

Digital Economy: Our Perspective

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Executive summary

Digital Economy Definition

An often-cited definition of digital economy and one used here in Queensland in the State Government digital economy strategy, *GoDigitalQld* (June 2014) is:

“The global network of economic and social activities that are enabled by digital technology, such as the internet, mobile and sensor networks” (Australian Government, 2013, p128).

This neat, but broad, definition captures both economic and social activities impacted by digital technologies. Yet, after discussions and interviews with funding partners’ representatives, this definition does not fully convey the complex digital trends, such as digital disruption, that are driving activity in the digital economy and are of interest to the partners. The definition frames digital technologies as enabling progress in the Industrial Age, rather than describing the new thinking required in a new era.

The PwC Chair funding partners all have clients and constituents who seek guidance on coping with and engaging digital innovation as a means to boost productivity in their firms which operate with Industrial Age business models. However, casting aside Industrial Age thinking and instead, engaging disruptive, digital thinking is needed.

What this means for the Chair, and what we seek to research and influence is:

“The dynamic, digital phenomena that radically change the way we work, live and think.”

Expansion Cycles of the Digital Economy

The table overleaf describes the three main cycles of expansion in the digital economy. These cycles are:

- Cycle 1: Business Economy;
- Cycle 2: Economy of People; and,
- Cycle 3: Economy of Things.

In preparing this table, we sought to delineate elements of the digital economy that are common themes in literature and everyday discourse. The main benefit of this table is that it allows us to identify aspects of the digital economy that are well understood by businesses and academics, i.e. digitisation of information (Component 1), online buying and selling (Component 2), and digital innovation in existing ‘bricks and mortar’ firms (Component 3). Those three components are strongly characterised by Industrial Age thinking.

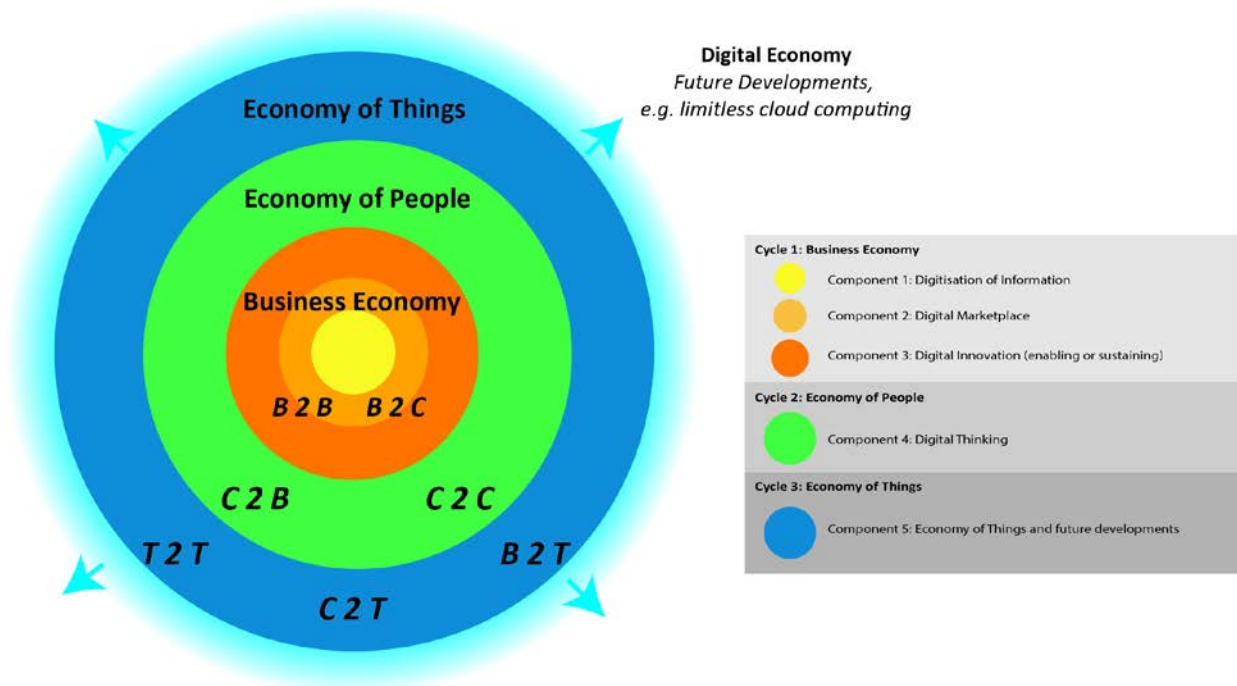
The model assigns recent topics and events, such as sharing economy, digital disruption, Internet of Things (IoT) and knowledge work automation to Components 4, 5 and beyond. Several commentators, such as Don Tapscott and Erik Brynjolfsson, who have been documenting and theorising the evolving digital economy for two decades, describe the need for organisations *“to fundamentally rethink everything about themselves and their future”* (Tapscott, 1996, p11). That is what components 4 and 5 are about.

