competitors, as a new start up has an amazing ability to segment their customers and targeting their acquisition by managing their base appropriately and providing personalised customer services. So looking after customers the way their customers want to be looked after and understanding their needs is the key. #001

How engaged customers will actually be in wanting to participate in a lot of demand management and monetisation of their assets. And I mean, we firmly believe that role is a role for energy services provider that will manage that on a customer’s behalf and offer products to the customer to choose that has some potential profit-sharing consumers are going to sit there with that app pressing buttons and watching responses all the time. Most digital apps usage gets used for a month or so and then it falls away. #006

There were 23 digital practitioners who mentioned this theme. These contributions (101 coded references) were predominantly made when discussing aspects of future drivers’ concept, with some related across the other themes. It was predominantly discussed during the bad story (eight practitioners) and good story (seven practitioners) discussion, with some discussion across all other interview questions. This theme has a very strong base of support from practitioners interviewed.

The essence of this theme is that customer centric organisational capabilities need to include understanding customer needs theme and it has a great impact on drivers for the future concept. The role of service providers in the energy industry should be more customer-focused due to the rise of innovative technologies as it is increasingly easier for core customers to replace the services either by other companies or through the access of technologies like microgrids. Alternatively, knowledge of the needs of customers coupled with innovative technologies can create value in organisations and allow
businesses to extend their relationship with customers. These digital platforms and services in conjunction with customer knowledge management provide an essential understanding of how future drivers can improve the digitalisation outcome of organisations from a customer relationship perspective.

4.5 Constraints Concept

The essence of this concept is that managing disruptive change and performance of digital disruption activities are often dictated by the following main constraints. The digital change constraints theme highlights the various digital change elements that provide constraints that conflict with other digital change elements. These digital change constraints, discussed in detail in the various themes in this group, need to be elicited from the various enterprise decision making stakeholders. An important part of the digital change constraints theme is the concordance of these conflicting digital disruption goals and selection of digital disruption activities, when considering the digital change constraints. The group of themes discussed include:

- Technological Constraints
- Organisational People Constraints
- Communication issues impact digital disruption activities and performance
- Regulation Policies and Compliance Constraints
- Change Capabilities Constraints
- Time and Activities Constraints

4.5.1 Technological Constraints

Technological issues and capabilities limit the possibilities from a managing disruptive change perspective, when new products, platforms and infrastructure are changed generating substantial systems risk when upgrades to new technologies are applied. New innovative technologies are constantly evolving. New digital products, ATPs and digital platforms take time and substantial investment in upskilling digital practitioners to enable digital disruption activities. Technological constraints are often misunderstood by stakeholders in buy-in and in its importance, degree of urgency and the return on investment. The migration to cloud for platform and infrastructure poses privacy risks and control potentially resulting in cyber based threats. The issue on implementing new digitalised systems and processes to replace legacy systems would also require substantial resources to implement.
There were 23 digital practitioners who mentioned this theme. These contributions (177 coded references) were predominantly made when discussing aspects of technological constraint theme, with some related across the other themes. It was discussed during the bad story (seven practitioners) and was not discussed during the good story discussion, with no discussion across all other interview questions. This theme has a very strong base of support from practitioners interviewed.

This theme highlights the impact of technological issues on the constraint concept. It can also have an impact on the external collaboration concept, being able to resolve digital disruption findings, flexibility and positive outcomes of managing disruptive change and customer experience. Technological issues are a significant constraint to embracing digital disruption activities whether through the improvement of legacy systems in terms of flexibility, scalability and efficiency or the introduction of new technology within organisations. The understanding of technological constraints in organisation contributes significantly to the digital technology adoption process as it shows which areas within the organisation are disablers and require more attention.

4.5.2 Organisational People Constraints

Interviewees listed organisational capability as one of the key contributing factors of company performance but some of the organisational constraints take the form of resources committed and allocated to digital change activities, change agents and include external resources including third party contractors and service providers. Internal resource constraints mentioned include leadership risk aversion, depletion of knowledge and experience following resignations of long term employees, time constraints in training new change agents and lack of stakeholder commitment. Customer service, customer experience and organisational learning can only be achieved through training of staff, coaching and development that underlines that. Excellence in these aspects feeds into the customer that subsequently feeds back into the business as long term loyalty and branding.

*One of the big challenges, interestingly, in regard to digital disruption, is how quickly a business model for delivery that we put in place last year is becoming antiquated. Skill sets are morphing, new skills are required with new technologies and profiles of current resources must be aligned with changes. As we change faster, we’re realising we don’t have the skill mix, we don’t have the right organisational design. So we have to keep emerging and evolving the new structure. How we operate is actually coming up as being one of the bigger issues for us in moving forward. #041*

*Yet the central challenge to successful digital transformation is that we live in exponential times. Technology is now changing at a geometric pace with vast new flows of people and sensor-generated data accumulating even more rapidly. As for people, well, we’re not changing at*
anywhere near these rates, so we somehow need to find sources of higher leverage to sustainably adapt ourselves to ever faster changing market conditions. #002

But our company is not moving as quickly because of resources. We and everyone else are being cautious. We’re being risk-averse because we don’t know what the payoff is. There isn’t as much free flowing energy as there used to be. Also, demand isn’t there. So it comes back to the capabilities and resources of ours to react quickly and to make big, risky decisions. The appetite isn’t there and it can’t be for financially sound reasons. So, you know, it may take management time for decision making and it may take disruptors to prove it too, you know, make the first move invest and change. #053.

There were 12 digital practitioners who mentioned this theme. These contributions (77 coded references) were predominantly made when discussing aspects of organisational people constraint theme, with some related across the other themes. It was discussed during the bad story (13 practitioners) and good story (seven practitioners) discussion, with some discussion across all other interview questions. This theme has a strong base of support from practitioners interviewed.

Organisational goals and constraints have a significant impact on the digital disruption outcomes. They provide another set of constraints that may conflict or compete with digital disruption activities. This can include the lack of digital knowledge, expertise, resistance to change within the organisation and the lack of resources for implementing change activities. The organisational people constraints can be related to the organisational culture of companies where a risk averse culture may be present which ultimately presents a constraint to the digitally evolving organisation. This presents major constraint in the implementation of digital technologies in organisations given that the mass adoption of technology has altered the constraints.

4.5.3 Communication issues impact digital disruption activities and performance

Ultimately, being communicated to about the vision and engaged from the start enables digital change agents, digital practitioners and all stakeholders to develop a shared digital disruption vision for the organisation. When issues arise due to miscommunication, misunderstandings will impact on disruptive change activities. This reduces productivity and performance of digital disruption activities. The analysis found that communication issues diminish clarity and transparency of vision, processes, goals and achievements and impact the opportunity to implement change management and get value from the performance of disruptive change activities.

And I guess the other thing, the other sort of bad experience is obviously where I’ve been, is that some companies don’t tend to communicate or tell the employees their strategies or where they
want to be, so there’s a lot of insecurity. But I guess with a bank, they’re pretty good in terms of communicating, outlining where they want to be. #008

But it all needs to be driven down from top management. As long as it’s been driven down from top management and relayed to the people that it needs to be done and that’s the direction and that’s the strategy forward, then people need to follow that. #014

So, if I think about what customers are looking for, they want to have the ability to communicate with us. There are a couple of factors but we’ll start with this one. In terms of the current situation, what a customer would like is to communicate with us through any channel that is suitable for them. #053

So, the emerging technology and where everybody’s trying to head, that’s the real space where we’ll be focusing, on communicating with customers. How do we get that technology implemented in a way that makes it really simple to interact with our customers and provide them real value with contextual information that’s unique to them is the main focus and we currently fall short #023

There were 12 digital practitioners who mentioned this theme. These contributions (34 coded references) were predominantly made when discussing aspects of constraints theme, with some related across the other themes. It was predominantly discussed during the bad story (eight practitioners) and good story (seven practitioners) discussion, with some discussion across all other interview questions. This theme has a strong base of support from practitioners interviewed.

The essence of this theme is that digital practitioners need to communicate across the different levels of the organisation as engagement, involvement and sharing enables and gives due consideration not only to resource planning but also the time given, resources allocated improving understanding of goals and performance across the organisation. Communication in digital disruptions is imperative for knowledge sharing and miscommunication represents a major problem in addressing the constraints in organisations.

4.5.4 Regulatory Policies and Compliance Constraints

One of the Australian Energy Commission (AEC)’s role is to support the energy council’s development of policies and a regulatory framework to sustain consumer choices in technologies recommended in energy supply. Regulations and government policies impacting disruptive change activities within the Australian energy industry challenge the technological capabilities of big organisations’ legacy systems, time constraints and regulatory privacy compliances as well as change capabilities. Maintaining secure energy supplies require careful balancing of many policy objectives by the authorities, facilitating timely and appropriately sized investment in the energy sector, moving to low carbon economy, providing
internationally competitive frameworks for Australian industry and delivering reliable, adequate and affordable energy to Australian households (Anceschi & Symons 2012).

Australian energy retailers have obligations to provide customers with their energy usage whenever they want through a portal of their choice and according to the regulators’ recommended technological capabilities to make energy easier for customers.

Currently, in the state of Victoria, smart meters have been installed but are not fully functional in certain regions whilst in other states in the country, decisions have yet to made by the regulators nor policies implemented. ‘Smart’ or advanced metering and sub-metering will offer consumers wider choices as people need and want to have access to their usage information, to shop for lowest rate, efficient consumption, lower their emissions and lower their expenditure.

The Law of Disruption, when technology provides capabilities exponentially but social systems grow linearly and it’s in that gap between that exponential capability provided by technology and social systems such as protocols, policies, regulation, accounting, law, privacy compliances, that is delaying digital strategic plans, and usually a lagging indicator of technological capability and the right policy frameworks to liberate those capabilities. #003

I can’t see the regulators pushing for disruption. In actual fact I see regulators creating ideas that are not consumer focus, that actually distract the industry from innovation. Innovation is one thing, digital disruption is the total different thing, even the speed of innovation is constrained by the regulator. #041

You are basically looking at the same product but using digital technologies and yet you’ve probably got a whole different raft of rules and regulations about interconnectivity, interaction and charging models and things like that. Until we get some consistency with regulations, it’s probably going to be quite a barrier for the roll-out of future innovative models. #001

There are policy guidelines from the AEWC, for example, we need to give consumers access to data. To specify, dictate and regulate that should be done is not engaging and that is not consumerfriendly. So what we end up doing is designing something that meets a minimum requirement that consumers will engage with. So retailers should be a little freer to innovate, because consumers are requesting for certain services or they will vote with their feet. So I think this area is not driving change, it is holding back change and again raises a whole lot of questions that need to be answered in the current regulatory environment. #041

Regulatory policies and compliances have been mentioned 9 times and reference 30 times in the interviews showing the importance of how regulations and policies impact the digital transformation of the energy industry generation and supply in Australia. This theme has a moderate base of support from practitioners interviewed.
The continuing challenge for regulators and governments will be the need to constantly keep up with the pace of disruptive change. New business models will emerge in the near future, in power generation, renewable energies, off-grids, smart homes, energy distribution, storage technology and retail. Those models, at that stage, will have seriously eroded the market position of those old utilities that are still ‘dragging an anchor of legacy’, coal-fired generation assets, and suffer the climbing capital market’s alternate demand as a result. The essence of this theme shows that regulatory policies constraint is a significant disabler to the digital disruption mindset and activities.

4.5.6 Time and Activities Constraints

The selection of disruptive change activities to be initiated and performed within an organisation is important and needs appropriate consideration, based on the organisational capabilities variables. There are quite a few considerations to make in relation to deciding which digital disruption activities to perform. The time given to perform disruptive change activities will and can dictate or limit what disruptive change activities can be performed. The digital practitioners often are required to operate business as usual (BAU) and to parallelise digital disruption activities with other daily tasks and activities thus reducing time given to digital disruption activities. Suggestions have been made that practitioners believe that expanding the digital disruption team will speed up the disruptive change activities in order to achieve the disruptive change outcomes expected. The following list has been discussed by various interviewed practitioners, which include:

- The time and resources available or the time after performing BAU that is allocated to performance of digital disruption activities,
- Organisation politics can impact on the decision of what disruptive change activities must be performed,
- The value added and created will be achieved by the performance of one or more digital disruption activities, and
- The need for flexibility with disruptive change activities in order to maximise digital disruption outcomes.

So, it is for the senior management to decide in allocating time and budget to plan the activities making sure sufficient resources are available. Budgetary constraints will impact current business activities, running in parallel with tight timelines, both the BAU activities and the change activities will suffer. So, decision makers have to ensure all human resources and systems are capable to cope to align with time and budget allocated. #010

Sometimes when we suggest to the finance decision makers, they don’t see why spending more money, to bring in more resources and not delay the systems change and disruptive change activities will save the company money in the long run but making customers happy and not take the business away, customer satisfaction and experience can actually translate to profits. #018
Managing radical changes, so these are around improving the customer experience, to becoming a world class retailer, helping to build a sustainable costs structure and working a bit on the next generation products, but I’d say, my sole focus role right in digital division is still in that gravitational pull of the core. So if I gave you a sense of where most of our time and activities would be, if digital strategy was about 20%, 80% back into day-to-day (BAU), and that is to my mind not a healthy mix. We should always be at 50/50 mix distribution of time and capabilities and that’s the problem in advancing forward. We are just constantly focused in what’s happening today. #053

There were 17 digital practitioners who mentioned this theme. These contributions (61 coded references) were predominantly made when discussing aspects of constraints theme, with some related across the other themes. It was predominantly discussed during the bad story (eight practitioners) and good story (seven practitioners) discussion, with some discussion across all other interview questions.

This theme has a very strong base of support from practitioners interviewed. The time and activities constraint theme is predominantly affected by the time given and budgetary allocation for digital disruption activities throughout managing disruptive change activities.

The essence of this theme is that time, resources and monies must be allocated to the performance of digital disruption activities and need to be considered carefully upfront before implementation. This constraint is the most common constraint that impacts on the performance of digital disruption activities. If disruptive change activities are conducted in parallel to BAU activities, it would require as much time, resources and monies in additional to what has been budgeted for. This constraint will impact flexibility and will impact change activity performance and outcomes. Senior stakeholder endorsement, sponsorship or budget allocation needed to aid in increasing the allocation of resources to perform disruptive change activities. Due consideration needs to be given to time and resources and timing of activities during strategic planning to avoid change management constraints.

This theme highlights the impact of time and activities constraint allocated to digital disruption activities that the allocation of time, change activities and shared resources have, on improving performance.

4.5.7 Change Capabilities Constraints

The central challenge to successful digital transformation is that innovative technologies change at exponential speed whilst organisations and consumers change linearly. When technology is now changing at a geometric pace with vast new flows of people and sensor-generated big data accumulating even more rapidly, there is an urgent need for organisations to find sources of high leverage to sustainably adapt to accelerating market change. Organisations must evolve and remain very agile in
responding to not only constraints in terms of resources but the changing preferences of customers. When big corporations are not massively agile, embracing digital transformation may take the form of a new business model operating differently as a separate entity from the main corporate business. In doing that, the new start up business model will be less cumbersome in managing change capabilities, more nimble and agile, not necessarily aligning with the environmental dynamics and environmental changes, in order to explore new opportunities that the digital world enables.

So you can certainly see by just focusing on the core, you can deliver tens of millions of dollars worth of extra value. That’s one thing. Then while that’s happening, how do you make sure you’ve got a series of incubation and innovation projects working that might be the disruptors of the future – how do you make sure you’ve got those change capabilities lined up ready to go? And that to me is one of those things, it’s the nexus we’re faced with right now. We aren’t doing enough of that, because we’re stuck in this gravitation around the core business. #041

With new industry changes and multiple markets communications, it’s so hard for the systems to deal with so many different ways of interacting. Somebody has to stand up and take the lead on changing the status quo with change capabilities. Or it’ll be done by regulators, it’ll be done by government or it’ll be done by customers. It’d be much better served to not be forced but to be done from within the industry. #001

There were 17 digital practitioners who mentioned this theme. These contributions (72 coded references) were predominantly made when discussing aspects of constraints theme, with some related across the other themes. It was predominantly discussed during the bad story (eight practitioners) and good story (seven practitioners) discussion, with some discussion across all other interview questions. This theme has a very strong base of support from practitioners interviewed.

This theme has a significantly strong contribution to constraints that impact digital disruption outcome. The constraint concept is predominantly affected by the change capabilities throughout managing disruptive change activities through leadership decision making, motivation for technology adoption and incentives to encourage collaboration. Change capabilities in organisations are important in responding to constant change in digital ecosystems in terms of resources and customer preferences due to the mass adoption of digital technologies.

4.6 Customer Focus Concept

Every company is targeting numbers to deliver the profit margin and to achieve, that is, to deliver unique products and services through exceeding exceptional customer service. It is listed as the main factor impacting enterprise performance at a time when technological changes allow consumers to choose how they want their energy delivered, how they use and can interact with energy providers.
Disruptive change impacting various dimensions of the energy industry through innovative technologies such as smart metering, smart grids and energy storage batteries create diverse options for customers in energy usage. In advancing the digital capability from a customers’ perspective, retailers’ systems have to be very agile, constantly looking for opportunities to digitise the exchange with customers and adopt a mindset of being focused laser-like on customer experience, customer capabilities and being demand focused.

This key super theme is the most mentioned by all participants interviewed with a total of 93 sources from practitioners and 531 references made in this research.

Consumers need tools to make use of the abundant information now available with big data and innovative technologies. Government metering reform paves the way for the competitive provision of advanced metering services to residential and small business customers. Consumers being offered with more choices and approach guided by the principle that competition is more likely to drive innovation will facilitate efficient products and services to consumers, at the lowest possible cost. This demonstrates Customer Focus is a major concept in managing disruptive change activities. The themes that form part of this concept include:

- Customer Experience Capabilities
- Customer Issues
- Customer On-Boarding
- Customer Care (Service)
- Customer as a Business Consumer
- Customer as End User

4.6.1 Customer Experience Capabilities

Good customer service and customer experiences come in the form of keeping the lines of communication with business interactions as seamless and simplified as possible. This is to ensure prompt response to queries, a range of choice where roadblocks to purchases are removed and product offerings are personalised to demonstrate customer ‘value’. Customers today are less concerned about price but consider something as having value. The introduction of innovative technologies such as digital platforms, blockchain technology and data analytic platforms have changed the customer experience capability to a more co-creative approach. This creates a mesh of dynamic connections of people, processes and services. The key differentiator between competitors is outstanding customer service.
Treating customers with respect and appreciation for their patronage of products and services remains one of the most effective ways to attract and retain high value customers.

As a tier one company, we have the customer experience capabilities covering multi-channels customer contact. Thus, customers are able to contact us whichever way they like at extended trading hours as well online requests for customer contact giving the customer the power of choice. #052

It’s crucial to look for every opportunity you can to digitise your exchange with customers, we must be laser-like focused on the customer, truly focused on the customer. Strategic management go to customer meetings rarely discuss about the customer experience, only about improving processes but that is changing. #055

There were 22 digital practitioners’ mentions for this theme. These contributions (148 coded references) were predominantly made when discussing aspects of digital disruption mindset theme, with some related across the other themes. It was predominantly discussed during the good story (twelve practitioners), bad story (ten practitioners) and typical day (six practitioners) discussion, with some discussion across all other interview questions. This theme has a very strong base of support from practitioners interviewed.

The customer centricity of a digitally mature organisation relies heavily on understanding customer needs, demand response and offering customer oriented products and services to improve perceived value, understanding and essentially offering service that is simple, swift problem solving and hassle-free experience. It shows the importance of customer experience in value creation and that it’s not just about digital maturity but customer-focus and perfecting customer-centricity.

4.6.2 Customer Issues

Customers are connecting with companies in more ways than ever in today’s busy, digitally-focused, competitive market. A satisfied or dissatisfied consumer has a larger voice via social media and ignoring customer issues can lead to not only losing that customer for life, but their network contacts and can possibly bring about a crisis management issue if it is played out in social media. Strong customer service practice is an invaluable tool in any business. In the energy industry, customers are benefiting from the new varied choices available due to disruptive technologies, bringing about frequent churning or transferring accounts to competitors. Customers are empowered with new technologies and information in their demand for energy providers that understand their real needs, demands and requirements.

Technologies changing fast and customers are learning fast too. So, we as retailers have to do things quickly, see things quickly and act on it quickly. The time taken for an agent to locate
information on a customer, searching through three or four pages online, you’ve completely lost interaction. You’ve lost the customer. You’ve also lost your agent. The agent just goes, ‘This is too hard. I’m not going to do that…. our competitors are faster in doing stuff because they using more up-to-date technology’. #006

Whilst great new technology is always a challenge, but we have to have technology that also serves all the customers because at the end of the day, collectively we serve the public interest, that public interest is a central service that all should have and all able to afford. It’s a challenge but it’s the one that if the competitive market fails to deal with effectively now, government will. If business owners don’t, government will enforce in regulatory compliance. And that’s what we have to think about. #010

This theme is mentioned by 15 sources and 55 coded references highlights the impact of customer issues on digital disruption and disruptive change management facilitating many innovative products and services on offer in a competitive market. This theme highlights the importance of acknowledging and resolving customer issues as decisions that drive investment and deployment particularly in technology are increasingly accessible to consumers. And consumers are making choices based upon their own values, their individual preferences and if their demands are not met and issues are not resolved as quickly, consumers will switch to other energy providers instantaneously.

This theme has a strong base of support from practitioners interviewed. The customer experience capabilities can take the form of skillsets, agile capabilities, simplified interactions and a demand driven client service perspective. The customer experience is imperative in demonstrating value and fostering relationships with the customer to form customer collaborative approaches which in turn enhances knowledge sharing. This shows customer issues do impact customer focus and without the knowledge of management on what is actually happening on the varied requirements of customers, the threat of customers ‘churning’ to competitors and the severe damage to the brand image will be costly to the organisation.

4.6.3 Customer On-boarding

Customers with access to choices and information today would move towards companies that can deliver outstanding service at a reasonable price not necessarily the best price. Those companies that offer products and services with features beyond just offering standard energy supply that differentiates, stand out in competition and being unique. The differential is the level of customer understanding, experience offered, the tools, the insights given to the customer, to excel and capture whatever opportunity there is to provide better customer service than everyone else. The improvements of customer data analytics because of the IOT have complemented customer channels
where real-time customer information, customer service and interactive marketing will be more important which ultimately revolutionises the consumer experience. The essence of this theme mentioned was that customisation, simplification and competitive pricing is important in winning the customers’ trust to be a part of the company.

*Well you could completely revolutionise the way you on-board customers, the way you train people, the way you retain people, the way you assess performance. So you could move from doing everything manually to doing everything in an automated way that was scientific and reliable. But that’s sort of stating the obvious that ultimately, customers don’t want hassles and user friendly systems.* #001

*It’s ripe for the picking for very good retailers who can understand their customer. They operate at scale. They can operate at scale, personalise the experience for the customer and on-board at scale using technology and automation.* #055

*This new fast growing competitor is successful because it has an amazing ability to segment their customers, not as a way of targeting their acquisition but as a way of managing their base appropriately. So their success feeds off looking after their customers the way their customers want to be looked after.* #011

This theme is mentioned by 22 sources and 113 coded references and highlights the impact of customer on-boarding on digitally mature organisations in managing disruptive change to create value on products and services being offered in a competitive market. This theme has a very strong base of support from practitioners interviewed.

This frequently mentioned theme shows, as more advanced and innovatively disruptive technologies give consumers greater choice, control and ability to make decisions about what retail service offering they choose. From a customer point of view, innovative technology leads to increased awareness, new choices and the confluence where technology and customers come together is a response to price point and smart choices. The Internet of Things (IoT) also plays a significant role in customer on-boarding where the ability to manipulate data from digitalised customer relationships enables organisations to improve customer incentives. This highlights the importance of customer on-boarding in the adoption of a customer focused approach in organisations faced with digital disruptions.

4.6.4 Customer Care (Service)

It is not a new theme. Customer Service has always been the cornerstone of any businesses’ success as well as a major component of business. The difference is today’s innovative technologies have given
customers more personalised interactions in terms of choices, options and information for them to vote with their dollars, their loyalty to the brand and speed. This enables organisations to align their business models to capture consumer and potential clients’ needs as well as improving the customer relationship. As a customer-driven market lies at the centre of all the competition, it will ultimately deliver the highest value, leveraging digital and innovative technologies to deliver multi-channelled, real-time response, efficient customer services.

*Working with your customers is the key factor, because we have to understand what the customer wants at the end of the day it’s the customer, we’re there to serve the customer. That’s where we generate our revenue, off the customer. But if we don’t clearly understand what the customer’s looking for and collaborate with them in the future direction to offer the best of services, they will change retailers instantly. #021*

*Customers are often debating whether or not they should stay with certain us as retailers, what service you’ve got. But if you provide top-notch service, simple processes, or with minimal delays to no delays, quick responses, correct bills, it’s going to be seen as premium quality service. And that includes multi-channel of engaging with customers which is something our management have failed to do. And they need to understand this and they need to perfect this in order to retain customers. #09*

*Consumers are benefitting from the new options available to them. They can now monitor the electricity they are using in real time, understanding ‘time of use’ pricing and the new ways for them to save energy and cost. A phone app. developed will give easy access to usage data. So that’s been a large push for our business to push more capability, more customers towards our digital platforms, which is great for ease of use for our customers. #19 & #20*

This theme is mentioned by 22 sources and 142 coded references and highlights the importance of customer care or service theme to the customer focus theme in a digitally mature organisation. Often there is a need for a specific customer service with digital skills because it is lacking within the organisation, which involves hiring more digital practitioners to perform the digital skills, educate or mentor others in the organisation. This demonstrates a higher level of digital maturity, when an organisation can identify a gap in the skills required to perform particular digital and technical tasks. Thus, this theme shows customer care capabilities are essential in answering to the demand of tech-savvy customers as well as maintaining their loyalty, trust and promotion of the brand in the future.

This theme has a very strong base of support from practitioners interviewed. Customer centricity requires exceptionally special customer care in performance of digital disruption activities. This is needed in order to consider providing real-time response, multi-channelled customer services by change agents to resolve issues encountered and engagement to value create. The key is maximising the value of customer experience, otherwise competitors will provide the perfect customer service. This theme shows the urgency of training those ‘change agents’ on the value of customer service utilising new technology to focus on customers’ needs.
4.6.5 Customer as a Business Consumer

Business consumers are making choices based upon their enterprise’s own values, business requirement and their coordinating mechanisms that will be deciding factors in all their choices and requirements from their retailers of an efficient, safe, secure and reliable energy systems supply. Business customer requirements most frequently mentioned include operational assistance, optimisation of energy use, satisfaction driven by value as well as efficiency and effectiveness of energy supply to their premises.

- Operational assistance
- Optimise energy use
- Satisfaction driven by value
- Efficiency and effectiveness

Firstly, businesses need straight energy efficiency and effectiveness. What are energy providers doing about in providing operational assistance in storing the excess solar energy that has been generated by their solar panels and what other products available to them to control and optimise that? We’re recognising that we do need to look after customers so we can keep the costs down for them. As more advanced measuring technology gives consumers greater choice, control and the right technology, we can provide info on optimising their energy usage and implementation of pricing rules, they are better able to make decisions about what retail service offering they decide to take up. #009

The role of the networks is to provide cost-effective pricing. The retailer’s role is to take wholesale costs, network charges and other potential energy services such as distributed energy or energy management systems, and package these up for business consumers. And many ways, their job is to be a consumer’s agent in dealing with the rest of the energy supply system with any operational assistance. This is satisfaction driven by value and competitiveness in the long term. #019SD

This theme, mentioned by 20 sources and 115 coded references, highlights the impact of customer on-boarding on digitally mature organisations in managing disruptive change to create value on products and services being offered in a competitive market. This frequently mentioned theme shows, as more advanced and innovatively disruptive technologies give consumers greater choice and control, they are better able to make decisions about what retail service offering they decide on. This theme has a very strong base of support from practitioners interviewed.