Description of the Expansion Cycles in the Digital Economy Model

	Cycle 1: Business Economy			Cycle 2: Economy of People	Cycle 3: Economy of Things
	Component 1	Component 2	Component 3	Component 4	Component 5 and beyond
	Digitisation of Information	Digital Marketplace	Digital Innovation and Growth in the Business Economy (Industrial Age business models)	Digital Thinking (Digital disruption by New Firms and Existing Firms)	Economy of Things (i.e. Internet of Things - "things that think")
Description	Delivery of text, images and audio in digital format via internet. This includes the web, social media, VoIP, collection of big data, etc.	Buying and selling goods and services online.	Creating and/or using digital technologies and solutions to improve existing products and services in existing firms and industries (digital enablement).	Re-imagining products and services that disrupt Industrial Age business models and penetrate larger markets. Includes sharing economy and related phenomena.	We move to an economy where things that think are part of our daily lives. Advancement in cloud computing and other new digital technologies and applications will also expand the reach of the digital economy.

Another way to view the cycles is illustrated below. This diagram shows how the digital economy has expanded as digital technologies, notably the internet, integrate into our daily lives and increasingly our 'things'.

Expansion Cycles of the Digital Economy



Role of the Chair

The Chair is to be at the forefront of digital economy research and will advise organisations on how to mitigate risks and exploit opportunities.

For all organisations, there are varying degrees of ‘what is known’ regarding digital technologies and solutions and ‘what is unknown’ (or future risks and opportunities). As technologies advance and digital disruption is more commonplace, ‘what is known’ narrows and the range of risks and opportunities increases.

With regards to the Expansion Cycles of the Digital Economy Model, we believe that Components 1 and 2 and, to some degree Component 3, are largely known and understood by business and academia. There is greater uncertainty and more opportunities and risks in Components 4, 5 and beyond. Since this is where the Chair can add most value, we propose that:

The PwC Chair in Digital Economy will focus on research and activities primarily in Components 3, 4 and 5 and beyond in the Expansion Cycles of the Digital Economy Model. The goal will be to research areas of greatest uncertainty and opportunity – including what will come in the future.

Research Agenda

This working paper underpins the research agenda to be pursued by the Chair. The agenda will be progressed through further consultation with the funding partners and other organisations that are interested in co-innovating with the PwC Chair in Digital Economy.

Working papers that progress our understandings of the digital economy, locally, regionally and internationally, will be part of the outcomes produced by the Chair.

The digital economy is amorphous, continuously expanding and conceptualised in different ways by different people. The purpose of this paper is to outline the Chair’s funding partners’ collective views of the digital economy; and therefore, the focus of the Chair’s activities. New topics and digital phenomena will change thinking, but as a thought leader, the Chair will bring informed intelligence and a new perspective on how to advance research and programs that will benefit individuals, firms and society.