To be competitive business consumers require efficient operational assistance, price sensitivity and optimisation of energy use. Provision of information is required to control and change the usage patterns of electricity, for example, from peak to off peak cheaper rates, to be more efficient in managing costs and ‘demand response’ that will affect the wholesale market. Essentially business consumers move swiftly based on efficiency, effectiveness and satisfaction driven by value in the way businesses manage their energy expenses.
4.6.6 Customer as End User

The main impact on digital business strategies from disruptive technologies is a shift in customer focus. Disruptive technologies are enabling the revolution of a new generation of smart information and communications technologies and tech-savvy consumers. It is providing consumers with options and choices and how they exercise those choices is driving the development in the energy sector. Customer requirements are changing at the rate of technological change.

*People are time-poor in general. They are always looking to do more things in a less amount of time. More consumers want things to be simple and convenient. They don’t like calling up contact centres, this sort of stuff. And some retailers have actively created this app where customers can monitor, control their usage when they are time-poor and it saves time. It’s convenient and in their hand. People feel empowered when they’re in control when they have knowledge. So those sorts of apps that other retailers have created are disrupting the industry but it’s also making the industry competitive and better.* #053

*Customers’ basic expectation of their retailers is to create a better experience for them. To compete in a disruptive environment, you have to get a little bit more advanced in your thinking. For competitive advantage, we have to offer things like owning the home smart devices, smart homes, and owning that space. And that’s where the future of energy lies; satisfaction-driven, demand-response, not just with the power supplies, wires and electrons. It is, ‘How do I own a customer’s lifestyle or enable a customer’s home lifestyle in our products and services offerings? It is offering a one-stop shop with all their power solutions and data in the simplest way possible, hassle-free and a brand they trust.* #054

*So without going too much into the strategy, there’s definitely a need and a desire to become more demand focused. To become more demand focused we need to understand our customers. To understand our customers, we need the technological basis to do that in a much more sophisticated way than we possibly can. We have restructured our organisation around this, it’s going to disadvantage us in the long run. So we are focusing, as a business, to generate more clients, more customers. The concept of the customers is at the heart of everything we do, as opposed to making a dramatic impact in the industry. The real message is to say, we have an app., that simplifies with digital technologies and we are not just like every other retailer.* #055

This theme of Customer as an end user was one of the most important contributions made by digital practitioners mentioning in 17 sources and 54 coded references. This theme has a very strong base of support from practitioners interviewed.

Customer as an end user demands value and satisfaction driven by simplicity and less cost centricity. The use of digital capabilities or interfaces builds stronger bond with the consumer, provide simpler choices, support demand response to all their energy needs and ensures all processes are customer
centric. This theme shows that understanding the customer as an end user and their expectations will contribute to a customer-focused organisation that will be relevant and sustainable in the future.

4.7 Conclusion

This chapter has presented digital disruption attributes and thirty-one key themes that have emerged from the analysis performed as part of this research that contribute to a theory that answers the research question. This set of themes have been further analysed in the next chapter (Chapter 5), where they have been grouped into concepts and relationships between them have been derived and comparisons made against practitioner attributes. The concepts presented in this chapter are analysed further, a theory is derived and presented in Chapter 5. This theory has been compared and contrasted against various literatures in Chapter 6, which was discussed in Chapter 2 and supports concepts discussed in this chapter.
Chapter Five – Analysis and Theory Development

This chapter provides an analysis and development of the concepts derived from the research data discussed in chapter Four, to reveal a theory that addresses the research question, discussed in Chapter Three. The outcomes of this chapter have been compared and enfolded using the literature in Chapter Six. The chapter will then form the basis of the conclusion discussed in chapter Seven.

This chapter will focus on further analysis of the concepts presented in Chapter Four. This chapter will demonstrate the development of the key elements of the theory that have emerged from the interview data. The emergence of the five major concepts has been discussed along with grouping the themes that shaped them. Relationships between the concepts have been examined along with the relationships between the themes, elements and other demographic attributes identified in the data. This chapter’s focus on relationships provides the basis for developing the theory and for the selective coding steps in the research plan, as discussed in section 3.6 of the methodology chapter. These building blocks (i.e. concepts, themes, elements and relationships) will form the theory that answers the research question presented in Section 3.1, which provides guidance to improve managing disruptive change outcomes in digital disruption.

The body of this chapter will provide various lenses on the interview data (presented in Chapter Four) that will highlight the examination that has occurred to develop the high-level concepts, which include:

- Analysis of each concept group, i.e. theme, prioritised from strongest to weakest
- Comparison of the concepts, themes, elements and across the interview questions
- Analysis of strong relationships between the concepts, themes and elements.

This chapter discusses the relationships between various concepts, themes and elements coded from the interview data, which were described based on the strength of the relationship. This relationship strength is drawn from two aspects: firstly, the number of sources (interviewed digital practitioners) who said something about the concept and then the quality of the discussion about the relationship was considered when examining its strength. Table 5.1 can be used as a guide to help recognise the strength of a discussed relationship. The number of interviewees who discussed a concept, theme and the elements attributed to it, or alluded to a relationship between concepts and themes by discussing them within their contribution, is used to highlight something of interest to this research. Hence, they help answer the research question. In most of the cases examined, key digital practitioners who were interviewed supported the relationship, with strong, supportive contributions. The number of sources...
and the number of references were not the only consideration made on strength, but they provided a starting point.

<table>
<thead>
<tr>
<th>Strength</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Strong</td>
<td>500+</td>
</tr>
<tr>
<td>Strong</td>
<td>150-500</td>
</tr>
<tr>
<td>Moderate</td>
<td>50-150</td>
</tr>
<tr>
<td>Weak</td>
<td>1-50</td>
</tr>
</tbody>
</table>

This chapter will cover the following:

- The five High level concepts are discussed as well as the relationship between concepts
- How the digital disruption Outcomes are impacted by five concepts and its related themes.
- Discussion of each of five concepts – showing a pie chart of concept themes, theme grouping relationships followed by cross interaction between themes highlighting the strong relationships
- Lessons learnt from themes discussion
- Inter-concept relationships
- Relationship linkage analysis
- Strong internal relationships are linked across concepts

The concluding parts of this chapter will draw on the comparisons and analysis presented herein to generate a theory provided by the interview data, derived concepts, themes and elements that relate to significant relationships identified by this research. The theory that emerges from this analysis has been enfolded with the literature in Chapter Six and then presented in the conclusion, Chapter Seven.

5.1 Concept discussion

The concepts have been derived by grouping themes built from raw data findings called elements (discussed in Chapter Four) with a common thread. This section will examine and compare the themes that relate to the concepts, providing evidence of prioritisation from the strongest to the weakest concept. Each of the five concepts has been discussed in this prioritised order in this section, but first a discussion on the prioritisation.
The majority of coded references focused on the digital disruption mindset concept. The least coded references are in the constraints concept as shown (see Figure 5.1). The five concepts in this research were well represented, based on the number of coded references from the underlying interview data (see Figure 5.1). When examining the relationships between the coded references across the five major concepts a few interesting facts emerge.

The ‘Digital disruption Mindset’ concept is very strongly related to each of the other three concepts based on coded references and moderately related to one of the concepts (see blue shaded cells in Table 5.2). These three relationships are the strongest three relationships among the five concepts. The other relationships are significant but are not as strong as the relationships linked to ‘Digital disruption Mindset’. All of the digital practitioners interviewed, commented on each of these relationships in various ways, focusing mainly on the importance of customer-centricity and digital disruption mindset concepts. As all the interviewees commented on all the concepts, weight is also given to the number of references of the concepts, themes and elements in the inter-theme relationships analysis.

All of these digital practitioners are organisational based and part of very large enterprises. The organisational capabilities, strategic management decision making, culture and change management capabilities impact significantly on how much ground can be gained from a digital disruption mindset perspective.
Table 5.2: Number of related sources and coded references for each concept

<table>
<thead>
<tr>
<th>All Concepts</th>
<th>Digital Disruption Mindset</th>
<th>External Collaboration</th>
<th>Future drivers</th>
<th>Customer Focus</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Concepts</td>
<td>(918)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital Disruption Mindset</td>
<td>(830)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Collaboration</td>
<td>(704)</td>
<td>(705)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future drivers</td>
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<td>(700)</td>
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<tr>
<td>Customer-Focus</td>
<td>(730)</td>
<td>(684)</td>
<td>(723)</td>
<td>(757)</td>
<td></td>
</tr>
<tr>
<td>Constraints</td>
<td>(461)</td>
<td>(400)</td>
<td>(441)</td>
<td>(410)</td>
<td>(517)</td>
</tr>
</tbody>
</table>

The relationship between sources and coded references, along with the percentage of coded references across the concept, all point to the ‘Digital disruption Mindset’ being the major concept for this research. Based on the representation by the coded references and sources presented in Figure 5.1 and Table 5.2, it suggests the following concepts priority:

- Digital Disruption Mindset - 7 themes – 46 elements
- Customer Focus Practice – 6 themes – 34 elements
- External Collaborative Approach – 5 themes – 30 elements
- Digital Change Constraints – 6 themes – 18 elements
- Future drivers – 7 themes – 40 elements

Later discussion also supports the importance placed on these concepts and the relationships between then (see Figure 5.2). The following discussions will also provide analysis of the concept groupings for each theme. It will highlight the importance of each of the concepts in answering the research question, which, in essence, improves the digital disruption outcome.
5.1.1 Managing Disruptive Change Outcome

Each of the major concepts has a group of related themes that describe important aspects or activities that impact on that concept, which ultimately impact the digital disruption outcome for a disruptive change, see Figure 5.3. The theme within each concept defines the essence of that theme. The group of themes also predominantly relate closely to each other. This has been explored in more detail below.

Appendix D provides a summary of the number of sources and coded references for each of the concepts and compares each concept with every other concept. It provides a cross reference between the thirty-one themes. This appendix is used as a guide to identify and evaluate key relationships among the elements that grouped into themes, identify concept groupings and relationships between the concepts. The strength of the relationships (based on Table 5.1 above) is used to highlight those relationships that may impact the digital disruption outcome and hence help answer the research question.
The following sections provide and discuss the essence of each of the five major concepts for this research. This discussion will incorporate the key ideas behind each of the themes grouped from elements discovered from the data collected with the concepts, as shown in Figure 5.3. The essence for each concept provides a high-level view of the concept that will underpin the theory generated in this research. Each concept has been followed by a discussion of any strong relationships between the themes grouped within the concept. This will provide the rationale for the theme groupings created in each of the five concepts.

5.2 Digital Disruption Mindset

A digital disruption mindset provides digital practitioners in an organisation with the values, understandings, culture, capabilities and strategic management to provide the leadership needed to make appropriate decisions. Adapting to digital changes and agility required shared vision, directions, digital maturity and collaboration as an organisation to successfully manage disruptive change and overcome digital disruption issues to capitalise on the opportunities available as they arise. Attaining this digital disruption mindset requires disruptive change activities strategically planned by strategic decisions makers, cascaded down and implemented by operational decision makers, executed and mediated by digital practitioners throughout the organisation.
The digital disruption mindset is defined by ‘Create a set of digital disruption activities to strategically manage disruptive change’ and ‘the articulation of organisational capabilities for competence, including skill sets, organisational learning and agility’.

This shared digital disruption vision (disruptive change), technological impacts and understanding of digital disruption value needs to be communicated and nurtured to empower organisational change agents across the organisation. Alternatively, strategic management could improve change management by increasing workforce and digital investment, adapting a firm’s existing resources and values to digital disruption, by mentoring as a demonstration of leadership, teaching the benefits of digital disruption concepts as a new business model and digital business strategy. In either case, strategic decision makers’ involvement with all in the organisation in a goal-oriented change management as an organisational culture, is imperative for motivation to make the digital disruption real and engage in digital disruption activities.

Figure 5.4: Digital disruption mindset concepts set of themes, showing the percentage of coded references
The lesson learnt from this concept is that building a digital disruption mindset across the organisation, starting with strategic management decision makers to reinforce organisational capabilities, can significantly improve the digital disruption outcome to manage disruptive change. This digital disruption mindset may start off with a new business model that nurtures the understanding of digital disruption value belief, but preferably a shared digital disruption vision from strategic management is communicated across the organisation as a shared vision and culture for organisational learning of new skill sets, flexibility, agility and competence to be developed. Furthermore, the development of a broader digital disruption mindset can be motivated by strategic decision makers investing in digital transformation, in human resources to mobilise and to empower change agents to scale digital maturity across the organisation beyond technological impacts to achieve competitive advantage. This progression of digital disruption to understand value creation and vision can predominantly be built best through communication, commitment and collaboration as organisational capabilities with agents’ involvement in digital disruption activities.

The main themes for this concept, shown in Figure 5.4, include ‘Strategic management’s leadership in new business model critical to promote a digital disruption mindset’, ‘Make disruptive change competence an organisational capability by investing in agile skill sets for organisation’ and ‘Nurture digital disruption understanding in change management for digital maturity’. These concepts factor heavily in the significant relationships discussed later, in sections 5.7. The following sections will discuss the concepts and relationships between themes for the digital disruption mindset concept.

It’s a matter of organisational mindset, of strategic management’s business decisions for right investment, the appetite for risk and the ability to use and influence change. It’s sharing value creation internally and externally, involving other players in the market, competitors, industry, industry regulators, distributors and customers to use our collective power to work towards a demand-led energy industry, it’s taking the lead to change the status quo for competitive advantage. #001

5.2.1 Digital disruption mindset concept – themes relationships

The seven themes within the digital disruption mindset concept correlate very well together, with twenty-one possible relationships between the themes. Of these relationships two are strong relationships, sixteen moderate relationships, and three weak relationships. The perspective of these themes supports the concepts of digital disruption mindset and provides more detailed discussion of the concept, which ultimately improves the overall outcome in managing disruptive change.

The themes within this concept are not independent of each other. Sequencing can be determined when examining each theme and relating them to each other. For example, the ‘Digital disruption
Strategic Management leadership strongly enhances Organisational Capabilities’ that leads to a strong relationship with ‘Organisational capabilities strongly influence Change Management which in turn has a great impact on digital disruption mindset’ theme. This sequencing of themes identifies how themes support other themes in enhancing each other (see Figure 5.5), ultimately to improve the digital disruption outcome to manage disruptive change.

The figure (Figure 5.5) presented here provides a guide to the themes that may relate to another theme. The relationships (i.e. shown as arrows) indicate the strength of the relationships between themes and the analysis of the interrelated themes and element memos from which it was built. It provides a progression in understanding digital disruption where continual nurturing is a fundamental role played by strategic management and digital practitioners. It also highlights stages of understanding and progression required to develop the digital disruption mindset. There are two significant relationship themes within this concept, where the relationship between the themes is very strong. The following two sections discuss these two relationship themes.

Figure 5.5: Digital disruption Mindset concept – group themes impact on digital disruption outcome
5.2.2 Strategic Management and leadership transforms organisational capabilities and improves digital disruption mindset

This relationship theme is the strongest amongst all the themes within the Mindset concept derived from the findings:
‘Demonstrating leadership and value belief to invest in new business models and create a shared vision for disruptive change management’ and ‘Digital disruption organisational agility and nimble capabilities create competitive advantage that promotes digital disruption mindset’.

The essence of this relationship is that articulating the strategic management leadership and demonstrating value belief for disruptive change is preferably done in consultation and with involvement of change agents, strategic decision makers and practitioners from an active context. This allows the disruptive change agents to learn, share and communicate vision, skill sets, flexibility capabilities and agility capabilities contributing to an organisational culture. This also gives them an understanding of why and how in fostering goal oriented change, a concordance of disruptive change activities has been reached. This provides digital practitioners and change agents with a real understanding of issues across disruptive change to achieve competitive advantage and improve knowledge management. The interview participants found that it is important to empower change agents with skill sets, share and communicate across departments, and to emphasis organisational learning and prioritisation of sharing digitalisation vision for change. Leadership, in conjunction with strategic management function as role-models to motivate a strong team with urgency and magnitude through modelling desired mindsets in pursuing a positive impact of disruptive transformation.

Figure 5.6: Strategic management relationship theme
5.2.3 Agile skill sets of Organisational Capabilities facilitate change management that transforms digital disruption mindset

This relationship comprises of two (2) of the strongest themes within the digital disruption mindset concept and consists of a group of elements ‘sharing and communicating vision, improving skill sets, flexibility and agility to gain competitive advantage will transform organisational capabilities’ which enable organisations to reposition themselves amidst digital disruption. The digital organisational capabilities gained through organisational learning, a shared mindset, nurturing understanding, empowering change agents in scaling digital maturity can grow beyond recognising the value of digital disruption to competitive advantage into the future. Organisational Capabilities in today’s digital environment is more than just incremental process improvement. Instead, digital change management will include a strong agile skilled team committed to a digital mindset of periodic performance transformations in digital organisational capabilities.

Figure 5.7: Organisational capability theme
5.3 External Collaboration

An external collaborative approach describes involvement of incumbents in the industry to participate in the digital disruption activities as a new business model. This involvement could take on various forms such as multisided digital platforms and collaborative consumptions. These may include active participation in the digital disruption activities or digital transformation by strategic decision makers to involve customers and collaborate with industry networks to explore fresh potential of the digital environment and reinvent core business models to co-create new markets. It is especially crucial for senior organisational decision makers to take the lead and be involved in making risk-averse decisions, investing in innovative technologies and resources, network and industry collaboration as well as involving service providers and customers. The involvement may incur resistance but strategic decision makers need to show leadership in sharing the vision across the organisation. This brings value creation and competitive advantage by employing co-creation and peer production to cost-effectively use the strengths of digital connectedness to tackle scale and innovation. Relationships with the various network ecosystems and the supply chain must be fostered to get continued involvement throughout the disruptive change management.

Figure 5.8: Collaborative Approach concept set of themes, showing percentage of coded references
The predominant themes, as shown in Figure 5.8 of this concept are: Involvement of Government Agencies, Service providers and Supply Chain in co-creating, Customer Involvement in New Business Models and technologies through the ability to manipulate data, Demand driven Digital networked economy that enhances the collaborative approach.

These concepts factor heavily in the significant relationships discussed later, in Section 5.7. The following section will discuss the concepts and relationships between concepts for the collaborative approach theme.

The collaborative Digital networked economy that we have, the more things connected to the network, the more opportunity for the arbitrage, the more differences we’re creating in terms of its value. And the value is created in those things by all. It’s not created by the end user. The end users are the analogue being that interprets all of these disruptive innovation things.

5.3.1 External Collaboration concept – themes relationships

There are five themes within the external collaborative approach concept that means a possible ten relationships between the themes. Of these relationships two are strong, four are moderate and four are weak relationships. These describe a group of themes that are highly cohesive. Based on the themes a sequence (shown in Figure 5.9) can be ascertained to guide the improvement of collaboration in a disruptive change.

The themes grouped with this concept can be sequenced to describe mutual relationships that impact a disruptive change’s digital disruption outcome. A theme such as ‘Leadership facilitates collaboration of service provider/supply chain involvement’ is a precursor to the ‘Digital networked economy of new collaborative business model and innovative technology for competitive advantage’. Another strong theme relationship ‘Establish shared vision of innovative network collaboration for mutual competitive advantage’ is a precursor ‘Involvement of customers in Digital networked economy to knowledge share, systems manage, cost efficiency and risk aversion enhances the collaborative approach concepts’. This theme needs a higher focus regarding ‘Network ecosystems collaboration strengthens customer focus concept’ themes.
5.3.2 Digital networked economy of new collaborative business model and innovative technology for competitive advantage

The relationships between themes shown in Figure 5.9, provides a guide to the themes that need a greater initial focus in a disruptive change, before a significant impact on the digital disruption outcome occurs. The digital networked economy requires a commitment of the individual collaborators towards progressive innovation to co-create value. Collaborative engagement with customers and enterprises along with the ability to manipulate data and customer knowledge to offer value added customer services does have a significant impact on enterprise performance in managing disruptive change with increased external collaboration. Innovative network collaboration relationships must be fostered to share vision and empower communities in network collaboration. This creates overlapping digital ecosystems which require the commitment of organisations, collaborators, suppliers and customers.

But once innovative networks, new business models and the competitive advantage have been identified, embracing digital technologies to co-create a supply chain (full stack), share knowledge and risks, improve cost efficiency, embrace multi-sided digital platforms and then involve network digital change agents in co-creation of value can strengthen digital disruption outcomes. Two strong relationships exist between themes grouped within this concept.

All those devices will be smart and customers know how to use them. They’ll know what’s expected of it, they’ll know how to program themselves, creating the energy they need, when
they need it. But they’ll do that across the network. And the bigger that Digital networked economy, the greater the efficiency. The greater the efficiency of the technology, the lower the cost and thus, the lower the environmental impact regardless of the infrastructure. #003.

5.3.3 Leadership vision to co-create facilitates collaboration of service providers, supply chains and customer involvement

Fostering relationships with network collaborators including service providers, supply chains and customers is important to maintain involvement in digital disruption activities. This can also include the collaboration of organisations with external stakeholders for value co-creation, improvements in customer services through social technologies and the facilitation of knowledge sharing platforms. Effective communication and co-creation are essential for value creation as strong commitment between service providers, supply chains and customers are required. This relationship has a very strong relationship theme within the External Collaboration Approach concept. This relationship theme comprises two strong relationships across the five themes in this concept, ‘Digital networked economy of new collaborative business model and innovative technology for competitive advantage’ and ‘Leadership facilitates collaboration of service provider/supply chain involvement’
The second strong relationship is between the concepts ‘Digital networked economy of new collaborative business model and innovative technology for competitive advantage’ and ‘Leadership facilitates collaboration of service provider/supply chain involvement’. The essence of these two concepts is that leadership’s strategic vision of a Digital networked economy, involving external collaboration in new collaborative business model that embraces innovative technologies, drives competitive advantage in disruptive environments.

The major difference between these two very strong internal relationships is that one focuses on fostering external collaboration required for establishing a shared vision among all involved change agents. The other relationship focuses on organisational leadership facilitating new business model to involve external disruptive change agents of the digital networked economy in digital disruption activities throughout a disruptive change. Both are key relationship concepts that can improve competitive advantage in managing disruptive change and hence improve the digital disruption outcome.

5.4 Future Drivers

Future drivers of the energy industry are an important consideration when employing for the current environment. Drivers for a digital future include *External Collaborative Approach, Customer Focus*
Practice and Managing Disruptive Change Constraints that play a major part in developing Digital Disruption Mindset activities. This predominantly involves consideration of new business models with increased digital investment in disruptive innovation, super agents to emphasise understanding customer needs and the right technology choices across the organisation sharing knowledge with network collaborations. Innovative technologies such as Blockchain technology, virtual technologies, energy storage technology and smart grids play significant roles in the success of a digitally mature organisations’ transformation. Digital leaders who embrace innovation, modernisation, flexibility, agile customer-centric organisational capabilities and branding, drive competitive advantage into the future.
In sharing a vision of disruptive change value creation, strategic management leaders are expected to be open to new business models, networks of digital enablement, customer-focused, demand-driven customer capabilities and high value activities to reach their successful future goals. Progressive technologies and innovations are shaped by the consumers, grid needs, regulations and the nature of applications. Successful organisations’ employ future drivers with techniques that best capture and channel the strengths of the networks with internal digital incubators e.g. lean start up approaches in product development, open APIs, app stores, hackathons, understand customer needs using automation to harness big data as vehicles for digital transformation at scale to avoid dependencies on central capacity and investment.

The lesson learnt from this concept is that due consideration must be given to innovative technologies, understanding customer needs and network collaboration for competitive advantage of organisational processes. Investment in new innovative technologies, implementing new business models, building
value platforms with unique and agile capabilities that are customer focused and understanding customers’ needs will drive success into the future. Customer capabilities include the enablement of much broader digitisation by empowering internal and external communities, change agents with the tools, resources, knowledge for competitive advantage and customised solutions in managing disruptive change for relevance in the future. Most importantly, rare capabilities that embrace digitalisation and share knowledge to virtual agents offer multi-channel interactions and data utilisation for value creation in network supply chain and customer collaboration are future drivers in the fast transitioning energy industry.

The main themes for this concept based on Figure 5.12 are Understanding customer needs through communication from a customer driven perspective, Embrace new technology using new business models and Innovation driven technology and competitive advantage and the theme’s relationships will be discussed in the following section 5.4.1.

The future is discontinuous. Things will change because there is randomness in the world. And the human brain is uniquely built to filter out randomness. The future is already here. It’s just not evenly distributed. The drivers for success in disruptive environment are being open to disruptive technologies and it is all about customer and communities with emphasis moving towards control, reliability, value and the services that is offered. #003

5.4.1 Future drivers’ concept – themes relationships

There are six themes within the Future drivers theme, with twenty-one relationships between the themes. Of these relationships three are strong relationships, thirteen are moderate relationship and five are weak relationships.

Successful digital network companies build a platform where the public can create value and scale higher performance by reaching global markets on the network. There are businesses such as a Japanese bank that uses Bitcoin (Fortune 2017) systems technology, building a platform with affordable technologies that enable innovation, people creating value for being on the network and where agile, aggressive competitors attempt to scale disruptive technologies with micro-grid, peer-to-peer trading using block chain cells. What does today’s energy industry need to change in future business models? How do strategic management leaders today make their decisions for tomorrow to build capabilities, understand innovative technologies and customers’ needs, to navigate disruptive new technologies, understand and advocate for those things that allow them to successfully compete in future with competitive advantage?
All futures exist simultaneously. You just don’t know which one will coalesce. Which is the future that’s going to coalesce and what drives coalescence in terms of the future? It’s usually external forces that your business operates in, technology, global economy, policies, popular culture and resource availability. All these forces act on the future, and as they act over time, different futures have the ability to emerge. #004

Figure 5.13: Future drivers’ concept—group of themes relationships impacts on digital disruptions outcome

5.4.2 Investment in new business models embracing innovative technology drives success

The strongest themes (shown in Figure 5.12), ‘Demand driven and customised solutions essential in understanding customer needs’, ‘Investment in new business models that embrace innovative technologies drives success’ introduces the future drivers in various parts of an organisation on disruptive change management. The relationship between the three themes constitutes a collection of driving forces, such as competitive advantage, knowledge sharing, active contexts (human resources), new business models and disruptive innovation that create relationships among other themes in different concepts.

The relationships between themes shown in Figure 5.13, provides a guide to the themes that need strategists’ and decision makers’ special focus and vision in disrupting status-quo and embracing change in preparation for the future.

Investments in new business models that embrace innovative technology such as virtual technologies, PV, digital platforms, Blockchain technologies, renewables, smart grids and energy storage, are strongly recommended as future drivers. This would provide a value platform of collaboration for disruptive innovation, innovative customised solutions and digital integration.
The rapid adoption of smart grid technology is especially important in energy companies as it enables them to understand customer energy usage through more frequent and autonomous smart meter-readings, extracting valuable information in the process. Smart battery storage connected to grids enables consumers with less reliance on traditional grids to achieve a level of energy independence.

Battery storage in conjunction with solar energy generation (PV) on the other hand, is likely to bring rise to many disruptions to the grid due to the reductions in electricity prices potentially brought about by battery technology and PV. Innovative technologies that merge the real and virtual business world to form a technological mesh in business processes along the value chain, can facilitate increasingly intelligent analysis and use of customer data for core-customer relationship management. This also creates flexible and new business models which may render businesses using conventional technology obsolete.

Simplified customer engagement skills and the ability to manipulate data to offer value and excellent customer experience is an important driver for a successful future. Two strong relationships exist between themes grouped within this concept.

If any digital strategists believe they will still be relevant in the future, what they should be doing today is to enable or at least try to be successful in embracing disruptive innovations as the external forces that businesses operate in, technology, global economy, resource availability are always the forces that act on the future, and as they act over time, different futures have the ability to emerge.—#004

Figure 5.14: Embracing New Technologies theme
5.4.3 Risk averse collaboration in innovative technology a necessity for future

The relationships between themes shown in Figure 5.13, provides a guide to the themes that help digital practitioners and strategic management to focus on the most promising factors to embrace digital technologies, create new dynamic capabilities to build digital platform capabilities, and to reinvent their core functions to accelerate digitalisation of future enterprises.

The strongest themes (shown in Figure 5.12), ‘Demand driven and customised solutions essential in understanding customer needs’, ‘Value platform collaboration and innovative technologies drives competitive advantage’ enable building on disruptive innovation theory and ascertains the role of dynamic capabilities in the performance of response to digital disruption. The relationship between the two themes essentially highlights the driving force of disruptive innovation on organisational dynamic capabilities by changing, learning, embracing and extending existing resources, processes, and values positively associated with building digital platform capabilities that impact performance in response to digital disruption concepts. These driving forces can constitute advanced systems that operate autonomously to allow businesses to co-create and extend their relationships with core customers. Progressive innovation between collaborative firms can better understand the needs of their users, analyse behaviour patterns and monitor emerging innovations. This can include the use of technologies such as smart grids in conjunction with Blockchain and data analytics.

Figure 5.15: Innovation driven theme
5.5 Constraints

Constraints are an important consideration when External Collaborative Approach, Customer Focus Practice and Future drivers are used to develop a digital disruption mindset to manage disruptive change. This predominantly involves consideration of technological constraints, organisational change capability constraints, which are disablers that constrain disruptive change activities (discussed in Section 5.5.1) across the organisation. The time and budgetary limits specified in strategic plans, the inevitable time and resources overruns, miscommunication, risk-averse leadership, tightening timelines and budgets significantly impact as disruptive change constraints. Regulatory compliances and government policies towards the energy industry, such as privacy laws and compliance processes may reduce flexibility when performing digital disruption activities and reacting to disruptive change resistance and findings. Initiation of disruptive change may also be limited as organisations continue to operate BAU whilst conducting disruptive change activities that puts stress on available organisational resources. The technological constraints, in the form of legacy systems and new innovative technology, often unknown and not obvious without change management, and digital practitioners’ involvement, can also have significant impact on the digital disruption change recommendations generated. The involvement of change agents and strategic decision makers, including digital practitioners, can lead to the elicitation, understanding and mitigation of disruptive change constraints.

Figure 5.16: Disruptive change constraint concept set of themes, showing percentage of coded references
The lesson learnt from this concept is that due consideration, communication and identification needs to be made of disruptive change management constraints. These constraints may conflict or compete with existing BAU processes and the articulated set of digital disruption goals that define the digital disruption mindset for change. These digital disruption goals and disruptive change management constraints may disable, conflict or compete, requiring agreement by digital practitioners. This is best done with leadership commitment and involvement communicated and knowledge-shared across the organisation.

The main themes for these concepts shown in Figure 5.16 are  *Technological Constraints involving legacy systems and innovative technology, Organisational people constraints regarding digital knowledge, risk aversion and change activities, Constraints regarding time and activities in an active context and Disruptive change capabilities constraints created from change resistance.*

The strongest theme (shown in Figure 5.16),  *Technological and Organisational people constraints,* discusses the tension generated between various parts of an organisation on disruptive change management. This could be construed as a weakness in the theme, but it is a collection of external forces, such as legacy systems, leadership and resources issues or hampering regulations and policies, that create tension among other concepts and themes.  *Allocating time and resources to digital disruption activities* is a strong contributor to this constraint theme discussed by many of the digital practitioners interviewed. Both themes factor heavily in the significant relationships discussed later, in Section 5.7. The following section will discuss the themes and relationships between themes for the disruptive change constraint concept.

*The Law of Disruption and its main constraint is, that technology provides capabilities exponentially, but social systems grow linearly and that gap between exponential capabilities provided by technology and social systems such as strategic management systems, organisational resources, culture, protocols, regulation, accounting and law, are usually a lagging indicator of technological capability.* # 002

5.5.1 Disruptive Change Constraint concept – themes relationships

There are six themes within the disruptive change management constraints concept, a possible fifteen relationships between the themes. Of these relationships four are strong relationships, two are moderate and nine are weak. This theme grouping is a well-related set that demonstrates a highly cohesive concept. These relationships are derived from the cross interaction between themes found in the primary data, see Appendix E.
A digital practitioner’s role includes consideration of Technological Constraints, resources of time and activities, organisational people constraints and managing change capabilities. These constraint themes require consideration to select, perform and add value in the performance of digital disruption activities. These themes are all key constraints identified as significant by digital practitioners during the interview.

The figure (Figure 5.17) provides a guide to the interaction between the themes grouping in the disruptive change constraint concept.

Stronger relationships are shown with thicker arrows. This demonstrates strong relationship between the four themes discussed earlier, which gives rise to the importance of disruptive change activities, leadership capabilities, new innovative technology and the limitations of resources for change activities. Individually these themes can impact the overall digital disruption outcome, but combinations of these constraints can amplify the limitations that impact the digital disruption outcome.

5.5.2 The influences of technological constraints define organisational capabilities and digital disruptions outcome

This strong relationship theme is based on a relationship between ‘Technological constraints impact embracing of new innovative technology’ and ‘Allocating resources to digital disruption activities’ themes.
The essence of this relationship is that the selection of digital disruption activities to manage change is often dependent on the constraints. The predominant constraints that affect the selection and performance of digital disruption activities are the availability of innovative technologies, time given and budget (cost) available. Performing other BAU activities in parallel with the digital disruption activities to save time is not desirable from a digital disruption perspective and may increase investment risks and costs. Often the disruptive change management activities will be impacted by the results of technological and human resources and digital disruption activities.

These digital disruption findings may even require further investigation or evaluation, hence the need to perform additional digital disruption activities. Engaging digital practitioners and collaborators late in a change management, often means digital knowledge limitations, limited time, inflexible digital disruption scope, and the set of digital disruption activities in strategic change management plan are often prescriptive.

Technological constraints arising from digital technologies services and cloud computing require organisations to strongly consider aspects such as cost structure, scalability and efficiency. This can be achieved through fostering relationships with collaborators to improve the communication of technological constraints within the organisations. The iterative nature of performing digital disruption activities and actions following digital disruption findings may require a further iteration of digital disruption activity performance. This is often not possible because of the digital technologies available, allocated time and cost constraint.
5.5.3 Organisational people constraints constitute digital knowledge limitations and impact on time allocations for change activities

‘Organisational people constraints constitute digital knowledge limitations’ and ‘Disruptive Change Constraints dictate digital disruption activities performance’. The essence of this strong relationship is that Organisational resources constraints, ineffective communication, knowledge share limitations and customer issues need to be identified to manage change resistance and technological constraints.

Organisational people, time and activities constraints can be lack of resources, digital knowledge and resistance to digitalisation due to lack of proper management by change agents. The transformation of value chains and collaboration through mass technological adoption has altered the preferences of consumers, which can be more personalised and have high availability.

These constraints may conflict or compete with existing BAU processes and the articulated set of digital disruption organisational capabilities and skill sets that define the digital disruption mindset for change. These digital disorganisational people constraints and disruptive change management constraints may disable conflict or compete, requiring agreement by digital practitioners. This is best achieved with leadership commitment, involvement, communication and knowledge shared across the organisation.

![Figure 5.19: Organisational people constraints theme](image-url)
5.6. Customer Focus

The organisational digital practitioners have the primary responsibility to ensure digital disruption customer focus practice within organisations is implemented and consistent. The theme group (see Figure 5.18) that comprises this digital customer focus practice describes two key areas of customer centricity of significant importance for digital practitioners.

Firstly, this research highlights various roles played by digital practitioners in managing customer experience capability, customer care capability and new customer on-boarding capabilities that can include demand driven client service and multi-channel engagement with customers. It can include capabilities that are digital based and agile, personalised, co-creating, knowledge sharing and fostering relationships, customisation, incentives and competitive advantage by offering a myriad of choices. Innovative technology such as Blockchain technology and data analytic platforms have enhanced these capabilities and improved the co-creation of customer experience and value. Secondly, the research shows that continual and progressive improvement of the digital customer-focus practice of a digital practitioner’s skill sets, sharing vision and value of innovative technology, is effective in managing disruptive change and reinforces performance of digital disruption activities. The digitally mature organisation invests in innovative technology and resources to improve its digital disruption skill sets, revolutionise the customer experience, build customer capability and an innovative technology base to deliver demand driven customer experience whilst empowering customers to make the right decisions.

Figure 5.20: Digital customer focus practice concept set of themes, showing percentage of coded references
The lesson learnt from this concept is the importance and significance of the digital disruption customer-focus concept, critical in managing disruptive change outcomes. The major role played by digital practitioners includes fostering relationships to move to a truly holistic, multi-channel digital customer experience. This will create value and so develop an organisation whose processes and structures are digitally reimagined and realised in a contemporary manner.

This includes a more efficient, connected, empowered, analytically driven and automated way of working, while the underlying technologies will define the skill sets required to engage agile digital technologies. This concept also shows that customer-centric enterprises have the ability to manipulate data, to offer customisation, deliver customer care, communicate value and incentives to capture a target market and foster loyalty in new customer on-boarding.

So it’s about providing customer experience capabilities that is personalised, simplified, giving our customers a sense of comfort that they’ve done the right thing, they’ve made the right choice that they have been looked after the way customers want to be looked after. # 001

The strongest theme is Customer Experience Capability of digital practitioners in organisation, but Customer Care and Services goals and Managing new customer on-boarding incentives and involvement also factor strongly in the significant relationships discussed later, in Section 5.7. The following sections will discuss the themes and relationships between themes for the digital disruption concept.

5.6.1 Customer Focus concept – themes relationships

There are six themes within the digital customer focus practice concept that means a possible fifteen relationships between the themes. Of the 15 relationships between themes the two stronger relationships will be discussed. This grouping provides a distinct grouping of ideas that describe various specific aspects of customer focus practice. They are largely related and discussed in the same contribution during the interviews with digital practitioners (see Figure 5.19). Discussions of customer focus practice themes are mentioned and highlighted by all interviewees, discussed across the interview questions and across the other themes.

The group of digital disruption themes for this concept highlights a list of important digital practitioner roles. Another group of themes related to customer focus practices can improve the effectiveness of a digital practitioner (see Figure 5.20).
5.6.2 Agile demand driven customer experience capabilities facilitate new customer on-boarding and customer-focused disruptive change.

The significance of customer experience capabilities and customer care relates to tasks that will improve the performance of digital disruption activities such as customer focus practices, during disruptive change management. These include theme elements such as sharing vision, improving agility capabilities, co-creating customer experience and value, knowledge sharing and improving client service.

Managing the customer experience is important in fostering relationships and understanding the nature of customers in a demand driven environment through multichannel customer services. The customer experience goes digital as a result of the IoT which revolutionises the experience of customers through digitalised products such as smart devices. This results in improvement in real-time customer intelligence, autonomous customer experience and collaborative marketing.

The practices that improve the effectiveness of a digital practitioner's role provide a different perspective of customer experience capabilities in relation to new customer on-boarding. These include elements such as up-skilling through technology to maintain agile capabilities, customisation using customer incentives, improving skill sets and harnessing data manipulation to demonstrate customer engagement value.
The increase in customer experience capabilities impacts performance of digital disruption activities and allow skill set improvement that can be adjusted to more effectively generate improved competitive advantage. Digital practitioners must be able to demonstrate the value of engaging with customers and effective communication in customer services.

Finally, the ability to manipulate data gathered from digital analytics provides customisation and personalised product offerings and incentives needed for new customers’ on-boarding. There is a strong relationship encountered within this theme performing digital disruption activities as digital practitioners identify aspects that can effectively improve customer experiences while performing a new customer on-boarding role.

5.6.3 Technologically enhanced effective communication and interaction fosters customer-care

This strong relationship theme is based on a relationship between themes Agile demand driven Customer Experience Capability and Effective communication essential for Customer Care.

The essence of this relationship is that a digital practitioner’s skill sets and customer experience capabilities are enhanced through learning and embracing digital technologies. Digital skillsets and the ability to manipulate data offers customisation of customer services for special needs, demand-driven
services, co-creation of customer value and foster relationships. Technologically enhanced multiple channel engagements and activities create value in customer solutions and choices. This demonstrated value and enhanced experiences will positively impact digital change management.

Introducing a customer collaborative environment fosters relationship and allows for improving customer relationships as well as understanding how the organisation’s services fit the needs of the customers. Effective communication further enables data and knowledge sharing and together with agile customer experience capability maximises the customer-care value, understands customers’ future expectations and allows the redesigning of what customers perceive as value.

Personalised multichannel interactions for effective communication and simplified interactions, customisation for needs, customer incentives and value for loyalty reinforce better disruptive change performance in the organisation and across the collaborative network domain.

![Figure 5.23: Effective communication impacts Customer care theme](image)

5.7 Inter concept relationships

The following inter concept relationships are established following analysis of one or more themes within the concept relative to one or more themes within another concept.
The thirty-one themes that have emerged from this research were thus compared. There were varying levels of strength in the relationships based on the responses of digital practitioners and coded references.

The following relationship themes have emerged from one or more concept comparisons. These significant relationships are part of the selective coding process, as discussed in the methodology chapter. The eight significant relationships presented here are standouts in the concept comparison. This subsection will discuss each of the significant relationships, describing the essence of each relationship. These relationships can consist of one or more sets of strong intersecting themes. These strong relationships have themes that are from two different concepts, while the strong internal relationship themes were discussed earlier during the individual theme discussion.

The intersecting themes have been grouped based on similar analysis results from the examination of the coded references. Each relationship theme has a graphic that represents the research framework. This highlights (in red) the relationship theme being discussed in the section.

At the end of this section, an analysis of the strength of the relationships between concepts is discussed.

5.7.1 Mindset and External Collaboration Concepts relationship

The first strong relationship is between Organisational Capabilities and strategic management transform digital disruption mindset and Involvement of customers, service providers, supply chain and industry participants enhance the collaborative approach themes. The essence of this relationship is to effectively nurture digital disruption understanding through involvement by all. Collaborators need to gain an appreciation of the philosophy behind digital disruption and the various activities performed to generate digital disruption findings.

The nurture of external collaboration in digital disruption mindset concept not only helps improve digital disruption outcomes for the current disruptive environment, but it offers guidelines for the whole network ecosystems transitioning into future digitalisation.

The second strong relationship is between the themes: ‘Creating Digital networked economy with new business model with embracing technology for change agents to competitive advantage’ and ‘Involve service providers and supply chain creates a shared vision to collaborate and co-create for a value
platform in managing disruptive change’ and ‘Establish customer involvement in new technologies engagement with shared digital disruption vision of fostering relationships and knowledge share for value creation’.

The essence of this relationship is to facilitate involvement in digital disruption activities, digital disruption learning and digital disruption collaboration of customer engagement with disruptive change agents. Firstly, this provides the opportunity to embrace digitalisation for innovative network collaboration to co-create a value platform and share digital systems management; secondly, it establishes a shared digital disruption vision for the disruptive change; ultimately, a digital disruption mindset cultivated with key disruptive change agents will improve the organisation’s digital disruption maturity.

This relationship theme describes a phenomenon whereby the involvement of disruptive change agents can extend the digital disruption mindset beyond performance of a specific digital disruption activity and outside disruptive change boundaries. It is more than just Digital networked economy or creating a shared digital disruption vision among the disruptive change agents.

The creation of a digital disruption mindset allows change agents to go beyond the embrace of disruptive change to instead allow appropriate digital decisions to be made through knowledge sharing, communication and collaboration with industries, service providers, supply chain and customers. This provides cost efficiency in resource sharing and distribution of risks amongst collaborators.
5.7.1.1 Shared digitalisation vision, skill sets and agile capabilities in collaboration by all in industry ecosystems – digital practitioners, change agents, government agencies and customers

Involving all disruptive change agents across the energy ecosystem is an important way to gain acceptance of the value of digital disruption. The understanding of digital disruption gained through involvement can grow beyond mere recognition of digital disruption’s value. It engages all change agents and creates a shared understanding of this digital disruption value that goes across the disruptive change activities for competitive advantage. This understanding of higher-level digital disruption becomes a shared vision for the disruptive change, both by customers and disruptive change agents. It is a key part of improving the digital disruption outcomes of a disruptive change. This relationship concept comprises two strong relationships across the thirty-one themes.

5.7.2 Mindset and Customer Focus Concepts relationship

The first strong relationship is between the themes ‘Investing in Organisational capabilities and digital disruption activities to create a shared vision for disruptive change agents’ and ‘Involvement by all from strategic decision makers, stakeholders to customers to change agents enhances the collaborative approach’. The essence of this relationship is that the involvement of disruptive change agents in activities that allow them to experience and observe disruption value creation opportunities, collaboration, risk and cost sharing and issue resolution.

This starts with the strategic management decision makers, stakeholders, digital practitioners, change agents and customers being involved in digital disruption activities, such as value platform for knowledge share, innovative technologies and ability to manipulate data.

Disruptive change collaboration members, such as network ecosystems of industry can increase cross-selling within industry and may observe digital disruption issues through involvement in digital disruption activities, to co-create innovative technologies for competitive advantage and coopetition of products and services. The organisational change agents need to be kept involved through constant communication and presentation of digital disruption findings.

Involvement and collaboration are a two-way mutual benefit and cooperation. All parties involved will benefit from understanding the problem domain and/or technological constraints of disruptive change.
environment by creating an exchange of expertise, resources, dispersing and sharing risks, from systems management to lobbying for positive government policies and regulations.

5.7.2.1 Fostering industry ecosystems collaboration with customer – centricity to establish a digitalisation vision for the Digital networked economy

Fostering industry ecosystems collaboration relationship with focus on customer experience to attain competitive advantage is important in digital networked economy. This has a very strong relationship outcome within the Mindset, External Collaboration and Customer Focus concepts.

The first strong relationship concept is based on a relationship between themes Knowledge sharing, effective communication and customer-focused relationship for co-creation must be fostered with industry collaboration and Establish a shared digitalisation vision of demand driven customer experience approach within the collaborative Digital networked economy.

The essence of this relationship is that fostering customer-focused knowledge and risk sharing, cost benefits relationships provides a collaborative environment that enables a shared digitalisation vision to be developed and adhered to. This includes empowering change agents across the industry between
internal organisational change agents and external collaboration agents of service providers, supply chain and customers.

The relationships enable the expertise of the various change agents and resources to be shared and experiences exposure to the disruptive change activities hence the shared digitalisation vision. For mutual competitive advantage and to improve the digital maturity and digitalisation vision, digital practitioners and digital change agents share risks and knowledge in multi channelled interactions with customers to enable better communication and provide constant feedback on performance and disruptive change activities management.

5.7.3 Customer Focus and External Collaboration Concepts relationship

The second strong relationship is between Multichannel interaction and demand-driven customer service enhances customer focused experience and Involvement of Digital networked economy change agents strengthens the industry collaborative approach. The essence of this relationship is that involvement of change agents from industry ecosystems of Digital networked economy in digital disruption activities allow knowledge sharing, systems management risk and cost sharing. This leads to improved understanding of digital disruption that enhances the vision for the disruptive change. Initial involvement provides acceptance of digital disruption value, which develops into a shared digital disruption vision for the disruptive change.

This theme relationship describes the importance of involvement to move beyond digital disruption value by making digital disruption real to create a shared digital disruption vision. This digital change collaboration is not limited to the disruptive change but provides digital disruption collaborative knowledge and resource sharing to enable better digital disruption decisions within the industry to gain competitive advantage. This concept describes something beyond simple digital disruption acceptance. It is beyond just understanding its value to enable digital disruption activity performance in a disruptive change. Here, disruptive change agents need to be digitally mature, experienced and educated in using multi channelled innovative technologies to understand customer need and improve customer experience.
5.7.4 Mindset and Constraints Concepts relationship

This strong relationship concept is based on a relationship between the concepts Organisational resources, knowledge retention and risk adversity influence disruptive change constraints and Involvement of disruptive change agents and strategic decision makers enhances the collaborative approach. The essence of this relationship is that identifying the organisational constraints is made easier when involvement of disruptive change agents and strategic decision makers is established from the start of the disruptive change activities.

The organisational constraints comprise, for example, organisational resources available for change activities, innovative technologies and digital maturity, change resistance and leadership decision making. Challenges in managing constraints involve regulatory compliances, politics, government structures and legal issues. These constraints along with risk adversity, time given and costs, disruptive change agent goals, digital knowledge and technological constraints, may not all work well together. Certain tensions between them may exist. For example, lowered costs associated with progressive
innovation can transform regulatory frameworks as the different combinations of these technologies will likely be able to arbitrage structures of the energy industry.

With disruptive change agents and strategic decision makers’ involvement in collaboration to manage change activities, disablers and issues can be prioritised and enfolded into the digital disruption mindset of the disruptive change. Engaging the right disruptive change agents to identify and understand the various other constraints (other than time and budgetary disruptive change constraints) allows effective constraints management outcomes. Involving disruptive change agents can help identify various organisational constraints, better understand disablers and empower change agents to manage constraints and resolve tensions and issues in change activities.

5.7.5 Constraints and External Collaboration Concepts relationship

This strong relationship theme is based on a relationship between concepts Organisational people constraints impacting effective constitute digital knowledge limitations and Leadership vision and risk adversity facilitates collaboration of service provider and supply chain involvement.
The essence of these relationships is that organisational people-constraints and conflicts limit digital knowledge sharing and digitalisation of the industry. Leadership vision of network collaboration and facilitating interdependent change activities with commitment from all stakeholders enables positive disruptive change management. Working towards mutual benefits to the Digital networked economy the organisation co-evolves with selected organisations and customers as well as individuals to innovate and to co-create, to realise and to develop. This value platform of network ecosystems in collaboration promotes and facilitates access to knowledge, experiences, shared resources, risks and capacities needed to exploit the opportunities of the rapidly evolving disruptive energy market. This collaboration promotes co-creation to develop, propose value add and provide opportunities in building up the resources required to configure or reconfigure a business model for the future.

5.7.6 External Collaboration and Future Drivers Concepts relationship

This strong relationship theme is based on a relationship between themes Value platform of network collaboration promote sharing of knowledge, risks and digital experiences and Disruptive new technologies enable innovations of convergence creating new digital products and services with embedded digital capabilities.
The essence of this relationship is that a digitally mature enterprise can create additional value by providing multichannel capabilities for customers, sharing infrastructure, attracting and retaining digital resources as the future is unpredictable. With network ecosystems collaboration, digital organisations can co-evolve in complex non-linear ways to constantly organise and reorganise for novelty and rareness capability in anticipation of industry change, particularly in the energy industry that has both high velocity and high uncertainty.

The pervasive adoptions of digitisation and innovations with digital technologies are radically changing the nature of products and services. A defining characteristic of pervasive digital technology is the incorporation of digital capabilities into objects that previously had a purely physical materiality resulting in product digitisation creating ‘smart’ products and tool. These ‘smart’ products and tools include smart cities (Schaffers et al. 2011), smart grids, smart homes and digital platforms (Kierman 2017) which are taking consumers off-grid entirely.

The resulting digital innovation of new products relies on digitisation, where the encoding of ‘analog’ information into digital format and digitization makes physical products with properties noted by Yoo et al. (2010) as programmable, addressable, sensible, communicable, memorable, traceable, and associable. As ‘digitalisation of the Digital networked economy’ occurs with competitive advantage, increasing value creation and branding highlights the importance of the shared vision of innovative new business models in co-creation within the collaborative ecosystems as drivers for future success.
5.7.7 Digital Mindset strongly related to External Collaboration and Customer Focus concepts

Establishing a digital disruption mindset improves digital transformation, digital maturity and creates sustainable digitalisation of new business model for the future. In collaboration with network ecosystems and the community including customers and supply chain, economies of scale and mass production can be created enabling risk sharing and cost effectiveness.

Knowledge sharing, systems management and redistribution of risks amongst economies of mass collaborators enable the best digital disruption decisions gaining competitive advantage collectively in current and future disruptive environments. Co-creating and engaging customers by establishing shared vision with a digital disruption mindset can have a significant impact on the Digital networked economy’s ability to influence speed in decision making of regulatory policies for digitalisation and digital maturity of the industry. This relationship concept is made up of the two strongest relationships across the thirty-one themes.
5.8 Digital disruption Management vs Digital practitioner

When examining the interview data, each digital practitioner was coded as either a digital disruption manager or a digital practitioner. The digital disruption managers were those who headed a collaboration of digital practitioners and whose role included managing and allocating digital disruption resources to manage disruptive change. This research encountered sixteen digital practitioners whose role included that of a digital disruption manager.

The digital practitioners were those who did not have digital disruption manager responsibilities and were focused on the performance of digital disruption activities in disruptive changes, either as a digital disruption consultant or an organisationally based digital practitioner. This research interviewed nine digital practitioners.

There are two themes that had significant (more than 30% coded references) difference in the number of digital disruption managers and digital practitioners who discussed the themes, as shown. All twelve digital disruption managers discussed the importance of having the disruptive change collaboration involved and understanding the digital disruption value. It was discussed in the typical day at work (four digital disruption managers), a good story relating to work (six digital disruption managers and three digital practitioners) and bad story (five digital disruption managers and one digital practitioner) during the interviews. In the discussions, all four digital disruption managers, talked about communication with and involvement of disruptive change collaboration members as important.

The concept ‘skill set and experience of digital practitioner’ describes the skills and experience required to achieve good digital disruption activity outcomes. The digital disruption managers, with their role of allocating digital resources, saw this as a crucial consideration when reallocating organisational resources for disruptive change activities.

Strategic management leadership need to be able to provide digital practitioners with appropriate skill sets and customer experience capability to provide digitisation value by managing the disruptive change constraints. This theme was also part of an internal relationship in the customer focus practice concept, which related to the theme about involving external collaborations. The digital operational manager’s focus on these two themes is clearly important.
A new, dynamic collaborative business model with digital skills, experiences and receptive to communities working together in co-creating for value, are key determinants for allocated digital resources to implement disruptive changes.

In summary, the digital disruption managers see the importance of digital practitioners having a good skill set and experience base when engaged to perform digital disruptive change activities. Digital disruption mentoring is a great way to improve digital practitioner skills. Digital disruption managers are also more aware of problems with involvement, especially the need to get involvement from the disruptive change collaboration agents, to bring the technological issues (constraints) into consideration.

5.9 Operational Management digital practitioners vs. Strategic management digital practitioners

The comparison of digital disruption consultants (eight practitioners) and organisational based practitioners (seven practitioners), presents an interesting set of differences that may impact the digital disruption outcome. There are six digital practitioners that had been in both roles, which for purposes of highlighting the concepts that have a significant difference (more than 30% of practitioners), have been ignored in this initial analysis.

Organisational based digital practitioners did not discuss working within the organisation process as being problematic, because they are working within the same organisation structure and have a clear understanding of what is possible. The selection and performance of digital disruption activities, and being flexible with performance of digital disruption was not a highly discussed concept. The technological constraints are less of an issue, because working within the organisation they can have conversations and discussion to gain an understanding of what is possible with the appropriate disruptive change collaboration agents.

The time and budget for a disruptive change to occur can be discussed and facilitated at the inception with involvement from the start. Nurturing digital disruption understanding and performing digital disruption education can be done when involved in the organisation because the digital practitioner is available from day-to-day to have conversations with the various disruptive change agents. Working within an organisation provides an opportunity to take the digital disruption mindset beyond the disruptive change to the organisation’s culture, to improve the digital disruption maturity. Validation of
digital disruption findings by external digital disruption consultants and limitations encountered by
digital disruption consultants were not discussed.

Disruptive change constraints have a significant impact on what can be selected and performed as digital
disruption activities for disruptive change. Technological constraints have a larger impact due to the
time and access needed to foster relationships with disruptive change collaboration members. Time
given and budget allocated also provide limitations on what can be done because often change agents
are not engaged at the start of a disruptive change to have an impact on the disruptive change plan. Due
to the disruptive change constraints they find it difficult to be flexible with the performance of digital
disruption activities to maximise the digital disruption findings generated. Often digital disruption
consultants will be asked to validate digital disruption findings generated by internal organisation digital
practitioners. Collaboration members were more likely to encounter limitations that are out of their
realm of control, in relation to the access to agents (involvement), an organisation’s digital disruption
maturity and organisational constraints (e.g. legal issues or politics).

There were other internal relationship themes (within concepts) that were also impacted by this
section’s analysis. The first was the internal relationship theme: ‘Disruptive change constraints impact
on the digital knowledge, digitalisation and performance of digital disruption activities’. This is impacted
by two themes discussed in this section.