Contents

page

Acknowledgements.....	i
Executive summary	ii
1 Introduction.....	1
1.1 Background.....	1
1.2 This Paper.....	1
2 Defining Digital Economy	2
2.1 Digital Economy Literature.....	2
2.2 Interview findings – defining digital economy	6
2.2.1 What is the digital economy?.....	6
2.2.2 What isn't part of our digital economy?	8
2.2.3 Internet economy and digital economy.....	8
2.2.4 Measuring the size of the digital economy	8
2.3 Expansion Cycles of the Digital Economy	9
2.3.1 Describing the Expansion Cycles of the Digital Economy Model	12
2.3.2 Summary.....	14
3 Role of the Chair.....	15
3.1 Research topics – Interview Findings.....	15
3.2 Chair purpose and activities – Interview findings	17
3.3 PwC Chair in Digital Economy Focus.....	18
3.4 Research Agenda	19
4 Glossary	20
5 References	21

1 Introduction

Queensland University of Technology (QUT) and PricewaterhouseCoopers (PwC) have partnered with Brisbane Marketing (BM) and the Queensland Government Department of Science, Information Technology and Innovation (DSITI), to create the PwC Chair in Digital Economy at QUT (the Chair). The purpose of the Chair is to promote advancements in the local digital economy through: thought leadership, advocacy, research, and guiding the development of new university programs.

Between December 2014 and April 2015, a short scoping study was conducted to:

- develop a common understanding of what the digital economy is; and,
- identify priority areas for research.

Digital economy literature was reviewed before interviews were conducted with representatives from the four funding partners: PwC, BM, DSITI and QUT.

1.1 Background

Nearly twenty years ago, Don Tapscott wrote The Digital Economy: Promise and Peril in the Age of Networked Intelligence (1996). He defined the digital economy as “(t)he economy for the Age of Networked Intelligence” where “information in all its forms becomes digital – reduced to bits stored in computers and racing at the speed of light across networks” (Tapscott, 1996, p6).

By the mid-1990s, people were already purchasing goods and services over the internet and new industries, such as the interactive multimedia sector, were emerging as an important income generating sector in the US.

*“In the 1990s, there is no status quo. The velocity of change in information technology has seen to that. Products are becoming digital. Markets are becoming electronic. **Industries are in upheaval. Organisations are having to go far beyond reengineering to fundamentally rethink everything about themselves and their future**” (Tapscott, 1996, p11).*

In 2015, the same quote could apply to today’s economy. The rate of technological change continues apace and it is not only industries that are in upheaval – so too are occupations, firms and societies¹. The ubiquitous presence of the internet and networked digital devices in our modern economies has resulted in profound changes that warrant academic enquiry and explanation.

Don Tapscott (2015) is still calling for organisations to rethink their existence and create new services and products that suit our consumer-centric economy (see also Ng and Ho, 2014). However, at the same time, many enterprises struggle to discard or radically change their current business processes, let alone re-imagine new products and services. Legacy issues remain and hold back progress in many organisations and in governments in particular. This creates concerns about business uncertainty linked to digital innovation, slow adoption of online shopping services among small businesses and societal impacts of technological change.

1.2 This Paper

This inaugural working paper of the PwC Chair in Digital Economy serves to collate and condense the Chair’s funding partners’ views of what the digital economy is, and what therefore, is the unit of analysis of the Chair. In Section 2, these views are contextualised by a brief overview of the literature, while the component parts of the digital economy are presented in the Expansion Cycles of the Digital Economy Model.

In Section 3, the priority research areas are presented along with further detail on what the partners expect from the Chair. Also, we conclude with the proposed research focus of the Chair which is shown to be Components 3, 4 and 5 of the Expansion Cycles of the Digital Economy Model.

¹ Social media use enabled the Arab Spring.

2 Defining Digital Economy

An often-cited definition of digital economy and one used here in Queensland in the State Government digital economy strategy, *GoDigitalQld* (June 2014) is:

“The global network of economic and social activities that are enabled by digital technology, such as the internet, mobile and sensor networks” (Australian Government, 2013, p128).