The first is that digital practitioners emphasised leadership risk adversity, knowledge share, digital
knowledge experiences and effective communication as impacting on digital change processes. This
constraint may need to be managed by strategic management leadership for organisational digital
practitioners to foster and establish better communication with disruptive change agents, to establish
digital disruption credibility and understanding of organisational development processes. This was
discussed by all the digital practitioners interviewed as being important and significant to a disruptive
changes digital disruption outcome.

The second is the internal relationship concept: ‘Digital disruption mindset and leadership nurtures
digital disruption understanding’. This relationship is like the significant relationship discussed earlier.
The essence here is the leadership and involvement required in nurturing digital disruption
understanding, culture and engagement in digital disruption activities. On the other hand, all the
organisational based digital practitioners discussed and described the importance of disruptive change
agent involvement as an important way to contribute to the nurturing of digital disruption understanding.

5.10 Interview questions

The interview questions, discussed in Section 3.8, comparing the five major concepts, see Table 5.3, highlight several significant relationships. The typical day question generated a lot of ‘Digital disruption Customer Focus Practice’ coded references. This highlights many practices performed by digital practitioners as part of their role. The nature of the question would suggest discussion about these sorts of activities performed on a day-to-day basis.

The majority of the ‘Constraints’ coded references were found in the bad story question as opposed to the good story. This makes sense, since stories that had a bad digital disruption outcome would often have elements that constrained the performance of digital disruption activities. Often digital disruption findings cannot be acted upon in the disruptive change because of constraints.

The background question did not yield many coded references for the major concepts. It was mainly a discussion of academic qualification and work experience, with the occasional mentoring roles played within disruptive change engagements or organisational positions. This question was used to code digital practitioner’s attributes that are used for analysis in this chapter.

The additional four questions were not asked at all the interview sessions, and therefore have a lower source and coded reference count. The most significant relationships were for the digital disruption goal conflict question relating to the ‘Constraints’ and ‘Digital disruption Mindset’ concept. This highlights a significant relationship that is discussed later. The digital disruption mindset was further discussed in the question about evangelism, but mainly in relation to gaining acceptance of digital disruption or improving agent’s perception of the value of digital disruption.
The questions on a good story and bad story produced many coded references for the concepts ‘Collaborative Approach’ and ‘Digital disruption Mindset’ and both have a significantly high number of sources and coded references. The ‘Digital Change Constraints’ theme lacked sources and coded references in the good story question, while ‘Customer Focus Practice’ concept lacked sources and coded references in the bad story.

In summary, the majority of the sources and coded references were for three of the major concepts’ topics (Digital disruption Mindset, External Collaborative Approach, and Constraints) discussed during the good and bad story questions. The typical day predominantly discussed the digital disruption practice concept. This analysis of the interview questions against the concept, provides further evidence of the symbiotic relationship between the collaborative approach theme and digital disruption mindset concept. The major questions on which the themes and concepts of the framework are based, are predominantly on the good story and bad story questions. This was the expected source of data for this research.

5.11 Beneficial impact on digital disruption outcome

To achieve a good digital disruption outcome for a given disruptive change there must be a certain level of adherence to the thirty-one themes (discussed in Sections 4.3, 4.4, 4.5 and 4.6) and twelve relationship themes (discussed in Section 5.2, 5.3, 5.4, 5.5 and 5.6). In the main, complying with the concept will improve the digital disruption outcome of a disruptive change. Complying with a large list
of concepts is difficult in practice. That’s why this section will examine a smaller list of key concepts that have been selected from the ones found in the good story discussion question in interviews.

During the interview, interviewees described a disruptive change where the digital disruption outcome was good. The analysis revealed many concepts. Figure 5.3 presents a key set of themes that were elicited from these stories. It can be said that these concepts were perceived by the digital practitioners interviewed as the most important to achieving a good digital disruption outcome. These six concepts represent only two major concepts, i.e. Digital disruption Mindset and External Collaboration. The Constraints and Future drivers’ concepts were not prominent concepts during the good story discussions.

These six themes are also the core set of themes that comprise the following significant relationships discussed (Section 5.2) and significant relationship discussed within concepts (Section 5.1):

- Digital disruption mindset prevails beyond the disruptive change context (Section 5.2.1)
- Shared digital disruption vision by all disruptive change agents disruptive change for future drivers (Section 5.2.2)
- Fostering disruptive change agent relationships to maintain involvement and collaboration of all parties (Section 5.1.6)
- Strategic management leadership decision making and vision in embracing disruptive change improves digital disruption mindset (Section 5.1.2)
These relationships highlight the strong interlinked nature of the external collaborative approach, customer focus practice, embracing drivers for the future and digital disruption mindset concepts. This reinforces the importance of this list of concepts and six relationship themes highlighted.

5.12 Detrimental impact on digital disruption outcome

When examining concepts that impact negatively on the digital disruption outcome for a given disruptive change management, we will examine the key themes based on number of sources, coded references and overall strength of discussion by digital practitioners during a bad story.

During the interview, interviewees described a disruptive change where the digital disruption outcome was bad. The analysis revealed many themes, but Figure 5.3 represents these six themes that were elicited from these stories. It can be said that these themes were the most important, as perceived by the digital practitioners interviewed, which resulted in some bad digital disruption outcomes. The top six themes represent three major themes, i.e. Disruptive change Constraints, Digital disruption Mindset and Collaborative Approach. The Digital Disruption Practice theme had no prominent concepts during the bad story discussions. The technological constraints do not factor at all during the good concepts
but are significant when the outcome is bad. Of the six themes, three features in both the good (Section 5.5.1) and bad story concepts.

5.13 Contribution to the Body of Knowledge

This theory's contribution to knowledge is not the thirty-one themes that have emerged, because these have been enfolded with the current literature (as described in Chapter 6).

The major contribution to knowledge is the key interrelationships that exist among the concepts and the relationships between each concept that converge, key elements and themes interplay and work together contributing to synergy to manage disruptive change as well as being a disruptor and leader within the industry ecosystem.

The summary of concepts, themes and key relationships that define the elements of the DCC framework that contribute to and guide the management of disruptive change outcome in a digital disruption environment is shown in Figure 5.33.

![Figure 5.33: Digital Disruption Outcome theory – major concepts and relationships](image)
The most important of the contribution to knowledge being the interrelationships’ between the concepts of digital mindset, external collaboration and customer focus. A digitally mature enterprise management foster:

- a shared, agile digital culture with collaborative organisational mindset to transform, resolve constraints and manage change effectively
- a customer-focused collaboration in building trust, co-creating value and maintaining mutually beneficial relationships
- engaging, developing, deploying and retain the collective digital talents with digital capabilities through organisational learning from direct workforce and external networks,
- Building networks with industry ecosystems, society, businesses and policy makers to shape attitudes and government action through communication, information, transparency and trust indirectly influencing regulatory policies and change.
- Progressively investing in innovative technologies as the future drivers, remaining responsive, adaptive and innovative as a key strategic priority for suitable economic growth.

The findings impacting the Australian energy industry were enfolded with literature in chapter 6 and further discussed in detail in chapter 7.

5.13.1. Interrelationships between key themes of Concepts

The following sections provide the essence of the interrelationships of a key theme(s) within a concept and a theme(s) across in another concept.

(i) Mindset <-> External Collaboration Concepts

Digital Networked Economy Strategies/ Industry Ecosystem Collaboration /Organisational Dynamic Capabilities themes

There are strong interrelationships between Digital Networked Economies Strategies management transform digital disruption mindset and Involvement of customers, service providers and supply chain’ and industry participants’ enhances the collaborative approach and Organisational Dynamic Capabilities themes.

This first interrelationship theme describes a phenomenon whereby the implementation of digital strategies mindset across the networked economy involving disruptive change agents both internal and external can extend the digital disruption mindset beyond performance of specific digital disruption
activities within one organisation but instead outside disruptive change boundaries. Creating Digital Networked Economy strategies with new digital business model to embrace technology for change agents to achieve competitive advantage is more than just digital networked economy strategies or creating a shared digital disruption vision among the disruptive change agents but a collective collaboration for the benefit of the whole network economy.

The essence of the second interrelationship is to facilitate involvement of industry ecosystem stakeholders in digital disruption activities, digital disruption learning and digital disruption collaboration of customer engagement with disruptive change agents across the industry ecosystem. Firstly, this provides the opportunity to embrace digitalisation for innovative network collaboration to co-create a value platform and share digital systems management; secondly, it establishes a shared digital disruption vision for the disruptive change; and thirdly, a digital disruption mindset cultivated with key disruptive change agents will improve the organisation’s digital maturity.

The nurture of industry ecosystem collaboration in digital disruption mindset concept not only helps improve digital disruption outcomes for the current disruptive environment, but it offers digital mindset and collaboration activities guidelines for the whole network ecosystems transitioning into future digitalisation influencing and impacting change for the future.

The essence of the third interrelationship is to effectively nurture a mindset of digital disruption understanding throughout the ‘Organisational Dynamic Capabilities’ and through involvement by all. Organisational dynamic capabilities assist collaborators to gain an appreciation of the philosophy and benefits behind digitalisation and the various activities performed to generate positive digital disruption outcome. It also facilitates the ability to influence attitudes and government action through communication and information to a firm’s advantage to be prepared for the future; by being a disruptor of an industry using tools such as big data, having insights, being in the right networks, and having the knowledge of an imminent environment conducive to a business. Organisational dynamic capabilities establish customer involvement in new technologies engagement with shared digital disruption vision of fostering relationships and knowledge share for value creation.

The above interrelationships between concepts comprise of two strong relationships across the thirty-one themes. The creation organisational dynamic capabilities with a digital disruption mindset allows change agents to go beyond the embrace of disruptive change to instead allow appropriate digital decisions to be made throughout knowledge sharing, communication and collaboration with industries,
service providers, supply chain and customers. This provides cost efficiency in resource sharing and distribution of risks amongst collaborators. Involving all disruptive change agents across the energy ecosystem is an important way to gain acceptance of the value of digital disruption. The understanding of digital disruption gained through involvement can grow beyond mere recognition of digital disruption’s value. It engages all change agents and creates a shared understanding of this digital disruption value that goes across the disruptive change activities for competitive advantage. This higher-level digital disruption understanding becomes a shared digital disruption vision for the disruptive change, both by customers and disruptive change agents across industry ecosystem and networked economy. It is a key part of improving the digital disruption outcomes of a disruptive change.

(ii) Mindset <-> Customer Focus Concepts

Collaborative approach of Stakeholders/Organisational Capabilities themes

The strong interrelationship is between the concepts’ themes Involvement by all from strategic decision makers, stakeholders to customers to change agents enhances the collaborative approach and Investing in Organisational capabilities and digital disruption activities to create a shared vision for disruptive change agents. The essence of this relationship is that the involvement of disruptive change agents in digital disruption activities allows them to experience and observe disruption value creation opportunities, collaboration, risk and cost-sharing and issue resolution.

This starts with the involvement of strategic management decision makers, stakeholders, digital practitioners, change agents and customers being involved in digital disruption activities, such as value platform for knowledge share, innovative technologies and ability to manipulate data.

Disruptive change collaboration members, such as network ecosystems of industry can increase cross-selling within industry and may observe digital disruption issues through involvement in digital disruption activities, to co-create innovative technologies for competitive advantage and coopetition of products and services. The organisational change agents need to be kept involved through constant communication and presentation of digital disruption findings.

Involvement and collaboration are a two-way mutual benefit and cooperation. All parties involved will benefit from understanding the problem domain and/or technological constraints of disruptive change environment by creating an exchange of expertise, resources, dispersing and sharing risks, from systems management to lobbying for positive government policies and regulations.
Fostering industry ecosystems collaboration relationship with a focus on customer experience to attain competitive advantage is important in digital networked economy. This has a very strong relationship outcome within the Mindset, External Collaboration and Customer Focus concepts.

The second strong interrelationship between themes Organisational Capabilities with knowledge sharing, effective communication and customer-focused relationship for co-creation must be fostered with industry collaboration and Establish a shared digitalisation vision of demand driven customer experience approach within the collaborative Digital networked economy.

The essence of these interrelationships is that the fostering customer-focused knowledge and risk sharing, cost benefits relationships provides a collaborative environment that enables a shared digitalisation vision to be developed and adhered to. This includes empowering change agents across the industry between internal organisational change agents and external collaboration agents of service providers, supply chain and customers.

The interrelationships enable the expertise of the various change agents and resources to be shared and experiences exposure to the disruptive change activities hence the shared digitalisation vision. For mutual competitive advantage and to improve the digital maturity and digitalisation vision, digital practitioners and digital change agents share risks and knowledge in multi-channelled interactions with customers to enable better communication and provide constant feedback on performance and disruptive change activities management.

(iii) Customer Focus <-> External Collaboration

Concepts Organisational Capabilities/ Digital Networked Economy themes

The strong interrelationship is between themes Organisational Capabilities of multichannel interaction and demand-driven customer service enhances customer focused experience and Involvement of Digital networked economy change agents strengthens the industry collaborative approach. The essence of this interrelationship is that involvement of change agents from industry ecosystems of Digital networked economy in digital disruption activities allows knowledge sharing, systems management risk and cost sharing. This leads to improved digital disruption understanding that enhances the digital disruption vision for the disruptive change. Initial involvement provides acceptance of digital disruption value, which develops into a shared digital disruption vision for the disruptive change.

This theme interrelationship describes the importance of involvement to move beyond digital disruption value by facilitating digital disruption to create a shared digital disruption vision. This digital change
collaboration is not limited to the disruptive change, but provides digital disruption collaborative knowledge and resource sharing to enable better digital disruption decisions within the industry to gain competitive advantage. This interrelationship also describes something beyond simple digital disruption acceptance. It is beyond just understanding its value to enable digital disruption activity performance in a disruptive change. Here, disruptive change agents need to be equipped with organisational capabilities digitally mature, experienced and educated in using multi-channelled innovative technologies to understand customer need and improve the customer experience.

(iv) Mindset <-> Future Drivers Concepts
Progressive Innovation/ Co-creation themes

There are two strong interrelationships between themes grouped within these two concepts are Mindset of Progressive Innovation in management strategies and Co-creation with external stakeholders and customers.

Strategic management mindset of progressively improving organisational innovation is critical in preparation for the future with investments in new business models that embrace innovative technology (e.g. virtual technologies, Photo Voltaic (PV) digital platforms, Blockchain technologies, renewables, smart grids and energy storage) are strongly recommended as future drivers. This would provide a value platform of collaboration for disruptive innovation, innovative customised solutions and digital integration.

The organisational mindset of progressive innovation and rapid adoption of smart grid technology is especially important in energy companies as it enables them to understand customer energy usage through more frequent and autonomous smart-meter readings, extracting valuable information in the process. Smart battery storage connected to grids enable consumers with less reliance on traditional grids to achieve a level of energy independence. Battery storage in conjunction with solar energy generation (PV) on the other hand, is likely to cause an increase to many disruptions to the grid due to the reductions in electricity prices potentially brought about by battery technology and PV. Innovative technologies that merge the real and virtual business world to form a technological mesh in business processes along the value chain can facilitate increasingly intelligent analysis and use of customer data for core-customer relationship management. This also creates flexible and new business models which may render businesses using conventional technology obsolete.
Simplified digital customer engagement skills and the ability to manipulate data that offers value and what the customer needs as well as excellent customer experience is an important driver for the digitalised future. The above two interrelationship themes confirmed the importance of progressive innovation as strategic management mindset as well as better understanding the customers’ needs by engagement and to co-create value products and services.

(v) Customer Focus <-> Future Drivers Concepts

Progressive Innovation/ Co-creation themes

The strongest interrelationship themes for the above two concepts (shown in Figure 5.12) are Demand driven and customised solutions essential in understanding customer needs, Value platform collaboration’ and ‘innovative technologies drive competitive advantage.

This enables building on disruptive innovation theory and ascertains the role of dynamic capabilities in the performance of response to digital disruption. The interrelationship between the three themes essentially highlights the driving force of disruptive innovation on organisational dynamic capabilities. This include changing, learning, embracing and extending existing resources, processes, and values positively associated with building digital platform capabilities that impact performance in response to digital disruption concepts. These driving forces can constitute advanced systems that operate autonomously to allow businesses to co-create and extend their relationships with core customers.

Progressive innovation between collaborative firms can be used to better understand the needs and expectations of their consumers, analyse behaviour patterns and monitor emerging innovations. This can include the use of innovative technologies such as smart grids in conjunction with value platform collaborations (e.g. smart home devices, renewable energy and storage, Blockchain and data analytics) to achieve competitive advantage.

(vi) External Collaboration <-> Future Drivers Concepts

Digital Networked Economy and Industry Ecosystem themes

This strong interrelationship theme is based on a relationship between themes Value platform of network collaboration promote sharing of knowledge, risks and digital experiences and Disruptive new technologies enable innovations of convergence creating new digital products and services with embedded digital capabilities.
The essence of this relationship is that a digitally mature enterprise can create additional value by providing multichannel capabilities for customers, by sharing infrastructure, attracting and retaining digital resources because the future is unpredictable. With network ecosystems collaboration, digital organisations can co-evolve in complex non-linear ways to constantly organise and reorganise for novelty and rareness capability in anticipation of industry change, particularly in energy industry that has both high velocity and high uncertainty.

The pervasive adoptions of *digitisation* and innovations with digital technologies are radically changing the nature of products and services. A defining characteristic of pervasive digital technology is the incorporation of digital capabilities into objects that previously had a purely physical materiality resulting in *product digitisation* creating ‘smart’ products and tool. These ‘smart’ products and tools include smart cities (Schaffers et al. 2011), smart grids, smart homes and digital platforms (Kierman 2017) which are autonomous in taking consumers off-grid entirely.

The resulting digital innovation of new products relies on digitisation, where the encoding of ‘analog’ information into digital format and digitisation makes physical products with properties noted by Yoo et al. (2010) as programmable, addressable, sensible, communicable, memorable, traceable, and associable. As ‘*digitalisation of the Digital networked economy*’ occurs with competitive advantage, increasing value creation and branding highlights the importance of the shared vision of innovative new business models in co-creation within the collaborative ecosystems as drivers for future success.

**(vii) Mindset ↔ Constraints Concepts**

*Embracing New Technologies* theme

This strong relationship concept is based on a relationship between the themes *Organisational resources, knowledge retention and risk adversity influence disruptive change constraint* and *Involvement of disruptive change agents and strategic decision makers enhances the collaborative approach*.

The essence of this relationship is that identifying the organisational constraints that will assist in managing disruptive change easier by involving internal and external disruptive change agents and strategic decision makers, in a collaborative approach and establishing from the start of the disruptive change activities.
The organisational constraints comprise, for example, organisational resources available for change activities, innovative technologies and digital maturity, change resistance and leadership decision making. Challenges in managing constraints involve regulatory compliances, politics, government structures and legal issues.

These constraints along with risk adversity, time given and costs, disruptive change agent goals, digital knowledge and technological constraints, may not all work well together. Certain tensions between them may exist. For example, lowered costs associated with progressive innovation can transform regulatory frameworks as the different combinations of these technologies will likely be able to arbitrage structures of the energy industry.

With disruptive change agents and strategic decisionmakers’ involvement in collaboration to manage change activities, disablers and issues can be prioritised and enfolded into the digital disruption mindset of the disruptive change. Engaging the right disruptive change agents to identify and understand the various other constraints (other than time and budgetary disruptive change constraints) allows effective constraints management outcomes.

Involving disruptive change agents can help identify various organisational constraints, better understand disablers and empower change agents to manage constraints and resolve tensions and issues in change activities.

(viii) Constraints <-> External Collaboration
Digital Networked Economy / Industry Ecosystem/ Regulatory Policies

The strong interrelationship concept is based on a relationship between themes Organisational people constraints impacting effective constitute digital knowledge limitations and Leadership vision and risk adversity facilitates collaboration of service provider and supply chain involvement’ and Regulatory and Policies constraints management.

The essence of these relationships is that organisational people constraints and conflicts and regulatory policies limit collaboration and digital knowledge sharing, progressive innovation and digitalisation of the industry.

Leadership vision of network collaboration and facilitating interdependent change activities with commitment from all stakeholders enables positive disruptive change management. Working towards
mutual benefits the Digital networked economy the organisation co-evolves with selected organisations and customers as well as individuals to innovate and to co-create, to realise and to develop.

This value platform of network ecosystems in collaboration promotes and facilitates access to knowledge, experiences, shared resources, risks and capacities needed to exploit the opportunities of the rapidly evolving disruptive energy market.

This collaboration promotes co-creation to develop and propose value add and provide opportunities in building up the resources required to configure or reconfigure a business model for the future. Strategic management in collaboration with stakeholders and industry ecosystems address and manage constraints by way of influencing and engaging regulatory authorities, sharing resources and knowledge staying agile moving forward to the future of the industry.

The key focus of this thesis is improving digitalisation outcomes for a disruptive change activity, which has resulted in the major findings of themes, concepts and inter-concept relationships that affirmed, enhanced and expanded the DCC framework processes discussed in chapter 2. This key contribution to the digitalisation literature has not been specifically discussed or addressed in the digitalisation literature in the past.

In this chapter, the various concepts and themes that have emerged and contributed to this key finding were shown to have a good grounding in the literature. The set of themes in the External Collaboration concept have been well established in the collaboration and involvement literature. The set of themes within the digital disruption Mindset concept and the Customer Focus also obtained a good grounding in the literature. The relationships between these three concepts are the strongest and forming key findings in this thesis.

The strong relationship between digital disruption mindset, customer focused and external collaborative approach concepts (discussed in Section 5.2.7) that has emerged in this thesis provides an important contribution to the digitalisation space.

The digitalisation research area has underpinned the various themes to emerge in this thesis, but this thesis has gone further by showing a strong relationship between core concepts. It reinforces within the digitalisation mindset and organisational learning, digitalisation customer experience capabilities and digitalisation innovative technologies areas that a prerequisite of success is to achieve a good external
collaborative approach, customer centric capabilities and a high level of digitalisation understanding. It is only through a collaborative approach that a digitalisation mindset can be improved, or conversely a digitalisation mindset can be shaped by a collaborative approach. These concepts work in collaboration with one another and one without the other reduces the attainable digitalisation outcome.

5.14 Summary

A key element of this research that has been highlighted in this chapter is the importance of enhancing the disruptive change agent’s digital disruption mindset. This is done through careful consideration of the disruptive change constraints, digitally enhanced processes for Customer Focus practices and predominantly using external collaborative approach emphasising the drivers to the future of the energy industry in Australia. This chapter has highlighted significant relationships that demonstrate the importance of the digital disruption mindset, customer focus practice, emphasising drivers to the future of the energy industry, managing constraints and embracing external collaborative approach with new business models.

The biggest impact on the digital disruption outcomes is what level strategic management decision makers, digital practitioners, and disruptive change agents can attain with a digital disruption mindset. The digital disruption mindset has a spectrum of levels. It can be a simple acceptance of digital disruption, understanding the disruptive change’s value, nurturing a shared digital disruption vision for digitalisation or creating a digital disruption mindset that change agents can use beyond transitioning and transformation of the energy industry. To achieve digitalisation success predominantly relies on a strong digitalisation mindset, external collaboration for competitive advantage and performance of disruptive change activities and value creation, applying and embracing the factors driving success for the future of the energy industry plus awareness of disruptive change constraints. Consideration needs to be given to the other factors raised in this research, which were of moderate impact level on digitalisation and managing disruptive change, which may be of significant contribution to the changing landscape of innovative technology.

The following chapter (Chapter 6) will describe and compare the literature review with the findings of this research. These concepts that were analysed (Chapter 5) to develop the theory, will be compared with the findings and validated against other similar research literature (Chapter 6).
Chapter Six – Literature Comparison

This chapter will describe aspects of the existing literature that is enfolded with findings in Chapter 5. As described in the research design and methodology chapter (Chapter Three), this enfolding of the literature is done as part of the research process. Elements of the discussion from this chapter and the analysis chapter will form the basis for the conclusion in the next chapter (Chapter Seven). This will provide some theoretical grounding for the theory generated. It will allow further analysis and synthesis of the generated theory in light of other research. It will also highlight gaps in the literature and analyse the contribution to knowledge discussed in the conclusion.

To achieve this comparative analysis and contrast with the literature, this chapter has been segmented into the five major concepts of this research. Each of the concepts will then be discussed in reference to their group of themes with emphasis on the strong themes in comparison to the related digital disruption literature. The concepts discussed are:

- Digital disruption mindset
- External Collaboration
- Future Drivers
- Constraints
- Customer Focus

The literature used in this section was presented in the literature review chapter (Chapter Two). Recent literature articles discuss the embrace of digitalised technologies by organisations, incorporating innovative technologies and digitisation into business models or managing change activities and value creation strategies. This body of research is discussed in more detail within the concept discussion. Also discussed is the main literature that is involved in the introduction of digital disruption (Tan, Tan & Land 2015; Schmidt & Cohen 2010; Pavlou & El Sawy 2006, 2010; Ramaswamy & Gouillart 2010; Rai et al. 2012; Davis, Eisenhardt & Bingham 2009).

This thesis provides a set of findings that identify senior management and digital practitioners’ perceptions of digital disruption from the technological, business strategy and decision making perspectives. The findings also revealed details of future drivers of the current energy industry in Australia, the embedded services, products and operations such as smart-metering and the artificial intelligence (Pratt et al. 2010; Krishnamurti et al. 2012, Ramchurn et al. 2012), which corroborates many of the themes that have emerged in this thesis.
6.1 Digital disruption mindset

Digital disruption mindset describes the importance of developing an understanding of digitalisation and digitalised transformation to better manage disruptive change and its outcomes. The digital disruption mindset concept incorporates seven emerging themes in this thesis. These themes are compared alongside the literature (Table 6.1) to highlight where they are supported, opposed, not covered or if there are gaps that exist.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Theme</th>
<th>Existing Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Disruption Mindset</td>
<td><strong>Strategic management’s leadership in new business model critical to promote a digital disruption mindset</strong></td>
<td>Ganguly (2015) and Styhre (2002)</td>
</tr>
<tr>
<td></td>
<td>Make disruptive change competence an organisational capability by investing in agile skill sets for organisation</td>
<td>Lucas &amp; Goh (2009) and Targett (2016)</td>
</tr>
</tbody>
</table>

These are the strongest of the seven themes for this concept and these will be used to enfold with literature refer Section 5.2 on the list of seven themes.

- **Strategic management** – The strategic management’s leadership in new business model is critical to promote a digital disruption mindset.

Chesbrough (2010) highlighted that the successful leadership of organisational change is responsible for developing the capability to innovate existing business models by overcoming the barriers to business model innovation, which previous academic research has identified as including conflicts with existing assets and business models as companies commercialise new ideas and technologies through their business models. The role of leadership in establishing the mindset of the organisation based on the findings of the thesis comply with these studies, indicating that it is important to make transformation meaningful, to role-model desired mindsets, build a committed team and relentlessly pursue impact. Articulation of digitalisation requirements and goals is important when procuring digitalisation requirements in the face of digital disruption (Ganguly 2015). The alignment of digital disruption with business drivers and goals is emphasised in the framework proposed by Ganguly (2015). The articulation of digitalisation – here the use of digitalised technologies and data to create revenue, value, improve
business, transform business processes and create an environment to embrace a new digitalised business model – is an important initial step for a digital disruption mindset.

➢ **Organisational capability** – *Make disruptive change competence an organisational capability by investing in agile skill sets for organisation*

According to Ganguly (2015), a shared mindset helps create a wider platform to build an ecosystem comprised of people, processes and technologies that enable organisations to reposition themselves. Theoretically, the study extends to a framework by Lucas and Goh (2009) in managing disruption response, which underpins knowledge advancement and organisational capabilities. Targett (2016) reinforces this by stating the importance of organisational flexibility and agility to obtain competitive advantage in the digitalisation of the energy industry. The insights gained from these studies indicate the importance of agility and organisational capabilities of firms to thrive amidst disruptive digitalised innovation, which justifies the importance of agility and organisational capabilities in the digital disruption mindset concept.