This neat, but broad, definition captures both economic and social activities impacted by digital technologies. Yet, after discussions and interviews with funding partners’ representatives, this definition does not fully convey the complex digital trends, such as digital disruption, that are driving activity in the digital economy and are of interest to the partners. The definition frames digital technologies as enabling progress in the Industrial Age, rather than describing the new thinking required in a new era.

The Chair funding partners all have clients and constituents who seek guidance on coping with and engaging digital innovation as a means to boost productivity in their firms which operate with Industrial Age business models. However, casting aside Industrial Age thinking and instead, engaging disruptive, digital thinking is needed.

2.1 Digital Economy Literature

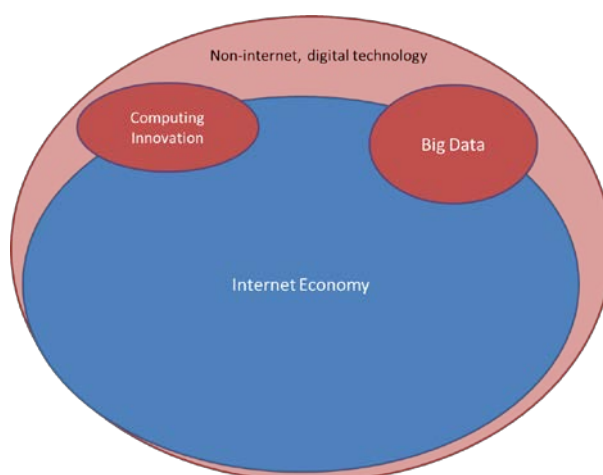
Since the advent of computing and then, the internet, a large body of literature that discusses the digital economy and its components has been created. Box 1 provides information on the distinction between internet economy and the digital economy.

Box 1 Internet economy as a subset of the digital economy

The internet economy can be identified as a large subset of the digital economy. The term, internet economy, has been defined as “the value of all economic activities that are undertaken on or supported by the Internet” (OECD 2013:6).

Technically, the digital economy expands a little further to include non-internet, digital technologies. The diagram below accurately shows how ‘big data’ collection and analysis requires networked computers, but not necessarily across the internet. Also, innovations through non-internet based digital solutions/technologies are common, for example software innovation enabled architects to migrate from hand drawn designs to computer generated design. It should be noted that apart from ‘big data’, non-internet digital technologies, are of little interest to the Chair.

Internet Economy as part of the Digital Economy



The **digitisation of information** is the antecedent for the creation of our digital economy. In the early years of the web, software developers used Hypertext Markup Language (HTML) and other coding languages to display information on webpages. Information on webpages, whether it was a news report, message, blog, advertisement or film, could be disseminated around the world at little or no marginal cost (Tapscott, Ticoll and Lowy, 2000, p5). Governments and large firms were the first to create static websites that presented information. Effectively they were digitising information that previously would have been presented on paper.

The functionality of the web has improved immensely since the mid-1990s with innovations (or disruption), driven by firms such as Amazon, eBay, Microsoft, Facebook, Google and Apple (Chaffey et al., 2009, p4-5 and Tapscott 2015, p9). As the functionality of the web improved, individuals increasingly began interacting and disseminating information through social media, peer-to-peer sites or their own website or blog. These developments have opened up new opportunities for business and society.

Some of the digital opportunities discussed in literature from the mid-1990s and 2000s is the **trade of goods and services online** or **e-commerce**. Amazon launched in 1994, followed by eBay in 1995 and since then the estimated size of retail sales (business to consumer) has grown to around US\$1.5 trillion (eMarketer as cited in Nielson, 2014, p2). Thousands of journal articles, books and business textbooks from the 1990s through to today discuss the use of the web for marketing and online sales. When the term 'e-commerce' is searched in the QUT library catalogue over 1 million entries are retrieved. Also, many shelves at the QUT Garden's Point library hold numerous internet marketing related texts.