➢ **Change Management** – *Nurture digital disruption understanding in change management for digital maturity and digitalisation.*

The study by Styhre (2002) discusses how change management and dynamic capabilities are related when viewed from a complexity theory perspective. Styhre (2002) also highlighted that organisational change capabilities with progressive innovation will determine the viability and impact of digital transformation. The ‘Engage and Learn Model’ proposed by (Worley & Mohrman 2014) shows how change management occurs in adapting and developing organisations. Regarding change management models, the ADKAR model (Prosci 2007; Hiatt 2006) describes how goal-oriented change management overlaps with the Lewis and Kotter models where there is a need to reinforce change. These findings from the literature are in line with the findings of this thesis that change management occurs as a product of digitalised change. The models of change management are found to have a relation with the findings of the thesis where change management was associated with the mindset of organisations faced with digitalised disruptions.

The findings from the literature (Ganguly 2015) corroborate the findings of this thesis where agile skillsets of Organisational Capabilities facilitated change management in transforming the digital disruption mindset. The need for change and strategic management were also discussed in the
literature. However, this thesis does not reveal quantitative results in operational aspects of creating value as discussed by Laaksonen and Peltoniemi (2016) as the thesis revolved around perceptions of practitioners by conducting qualitative interviews. The social collaboration tools and technologies model proposed by Skarzauskiene, Tamosiuandaite and Zaleniene (2013) adheres to the concept of the digitalisation mindset where social technology’s impact is required in knowledge management and organisational capabilities. Hence, based on the literature, the above mentioned themes of organisational capability, change management and strategic management were determined to be well grounded with the digital disruption mindset of organisations.

6.2 External Collaboration

The external collaborative approach looks to active involvement of internal and external stakeholders in disruptive change activities to improve disruptive change outcomes. The external collaborative approach concept incorporates five emerging themes in this thesis. These themes are compared alongside the literature (table 6.2) to highlight where they are supported, opposed, not covered or if gaps exist.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Theme</th>
<th>Existing Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Collaboration</td>
<td>Involvement of Service providers, Supply Chain, regulators and ecosystem in co-creating</td>
<td>Tan et al. (2016), Abrell et al. (2016) and Karimi &amp; Walter (2015)</td>
</tr>
<tr>
<td></td>
<td>Customer Involvement in New Business Models through the ability to manipulate data</td>
<td>Lawrence, Suddaby &amp; Leca (2009), Barrett et al. (2015),</td>
</tr>
<tr>
<td></td>
<td>Demand driven Network Economy that enhances the collaborative approach</td>
<td>Barrett, Faraj &amp; Faik (2017), Warren (2013) and McGrath (2010)</td>
</tr>
</tbody>
</table>

These are the strongest of the five themes for this concept and these will be used to enfold with literature refer Section 5.3 on the list of five themes.

➢ Involvement of Service providers, Supply Chain, government agencies and ecosystem in co-creating

Botsman (2015) notes four key elements in order for collaborations to occur, which are: critical mass, idling capacity, belief in the commons and trust between strangers. A review of collaborative economy start-ups found that many have failed due to their inability to satisfy these conditions (Tan et al. 2016).
A study of disruptive change practitioners alludes to an external collaborative approach involving supply chains as an important part of digitalised disruption, saying, ‘Adopting a service-dominant theorising approach, we uncover the role of technology through which participants of online marketplaces in multi-sided-digitalised platforms are empowered to co-create value’ (Tan et al. 2016, p. 2). The major aspect of this study was cultivating IT-enabled collaborative consumption in a car sharing organisation known as GoGet, to investigating how IT systems have become the key proponents reinventing, co-creating and distributing product service systems (Tan et al. 2016). The discussion by Tan et al. (2016) about ‘GoGet’ on collaborative consumption discusses network ecosystems and economy, establishing a shared vision, customer involvement in new technologies co-creation and involvement of agencies/service providers/supply chain, as detailed in the literature review. This is imperative in value co-creation of digitalised networked economy and the involvement of customers, agencies, service providers and supply chain in the creation of value for the enterprise (Tan et al. 2016). Rohrbeck et al. (2013) highlighted in a research that collaborative business modelling creates a powerful platform for jointly identifying economic and societal value, defining value creation/value capture systems, and planning of complex and uncertain future markets.

The focus of this thesis is on how effective communication and collaboration between independent but interdependent components of the digitalised networked economy results in an improved disruptive change outcome for a disruptive change activity. The theme enfolds with the literature described by Tan et al. (2016) where multi sided digitalised platforms were empowered in the co-creation of value that led to sustainable growth and competitive advantage. This further emphasises the importance of involvement to enhance digital capabilities for a disruptive change activity.

In summary, external collaboration across the energy ecosystems including supply chains and customers to co-create and value add was identified in the literature, which, in part, contributed to the findings of this thesis.

The role of disruptive technologies in the external collaboration concept, from the digital practitioners’ point of view, enhances organisational agility to respond to disruptive change through the creation of new resources, primarily knowledge and skills. This occurs through the integration of resources from a host of actors of external collaboration for mutual benefit in the industry ecosystem.

➢ Customer involvement in new technologies – Customer Involvement in New Business Models through the ability to manipulate data
A recent study also described the necessity for supply chain coordination in a big data environment and the improvements effected through big data (Liu & Yi 2016). As an equilibrium strategy supply chain collaboration was becoming increasingly important, as was apparent from digital disruption (Boyaci & Gallego 2004). Thus, design coordination contracts are proposed in an attempt to improve the coordination of supply chains in a collaborative big data environment (Liu & Yi 2016). External collaboration brings about creativity that enables value-add and innovation which may not be available within an organisation. In building and maintaining mutually beneficial relationships requires individuals and organisations to rethink the distribution of power, the importance of trust, ethics and authenticity, in building a strong valuable brand. Without strong relationships, built on a foundation of trust, the values of business brands are exposed to scrutiny and can change quickly in a highly networked, digitally-enabled environment. It is especially crucial for senior organisational decision makers to take the lead and be involved in risk averse decisions, to knowledge share, to invest in innovative technologies and resources, to network and collaborate with industry and to co-create value with service providers and consumers. The involvement may require commitment of the important stakeholders for the interdependent activities but strategic decision makers need to show leadership and share the co-creation vision across the organisation. Gaziulusoy and Twomey (2016) highlighted that business models consist of several components, which together establish the conceptual architecture of businesses that fundamentally need to articulate value proposition, target customer, distribution channels, customer relationships, arrangement of activities and resources, core competencies, partner network, cost structure and revenue model.

In regard to big data and digitisation, Loebbecke & Picot (2015) has highlighted how business models are shaped and knowledge among workers is impacted. These changes include replacement of analogue forerunners by digitalised services, mass amateurisation, and replacement of decision making by machine-supported decision making, manipulation of data, data analytics and the elimination of knowledge based, cognitive processes (Loebbecke & Picot 2015). Warren (2013) highlights the importance of interdependent activities which require commitment of the firm, its partners, suppliers, customers, investors, collaborators and other stakeholders with which an organisation co-evolves. McGrath (2010) also describes the interdependencies of such systems in bringing up resources to configure or reconfigure a business model. Thus, related to the literature findings, the external collaboration concept is greatly affected by the big data environment across industry sectors and work processes as proposed by the findings of this thesis. This enfolds with the relationship theme of Customer Involvement in new collaborative business model through the ability to manipulate data strongly aligns with these business model components and enfolds with the literature.
The Digitalised Networked Economy theme is a key part of the external collaboration concept. It is the cornerstone of a successful digital disruption outcome. This concept has a very strong theme that focuses on all entities of the industry ecosystems’ stakeholders involved in disruptive change activities, i.e. Involvement of customers in the digitalised networked economy to knowledge share, manage systems, improve cost efficiency while remaining risk averse, enhances the collaborative approach concepts. These disruptive change activities relate to the digital platforms that enable ongoing knowledge collaboration (Barrett, Faraj & Faik 2017). New business models connect the dynamic evolution of collaborations, which have underlying digitalised platforms and can have far reaching implications for the digitalised networked economy (Barrett, Faraj & Faik 2017) and to engage in work to maintain, disrupt and create institutions (Lawrence, Suddaby & Leca 2009), which is a vital part of innovation. Furthermore, technology, once diffused and accepted becomes integral to the market component of innovation. In managing disruptive change, digitalised organisations are instrumental in the cooperation and coordination activities by providing the building blocks (Ostrom 2005) for increasingly complex and interrelated resource integration and service-exchange activities.

In this research, the decision making stakeholder group that needs to be involved is specified as ‘all stakeholders’, but especially the customers and cooperative entities within the collaborative network ecosystem. According to Warren (2013), the prism of business models has different actors and relationships that exist between the firm, distributors, customers, allies, investors and other stakeholders. Weill & Ross (2005) acknowledges this and discusses the need for support by all disruptive change activity stakeholders during disruptive change practice, which includes firms, distributors, customers, allies and investors. The literature supports the themes formed from the external collaboration approach because of the interdependencies of businesses. Barrett et al. (2015) discusses the trend of increased focus on personalised services along with development of disruptive social technologies and how it outlines increased expectations and driven evolution of professional coordination services, both intra and inter-organisationally. Barrett et al. (2015) also looks at how procuring disruptive change requirements uses the digitalised networked economy platform to facilitate knowledge share and innovation, sharing risks, costs and cross-selling of products and services involving collaborators, industry ecosystem members and external stakeholders. The literature that focuses on co-creation and collaboration (Abrell et al. 2016; Akram & Åkesson 2011; Galbraith 2012; Karimi &
Walter 2015; Rai et al. 2012) in disruptive change activities to improve digital disruption outcomes for
the digitalised enterprise confirms the importance of the external collaboration approach.

This enfolds with the theme as shown in development of disruptive change activities currently working
within the energy industry ecosystem like the Australian Energy Market Operator (AEMO) and energy
industry regulators.

6.3 Future Drivers

The future drivers concept describes how forces of digital disruption such as innovative technologies
and the ‘Internet of Things’ create a rapid transformation of industries. The future drivers concept
incorporates seven emerging themes in this thesis. These themes are compared alongside the literature
(table 6.3) to highlight where they are supported, opposed, not covered or if gaps exist.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Theme</th>
<th>Existing Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future Drivers</td>
<td>Understanding customer needs through communication from a customer driven perspective</td>
<td>Glavas &amp; Letheren (2016) Wessel, Levie &amp; Siegel (2016) and Trejo, Gutierrez &amp; Guzman (2016)</td>
</tr>
<tr>
<td></td>
<td>Embrace agile disruptive technologies using new business models</td>
<td>Henfridsson, Mathiassen &amp; Svahn (2014),</td>
</tr>
<tr>
<td></td>
<td>Innovation driven technology and competitive advantage</td>
<td>Panetta (2016), Kulkarni &amp; Padmanabham (2016) and Ji &amp; Zhang (2016)</td>
</tr>
</tbody>
</table>

Of the seven emerging themes within this concept, the three strongest are: Understanding customer needs through communication from a customer driven perspective, Embrace agile disruptive technologies using new business models and Innovation driven technology and competitive advantage.

The relationship between the themes and future drivers concept is, The understanding of customer needs with embracing digitalised technologies and innovation, Regulations and policies impacting adoption of innovative technologies and Automation of processes will transform how businesses operate, interact with customers.
➢ Understand customer needs/chatbots/effective communication – *Understanding customer needs through communication from a customer driven perspective*

Understanding customer needs from a customer-driven perspective through communication is discussed in the literature. One example is the improvement of customer experience by the energy wholesaler Powercor in Victoria with the use of smart grids. The use of data and analytic platforms improves decision making in tandem with reduced costs which proactively enables identification and resolution of network reliability issues for customers (Kiernan 2017). This is similar to the research by Schaffers et al. (2011) where ‘smart cities’ improved internet-enabled services which can be shared in open innovation environments. Pombriant (2016) describes the importance of customer relationship management and journey maps following digitalised disruption.

In relation to understanding the customer, Wessel, Levie and Siegel (2016) suggests that the advances in communications allow businesses to extend their relationships with customers and create more interdependent architecture for the innovation. This is supported by Feloni (2015) which describes the importance of strengthening relationships with core customers through investing in sustaining innovations. Research by Trejo, Gutierrez and Guzman (2016) has shown that customer input is a valuable component of the future innovation process. The literature is related to the research theme as it identified the importance of understanding customer needs through communication from a customer driven perspective in embracing digitalised technologies and innovation.

➢ New technologies/Embedded smart grids/blockchain/renewables storage batteries – *Embrace agile disruptive technologies using new business models*

In the embedment of new technology from digitalisation, Panetta (2016) and Kaplan (2017) suggest that AI and machine learning are disruptive technologies that are emerging and have substantial disruptive potential across industries. These include new technologies, such as deep learning, neural networks, natural language processing and advanced systems that adapt, learn predict and operate autonomously (Kulkarni & Padmanabham 2016; Kaplan 2017). Henfridsson, Mathiassen and Svahn (2014) highlight the importance of embracing new technologies in the hierarchy-of-parts frame which consists of the lifecycle, design and production when faced with digitalised change in product innovation. Innovative ways to obtain renewable energy through lower costs from solar cells are disrupting the future of energy industry (Lejumaan 2012). According to Lejumaan (2012), this is because the cost per watt of solar energy is coming down rapidly and the total amount of solar energy is growing exponentially. Cox (2017),
discusses how innovative technologies like renewable energy storage on a mass scale, such as the 13 megawatt SolarCity solar farm by Tesla located on the island Kauai, in Hawaii are able to disrupt energy companies who fail to alter their business models.

The future of automation, machine learning, ushering in a new era of man–machine collaboration, will require the biggest change in the way work and interactions will be conducted. Pyle and San Jose (2015) highlights that access to troves of useful and reliable data is required for effective machine learning, and while the machine identifies patterns, the human translator’s responsibility will be to interpret them for different microsegments and to recommend a course of action or decision making. Research by Ji and Zhang (2016) and Spencer (2016) supports this and describes how such new technologies will lead to an economy of automation where multilayered digitalised mesh and new technology such as augmented reality, virtual reality, artificial intelligence, machine learning and chatbots create new ways to use data that go beyond internet or digitalised influence. In the case of virtual learning, knowledge gaps can be overcome through the improvement of attention, actualisation, attraction and action (Katernyak & Loboda 2016). An integration of information and pedagogical technologies has much potential the digital disruption environment and according to Kerimbayev (2015), can be considered a successful approach to workplace learning.

This literature corroborates the findings of this thesis’s theme that new technologies and agile disruptive technologies using new business models needs to be embraced in transforming and driving the digitalised organisation into the future.

➢  **Digitalised technology transformation** –  **Digital evolution through embracing technology and digitalised systems management**

Blockchain technologies on the other hand have caused disruption in banking, mortgage systems and security management (Prevett 2016). Blockchain technology is understood as decentralised data management technology dealing with transactions and emulates a ‘trusting’ computing service through distributed protocol run by nodes connected over the internet (Cachin 2016). This service creates an asset for many companies due to its public ledger system that’s accessible for all and is highly secure (Cachin 2016). Usage of Blockchain technology will influence global financial organisations on banking infrastructures and functions based on their applications. Blockchain-enabled innovations should not be confused with improved database management but as an innovative new technology which influences digitalised transformation in institutions.
Energy storage technologies such as smart batteries have the potential to disrupt energy markets in operations of grids, power markets and regulatory incentives for renewables. Glavas & Letheren (2016) states that disruptive technologies are new technological innovations that render conventional technology obsolete and transform how new businesses are established and how existing business compete. The rise of electric vehicles is most likely to bring forward the mainstreaming of renewable battery storage according to Hershan (2016). This creates a level of energy independence and control that solar and photovoltaics alone cannot provide. The low costs associated with digital disruption can be seen in the dropping of storage prices due to growing market for consumer electronics and demand for electric vehicles (Frankel & Wagner 2017).

This significantly affects the future of the energy industry and the transformation of grid operations. The difference between technological innovation, business model innovation and product innovations is made clear by Markides (2006). It is important in understanding these differences for digital practitioners to predict the disruptive effects on different markets and managerial implications (Markides 2006). According to Hershan (2016), the future is likely to be won by businesses with flexible infrastructure and business models that enable resources to be shared in local areas through digitalised platforms and infrastructure. The implementation of new technologies apparent from progressive innovation in the energy market is strongly governed by regulations and policies. Thus, as discussed in Section 2.3.5., the structures of implementing technologies such as smart grids, energy storage and photovoltaics will likely be more complex and sustainability based.

➢ Innovation/digital platforms/mass collaboration/ecosystems communities – ‘Innovation driven technology and competitive advantage

Digitalised technology platforms and services in conjunction with customer knowledge management is described by Trejo, Gutierrez and Guzman (2016) as a potentially powerful tool which contributes to competitive advantage for companies and their customers. The continuous strategic process by which companies allow their customers to move from passive information sources to active knowledge through new technologies enables value creation in companies (Trejo, Gutierrez & Guzman 2016). This use of digitalised innovation is supported by Fichman, Santos and Zheng (2014) where four stages for overall innovation process were proposed. These include discovery, development, diffusion and impact, which describe how the customer relationship is understood through three conceptualised types of innovation: process, product and business model delivery.
In summary, the literature has revealed that the involvement of innovation driven technology has a substantial disruptive effect across industries. Disruptive technologies, such as Blockchain technology, autonomous technologies and innovative platforms can change how businesses compete due to the capability of disruptive technologies to render conventional technology obsolete. Developments in digitalised technologies, such as sensors and machine learning, are expected to widen the boundary of the types of tasks that can be automated and change the future of Australian workforce landscape. Currently there remain tasks that have proven difficult to automate, including those requiring perception or creative and social intelligence (Productivity Commission Australia 2016).

These are in line with the literature review in Section 2.5.3, which discussed the innovation driven technology and new business models embracing agile digitalised technologies that were key themes in future drivers of organisations.

The findings of this research agree with literature review (in Section 2.3.4.) highlighting enterprises who master the flow of relevant data, having access to customers’ data patterns and improve customer relations will have the edge (Bernoff et al. 2013). This includes the use of innovative platforms to extend an organisation’s relationship with customers and to manage customer communications. Through understanding the customer’s needs, companies are able to utilise the knowledge in conjunction with new innovative technologies in value creation in the industry. The analytics of the data, its role in presenting the results that allow the creation of business value in terms of new products or services is stressed by Akter & Wamba (2016) also describes big data as voluminous, variety, velocity, veracity and value (White 2011). This relates to improving customer capabilities through innovative technology, which is one of the major findings of the thesis.

- **Regulations and policies – Policy and government regulations development drives the digitisation of industries**

According to recent research conducted by CSIRO (2017) for the Australian Electricity Market Commission, energy storage is seen by many as the next big change facing Australia’s electricity system. The energy storage technology can solve challenges that range from smoothing the intermittency of renewable generation to providing power quality support, managing peak demand to reducing customers’ electricity bills, which will significantly benefit the broader electricity system. Such benefits require careful control of the batteries and their operation. However, the interplay between battery operation that benefits the end-customer (typically through reducing their electricity bill) and battery
operation that benefits the broader electricity system is not straightforward. This will require careful regulation, tariff design or other mechanisms to ensure optimal outcomes highlighting the extent of government regulations and policies that will impact future drivers of innovative technologies. This emerging theme enflods with literature as discussed in Section 2.3.5., that any government regulatory policies either as enablers or disablers of digital disruptions will dictate investments into the various sectors of the energy industry currently operating within the energy ecosystem.

6.4 Constraints

The disruptive constraint concept describes various themes that can impact digitalisation outcomes. The constraint concept incorporates six emerging themes in this thesis. These themes are compared alongside the literature (table 6.7) to highlight where they are supported, opposed, not covered or where gaps exist.

Table 6.4: Constraints - Summary of existing literature which supports theme

<table>
<thead>
<tr>
<th>Concept</th>
<th>Theme</th>
<th>Existing Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constraints</td>
<td>Technological Constraints involving legacy systems and innovative technology</td>
<td>Warren (2013), (Yoo et al. 2012), Schmidt et al. (2015) and Sultan &amp; van de Bunt (2012)</td>
</tr>
<tr>
<td></td>
<td>Organisational people constraints regarding digital knowledge, risk aversion and change activities</td>
<td>Farrall et al. (2012), Eady &amp; Lockyer (2013) and Molla, Cooper &amp; Karpathiou (2015)</td>
</tr>
<tr>
<td></td>
<td>Time and activities in an active context’ and ‘Disruptive change capabilities constraints created from change resistance</td>
<td>Leimeister, Osterle &amp; Alter (2014), Rechert et al. (2014) &amp; Krüger (2016)</td>
</tr>
</tbody>
</table>

The three strongest out of the six emerging themes of the constraints concept in this thesis are: Technological Constraints involving legacy systems and innovative technology, Organisational people constraints regarding digital knowledge, risk aversion and change activities, Constraints regarding time and activities allocation in an active context.

The relationships between these strong themes to the constraints concept are: The influences of technological constraints define organisational capabilities for change and digital disruptions outcome; Organisational people constraints constitute—digital knowledge limitations and Impact on time allocations for change activities.

➢ Technological constraints – Technological Constraints involving legacy systems and innovative technology
This theme above highlighted the role played by technological issues and Warren (2013) in his list of digital practitioner skills discusses the importance of digital practitioners’ understanding of technological issues and barriers. The paper by Warren (2013) presents it as a digital practitioner skill impacting disruptive change activity outcomes and technological constraints impacting on digital practitioner’s practice. There is some research that highlights the need to better understand the digital software developers’ role (Yoo et al. 2012), embracing disruptive technologies, the digital convergence and embedding digital capabilities into non-digital products and services.

Sultan and van de Bunt (2012) described the emergence of technological constraints in regard to cloud computing, which has emerged because of the computing and digitally disruptive paradigm. Technological constraints are embraced by organisations due to advantages of flexible cost structure, scalability and efficiency (Sultan & van de Bunt 2012). Christensen’s (1997) theory of disruptive innovation is reflected upon in this research to address the issue of technological constraints and the implications of innovative technology. Schmidt et al. (2015) also supports the emergence of technological constraints arising from digital technologies in services and cloud computing. In the research by Schmidt et al. (2015), the product and value creation perspective are discussed, which identify the disablers of digital technology, a key element of the technological constraints theme. The literature and the emerging themes of this thesis concur that the digital practitioner needs to foster relationships to improve communication and promote benefits of embracing new technologies, while decision makers need to take risks in innovative technology investments that enhance competitiveness as well as consider technological issues in a disruptive change activity.

➢ Organisational people – Organisational people constraints regarding digital knowledge, risk aversion and change activities

The most common constraint found in the literature that enshrouds with the emerging themes is: Organisational people constraints regarding digital knowledge, risk aversion and change activities and Resource Constraints. Farrall et al. (2012) described organisational people constraints as an obstacle to strategic digitalisation, with consideration for time given, budgetary limits and stakeholder involvement limits. Eady and Lockyer (2013) discussed Understanding resource limitations when introducing digitalisation into an organisation or disruptive change activities for the first time. Eady and Lockyer (2013) also highlight how organisational people were a constraint in the face of digital disruptions as developing knowledge and integrating technology into organisations required sufficient resources.
Research by Molla, Cooper and Karpathiou (2015) suggests that resources were a main factor in digital disruption and the main response of IT managers was to build a digital presence because of the need for change capabilities within the organisation. Similarly, Gilley, Gilley and McMillan (2009) state that resistance by an organisation’s change agents, such as leaders and decision makers, will contribute considerably to the inability of organisations to adapt to disruptive change.

These literature highlight time given and cost as constraints, but also include limits on stakeholder involvement, issues this thesis highlights in the collaborative approach theme (i.e. problems with gaining disruptive change stakeholder involvement were included in the Involvement by all in disruptive change activities enhances the collaborative approach concept).

The selection and performance of digitalisation activities is often constrained by various disruptive change elements. The performance of digitalisation activities is greatly influenced by regulatory systems and associations (Warren 2013). Research by Warren (2013) describes how the airline industry in the European Union states was affected by deregulation and required structural change at the supranational level. The disruptive change from the deregulation stemmed from systemic transformation of value chains through new technology that changed consumer behavior (Warren 2013). Similarly, Daly (2016) observed the implications of regulations on energy production and consumption in Australia. Due to the strong vested interests in large scale carbon energy generation, the activities of prosumers were met by a pushback from Australian regulations and policies (Daly 2016). This literature provides good coverage of the concept Constraints dictate digitalisation activity selection & performance from this thesis.

➢ Time and activities – Constraints regarding time and activities allocation in an active context

The literature also highlights the constraints associated with organisational capabilities, time and activities. Leimeister, Osterle & Alter (2014) highlight the changing preferences of customers who are empowered by digital gadgets and choices due to digital disruption, services which are often personalised, context adaptive, real-time and requiring high availability of knowledge and resources. This thesis has found that organisations must improve digital knowledge, experience, skills and organisational capabilities for managing disruptive change. This is supported by findings of Rechert et al. (2014) who discuss the challenges in terms of perceived usefulness, ease of use and individual user-centricity. Krüger (2016) discussed how the biggest challenge to scale up renewables was land, suggesting that resource was a major constraint. Due to digital disruption, innovation activities increasingly become horizontal as the same innovation activities and knowledge are applied across
multiple platforms, presenting a major digital disruption constraint (Yoo et al. 2012). Warren (2013) has pointed out that the improvements in digital technology and the rise of digital disruption in practical management requires more knowledge on dynamics of how complexes interact and the relationship between the exploration of new possibilities and the exploitation of old certainties in organisational learning.

The following two themes are not the strongest of the six themes of the concept but are significant and have direct impact on constraints management.

- Regulatory compliance and policies – Compliancy with government policies and regulations presents a challenge in managing disruptive change

As highlighted in the literature review in Section 2.5.2.3., significant regulatory interference (Nelson et al 2014), government policies impacting energy pricing and business processes (Besser et al. 2002; Oren 2003; de Vries 2003; Wen et al. 2004; Finon & Pignon 2008; Joskow 2008; Simshauser 2009) are contributing factors to the trilemma currently impacting the energy sector. The constraints of organisations also extend to the structural nature of economic systems in providing a framework, which is affiliated with regulatory systems (Warren 2013). Energy technologies combined with advances in information and communication technology, distributed energy generation (notably solar and wind) and improved storage technologies are currently under the government regulatory and physical infrastructure for energy supply which supports a centralised energy transmission and distribution network, thus raising questions about how these advances in technology will respond to disruptive technologies (Productivity Commission Australia 2016). Recent policies combined with potential for technological innovations and business opportunities have attracted a high level of interest in smart grids (Amin 2011) and according to Soshinskaya et al. (2014), regulatory barriers exist due to interconnection rules with the main grid and the prohibition of bi-directional power flow and local power trading between micro grid and the main network.

The literature highlights that modernisation of grids primarily influences the establishment of new regulations and policies that ultimately present constraints and challenges to many energy companies in managing disruptive change and to potential investments into new technologies.

- Change capabilities – Disruptive change capabilities constraints created from change resistance

The literature also highlighted the need to increase the explicit support for digitalisation activities and its role in the disruptive change activities (Carlsson & El Sawy 2008). The study by Carlsson and El Sawy
(2008) suggests that the turbulent environments in organisations associated with digitalised disruptions (Yoo et al. 2012) poses five types of tensions which revolve around contraints in activities of the organisation. The digitalisation activities selected are often participatory type activities, which rated highly in the survey of digitalisation practitioners conducted by Carlsson and El Sawy (2008). The study by Molla, Cooper and Karpathiou (2015) supports and describes how digitalisation practitioners have had to respond to the constant change of activities in organisations in the mass adoption of technology. Fuller, Warren & Argyle (2008) discusses whether an organisation has change capabilities and is ready to invest in digitalisation, which was not discussed at length in this thesis. An assumption was made that organisations were ready, because they had involved digitalisation practitioners, no matter the level of digitalisation maturity, to consider digitalisation in disruptive change activities. Farrall et al. (2012) discusses the resistance to ‘user-centered design/digitalisation’ being lack of management interest/respect/support, organisational digitalisation mindset slow to change, value not seen in digitalisation, and disruptive change team members resistant to it. All of these are organisational constraints and change resistance that impact disruptive change activities. This thesis concept also discussed the need for a digitalisation champion from the organisational stakeholders to help elicit organisational constraints, which is discussed later. The support for digitalization activities by organisations and disruptive change activities corroborates the literature focus and the results.