Many government strategies and information sites encourage businesses to have a web presence, engage in online marketing and take orders and payments online. Current examples are the Australian Government's website *Digital Business: Your guide to getting online*² and the Queensland Government's Business and Industry Portal webpage: *Doing business online: the basics*³

Australian government agencies, such as the Australian Bureau of Statistics (ABS) and the Australian Communications and Media Authority (ACMA) regularly produce statistics on business use of the internet for communication, work and trading goods and services. Recently, ACMA (2014, p5) conducted a survey of small and medium sized enterprises for their report: *Australian SMEs in the digital economy*. They found that while the vast majority of businesses are connected to the internet and 90 per cent of medium sized businesses have a web presence, around 36 per cent of Australian small businesses do not have a web presence (ACMA 2014, p16). In Brisbane, a survey conducted in 2012 revealed that 30 per cent of businesses sold products and services online (Ernst & Young and UQ Business School, 2012, p4). This proportion of businesses is considered relatively low.

As a result, many government economic development strategies focus on **innovation, improving productivity and increasing economic growth through ICT and digital solutions**. During the 2000s, key Queensland economic development strategies aligned with the Smart State Strategy, such as *Smart Queensland: Smart State Strategy 2005 – 2015*, focussed on building emerging knowledge industries including ICT and creative digital industries.

In more recent times, government digital economy strategies have been framed around *jobs creation, business productivity, infrastructure requirements and making government services more efficient and customer-centric*. In Australia, the focus is on small to medium sized enterprises, rather than large businesses. Specifically, the Australian Government (Department of Communications website⁴) has several programs to support the digital economy, including, but not limited to progressing high speed broadband (the NBN), national regulatory changes, promoting cloud computing and increasing digital skills for sections of the community that have low engagement with digital technologies.

In Queensland, similar matters are the focus of government policies. The Queensland Government's

² <http://www.digitalbusiness.gov.au/> Accessed 1 April, 2015

³ <https://www.business.qld.gov.au/business/starting/business-startup-options/business-online-basics> Accessed 1 April, 2015

⁴ http://www.communications.gov.au/digital_economy accessed 1 April 2015

GoDigitalQld (June, 2014) strategy is focussed on building digital capacity within Queensland's economy, improving government services through digital solutions, generating new digital business activity and improving community access and use of the internet. Brisbane City Council's *Digital Brisbane* (2013) strategy targets businesses and investors, start-up firms and the community. Their main focus is on digital capacity development as well as improving internet connectivity throughout the city's public spaces. An example of a digital capabilities project underway nationally is the Go Digi Network⁵ which is a peer-to-peer learning platform provided by Infoxchange and Australia Post. Go Digi aims to reach: "Ageing community members, regional and remote communities, culturally and linguistically diverse communities, indigenous communities and small businesses" (Go Digi, 2015, para. 3).

Globally, large, multinational economic organisations, such as the Organisation for Economic Co-operation and Development (OECD) and the European Commission, have also made significant contributions to digital economy literature. Papers prepared for these organisations generally have a strong policy and economic focus and investigate issues such as global taxation in the digital economy, data security, privacy, developing global measuring tools, infrastructure development, e-commerce, big data, etc.

Since 1985, the OECD Directorate for Science, Technology and Innovation has sponsored research that aims to "understand how information and communication technologies (ICTs) contribute to sustainable economic growth and social well-being" (OECD website⁶ 2015). Recently they published research papers looking at measuring the size of the internet economy (Measuring the Internet Economy, paper n. 226, July 2013) and the size of the digital economy (Measuring the Digital Economy: a New Perspective, 8 December 2014). With regard to measuring the digital economy, the OECD (2014, p18) looked at existing education, innovation, entrepreneurship and economic metrics and compared them against current digital economy policies. One of the major shortfalls of current metrics is that the focus has been on measuring the role of ICT on business performance, rather than broader social impacts and outcomes. Another key finding is the need for statisticians to understand and account for the structural changes to the 'traditional economy' brought on by ICT use (for further details and the recommended actions from this report see OECD 2014).

Digital economy papers prepared by **large consulting firms**⁷ generally frame digital economy discussions around how digital technologies and solutions are changing industries and large organisations (private and public). For example, IBM funded the IBISWorld Paper: "*A Snapshot of Australia's Digital Future to 2050*" that predicts how the Australian economy will change over the next 30 to 40 years through use of digital technologies. The report refers to 509 ANZSIC industry classes which is the usual way for government, large business, consulting firms and most business-orientated academics to conceptualise the economy. As an aside, there is a call for economists to rethink the structure of national accounts to capture the value created by digital technologies (see Quiggan, 2014). Deloitte (2012) also investigated the impact of digital disruption on Australian industries in *Digital Disruption Short fuse, big bang?* They found that sectors such as finance, retail, media and information and communications technologies would be significantly disrupted by digital technologies in the near future. Other sectors, such as health and education, would also be significantly disrupted, however their disruption was projected to come later, i.e. long fuse (p3).

PwC is a leading digital economy consulting firm that regularly publishes reports that describe the evolving digital economy and explains how businesses can create value through digital solutions. In the report *Expanding Australia's Economy: How digital can drive the change* (PwC, 2014b, p2) the authors note that Australia is lagging behind other advanced economies and cites the OECD rating of Australia being 'average' in its innovation competency and capacity. Their strategy recommendations to business leaders include: defining and driving digital innovation, look outwards for innovation, collaborating with other organisations, inform decisions with data, and last, aim to deliver solutions that are customer-centric (p10).

Academic literature naturally spans all possible topic areas that relate to our 'digital world' or 'digital

⁵ <https://www.godigi.org.au/about> accessed 21 April 2015

⁶ http://www.oecd-ilibrary.org/science-and-technology/oecd-digital-economy-papers_20716826;jsessionid=9wut1vtf9jux.x-oecd-live-02?page=5 accessed 1 April 2015

⁷ Firms such as PwC, Deloitte, Boston Consulting Group, McKinsey, Ernst and Young have all published numerous digital economy papers in recent years.

economy'. There is literature looking at the benefits that can be derived through digital technologies and disruption as well as literature that look at the downside of digital advancement.

At QUT, there are several academics from Law, Creative Industries, Advertising, Marketing and Public Relations, Science and Engineering who have contributed to digital economy research. An example of a new project being undertaken at QUT is a three-year, Australian Research Council Discovery Project undertaken by academics from the Science and Engineering Faculty⁸ that aims to discover how "the Internet of Things can be democratised: designed and built by everyone young and old, of different cultures and remote, with a domain focus on enabling social engagement and connectedness" (ARC Discovery Project List for 2015). Another current ARC Linkage project, financially supported by the Bank of Queensland, explores how the emerging sharing economy and design opportunities related to digital communities and peer-to-peer interactions can facilitate new forms of customer engagement and revenue resilience.

It is also important to highlight that the ARC Centre for Excellence for Creative Industries and Innovation (CCI) at QUT has been deeply engaged in *creative* digital economy research for a decade. They are internationally renowned for their contribution to creative industries research and innovation more broadly. As an example of their contributions in the digital realm, Dr Ben Goldsmith from CCI has published articles on embedded digital creatives (See Goldsmith, 2014a) and the smartphone app economy (Goldsmith, 2014b). In business orientated academic literature, there is a large body of research around adoption of digital technologies, innovation and enablement, labour, marketing and industry level investigation.

One way of framing elements of this research is to use Christensen (1997) pioneering distinction between innovating to improve existing processes, products and services and innovating that resulted in 'disruptive change'. Some innovations, ranging from incremental to radical in magnitude (e.g. Henderson and Clark, 1990), have allowed organisations to provide improved versions of existing products and services (e.g. 3G to 4G networks). These developments, referred to as 'sustaining innovations', have continued to satisfy the existing product/service value demanded by the market. However, other developments based on digital technologies have caused notable shifts, compelling the market of adopters to change the way they evaluate or assign value to products and services. For instance, the advent of cloud computing has modified market expectations by rendering the memory capacity of electronic gadgets (e.g. smart phones, phablets, tablets, and laptops) as a secondary consideration to the attribute of memory accessibility (e.g. through wireless networks). Such shifts in the market value demand are often accompanied by the entrance of new organisations to a given industry through their unique innovation, at the expense of previously successful incumbents which fail to spot and react to the radical technological change. This mode of market-industry change is referred to as a 'disruptive change' (Christensen, 1997).