In summary, the various emerging themes of constraint concepts were discussed in the enfolding literature. The most prominent emerging constraint theme, the Technological Constraint, was addressed by the literature and confirmed by the findings of this research, where the influence of technological constraints define organisational capabilities (Bruno 2011) and disruptive change outcome. The understanding of the technological constraints highlighted in this thesis was described in some literature and discussed as a required skill for digitalisation practitioners. The time given and cost of performing digitalisation was also discussed. The initiation of digitalisation was discussed from an involvement of disruptive change stakeholder’s perspective, where this research highlighted digital practitioner engagement, which is expected when interviewing digital practitioners.

Integration of digitalisation activities into disruptive change activities was highlighted in literature, in accordance with the thesis findings where constraints were identified in the form of time and activities in an active context.
6.5 Customer Focus

The digitalisation customer focus practice looks to describe the roles and practices that digitalisation practitioners perform to potentially improve digitalisation outcomes. The digitalisation practice concept incorporates six emerging themes in this thesis. These themes are compared with the literature (table 6.5) to highlight which were supported, opposed, not covered or reveal gaps in the literature.

Table 6.5: Customer Focus - Summary of existing literature which supports theme

<table>
<thead>
<tr>
<th>Concept</th>
<th>Theme</th>
<th>Existing Literature</th>
</tr>
</thead>
</table>

The three strongest emerging themes out of six themes are: *Customer Experience Capability of digital practitioners in organisation*, *Customer-centric products and services goals* and *Managing new customer on-boarding incentives and involvement*.

The relationships between the themes and customer focus concept are: *Agile demand-driven customer experience capabilities facilitate new customer on-boarding and customer-focused disruptive change* and *Technologically-enhanced effective communication and interaction fosters customer-care*.

- **Customer experience capability – Customer Experience Capability of digital practitioners in organisation**

The customer experience capability of digital practitioners in organisations is widely covered in the literature. In the co-creating of customer experience and value, Brodie et al. (2011) describes the importance of dynamic and interactive customer as potential power of consumers is very great, and computer-communications technology offers the means to help realise that potential engagement (Rakic & Rakic 2015). The analysis by Brodie et al. (2011) generated five fundamental propositions, which...
revealed that involvement and participation by digital practitioners were crucial in facilitating the customer experience.

The dynamic connection of people, processes and services known as the Mesh relates to one of the five digitalised technology platforms, which is the customer experience in organisations (Panetta 2016). As the role of consumer is changing, the role of digital practitioners is thus recognised in the literature as pivotal in achieving customer centricity, which affirms this researcher’s findings that Customer experience capabilities facilitates new customer on-boarding and customer-focused disruptive change and Technologically-enhanced effective communication and interaction fosters customer care.

However, the application of new technologies themselves is shown to have clearly played a significant role in achieving customer focus during digital disruption. Innovative Ledger technology like Blockchain which is hoped to improve cyber-security, impacts banking and transforms the customer experience by giving a new measure of legitimacy (Spencer 2016). Spencer (2016) also describes the rise of the ‘experience’ economy where products are no longer the centre of capitalism and customer experiences are a key component in products and services. A review one disruptive technology by Prevett (2016) suggests that advancements in Artificial Intelligence fuelled machine learning and cloud software have led to improvements in chatbot performance, which creates an opportunity for many businesses. This relates to the customer experience capability where customer support is deployed and able to take advantage of the consumer confidence in such applications (Prevett 2016).

Data analytics is another tool by which the customer experience may be impacted positively but also opened the possibilities of lower customer satisfaction. Kiernan (2017) studied one of the platforms in data analytics utilised by energy wholesaler Powercor where customer experience is improved through identification and resolution of potential network reliability issues. The advanced metering infrastructure platform used by Powercor allowed the company to leverage compute on demand and led to better customer experience through determining better solutions for their consumers (Kiernan 2017). However, research by Barrett et al. (2015) indicates that the overreliance on self service automation may lower customer satisfaction.

Scherer et al. (2015) supports this claim and states that a mix of self-service and human-service channels is important in maintaining a quality customer experience which confirms and aligns with the theme emphasising the role of Customer experience capability of digital practitioners.
Customer on-boarding – Managing new customer on-boarding incentives and involvement

In regard to the ‘new customer on-boarding’ theme, Day and Hubbard (2003) identified how customer relationships are digitalised as a result of the Internet of Things and that the internet offers opportunities to reduce customer service costs while encouraging customer contact, forging close customer relationships and enabling personalisation of communications (Day & Hubbard 2003). The research from Day and Hubbard (2013) has also found that the internet will complement existing customer channels and many digitally mature firms will leverage the internet to stretch their lead in customer-focus practices. Hoffman and Novak (2016) describes how the ‘consumer Internet of Things’ has the potential to revolutionise the experience of the consumer through the extension and expansion experience from digitalised objects. The framework proposed by Hoffman and Novak (2016) develops a conceptualisation of consumer-object experiences which lead to understanding the nature of customers. This relates to the new customer on-boarding theme where the process of defining customer relationship has changed due to the influence of digital disruptions.

In communicating the customer focus capability, Markham et al. (2010) and Christensen, D (2008) suggests that a digitalisation leader or ‘champion’ is needed in organisational digital transformation to communicate the unique capabilities, to conceptualise ideas and communicate disruptive change processes throughout the digitalisation activities. The digitalization leader and champion are discussed as part of the customer focus concept because teaching disruptive change to stakeholders is related to improving the customer service capabilities within organisations.

An outcome of the customer focus practice concept was the importance and opportunities of digital disruption, in managing customer care, innovative service offerings and service goals. Barrett et al. (2015), recognised four dimensions of service innovation in a digitalised industry: service concept, client interface, service delivery and technology. These dimensions, similar to the five key areas in the framework by Nylen and Holmstrom (2015) are customer focused and develop client interactions through new spheres of knowledge relevant to customised services (Barrett et al. 2015). Lusch and Nambisan (2015) discuss the importance of service innovation where actor-to-actor networks, resource liquefaction, density creation and resource creation are important aspects to focus on from a service-dominant logic. The tripartite framework presented by Lush and Nambisan (2015) further highlights the importance to derive insights on service innovation, namely:

- service ecosystems where actors create and recreate through their effectual actions offering an organizing logic for the actors to exchange service and co-create value.
• service platforms which enhance the efficiency and effectiveness of service exchange by liquefying resources and increasing resource density facilitate access to appropriate resource bundles and serve as the venue for innovation
• value co-creation which views value as co-created by the service provider and the service beneficiary (e.g. customer) through resource integration and indicate the need for mechanisms to support the underlying roles and processes.

➢ Customer care – Customer-Centric Products and Services goals – focus on branding and rareness capability

Yoo et al. (2012) supports this view by recognising the importance of customer-focused services that have personalised interactions and are demand-driven. Amit and Zott (2001) highlighted how companies increasingly introduce new ways to conduct and align commercial transactions to capture consumer and potential client needs. Value is created through connecting parties, eliminating inefficiencies in the buying and selling process through the adoption of digitalised transaction methods (Amit & Zott 2001). Similarly, in the research conducted by Tax, McCutcheon and Wilkinson (2013), the service delivery network, where from the customer viewpoint organisations interacted with one another, was important in defining the overall customer experience. From a service delivery network perspective, digital practitioners in organisations should participate in building and managing service delivery to understand how organisations fit into the customer’s service delivery network (Tax, McCutcheon & Wilkinson 2013).

The customer care theme, identified in this thesis from the customer-focus concept, is apparent from the literature where organisations need to understand their roles in improving customer relationships by understanding customer needs, offering and delivering services.

Bernoff (2013) describes how the only sustainable competitive advantage in the age of the customer is the knowledge of and engagement with customers. The study by Bernoff (2013) proposed that four priority areas should be the focus to leverage traditionally created customer dominance: real-time customer intelligence, customer experience/customer service, sales channels that deliver customer intelligence and useful content/interactive marketing to deliver value, efficiency and effectiveness.

In the research conducted by Markham et al. (2010), the ‘champion’ in organisations adopts ideas and work with the ‘sponsor’ and ‘gatekeeper’ to demonstrate its viability to further develop the idea. This relates to the integration of innovative technology in organisations when faced with digitalised disruptions. In the study conducted by Lukas et al. (2007) on transformational change in patient care,
leadership and aligning organisational goals with resource allocation was a major finding. Lukas et al. (2007) suggests that these findings were key drivers that affect organisations in their delivery of customer services and support. In the resource-based view (Newbert 2008), the firms’ capabilities were the main focus but McGrath (2010) suggests that it did not help managers to determine what resources to invest in and how it would contribute to the future competitive position of organisations. McGrath (2010) suggests the importance of leaders to mobilise resources in addressing change to business models during digitalised disruption. An example was the threat of customers converting from film-based analogue cameras to digital cameras. At Kodak a leadership challenge arose which needed to recognise digital disruption threats (McGrath 2010). This literature addresses the theme above and highlights the importance of customer capabilities of support and services driven by value, efficiency and effectiveness in the business to business space.

In summary, there was good coverage of the theme for the Customer focus concept in the literature with such things as: need for customer-centric care products and services goals, customer experience capability of digital practitioners in organisations and the management of new customer on-boarding incentives and involvement. The literature reinforces the customer focus concept and highlights the importance of service innovation in the energy industry to manage customers and achieve personalised demand-side service goals. The digitalisation of customer relationships as a result of IoT and new technologies were also discussed where personalised communications with customers were essential for new customer on-boarding and customer care. The customer experience capability of digital practitioners in organisations was mentioned in literature where the use of digital platforms to promote active interaction and real-time customer information is able to improve customer experience.

The literature captures the essence of this research, suggesting that there must be value attained from the performance of digitalisation activities and customer-focused performance. With the rapid growth of global communications networks, more and more disruptive innovation will be intangible, digitally-enabled, and created or co-created around social phenomena (Lyytinen, Yoo & Boland Jr 2016; Lusch & Nambisian 2015).

Customer focus concept and the themes are covered and confirmed as critical in managing disruptive change; that is, delivering a better customer service value chain, creating a consistent and well aligned interactive platform designed to deliver seamless customer experiences underpinned by agile and flexible business processes that are fast, responsive and adoptive to customer demands and market needs.
6.6 Relationships

The need for a strong relationship between the concepts of mindset and external collaboration of stakeholders is covered in the literature. Tan et al. (2016) alludes to it in discussing the value co-creation of the digital networked economy and the involvement of digitalisation stakeholders. The essence of the relationship is nurturing the external collaboration of stakeholders through understanding the digital mindset to improve digital disruption outcomes. Tan et al. (2016) discusses how the company, ‘GoGet’ focuses on the multi-sided digital platforms which considers the interdependent digitalisation and disruptive activities with stakeholders as they co-evolve. Similarly, Warren (2013) and McGrath (2010) discuss the importance of interdependent activities that organisations co-evolve with in a digital networked economy. This shows that improving the digitalisation mindset of disruptive change stakeholders can create relationships with stakeholders of disruptive change which enhances the external collaboration within a firm.

Another key relationship between future drivers and customer focus concepts is evident as described by Kiernan (2017) in the case of energy wholesaler Powercor, which utilised innovative technology in the form of smart grids to improve customer experience. The use of the smart power grids by Powercor allows the company to leverage on demand computing and results in better customer care and experience through determining better solutions (Kiernan 2017). Advances in innovative technology such as Blockchain have also transformed the customer experience by introducing new measures of legitimacy (Spencer 2016). In relation to innovative technology, the introduction of AI and cloud software has improved chatbot performance, which creates opportunities for many businesses in customer support (Prevett 2016).

The relationship between the mindset and customer focus concepts through customer capability can be derived from the research by Markham et al. (2010) where a digitalisation leader is required in organisations for the conceptualisation of digitalised activity ideas. The digitalisation leader in improving the capabilities of an organisation is associated with the customer experience capability where the goals and requirements of organisations are articulated (Ganguly 2015). This corresponds to the disruptive innovation theory as described by Karimi and Walter (2013) in adapting resources and processes of a firm in response to digitalised disruptions. The four dimensions of service innovation described by Barrett et al. (2015) have also shown the relationship between the two concepts through the organisational capability theme. The dimensions proposed relate to the customisation of services
through client interactions from new spheres of knowledge (Barrett et al. 2015) and the personalisation of communications while reducing service costs (Day & Hubbard 2013). The literature highlights the importance of service innovation that looks to improve the value of customer experience capability and highlights the need to focus on the value placed on organisational capability embracing innovative technologies to respond to innovative change.

In summary, there was good coverage of most of the themes for the five concepts in the literature. A number of themes do not go into the same level of detail as the literature therefore there are gaps, which is expected based on the scope of the research done. A number of themes are not covered by the literature and vice versa.

6.7 Disruptive Change Capability framework processes compared

Table 6.11 shows the comparison with the emerging themes in this thesis and does provide a broad coverage of all the processes in this section. This table shows the emerging themes’ strong link with each of the processes of the disruptive change capability framework in this research.

<table>
<thead>
<tr>
<th>Processes of Theories</th>
<th>Link</th>
<th>Related theme that emerged from the thesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational Learning Active Context</td>
<td>✓</td>
<td>Organisational people constraints regarding digitalised knowledge, risk aversion and change activities</td>
</tr>
<tr>
<td>Organisational Learning Experience</td>
<td>✓</td>
<td>Strategic management’s leadership in new business model critical to promote a digital disruption mindset</td>
</tr>
<tr>
<td>Organisational Learning Knowledge</td>
<td>✓</td>
<td>Involvement of customers in network economy to knowledge share, systems manage, cost efficiency and risk aversion</td>
</tr>
<tr>
<td>Value Capability</td>
<td>✓</td>
<td>Customer Experience Capability of digital practitioners in organisation</td>
</tr>
<tr>
<td>Rareness Capability</td>
<td>✓</td>
<td>Innovation driven technology and competitive advantage</td>
</tr>
<tr>
<td>Competitive Advantage</td>
<td>✓</td>
<td>Make disruptive change competence an organisational capability by investing in agile skill sets for organisation</td>
</tr>
<tr>
<td>Organisational Change</td>
<td>✓</td>
<td>Organisational people constraints regarding digitalised knowledge, risk aversion and change activities</td>
</tr>
<tr>
<td>Change Theory</td>
<td>✓</td>
<td>Nurture digital disruption understanding in change management for digitalised maturity</td>
</tr>
<tr>
<td>Social Collaboration Tools and Technologies</td>
<td>✓</td>
<td>Involvement of Service providers and Supply Chain in co-creating Demand driven Network Economy that enhances the collaborative approach</td>
</tr>
<tr>
<td>Digitalised Innovation Stages</td>
<td>✓</td>
<td>Embrace agile disruptive technologies using new business models</td>
</tr>
<tr>
<td>Digital Business Strategies</td>
<td>✓</td>
<td>Digitalised technology transformation – Digital evolution through embracing technology and digitalised systems management Strategic management – The strategic management’s leadership in new business model is critical to promote a digital disruption mindset</td>
</tr>
</tbody>
</table>
6.8 Discussion Summary

This chapter has contrasted the emerging themes and concepts from this thesis with the literature, predominantly the digitalisation and disruptive innovation literature, along with the disruptive change capability framework and disruptive innovation capabilities models.

Many themes and concepts from this thesis were found to have good coverage in the literature. The latest literature and research had varying degrees of coverage against the concepts and themes, unlike the energy industry where there are more reports than research papers on impacts of digitalised disruption. An example of this is the concept of customer focus and collaboration between disruptive change stakeholders and customers. Where this thesis has highlighted the need for customers and ecosystems, the literature has corroborated many of these. This thesis has not provided fine detail on the various factors of collaboration. The emerging concepts and relationships in this thesis have highlighted that development of a digitalisation mindset is best obtained through involvement and leadership of decision makers with an opportunity to collaborate externally to improve digitalisation value, shared digitalisation vision and digitalisation mindset of all disruptive change stakeholders. This was discussed in the analysis chapter (Chapter 5) and in particular the key relationship was discussed.

There were thirteen concepts discussed. The study highlighted Digitalised Mindset, External Collaboration and Customer Focus concepts as distinctly important. All five concepts were covered by this study. But the key relationship between collaborative concept and constraints concept was not discussed in detail as it is not as strong a concept as the others discussed.

In Table 6.6 each of the themes and inter-concept relationships highlight that most of the concepts are well supported by the literature.

The key focus of this thesis is improving digitalisation outcomes for a disruptive change activity, which has resulted in the major findings of themes, concepts and inter-concept relationships that affirmed, enhanced and expanded the DCC framework processes discussed in chapter 2. This key contribution to the digitalisation literature has not been specifically discussed or addressed in the digitalisation literature in the past.
Table 6.7: Summary of coverage, support and gaps of the concepts, themes, relationships and other literature

<table>
<thead>
<tr>
<th>Concept</th>
<th>Theme</th>
<th>Not covered</th>
<th>Supported</th>
<th>Concept Gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Digital Mindset</strong></td>
<td>Organisational Capability</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Change Management</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strategic Management</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Organisational Culture</td>
<td>✓</td>
<td></td>
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<tr>
<td></td>
<td>Customer Capability</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Stakeholders Collaborative Approach</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value Resource Capability</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Customer Focus</strong></td>
<td>Customer Experience Capability</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Customer on-boarding</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Customer Care</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manage Customer Issues</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Customer as a Business Consumer</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Customer as End User</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Constraints</strong></td>
<td>Technological Constraints</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Organisational People</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Change Capabilities</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time and Activities</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communication Issues</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Regulatory Compliance</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>External Collaboration</strong></td>
<td>Customer Involvement in New Technologies</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Involve Government Agencies/Service Providers/Supply Chain (Full stack)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Digitalised Networked Economy</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Network Ecosystem</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Establish a Shared Vision</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td><strong>Future Drivers</strong></td>
<td>Embracing New Technologies</td>
<td>✓</td>
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<tr>
<td></td>
<td>Progressive Innovation</td>
<td>✓</td>
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<td></td>
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<tr>
<td></td>
<td>Understand Customer Needs</td>
<td>✓</td>
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<tr>
<td></td>
<td>Data Analytics/Big Data Mining</td>
<td>✓</td>
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<tr>
<td></td>
<td>Digitalised Technology Transformation</td>
<td>✓</td>
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<tr>
<td></td>
<td>Regulations and Policies</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Automation</td>
<td>✓</td>
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<td></td>
</tr>
</tbody>
</table>

The strong relationship between digital disruption mindset, customer focused and external collaborative approach concepts (discussed in Section 5.2.7) that has emerged in this thesis provides an important contribution to the digitalised area. The digitalisation research area has underpinned the various themes to emerge in this thesis, but this thesis has gone further by showing a strong relationship between core concepts. It reinforces within the digitalisation mindset and organisational learning, digitalisation customer experience capabilities and digitalisation innovative technologies areas that a prerequisite of success is to achieve a good external collaborative approach, customer centric capabilities and a high
level of digitalisation understanding. It is only through a collaborative approach that a digitalisation mindset can be improved, or conversely a digitalisation mindset can be shaped by a collaborative approach. These concepts work in collaboration with one another and one without the other reduces the attainable digitalisation outcome.

Chapter 7 will describe the conclusion and future research, which will answer the research question for this thesis, where a theory has been presented that emerged from the analysis together with suggestions of future research that can build and follow on from the theory presented in this research.
Chapter Seven – Conclusion and Future Research

7.1 Introduction

This chapter will provide the conclusions of this research, where a theory has been presented that emerged from the analysis (based on the interview data in Chapter 4) discussed in Chapter 5 and the related findings from the enfolding of literature in Chapter 6. As described in the methodology chapter (Chapter 3), the story told by this research will conclude with a theory that answers the research question.

The main aim of this chapter is to provide a summation of the theory that has emerged from the data analysed. It is an accumulation of the analysis performed and literature enfolded to generate a theory that will answer the research question and subquestions. This will lead to the key contribution of this research to be articulated and discussed in light of other key areas for which this theory will have implications.

This chapter will:

- Provide the essence of the theory generated.
- Look to the key contribution to knowledge that this theory provides.
- Will examine the implications of this research on the literature, energy and technology. Industry practices, digitalisation education and the discipline of information systems.
- Discuss the limitations of this research.
- Suggest future research that can build and follow on from the theory presented in this research.

7.2 Discussion of Key Findings

The key finding for this research is the importance of enhancing a change agent’s digital disruption mindset whilst considering other aspects of digital disruption, such as external collaborations, future drivers, customer focus perspectives and disruptive constraints.

It should be highlighted that it is not sufficient simply to consider the aspects that affect digital disruption outcomes.

The relationships that link these concepts of digital disruption should also be understood to develop a shared vision for the management of disruptive change, to embrace transformation and implement new
digital business models beyond other collaborative activities across the Australian energy industry ecosystem.

The digital disruption mindset has a spectrum of levels. It can be a simple acceptance to embrace digital disruption transformation, understand the disruptive change’s value, nurture a shared digital maturity vision for digitalisation or create a digital disruption mindset that change agents can use beyond digitisation, transitioning and transformation of the enterprise organisation. Achieving digitalisation success predominantly relies on a strong organisational culture that embraces the digitalisation mindset working with external collaboration to achieve competitive advantage and effectively manage rapid technological disruptions.

As the growing wave of disruptive technologies drives irreversible disruptive changes, emphasis is also placed on future drivers for the energy industry such as micro grids, renewable energy, smart batteries, Blockchain technology, demand response devices and regional market developments.

The findings of the research show that a digital mindset concept enables efficient planning for the digital energy transition and transformation, customer focused value creation, applying and embracing the factors that drive success and sustainability for the future of the energy industry along with consideration of managing disruptive change constraints.

Understanding the challenges and opportunities associated with digital disruption helps develop and propose value creation by organisations through business model configurations or reconfigurations for the future. Decision makers promote and facilitate access to knowledge, experiences, resources and capabilities needed to exploit opportunities through network collaborations. This creates a co-evolving organisation with other organisations and customers, which exploits the opportunities of digital disruption through creation, realisation and development. Digital disruption challenges in managing constraints involve regulatory compliance, politics, government structures and legal issues. These constraints along with risk adversity, time given and costs, disruptive change agent goals, digital knowledge and technological constraints, may not all work well together. With disruptive change agents and strategic decision makers involved in collaboration to manage change activities, disablers and issues can be prioritised then enfolded into the digital disruption mindset of the disruptive change. By engaging the right disruptive change agents, the identification and understanding of the various other constraints (other than time and budgetary disruptive change constraints) allows effective constraints management outcomes.
An Australian energy industry digital practitioner’s role is to facilitate the disruptive change process in organisations, provide the expertise or knowledge to enhance the outcome of disruptive change activities and manage constraints. This role includes use of internal and external data, negotiating a broad knowledge base to make trade-off decisions, bringing together cross-functional teams and ensuring alignment between diverse functions. This role extends to educating, mentoring and involving digital disruptive change agents in the concept of digital disruption for change activities. Nurturing the understanding of digital disruption will drive the digital mindset, encourage external collaborations and provide a customer focus perspective. Ultimately, this improves the digital maturity of organisations which will routinise disruptive change and progressive development of the digital mindset that will improve decision making in a given environment or context.

7.2.1 Five Major Concepts

The essence of this research is highlighted by the five major concepts that have emerged from the analysis of the data. This provides the answer to the research question. The theory generated by this research is based on these five major concepts (as discussed in Section 5 and compared with literature in Chapter 6):

- **A digital disruption mindset** provides digital practitioners in an organisation with the values, understandings, culture, capabilities and strategic management to provide the leadership needed to make appropriate decisions. Adapting to digital changes requires organisational agility and flexibility, effective knowledge management, shared vision, directions, digital maturity and collaboration as an organisation to successfully manage disruptive change and overcome digital disruption issues to capitalise on the opportunities available as they arise. In the Australian energy utilities industry, at the intersection of smart technologies, transitioning energy policies and customer expectations; by leveraging renewable energy sustainability factors and emerging new market opportunities, organisations can obtain competitive advantage with the right mindset. Converging disruptions of innovative technologies, uncontrollable cost increases in energy supply, evolving consumer needs and changing regulatory framework in the energy industry ecosystem require significant adaptations of existing resources, processes and values towards disruptive change. The lesson learnt from this concept is that building a digital disruption mindset across the organisation is crucial. It starts with strategic management decision makers to reinforce organisational capabilities, refocus business models, requiring changes in organisations, processes, systems and culture and leading
the disruptive change transformation with support, pursue progressive innovation and impact, which is inevitable to significantly improve and facilitate a positive digital disruption outcome.

Future leaders are open to progressive innovation and digitised network economy placing strong emphasis on customer centricity and understanding customer needs. In applying dynamic pricing, they match supply and demand through real-time price changes to ensure customer engagement and systems reliability as personalised and customised energy products drive digital transformation at scale and avoid dependencies on central capacity and investment. Deploying innovative technologies such as Internet of Things (IoT) and real-time access to information will offer powerful tools for the energy sector. This would enable granular visibility into energy usage hour by hour, improved remote operational management of energy network equipment and distribution automation that will ensure certainty with sustainable, reliable, affordable energy supply into the future.

- An **external collaborative** approach describes the collaboration of incumbents in the energy industry ecosystem to participate in the digital disruption activities as a new business model and embrace innovative technologies. This involvement could take various forms. The new disruptive technologies facilitate collaboration, participation and engagement within supply chains, opening up powerful new avenues for collaboration and pushing the most potent roles away from the centre towards the customer. In this new world of democratised participation and public engagement, the cultural shift in the role and expectations of the consumers, the thesis recommends organisations to implement participatory strategies with new approaches to decision making, trust building, transparent information flows, incentives schemes, hiring systems and career progression will need to change.

These may include active participation in the digital disruption activities or digital transformation by strategic decision makers to involve customers and collaborate with industry networks to explore fresh potential of the digital environment and reinvent core business models to create new markets.

This leads to a competitive advantage by employing collaborative co-creation, peer production and cost-effectively using the strengths of digital connectedness to tackle scale and innovation.
• **Key Drivers of the future** of the energy industry, an important consideration when employing for the current competitive environment, are innovative technologies in conjunction with a strong understanding of customer needs, collaborative platforms and managing policy changes. This predominantly involves consideration of new business models with increased digitisation of processes, increased investment in appropriate digital technologies and resources for disruptive innovation to allow autonomous agents to emphasise on understanding customer needs across the organisation. This includes digital platforms, network of communities to share knowledge and infrastructure through to value co-creation and progressive innovation across the ecosystem. Innovative technologies play significant roles in the success of digitally mature organisations’ transformations through reducing costs whilst digital leaders embrace innovation, modernisation, agile customer-centric organisational capabilities and brand to drive competitive advantage into the future.

Future leaders will emphasise that regulatory policies play an important role, notably in renewable energy generation and storage technologies that provide the supporting regulatory framework and guidelines for energy supply and the distribution networks. Strategic digital business plans require the ability to sense in real time what signals are emerging as time unfolds, the building of agile organisational capabilities that are suited to future not past challenges and the willingness to take prudent risks, learning as a way of developing, digitally savvy, systemic thinker, confident and an ability to influence widely.

Successful organisations’ future drivers employ techniques that best capture and channel the strengths of the collaborative industry ecosystems and networks with Blockchain technology, smart grids, solar photovoltaic (PV) renewables and energy storage technology, data-analytics, customer-focused approaches in product development, automation/artificial intelligence, open APIs and digital network platforms.

Leaders of the future as analytics specialists, utilise insight-driven decision optimisation technologies, are adept at applying machine-learning technologies in decision making augmentation, innovate progressively, harness big data and garner valuable insights to develop new processes that will improve their services and competitiveness.