In the realm of the digital economy an area of significant interest is 'digital disruption', in other words, the disruptive change that is brought about by the implementation of digital technologies in the creation of new products and services. Digital Disruption is *"about innovating to break the ranks of status quo, it redefines the norm, and changes the markets and competitors around us. This comes through a relentless focus on the customer and offering new business models and new ways of applying technology"* (Girn, 2014, para. 9). Fishenden and Johnson (2014) offers a similar definition of digital disruption designed to suit government organisations: *"the transformation of the organisational model and culture, radical process change, accountabilities for citizens' experience, new models of service delivery, real-time feedback, tangible operational efficiencies, measurable business value, and the use of data driven insight to improve and inform policy formulation"* (p7).

Several trends and phenomena are behind digital disruption including massive community uptake in mobile technologies as well as the influence of big, privately owned corporations in the digital economy: i.e. Google, Apple and Facebook. These firms, and numerous smaller, born digital firms, have a massive

⁸ Prof Margot Brereton, Prof Paul Roe, Dr Daniel Johnson, Dr Peta Wyeth, Prof. Yvonne Rogers are conducting the ARC project looking at democratising the Internet of Things see http://www.arc.gov.au/pdf/DP15/DP15_Listing_by_State_and_Org.pdf p208

influence on the shaping of our digital economy - shifting us from a business economy with Industrial Age business models to an 'economy of people'.

Other topics that are regularly the focus of media releases, consultant reports (see Manyika *et al.*, 2013) and academic work include, but are not limited to:

- Big data;
- Cloud computing;
- 3D printing;
- Internet of Things (IoT); and
- Knowledge-work automation.

Accordingly, digital disruption forms one of the focal points of the Chair of Digital Economy. Following the framework of disruptive change, there are two salient issues that pertain to digital disruption. First, from the perspective of incumbent or legacy organisations, it is important to forecast and negotiate the encroachment of technological changes that are (potentially) disruptive in their nature. The second issue that carries greater importance to the future of the local economy relates to new entrant organisations (e.g. start-up ventures, young firms, and SMEs), which may have the possibility of developing innovations to disrupt existing markets and industries, with the prospect of penetrating larger markets beyond the local, potentially on a global scale. In addition to digital disruption, another focal area of the Chair in Digital Economy, as also voiced by some of the Chair's key stakeholders, is associated with sustaining innovations. The significance of this area rests on the sizable presence and contribution of a vast spectrum of organisations (e.g. private, not-for-profit, governmental) to current markets and citizens. The central question here relates to the delivery of better products and services through the employment of new digital technologies.

In this brief review, the key themes in literature on the digital economy are noted. The key themes range from the early stages of digitisation or areas of high maturity through to more nascent phenomena:

1. Digitisation of information
2. Purchasing goods and services online
3. Innovation, improving productivity and increasing economic growth through ICT and digital solutions
4. New digital industries for economic development
5. Sharing economy, Internet of things, knowledge work automation (digital disruption)

These themes guided questions to interviewees, prompting them to discuss the relevance of the topics to the Chair and the interviewees' understanding of what comprises the digital economy.

2.2 Interview findings – defining digital economy

Eight people (four QUT representatives, two DSITI representatives, one representative from both Brisbane Marketing and PwC) were interviewed for this study. These representatives were chosen as they were engaged in the discussions and negotiations for the Chair over 2014. As such, they understand the history of the Chair and represent their organisation's interests in the creation of the Chair role.

The purpose of the interviews was to gather detailed information on what elements of the digital economy each of the funding partners are most interested in advancing through the Chair's role. We also asked them to define 'digital economy' and describe its underlying drivers and enablers.