• **Constraints** are an important consideration in the use of the *External Collaborative Approach, Customer Focus Practice and Future Drivers concepts* to manage disruptive change. This predominantly involves consideration of technological constraints, organisational change capability constraints, time and activities constraints and government regulatory constraints.
across the organisation. The time and budgetary limits specified in strategic plans, limited resources, low scalability, and low efficiencies have significant impact as a disruptive change constraint. In the mass adoption of technology, regulatory and government policies towards the energy generation, supply infrastructure storage, grid management and cybersecurity are important factors that will fundamentally constrain the energy industry’s technology growth and development. A long-term government energy policy is critical for the industry to operate with some certainty. It needs some surety for rules and regulations for power generation, for storage, privacy laws and compliance processes, as well as containing rising energy costs and consumer preferences that can rapidly change. Without this, the energy sector may be inflexible and unable to react when performing digital disruption activities; it may lack the agility to quickly respond to the disruptive change. Management and decision makers need to realise that they can influence the environment through innovation, social networking and political action, participatory strategies and public engagement to influence the business environment to their advantage, effectively transforming attitudes and government action through communication and information.

The timing of when disruptive change is initiated may also further limit what can be done from a digital disruption perspective as organisations continue to operate BAU whilst conducting disruptive change activities that put stress on available organisational resources. Technological constraints in the form of legacy systems, slow adoption of digital knowledge and new innovative technology, are often unknown and not obvious without change management. Digital practitioners’ involvement can also have significant impact on the digital disruption change recommendations generated in terms of value co-creation with important stakeholders. Collaboration across industry ecosystems, involving change agents, customers and strategic decision makers, including digital practitioners, can elicit understanding and mitigation of disruptive change constraints.

- The **customer focus** practices and capabilities within organisations are critical factors in managing disruptive change as customers, empowered by personalised technologies become energy generation participants using energy storage technology, solar panels, blockchain technology and micro grids and employing digital devices to track their own power generation, storage and demand management. Thus, the primary responsibilities of organisational digital practitioners are to ensure digitalisation is implemented and is consistent. Emerging themes that make up this customer focus concept describe two key areas of customer centricity
important for digital practitioners: meeting customer expectations and delivering innovative technologies.

Firstly, this research highlights various roles played by digital practitioners in managing customer experience, customer care and new customer on-boarding capabilities that can include co-creating demand-driven client service and multi-channel engagement with customers. It can include capabilities that are digital-based, agile and automated. Improved communication, knowledge-share and fostering relationships with customers, offers a myriad of choice regarding customisation and incentives that enable trust and competitive advantage.

Secondly, this research shows that continual and progressive improvement of the digital customer focus concept of a digital practitioner’s skill sets, sharing vision and value to embrace innovative technology, is effective and reinforces performance of digital disruption activities. The digitally-mature organisation invests in IoT, automation and data analytic platforms to improve its digital maturity skill sets, builds customer capability and an innovative technology base to deliver demand-driven customer experience. The need for investments in the portfolio of solutions aimed at delivering outcomes in business efficiency, asset productivity and demonstrable customer value will ensure uptake as well as improve real-time customer intelligence whilst empowering customers to make the right decisions.

Traditional energy sourced from gas and coal generation is seeing a decline in demand due to customer demand responses, seen in the rapid take up of alternative energy sources such as solar photovoltaic (PV), both embedded and grid connected, efficient energy storage battery options that extend the use and effectiveness of renewables and the recent rising cost of traditional energy supply. In managing disruptive change and fierce competition from both energy supply rivals and customers, such as micro grid energy generators, energy organisations need to invest in new business models that engage effectively with customers and the industry ecosystem, with competitive options of energy supply, sustainable solution packages and positive customer experience.

In the complex Australian energy generation, distribution and supply industry, multiple players and powerful interests are keen to protect their investments whilst diverse competitors with disruptive technology capabilities are emerging from many directions. Consumers will pursue their own agenda in demanding equity, rights, affordability and choices from across the energy
sector. Thus, a much stronger emphasis on customer focused capabilities is required of successful energy enterprise organisations in managing disruptive change.

The various themes of this theory are discussed in detail in Chapter 5. The key themes are the five concepts and the significant relationships between the concepts (shown in Figure 7.1). There are key inter-concept relationships established by analysing one or more themes within the concept relating to one or more themes within another concept. This highlights the crucial importance for each concept to be symbiotically related to achieve a beneficial digital outcome. However, the digital disruption mindset was found to be more strongly related to the external collaboration and customer focus concepts in comparison to the relationships with other concepts. This would highlight the importance of the three concepts (mindset, customer focus and external collaboration) amongst the five concepts in influencing the digital disruptive outcome for disruptive change. The thirty-one themes (which define the five concepts) are illustrated in Figure 5.3 (fishbone) and discussed in Sections 4.2, 4.3, 4.4, 4.5 and 4.6. The six significant theme relationships between concepts as well as the strongest theme within each concept are discussed in Section 5.7.

As discussed, there are relationships of the established theory and the five concepts with their strongest themes respectively. When examined closely, this symbiotic relationship shows that achieving digitalisation success predominantly relies on strongly embracing the disruption mindset and working with external collaborations while considering a customer focused perspective. The relationship between the concepts also shows that consideration needs to be given to the other concepts which were interrelated despite them having a moderate impact in achieving a beneficial digital outcome.
7.2.2 Inter-Concepts Theme Relationships

Understanding how to improve digital disruption outcomes has emerged from analysis of the strongest themes within concepts and the theme-relationships between concepts. Between the five broad concepts, there are eight inter-concept relationships but the four strong emerging theme relationships are:

- Embracing New Innovative Technologies
- Digital Networked Economy – Industry Ecosystem
- Organisational Capabilities
- Progressive Innovation – Co-creation

7.2.2.1 Embracing New Technologies

The essence of the relationship between the digital mindset and constraints concepts is how the influence of *embracing new technologies* will define organisational capabilities to improve the digital
disruptions outcome. The predominant constraints that impact the selection and performance of digital disruption activities are innovative technologies, skilled resources, time allocation for change activities and government regulations.

The responsibilities of Australian Electricity Market Commission (AEMC) in approving and enforcing rules and regulations on reliability, rates, security, terms and conditions of energy transmissions, standards and adopting new technologies will dictate and define the adoption of innovative technologies management of disruptive change.

Performing other BAU activities in parallel with the digital disruption activities to save time is not desirable from a digital disruption perspective and may increase investment risks and costs. Often the disruptive change management activities will be impacted by the lack of resources in technological and human resources in digital disruption activities. The technological constraints of digital technology may affect the digital mindset through digital knowledge limitations, limited time and inflexible digital disruption scope.

7.2.2.2 Digital Networked Economy and Industry Ecosystems Themes

All the concepts of mindset, external collaboration, future drivers, constraints and customer focus have the digital networked economy theme relationship that is a commonality that links them all together. This important inter-concept relationship highlights how all the concepts are interwoven throughout this emerging type of economic environment, catalysed by the exponential increase in the network of devices connected via the Internet of Things (IoT) and the digitisation of fast-growing, multi-layered, highly interactive, real-time connections among people, devices, and businesses.

1. The relationship between the themes of the mindset concept and external collaboration concept describes a phenomenon whereby the involvement of disruptive change agents can be such that the digital disruption mindset extends beyond the performance of a specific digital disruption activity and outside disruptive change boundaries. It is more than just Digital networked economy or creating a shared digital disruption vision among the disruptive change agents. The creation of a digital disruption mindset allows change agents to go beyond just embracing the disruptive change perspective. Instead it allows appropriate digital decisions to be made throughout knowledge sharing, communication and collaboration with industries, service
providers, supply chain and customers. This provides cost efficiency in resources sharing and distribution of risks amongst collaborators.

2. The digital networked economy relationship between the *customer focus* concept and the *external collaboration* concept is based on the idea that fostering customer-focused knowledge and risk sharing, cost-benefits relationships provides a collaborative environment that enables a shared digitalisation vision to be developed and adhered to. This includes empowering change agents across the industry between internal organisational change agents and external collaboration agents of service providers, supply chain and customers. The relationships enable the expertise of the various change agents and resources to be shared. They gain exposure to the disruptive change activities hence the shared digitalisation vision. For mutual competitive advantage and to improve the digital maturity and digitalisation vision, digital practitioners and digital change agents share risks and knowledge in multi-channelled interactions with customers to enable better communication and provide constant feedback on performance and disruptive change activities management.

3. The relationship within the digital networked economy between *external collaboration* and *Future Drivers* concepts is that a digitally mature enterprise can create additional value by providing multichannel capabilities for customers, sharing infrastructure, attracting and retaining digital resources as the future is unpredictable. With network ecosystems collaboration, digital organisations are able to co-evolve in complex non-linear ways to constantly organise and reorganise for novelty and rareness capability in anticipation of industry change, particularly in the energy industry with its high-velocity and high uncertainty. The pervasive adoptions of digitisation and innovations with digital technologies are radically changing the nature of products and services. A defining characteristic of pervasive digital technology is the incorporation of digital capabilities into objects that previously had a purely physical materiality resulting in ‘product digitisation’ creating ‘smart’ products and tools. As digitalisation of the Digital networked economy occurs with competitive advantage, increasing value creation and branding highlights the importance of the shared vision of innovative new business models in co-creation within the collaborative ecosystems and communities as drivers for success into the future.

4. The digital networked economy relationship between the *constraints* and the *external collaboration* concept presents the notion that organisational people constraints and conflicts
limit digital knowledge sharing and digitalisation of the industry ecosystem. Leadership vision of network economy and industry ecosystem collaboration and facilitation of interdependent change activities with commitment from partners, suppliers, customers, investors, collaborators and other stakeholders enables positive disruptive change management. There are mutual benefits in the digital networked economy with the organisation co-evolving with selected organisations and customers, as well as individuals to co-create, realise and develop. This value platform of network collaboration promotes and facilitates access to knowledge, experiences, resources and capacities needed to exploit the opportunities of the rapidly evolving market and to develop and propose value creation opportunities to build up the necessary resources to configure or reconfigure a business model for the future.

7.2.2.3 Organisational Capabilities

The organisational capabilities relationship is significant and occurred in three areas as highlighted in yellow in Fig. 7.1. This relationship relating to the mindset to customer focus and external collaboration concepts is identified in sharing and communicating vision, improving skill sets and agility to gain competitive advantage and transform organisational capabilities. The digital organisational capabilities gained through organisational learning, nurturing understanding and empowering change agents to scale digital maturity across all digital practitioners, can grow beyond recognising the value of digital disruption to competitive advantage into the future. The essence of the relationship between mindset and the external collaboration is to effectively nurture digital disruption understanding through involvement by all. Collaborators need to gain an appreciation of the philosophy behind digital disruption and the various activities performed to generate digital disruption findings. This includes making the digital transformation meaningful, role-modelling desired mindsets, building a committed team and relentlessly pursuing the impact of disruptive change and progressive innovation. The nurture of external collaboration in the digital disruption mindset concept not only helps improve digital disruption outcomes for the current disruptive environment, but it offers guidelines for the whole network ecosystems transitioning into digitalisation into the future.

7.2.2.4 Progressive Innovation

The progressive innovation relationship between future drivers with the customer focus and mindset concept is that a digital practitioner’s skill sets and customer experience capabilities in effective
communication and simplified interactions are enhanced through learning and embracing digital technologies.

A Progressive Innovation relationship between customer focus concept and future drivers concept through improved digital skillsets, ability to manipulate data customised to needs, demand driven services and fostering relationships with customers will enhanced customer care and customer experience. Technologically-enhanced multiple channel engagements and activities create value in customer solutions and choices and enhance experiences that can positively impact digital change management. A customer collaborative environment fosters relationship and allows for broadening of customer understanding and needs, which further enables data and knowledge sharing and maximises agility in customer care value and disruptive change management. Personalised multi-channel customer interactions enhance effective communication, allow needs based customisation, customer incentives and loyalty recognition. This reinforces improved performance of disruptive change activities in the organisation and across the collaborative network domain.

A Progressive Innovation relationship between the digital mindset and drivers of future concepts highlights leadership that shares a vision of disruptive change value creation and strategic management. Leadership capabilities expected include openness to the multilayered digital mesh, agile business models, collaborative network of digital enablement, customer-focused and demand-driven customer capabilities and right choices of innovative technologies investment to reach their successful digital future goals.

7.2.2.5 Key Theme Relationships

The theory described, at a broad level, comprises the five key concepts and the theme relationships between them that will support a beneficial, rather than detrimental impact on the positive digital outcome of managing disruptive change. The more concrete list of concepts provides a set of specific themes that should be considered as part of effective digital change processes. Section 5.5 discusses a shortened list of themes that are more important to consider. The key themes that can be used as guidelines for practice include:

➢ Strategic management’s leadership in new business model critical to promote a digital disruption mindset
➢ Make disruptive change competence an organisational capability by investing in agile digital skill sets for organisation
➢ **Nurture digital disruption understanding in change management for digital maturity**

➢ **Involvement of Service providers and Supply Chain in co-creating**

➢ **Customer Involvement in New Business Models through the ability to manipulate data and co-create**

➢ **Demand driven Network Economy that enhances the collaborative approach**

➢ **Understanding customer needs through communication from a customer driven perspective**

➢ **Embrace agile disruptive technologies using new business models’ and ‘Innovation driven technology and competitive advantage**

➢ **The influence of technological constraints defines organisational capabilities and digital disruptions outcome**

➢ **Organisational people constraints constitute digital knowledge limitations and impact on time allocations for change activities’**.

➢ **Technological Constraints involving legacy systems and innovative technology**

➢ **Organisational people constraints regarding digital knowledge, risk aversion and change activities**

➢ **Constraints regarding time and activities in an active context**

➢ **Disruptive change capabilities constraints created from change resistance**

➢ **Customer Experience Capability of digital practitioners in organisation**

➢ **Customer Care and Services goals**

➢ **Managing new customer on-boarding incentives and involvement**

This theory’s contribution to knowledge is not the thirty-one themes that have emerged, because these have been corroborated with the current literature (as described in Chapter 6). The major contribution to knowledge is the key relationships that exist among the concepts and the theme relationships between each concept. The most important of these being the theme relationships between the digital mindset with the external collaboration and customer focus concept discussed earlier in section 6.6 which includes:

- Section 7.2.2.1 – Embracing New Technologies
- Section 7.2.2.2 – Digital Networked Economy and Industry Ecosystems,
- Section 7.2.2.3 – Organisational Capabilities and
- Section 7.2.2.4 – Progressive Innovation
- Section 7.2.2.5 – Key Theme Relationships
7.2.3 Research Questions Link to Key Findings

This section will answer the research questions considering the theory generated by this research, as summarised in the previous section. The research subquestions, as discussed in Section 1.3, will also be discussed.

Based on the literature that defines digital disruption in the Australian energy industry in Section 2.2., there is little theoretical advancement regarding disruptive change capabilities, aspects of digital disruption and disruptive change.

As a result, based on objectives discussed in Section 1.1, the first objective of this research was to determine how decision makers currently manage disruptive change and its impacts within the energy industry. This is to establish the current decision makers and digital practitioners management practices for managing disruptive change within a digitally mature enterprise organisation.

The second objective was to understand the various aspects, capabilities and specific factors that enable or inhibit digital disruption and managing disruptive change. This is to determine if a proposed ‘disruptive change capabilities’ consisting of three separate but complimentary aspects namely; organisational learning capabilities, digital business strategies and RBC capabilities impact competitive advantage in responding to disruptive change.

The third objective was to determine if the use of the proposed framework of disruptive change capabilities (DCC) would provide competitive aspects for decision makers to manage and lead disruptive change thus creating value for the enterprise organisation.

These objectives are all incorporated into the research questions for this study:

“How do enterprise decision makers understand the various aspects of digital disruption and manage disruptive change in the Australian energy industry?”

An analysis of the emergent concepts, themes and relationships identified from the study provided a benchmark for how decision makers currently understand the aspects and manage digital disruption and disruptive change.
The following describes the key conclusions from the findings as detailed in Section 7.2. As discussed in Section 7.2., the key findings show that aspects of digital disruption include organisational agility and flexibility, effective knowledge management, shared vision, directions, digital maturity and collaboration as an organisation to successfully manage disruptive change and overcome digital disruption issues to capitalise on the opportunities available as they arise.

Faced with disruptive technological change and a turbulent environment, the important concerns that affect the digital disruption change outcomes from a decision maker’s point of view are the digital disruption strategies and change capabilities to respond swiftly to digital disruption. The discussion of the Key findings provides answers to the above research question and shows how understanding the aspects of digital disruption is the first step to managing disruptive change and to add value to the energy enterprise.

Firstly, the digital mindset concept is highlighted as crucial for strategic management and leadership to understand various aspects of digital disruption in order to respond by transforming the organisational capabilities and embrace digital disruption change activities. This includes the continuous broad communication of the digital disruption mindset throughout the organisation to progressively improve the change capabilities.

Secondly, the aspects of external collaboration, new collaborative business models, the networked economy and innovative technologies collaborating within the industry ecosystem and influencing energy policies are crucial in improving competitive advantage to respond to disruptive change. Progressive multi-stakeholder and decision maker collaboration, implementing aspects of future digital business drivers and innovative technologies in addition to embracing disruptive innovation in the digital ecosystem to create opportunities for organisations to leverage for competitive advantage.

Thirdly, decision makers must understand and deliver solutions to customers’ needs by embracing digital technologies, agile customer-focused capabilities and innovation-driven technology. These constitute the drivers to a sustainable future of the energy industry. Consideration must be given to the influence of technological and organisational constraints in defining organisational capabilities and their impact on time allocations for disruptive change activities.

Lastly, agile demand driven customer experience capabilities must be in place to facilitate new customer on-boarding and customer-focused disruptive change management. The continuous adaptation of
innovative technologies is crucial to respond to disruptive environments that suit the changing customer needs and expectations.

*How do decision makers in the Australian energy industry identify the relevant capabilities needed to manage digital disruption and disruptive change?*

As established by literature review in Section 2.8. and Key Findings in Section 7.2., most decision makers agree that capabilities of organisational learning, collaboration and digital transformation (Riemer et al. 2014) provide competitive advantage and improved performance (Guimaraes et al. 2017). Furthermore, the enterprise organisation is digitally mature and potentially a successful digital disruptor itself when the organisation is able:

- To anticipate and understand both digital disruption and disruptive changes aspects
- To “sense-and-respond” accordingly to manage disruptive changes and changing customers’ needs
- To identify opportunities and enablers that can be leveraged and/or to capitalise on digital enablers
- To learn from previous experiences, manage the impacts, improve and innovate disruptive change capabilities
- To collaborate with industry ecosystems in co-creating value and alleviating risks and sharing resources
- To adopt digital strategies that is customer-focused and facilitates progressive innovative technologies

The following recommendations from the study linked to the above research subquestion summarises key activities and capabilities discussed in Section 7.2.1. Five Major Concepts.

1. In dynamic environments, decision makers’ leadership can enable organisational changes by developing a *mindset* and atmosphere of continuous change (Ganguly 2015; Worley & Mohrman 2014) identified in Section 7.2.2.

2. The research findings also emphasised the importance of maintaining focus of embracing disruptive change activities while at the same time focusing on digital innovation, creativity and strengthening organisational capabilities. Benamati and Lederer (2010, 2001, 2000) supported
in their studies of coping mechanisms to deal with change and the importance for decision makers to maintain stability and progressive change.

3. A key measure of success when managing disruptive change is customer-focused organisational capabilities proactively tending to the changing needs of enterprise customers by continuously engaging, changing and creating enterprise value (Davern & Kauffman 2000).

4. The decision maker’s main focus is to manage the digital disruption outcome, progressively embrace innovation and digital change through improving the disruptive change capabilities, structuring new business models to promote external collaboration and nurture relationships (Agarwal & Sambamurthy 2002) within network ecosystems.

5. A major concept of developing future drivers for the enterprise organisation is crucial to manage disruptive changes and it includes strong understanding of customer needs (Glavas & Letheren 2016) collaborative platforms and managing policy changes as discussed in Section 7.2.1. Future Drivers.

Furthermore, the perspective of the decision maker in embracing organisational learning is through change in the digital practitioner experience, skill sets and knowledge of digital disruptions. Disruptive change agents in organisations need to be digitally mature, experienced and educated in using multichannelled, innovative technologies. This creates an understanding of digital disruption value, which can be communicated across the organisation as a vision and culture for organisational learning and development of new skill sets, agility and competence (Lucas & Goh 2009; Targett 2016).

The dynamic capabilities, created from organisational learning through changing, learning, embracing and extending existing resources and values are associated with reinventing core functions of organisations to accelerate digitalisation within the enterprise for the future. Furthermore, the value capability and uniqueness capability of the RBV capabilities discussed in Section 2.8, improve the image and branding gaining long standing customer loyalty for the enterprise (Newbert 2008; Lopez-Cabarcos 2015). The decision maker should pursue to facilitate these processes in managing the disruptive change outcome.

A key role of digital decision maker is to develop an understanding of and identify the relevant capabilities to manage issues caused by disruptive change and better prepare for potential opportunities of digital disruption outcomes.
How could the use of Disruptive Change Capabilities (DCC) framework by decision makers to manage disruptive change create value to the organisation?

Introducing disruptive change capabilities in a systematic manner into the enterprise organisation is the proposed solution to the problem domain of this study. Thus, the Disruptive Change Capability (DCC) framework was conceptualised:

1. Based on the literature and primary data collection,
2. Used to analyse the data and
3. Augmented by research findings

Another key role of digital decision maker is to develop a framework to understand and guide strategic decision making in managing digital disruption. A framework provides a way to assess how assumptions, concepts, values and practices impact reality by providing a means of explanation, focus for discussion, basis for analysis and design and a baseline for process improvement (Whitman et. al 2001). During the participant interviews in this qualitative study, the conceptualised DCC framework (as discussed in Section 2.8. and Section 2.9.) were reviewed with each decision maker to obtain his or her feedback and suggestions about how the DCC could be used. Feedback was coded in the research model and changes suggested were incorporated into the final version of the research model and DCC framework that include:

- Creating separate components for aspects of ‘capabilities- Organisational Capabilities’, ‘digital strategies-digitalisation mindset’ and ‘RBV- Value and Rareness capabilities, innovative technologies’ to allow for managing impacts of digital disruption and disruptive change that would directly affect customers needs and ongoing business operations.
- Adding the concept of Mindset, ecosystem relationships and collaboration processes to the digital business strategy component as part of the strategic management responsibilities in engaging External Collaboration and influencing policies. This management processes include digital strategies planning, risk management and change agents.
- Recognising that the concepts of Future Drivers’ aspects and Customer Care are critical success factors for planning and managing future change.
- Recognising the importance of managing the aspects of Constraints that exists in all the components of the framework
- Determining how each aspect of the DCC framework components improves the enterprise’s ability to manage disruptive change with competitive advantage.
Decision makers determined that the DCC framework will be useful for strategic planning, develop questions and assists in decision making and create scenarios in preparation for different outcomes for various digital business strategies discussed in Section 4.2.7. Different scenarios and disruptive situations could be analysed by considering modifications and implementation of the various components of the framework shown in Figure 2.5 of Section 2.8.

7.3 Implications of this research

This section will examine the implications of theory generated in this research on the area of digital disruption research and management practices in the Australian energy industry.

7.3.1. Implications for the Australian Energy Industry

The theory presented in this thesis provides a clearer understanding of the roles, specific components and characteristics of disruptive change activities that impact how digital practitioners; both strategic decision makers and operational decision makers, manage digital disruption and disruptive change currently transforming the energy sector.

This research has shown that managing disruptive change outcomes can be improved through deeper examination of the required skillsets of digital practitioners based on the theory generated by this research supplemented with literature. The theory comparison, in Chapter 6, compares many of the key concepts and themes highlighted in this theory against theory found in the digital disruption literature.

This enables the energy sector, currently undergoing unprecedented disruptive change, operating with multiple stakeholders, deregulated competitive markets and transitioning energy policies, to potentially improve the performance digital disruptions outcome.

This research has shown that disruptive change outcomes can be improved through increased development of digitalisation mindsets amongst stakeholders, decision makers and cascaded down fostering a shared vision of an agile, scalable, collaborative organisation as discussed in Section 6.1.
Establishing the importance of the concept of external collaboration within industry network, bringing together digital communities, innovative technologies and digital services on collaborative digital platforms and new business models, will enable the energy sector to continually improve disruptive change outcomes.

As discussed in Section 6.2., the effective digitised energy enterprises will transition to a network with flexible infrastructure, new agile business models that enable resources to be shared, continually co-creating energy services and solutions.

The research has identified the importance of identifying the drivers of digital disruption as the future of the energy industry is being confronted with diverse challenges, disruptive convergence of innovative technologies and the economics of changing energy sources discussed in Section 6.3.

The drivers of the future is key to the sustainability of the Australian energy sector with delivery of reliable, secure and affordable on-demand energy supply for essential service to consumers, industrial processes and provision of public services.

The conceptual nature of this research theory covers across a number of aspects digital disruption as shown in the emerging themes of Section 6.3. This highlighted the importance of progressive investment in innovative technologies like smart grids, energy storage devices, blockchain technologies, big data, Artificial Intelligence, machine learning gadgets for effective energy management and automation for competitive advantage within the constraints of regulatory policies development. The implementation of new technologies in the energy generation, distribution, cost influences within a carbon constrained future of the energy industry is strongly governed by regulations and policies discussed in Section 6.4 and in the literature review Section 2.4.1.

Operating and managing within these constrained parameters, this research’s DCC (Disruptive Change Capability) Framework provides the decision makers, useful guidelines to meet customers’ energy requirements, maintaining systems reliability delivered through digital applications and emerging technologies at acceptable price.

This theory highlights the importance of the concept of customer centricity and industry ecosystem collaboration shown in Section 6.5, with data analytics assisted energy management products and services that will dominate the future energy industry.
Within this context, this theory shows the importance of the adoption of innovative technologies like energy storage, solar PV systems, digital meters, smart grid generation and distribution in managing customer expectations.

Thus, decision makers of the energy industry need to focus on and be prepared for disruptive changes with progressive implementation of innovative technologies, agile and scalable customer-centric organisational capabilities to capitalise on future waves of disruptions.

7.3.2. Digital disruption research

This research’s DCC Framework provides literature in digital disruption for use in future research. A literature comparison of other theories, performed in chapter 6, compares the important concepts and themes against theories found in digital disruption literature. The major parts of this DCC Framework were found to corroborate the literature and have been discussed in many ways from a variety of perspectives from the literature.

The Future Drivers Concept was found to be very important in managing digital disruption where innovative technology such as smart grids, digital platforms and Blockchain technology offer technological capabilities for energy organisations in understanding the needs of customers. The policies and regulations, representing potential constraints also govern the use of these innovative technologies in areas such as cyber security, issuance of energy transmission permits, research and development. The co-creation of value through digital ecosystems collaborations between organisations, communities and customers in the networked economy was also found to be of great importance in managing disruption. For example, the improvement of organisational capabilities through technology enabled collaborative consumption allows new, dynamic business models to be created and progressive technological innovation to be implemented.

This thesis groups the concepts and themes into a comprehensive thesis that broadly covers the digital disruption outcomes. However, it should be noted that the other aspect of the DCC Framework is the findings of the theme relationships between these concepts in providing a unique insight that can lead to an improved digital disruption outcome.

Use of this DCC Framework in digital disruption research enables academics to consider the various aspects that are important for an improved digital disruption outcome. Knowledge and understanding of these digital disruption aspects enables researchers to form their own insights as to how digital disruption is viewed from a different perspective. This enables them to assess their own work to
highlight gaps in their research theory, or conversely highlight gaps in this research’s DCC Framework. Rather than applying digital disruption activities, this theory has highlighted the importance of understanding the relationships between concepts to better understand the phenomenon of digital disruption. Understanding the concepts contributes to digital disruption as well as the practices that affect digital disruption and presents a perspective that nurtures the digital disruption mindset through many digital disruption research areas such as:

- Digitalisation of products and processes introduction into organisations
- Digital maturity business models
- Disruptive change transformation activities
- Organisational learning in improving change capabilities
- Decision making in response to digital disruption
- Progressive technological innovation

7.3.3. Digital disruption management practice

The aspects which impact digital disruption can allow digital disruptive practitioners to reflect on their own practice. By doing so, new concepts or ideas may be derived to produce a positive impact on the management practice. The key concepts and relationships highlighted and discussed in chapter 5 of the thesis, provide an appropriate perspective in exploring the management practices associated with digital disruption.

An illustration of the key aspects that impact the digital outcome theory is shown in figure 7.2 which describes the key activities in digital disruption management practices (Engage, perform, foster, manage/maintain, outsource). Regarding the digital disruption management practice, a progressively collaborative approach is needed, with engagement to foster and develop the relationship across various disruptive change agent groups. The development of the digital disruption mindset of a digitally agile organisation needs to be shared with the disruptive change agents enabling contribution to the disruptive change outcome. This disruption mindset includes continuously adapting innovative technology to suit the market through the input of consumers and multi-stakeholder collaborations. The coded references of each concept in Table 5.3 in section 5.10 show the importance of the external collaborative approach and digital disruption mindset in determining the digital disruption outcome. This shows that management-based digital disruptive practitioners have a great opportunity in applying this theory to achieve a good digital outcome.
The research has uncovered that the performance of managing disruptive change activities alone is insufficient. A good understanding of the key elements and actors during digital disruptions is critical to improve digitalisation outcomes. This leads to the improved digital maturity across an organisation.

Figure 7.2: Interplay of key elements that impact on digital disruption outcome from this research’s DCC framework

7.3.4. Digital disruption education

The education of digital disruption professionals, mainly done through university undergraduate programs and many postgraduate programs, can benefit from this theory. Understanding the various aspects of the digital disruption activities and their implications from a disruptive change perspective, can enhance the digital mindset. The external collaboration with the provision of skills sharing, knowledge gathering and exchange of resources for co-creation will help foster and maintain relationships to enhance digital disruption outcomes and further develop the digital mindset, which are key concepts of this theory.

A digital disruption education program should consider the following key themes in order to improve disruptive change outcomes for activities.

- Strategic management and organisational learning to promote a digital disruption mindset, industry ecosystem collaboration and co-creation in organisations to form disruptive change business models
• Innovation driven technology to obtain competitive advantage in digital disruption
• Customer experience capabilities of digital practitioners in organisations
• Disruptive change capabilities constraints in an active context

These key themes seek to optimise the digital disruptive outcomes of organisations and act as the five enabling pillars for the mindset, external collaboration, constraints, future drivers and the customer focus concepts, which should be the dominant aspects of the various themes discussed above.

7.3.5. Discipline of Information Systems

The digital disruption discipline is grounded in the development of digital disruption business problems. Effectively solving a business problem requires consideration of digital disruption. This theory provides the digital disruption discipline with an important set of concepts and relationships between concepts to be considered throughout disruptive change activities, which will allow a more beneficial digital disruption change outcome to be reached.

7.4 Limitations of the Research

The research has some primary limitations which should be considered when adopting the theory generated as it might alter the outcomes. These limitations include:

• In this study, the case study methodology used was to interview decision makers to obtain the findings. The generalisability of the results is in question for the case study methodology according to Yin (2003) due to the low sample size. The findings from this study are also based on the Australian energy utilities industry within Australia, which suggests that it may not be indicative of the digital disruption in other countries. Other limitations regarding the research design and method is the response bias due to the perception of decision makers – the only level of staff interviewed and the questions asked or the reflexivity of the interviewee as described by Yin (2003). This generates issues on the internal data reliability of the study where causal relationships might be formed which would generate incorrect results.

• Analysis of elements, themes and concepts. In generating the findings of the study, only the most discussed elements were used as the basis for generating the themes and concepts. The other details omitted when analysing the interview data did not allow for a finer level of analysis.
Thus, other elements which were mentioned but were rarely discussed have not been examined in detail. The relationships between the themes were also not investigated further in the contribution to improving the digital disruption outcome. This affects the comprehensiveness of the theory in providing a wider picture on the aspects of digital disruptions in the utilities industry.

- Discussion of themes and concepts. When discussing the contributions of each theme and concept, the socioeconomic status of the digital practitioners was not considered. This creates a limitation where the theory generated is limited by its context.

7.5 Suggestions for Future Research

During the analysis of the interview data, other findings were discovered which could contribute to improving the current proposed theory. However, due to the lack of resources and time these findings have not been investigated in detail. They are thus generated as suggestions for future research. These future research suggestions were mostly found in the relationships between the themes and concepts.

- The societal impact of digital disruptive technologies. Despite discussing the major impact of digital technologies on organisations and other stakeholders, the societal impact was not discussed in detail. The effect of progressive new innovative technologies on societal impacts can include poverty and unemployment, access and ability to use latest innovative technologies, which mean access to a wealth of information and the ability to learn, experience, and grow. From a business standpoint, these societal risks can threaten to disrupt commerce in the global economy. Thus, the significance of these societal impacts highlights the need to mitigate and control these risks, providing an important topic for future research.

- How digital capabilities affects organisational skills. The digital change capability (DCC) framework discusses what constitutes the disruptive change capability but does not discuss the improvements in organisational skills. In the deployment of digital technologies, different skills and motives are required due to adapting economies of mass that are intensifying across the economy, driving new business models of collaboration. As a result, the organisational skills required by digital practitioners in the waves of digital disruptions require upskilling and retraining as innovative technologies such as artificial intelligence (AI) and machine learning, super chatbots and automation will change organisational skillsets.
• Progressive innovation and embracing disruptive technologies like the Blockchain technology, Big data and AI robots impacting employment of current human resources provide an important topic for future research

• The impact of government policies and energy authorities’ regulations and guidelines on the energy industry, regulations on renewable energies and the adoption of disruptive technologies. Regulation is an important driver in leveraging opportunities created by digital disruptions. For example, the aligning of institutions and techniques around the government regulations which are aimed for innovative outcomes. The idea of redesigning regulations to enable rather than block the adoption of digital technologies was not discussed in the thesis and regulators and policymakers as disruptors may provide a substantive research for the future.

• The role of full stack industry ecosystems in organisational structures. Within a stack, multiple organisations coexist in a mutually sustaining structure where each is focused on the activities where it has an advantage. The thesis only briefly discusses the architecture of the full stacked ecosystem which comprises of communities, platforms, traditional oligopolies and infrastructure organisations. This provides ideas for future research on the activities and roles contributed to the organisational structure and the whole supply chain by these full stack ecosystems.

7.6 Conclusion

The analysis of the findings of the thesis have illustrated that digital disruption outcomes can be improved through consideration of the five concepts and the theme relationships between each concept, particularly, the digital mindset, external collaboration and customer focus concepts. The DCC (Disruptive Change Capability) Framework discussed in Section 2.8 and as shown in Fig. 2.5, is used to provide a common understanding of managing enterprise organisations’ digitally disruptive changes and to determine how to achieve future digital disruption benefits. It was found that the proposed DCC Framework adhered to the findings where the disruptive change capabilities broadly constitute and is expanded by the concepts, themes and relationships uncovered in the thesis. The dynamically evolving digital environment presents a challenge to industries and consumers to improve change capabilities consistent with technology improvement. Thus, a multi-stakeholder industry ecosystems collaboration that considers the input of customers is essential to create value and
opportunities to remain relevant in the ever more complex environments and digital communities. In responding to digital disruption, it is imperative to act early or risk being left behind as the future will be less secure, more unreliable and potentially very costly.

Consideration of regulatory and policy frameworks is necessary as any policy changes could represent incentives or disablers which will dictate the adoption of innovative technologies. In the context of the Australian energy industry, ecosystems collaboration is essential in working towards influencing policies that adopt innovative technologies for competitive advantage, sustainability, shared resources and cost efficiencies for the future. Energy utilities have abundant opportunities to use customer data to exploit their knowledge of grid behaviour, consumption patterns, signals from smart-home devices to detect and anticipate mechanical failures in homes and consumption efficiencies to offer energy cost reductions for consumers. This will improve customer experience, broaden and deepen relationships with customers, increase utilisation, reduce customer churn and ultimately impacts branding, trust and customer loyalty.

The growing importance of data analytics and machine learning in decision making, increased customer and design focus, the evolution of energy grid power generation and distribution is pressuring more enterprises outside of the technology sector into building software capabilities for success in the digital era. The latest innovative technologies allow businesses to look at their historical data, internal and external data in predicting behaviour or outcomes in the future. The energy sector is facing an increasingly disruptive competition from the exponential growth of solar power, off grid renewable energy and energy storage adoption by customers. Thus, it is critical that energy industry decision makers recognise and take advantage of one of the most immediate benefits of disruptive change in the era of digital disruptions: the Digital Change Capability (DCC) Network bringing about the convergence and dissolution of boundaries of business and consumer networks where opportunities exist in digital platform optimisation.
Appendix A – Ethics Consent Form

RMIT Human Research Ethics Committee
Prescribed Consent Form for Persons Participating in Research Projects Involving Interviews, Questionnaires, Focus Groups or Disclosure of Personal Information

School
RMIT University School of Business Information Technology & Logistics

Name of Participant:

Project Title:
Digital Disruption: Australian Perspective of managing disruptive change in enterprise organisations

Name(s) of Investigators: (1) Sylvia C Y Lee
(2) Dr. Paul Cerotti
(3) Dr. Vince Bruno

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

Participant’s Consent
Participant: __________________________ Date: __________________________

(Signature)

If you have any concerns about your participation in this project, which you do not wish to discuss with the researchers, then you can contact the Ethics Officer, Research Integrity, Governance and Systems, RMIT University, GPO Box 2476V, Vic 3001. Tel: (03) 9925 2271 or email human.ethics@rmit.edu.au
Appendix B – Ethics Plain Language Statement

INVITATION TO PARTICIPATE IN A RESEARCH PROJECT

PROJECT INFORMATION STATEMENT

Project Title:
- My thesis topic is “Digital Disruption: Australian Perspective of managing disruptive change in the energy industry”

Investigators:
- Sylvia C Y Lee Ph.D. Student, School of BIT, RMIT University, sylvia.lee@rmit.edu.au
- Dr. Paul Cerotti (Supervisor, Senior Lecturer, School of BITL, RMIT University, paul.cerotti@rmit.edu.au, 99853619)
- Dr. Vince Bruno (Supervisor, Lecturer, School of BITL, RMIT University, vince.bruno@rmit.edu.au, 99853668)

Introduction
You are invited to participate in a research project being conducted by RMIT University in the School of Business Information Technology and Logistics. This information sheet describes the project in straightforward language, or ‘plain English’. Please read this sheet carefully and be confident that you understand its contents before deciding whether to participate. If you have any questions about the project, please ask one of the investigators.

Who is involved in this research project?
This research is being conducted as part of a PhD program which is being undertaken by Sylvia Lee. This research project has been approved by the College of Business CHEAN and the proposal describing the PhD research and this methodology (interviews) has been accepted by the School of Higher Degree by Research (HDR) and School of Business Information Technology and Logistics at RMIT University.

Why is it being conducted?
Digital practitioners will be interviewed to understand how digital disruption affect their daily work and how digital capabilities impact effective decision-making in their workplace. The transcripts from the qualitative interviews will be analysed to conceptualize key concepts that will be compared and contrasted against the literature.

Why have you been approached?
You have been invited through approaches to the Corporate Affairs and senior management of the company. After their approval and through their recommendations, relevant staff with digital technologies expertise will be requested to volunteer some time to discuss their profession regarding Digital Disruptions. Yours and the company’s confidentiality will be protected throughout this project.

What is the project about? What are the questions being addressed?
The underlying research question being answered is:

“How do decision makers manage digital disruption and disruptive changes in digital enterprise organisations?”

The aim of this research is to elicit from industry-based digital practitioners, the aspects of their job that may lead to a beneficial or detrimental digital outcome. This can support the industry practice for digital practitioners with results that can direct practice to achieve a beneficial disruptive change outcome for enterprises’ digital strategies and its stakeholders.

- 1 -

4 July 2017
If you agree to participate, what will you be required to do?
You will be asked to participate in a semi-structured interview, for approximately 45 to 60 minutes, where discussion will take place about the digital disruption and decision-making activities performed by the participant in their job. This will include describing digital disruptions, speed of decision-making activities performed in various projects that the participant has been involved in. This may include projects that have gone well or not so well. This may include discussion of daily activities in supporting projects. This interview will be recorded (audio only) and you have the right to request that recording cease at any stage during the interview. Your identity will remain confidential and you will be able to request to withdraw from the research at any time after the interview.

What are the risks or disadvantages associated with participation?
There are no apparent risks in participating in this research; it involves discussion based on a professional level only. If you are unduly concerned about your responses to any of the interview questions or if you find participation in the interview distressing, you should advise the interviewer, to strike that section of discussion from the record or discontinue the interview. The researchers will then discuss your concerns with your confidentially and suggest appropriate follow-up, if necessary.

What are the benefits associated with participation?
Participation in this project will benefit the digital technologies profession, providing insight into the role of digital technologies professionals. For you and your organisation, the researchers can offer any results, papers, and other outcomes. This may also provide an avenue for future research partnerships between your organisation and the university.

What will happen to the information you provide?
All recorded data will be transcribed, encrypted and archived. The transcribed data will be kept during the analysis phase of the research on a secured network (eg, RMIT) with password access to the secured files and destroyed within 5 years of completion of this research. If the data is required for some other purpose (other than use in this project), then permission will be obtained from you and your organisation before use. Data collected in the course of research will be available to them on request.

What are your rights as a participant?
You have the right to withdraw your participation at any time, without prejudice. You have the right to have any unprocessed data withdrawn and destroyed, provided it can be reliably identified and it does not increase the risk for you. You also have the right to have any questions, in relation to the project and their participation, answered at any time. Results from the study will be available to you on request.

Whom should you contact if you have any questions?
The primary investigator (Sylvia Lee) or supervisors (Paul Cerotti and Vince Bruno – vince.bruno@rmit.edu.au) can be contacted, contact details given previously.

Yours Sincerely

Sylvia C Y Lee
PhD Research Student

Paul Cerotti
Doctor of Philosophy

Vince Bruno
Doctor of Philosophy

If you have any concerns about your participation in this project, which you do not wish to discuss with the researchers, then you can contact the Ethics Officer, Research Integrity, Governance and Systems, RMIT University, GPO Box 2476V, Vic 3001. Tel: (03) 9925 2251 or email human.ethics@rmit.edu.au
Appendix C – Individual Participation Letter

Dear Madam/Sir,

My name is Sylvia Lee, and I am currently studying for a PhD (Doctor of Philosophy) program by research in the School of Business Information Technology at RMIT. My thesis topic is “Digital Disruption: Australian Perspective of managing disruptive change in the utilities industry”; under the supervision of Dr. Paul Ceretti and Dr. Vince Bruno.

The research question that will be focused on by this research is:

“How do decision makers manage digital disruption and disruptive changes in digital enterprise organisations”

I am inviting you to participate in this research as a Digital Technologies Practitioner who are impacted by Digital Disruptions and who are involved in performing various decision-making activities.

The data collected will be analysed for my PhD thesis and the results may appear in publications. Participation in this research is voluntary and you may withdraw at anytime. This interview will be recorded (audio only) and is strictly confidential. The results will be reported in a manner which does not enable any of the participating companies or individuals to be identified. Thus the reporting of results will protect the anonymity of participants and their company. All data including back-ups will be kept on a secure (password protected) RMIT network.

You have the right to withdraw your participation at any time, without prejudice. You have the right to have any unprocessed data withdrawn and destroyed, provided it can be reliably identified and it does not increase the risk for the participant. Participant also has the right to have any questions, in relation to the project and their participation, answered at any time. Data collected in the course of research will be available to them on request.

If you have any queries regarding this research work, please contact me on

Thank you for your assistance and taking time to consider this request.

Regards,

Sylvia C Y Lee
## Appendix E – Elements, Themes and Concepts

### Table 7.1: List of all elements, themes and concepts

<table>
<thead>
<tr>
<th>Category</th>
<th>Elements</th>
<th>Themes</th>
<th>Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational Culture</td>
<td>Knowledge Intention</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Strategic Management</td>
<td>Knowledge Intention</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Network Economy</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Data Analytics</td>
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<td>-</td>
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<td></td>
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<td>-</td>
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</tbody>
</table>

### The above table (Table 7.1) shows the list of all one hundred and forty eight elements, thirty one themes and five concepts. The table shows the lists of grouped elements per theme and grouped themes per concept.
Appendix D – Interview Questions

The Digital Technologies Practitioner Interview

Rapport – to make the participant comfortable and perform introductions.

- My name is Sylvia Lee
- PhD Student performing qualitative research into digital disruptions in the utilities industry. Information gained from the interview will be used for the purposes of my PhD research. Any results will be provided in summary. It will be done in such a way to preserve your anonymity. Any information which is provided (detailed in Participation letter) to anyone will also be available to you.
- The purpose of this interview is to examine your experience in performing digital activities in your day to day job as a digital technologies professional.
- We will be spending approximately 1 hour discussing the following issues.

Audio recording consent form

- I will be recording this interview, which will be transcribed and analysed as part of my research.
- I have an audio consent form, giving me permission to record the interview.

Background information, context and experience of participant

What is your current job title and how long have you been at the position?
What is your educational background?
What career path led you to your current position?
What experience do you have with digital technologies and decision making capabilities?
What sort of digitally disruptive technologies have you worked with?
How long have you been working in the digital resources area?
How and in what general way are disruptive technologies and digital capabilities promoted/fostered/supported/nurtured in your current organisation?
  - How are digital business strategies performed by your organisation? i.e., senior strategic management, operational management, consultants, separate team, digital technologies practitioner – individual, – part of role, business analyst – part of role.
  - Have digital disruptions changed the organisation?
  - Approximately how many IT staff work in your organisation?
  - How many staff work as digital technology practitioners?
What sort of digital resources and decision making process is promoted to enhance performance of the firm’s digital capabilities?
How closely do you follow the disruptive technologies research literature?

Describe a typical week of work as a digital business strategist / digital technologies professional?

- What disruptive change capabilities and organisational learning capabilities are applied or performed by your organization? Do you perform many decision making processes using digital technologies and resources for digital disruptions success? e.g. Real-time
 analytics and dashboards

▪ Do you use digital sense-and-respond technologies for better customer experience and improved performance?
▪ Are you usually involved in strategic decision making aspects of recommending digital resources in activities and capabilities throughout digital business strategy implementation?
▪ Are organisational learning and disruptive change capabilities crucial in the success of digital strategies of the organisation?
▪ Describe both positives and negatives of digital transformation within your organisation?

Describe the positive experiences embracing digital maturity to manage disruptive change?

▪ What was the digital disruption about?
▪ What digital technologies capabilities were considered most important? What were the set digital disruptions attribute goals? Were some digital disruption capabilities competing and conflicting in managing disruptive change success? Did organisational learning have any impact on the set of customer service capabilities?
▪ What disruptive technologies capabilities and digital organizational learning were performed in the digital disruptions?
▪ Why was it a good experience?

Describe the negative experiences performing digital disruptions in your firm?

▪ What was the digital disruption about?
▪ What digital technologies capabilities were considered most important? What were the set digital disruptions attribute goals? Were some of the digital disruptions dynamic capabilities competing and conflicting in enhancing digital disruptions success? Did the speed of decision making have any impact on the set of customer service capabilities?
▪ What digital technologies capabilities and digital organizational learning were performed in the digital disruptions?
▪ Why was it a bad experience?

Summary

a. What, in your opinion, is/are the key aspects to the success of digital business strategy?
b. What should strategic decision-making management know in embracing digital technologies for disruptive change?
c. Would the use of a proposed Disruptive Change Capabilities (DCC) Framework assist to better manage digital disruption and create value for the enterprise?
The above table shows the list of thirty one themes compared against each other. The diagonal shows the total number of sources for a given theme. The various shade colours indicate the strength of the relationship between themes. The blue shades indicate strong relationships, followed by moderate relationships indicated by green and purple shades and weak relationships are indicated by the pink and white shades. The numbers in this table show the number of sources (interviewees) who mentioned the themes involved. The comparison is purely based on mentioning both themes.
Table 7.3: Comparison of all themes versus all concepts

<table>
<thead>
<tr>
<th>Themes versus concepts</th>
<th>Mind-set</th>
<th>External Collaboration</th>
<th>Customer-Focus</th>
<th>Constraints</th>
<th>Drivers Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constraints - Change Capabilities</td>
<td>178</td>
<td>170</td>
<td>162</td>
<td>183</td>
<td>174</td>
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<tr>
<td>Constraints - Communication Issues</td>
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<tr>
<td>Constraints - Organisational People</td>
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<td>168</td>
<td>200</td>
<td>172</td>
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<tr>
<td>Constraints - Regulatory Compliance</td>
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<td>69</td>
<td>81</td>
<td>73</td>
</tr>
<tr>
<td>Constraints - Technology</td>
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<td>267</td>
<td>229</td>
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<tr>
<td>Constraints - Time and Activities</td>
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<tr>
<td>Customer-Focus - Customer as a business consumer</td>
<td>115</td>
<td>112</td>
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<tr>
<td>Customer-Focus - Customer as end user</td>
<td>134</td>
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<td>107</td>
<td>132</td>
</tr>
<tr>
<td>Customer-Focus - Customer Care (service)</td>
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<td>312</td>
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<td>295</td>
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<tr>
<td>Customer-Focus - Customer Experience Capabilities</td>
<td>660</td>
<td>631</td>
<td>660</td>
<td>356</td>
<td>650</td>
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<tr>
<td>11: Customer-Focus - Customer Issues</td>
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<td>170</td>
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<tr>
<td>12: Customer-Focus - Customer On-boarding</td>
<td>274</td>
<td>256</td>
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<tr>
<td>13: Drivers Future - Automation</td>
<td>168</td>
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</tr>
<tr>
<td>14: Drivers Future - Data Analytics &amp; Big Data Mining</td>
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<tr>
<td>15: Drivers Future - Digital Technology Transformation</td>
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<tr>
<td>16: Drivers Future - Innovation</td>
<td>697</td>
<td>662</td>
<td>671</td>
<td>389</td>
<td>701</td>
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The above table shows the list of thirty one themes compared against the five concepts. The blue shades indicate strong relationships, followed by moderate relationships indicated by green and purple shades and weak relationships is indicated by the pink and white shades. The
numbers in this table shows the number of sources (interviewees) who mentioned the themes involved.

**Table 7.4: Comparison of all themes versus elements**
The above table shows the list of one hundred and forty eight themes compared against the thirty one themes. The blue shades indicate strong relationships, followed by moderate relationships indicated by green and purple shades and weak relationships is indicated by the pink shades. The numbers in this table shows the number of sources (interviewees) who mentioned the themes involved.
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Glossary

Active context
Organisation’s members and tools, which interact with the organisation’s task through which organisational learning occurs. (Argote & Miron-Spektor 2011)

Artificial Intelligence (AI)
The simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using the rules to reach approximate or definite conclusions), and self-correction (Laskowski 2017)

Big Data Analytics
Big data analytics examines large amounts of data to uncover hidden patterns, correlations and other insights. With today’s technology, it’s possible to analyse your data and get answers from it almost immediately – an effort that’s slower and less efficient with more traditional business intelligence solutions (Sas 2017)

Blockchain
A Blockchain emulates a ‘trusted’ computing service through a distributed protocol, run by nodes connected over the Internet. The service represents or creates an asset, in which all nodes have some stake. The nodes share the common goal of running the service but do not necessarily trust each other for more. In a ‘permissionless’ Blockchain such as the one underlying the Bitcoin cryptocurrency, anyone can operate a node and participate through spending CPU cycles and demonstrating a ‘proof-of-work’ (Cachin 2016, p.1).

Business Model
A business model can be described as the logic and architecture of economic and societal value creation and value capture that allows a firm to attain a competitive advantage and/or to create a new market (Rohrbeck, Konnertz & Knab 2013).

Cloud computing
The delivery of on-demand computing resources—everything from applications to data centres—over the internet on a pay-for-use basis (IBM 2017)

Coded Reference
A contribution made by a digital disruption practitioner during an interview that forms part of the primary data analysed in this research. This contributes to the grouping of the elements into themes and themes into concepts.

Collaborative consumption
The reinvention of traditional market behaviors—renting, lending, swapping, sharing, bartering, gifting—through technology, taking place in ways and on a scale not possible before the internet (Botsman 2015)

Customer on boarding
The process users go through, from the start of their journey to become a customer and beyond. It encompasses a variety of interactions and engagements with your brand, typically created to enhance the customer experience and influence the ongoing relationship your customer has with your brand and product (Kothari 2017).

Digital Disruption
Digital disruption refers to changes enabled by digital technologies that occur at a pace or magnitude that disrupts established ways of value creation, social interactions, doing business (Johnston & Riemer 2014) and the ways in which people within the digital space and that culture socially react and innovate for themselves (Lindgren 2013).

Digital Ecosystem
An interdependent group of people, enterprises and/or things that are involved in standardised digital platforms for a mutually beneficial purpose. Digital ecosystems enable the communication with customers, partners and adjacent industries (Panetta 2016)

Digital Maturity
The extent to which digital technologies are used as enablers or drivers in processes within organisations that improve the disruptive outcome (Flott et al. 2016)

Digital Mindset
A digital disruption mindset provides digital practitioners in an organisation with the values, understandings, culture, capabilities and strategic management to provide the leadership needed to make appropriate decisions. (as discussed in Chapter Five)
A stronger economy created by telecommunications technologies that interconnect societies and economies from widespread adoption, causing improved interaction with customers and suppliers in value chains (Wieland 2004)

**Digital Strategies**

Digital Strategies has been defined as organisational strategy formulated and executed by leveraging digital resources to create differential value (Mithas et al. 2013). This definition highlights IT strategy as a function within firms and recognises the pervasiveness of digital resources beyond systems and technologies as well as explicitly linking digital business strategy to creating differential business value. Digital technologies are also transforming the structure of social relationships in both the consumer and the enterprise space with social media and social networking (Susarla & Tan 2012).

**Ecosystem (Business/Industrial)**

A network of interlinked companies, such as suppliers and distributors, who interact with each other, primarily complementing or supplying key components of the value propositions (benefits for customers) within their products or services (Lexicon 2017)

**Energy Storage Technology**

Methods to manage power supply in order to create a more resilient energy infrastructure and bring cost savings to utilities and consumers (Energy Storage Association 2017)

**External Collaboration**

An external collaborative approach describes involvement of incumbents in the industry to participate in the digital disruption activities as a new business model. This involvement could take on various forms. These may include active participation in the digital disruption activities or digital transformation by strategic decision makers to involve customers and collaborate with industry networks to explore fresh potential of the digital environment and re-invent core business models to create new markets (as discussed in Chapter Five).
Information Systems (IS)

‘An integrated set of components for collecting, storing, processing, and communicating information. Business firms, other organizations, and individuals in contemporary society rely on information system to manage their operations, compete in the marketplace, supply services, and augment personal lives. For instance, modern corporations rely on computerized information systems to process financial accounts and manage human resources; municipal governments rely on information systems to provide basic services to its citizens; and individuals use information systems to study, shop, bank, and invest’ (Dictionary.com 2011a).

Information Technology (IT)

‘The development, implementation, and maintenance of computer hardware and software systems to organize and communicate information electronically.’ (Dictionary.com 2011b)

Internet of Things (IoT)

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction (Rouse 2017b)

Mesh (technology)

The mesh refers to the dynamic connection of people, processes, things and services supporting intelligent digital ecosystems (Panetta 2017)

Mass Collaboration

When individuals and masses of people interact on online platforms in a collaborative effort, they enter into a bidirectional relationship and exert mutual influence on each other (Cress, U, Jeong, H & Moskaliuk J 2016)

Multi-sided digital platforms

Technologies, products or services that create value primarily by enabling direct interactions between two or more customer or participant groups (Hagiu 2014).

Network Economy

The interlinking of business processes and economic activity through the use of information technology.
Research

Research is defined in the dictionary (Dictionary.com 2011c) as the ‘diligent and systematic inquiry or investigation into a subject in order to discover or revise facts, theories, applications, etc.’ It’s also described as ‘Systematic investigation of a subject aimed at uncovering new information (discovering data) and/or interpreting relations among the subject’s parts (theorising)’ (Vogt 1993).

Smart grid

Application of computer intelligence and networking abilities to an electricity distribution system (Rouse 2017a)

Solar/Photovoltaics (PV)

Technology in which daylight is converted into electrical power. Solar PV takes advantage of energy from the sun to create electricity that will operate electrical appliances and lighting (SolarPV.co.uk 2017)

Sources

Refers to digital disruption practitioners who were interviewed during this research and have provided data to be analysed.