2.2.1 What is the digital economy?

Initially, three interviewees offered "*the marketplace on the internet*" (dig_g_302, p1) as a definition for the digital economy. However, as the discussions continued, there was a much broader, all-encompassing notion that digital economy describes all activities within the economy that are impacted by digital technologies. For example:

“the digital economy is basically the economy in which we all live and exist that is rapidly being enabled by digital devices and applications” (dig_g_301, p7).

“I kind of caution the use of ‘digital economy’ because as I look at it there is only one economy, right and that is ‘the economy’, the Australian economy.... So, to me the entire economy in the most part is somewhat impacted by the megatrend of technological change” (dig_p_306, p4).

While acknowledging that digital technologies influence the entire economy, there was strong emphasis on learning more about elements of the economy that are disrupted by digital technologies or where economic activity is new and attributed to a new use of digital technologies.

“[What is] fundamentally new because of digital?” (dig_g_308, p6)

Interviewees also talked about key **enablers** of the digital economy including: having citizens and workers with digital skills, high standards for ICT infrastructure provision and progressive government policy.

The **drivers** for change in these areas mentioned by interviewees include:

- The emergence of the sharing economy and massive consumer uptake of mobile technologies
- Entrepreneurial, born digital firms disrupting existing value chains
- Rise of the ‘prosumer’ and individuals becoming CEO of themselves and generating micro-revenue
- Globalisation and, increasingly, porous boundaries in the digital world
- Technological advances in artificial intelligence, knowledge work automation, internet-of-things and creation of ‘big data’.

Further, interviewees were deeply interested in how business, government and households will adjust to and participate in the new economy of people.

“What are the business models that shift from the current, say bricks and mortar business models, to the sharing economy type business models?” (dig_g_302, p9)

While interviewees suggested that the Chair should focus on research topics that are on the digital economy frontier, each of the partners have customers or constituents who remain in the legacy economy and are looking for guidance on innovating and boosting productivity through digital technologies. For example:

“We are very keen to increase the level of understanding and confidence towards adoption (of digital solutions) in small and medium business in Queensland and we see the Chair has a big role in this” (dig_g_301, p10).

2.2.2 What isn't part of our digital economy?

Interviewees were asked to identify what topics or elements that were **not** part of the digital economy. Some of the interviewees were initially hesitant to nominate specific areas; however there was consensus around avoiding research on topics that are perceived to be well-researched or largely adopted as standard business practice:

“We don't need to be looking at internet banking or smart phones or the impact of social media” (dig_g_308, p6).

“The digitisation of information, that's just happening. E-commerce, that's just happening, it's just normal business. Innovation for digital solutions, it's largely happening” (dig_u_207, p6).

2.2.3 Internet economy and digital economy

Two respondents mentioned that internet connectivity was the critical ingredient in defining the digital economy. These respondents were less interested in hardware development or robotics unless their value is realized through connection to the internet.

*“The digital economy is the internet-enabled economy...a fundamental difference from using IT to automate ... and **thinking about complete new ways of living, working and interacting**” (dig_u_303, p1).*

All of the interviewees mentioned that connectivity between individuals (and increasingly things) that was organically changing how we live and work. The role of the internet in facilitating that connection is clear. Most of the interviewees are aligned with this thinking, i.e. the citizen or consumer-driven digital disruption, and understanding these phenomena deeply is one of the reasons for creating the PwC Chair in Digital Economy.

However, for other respondents, internet connectivity was not a limiting factor in defining the digital economy, rather topics such as productivity gains through non-internet digital technologies and the activity of developing new technology that is digital in nature should also be included:

“The economic activities that are enabled by the internet and other digital technologies.” (dig_u_304, p7)

However, it should be noted that apart from ‘big data’, non-internet digital technologies, were of little interest to interviewees.

2.2.4 Measuring the size of the digital economy

During the interviews, respondents were asked to discuss their experiences in measuring the digital economy. Four of the interviewees had some knowledge or experience in this task and noted that it was a

complex and problematic exercise. It was suggested that many attempts have been made in the past to value the digital economy (see OECD 2013; Brynjolfsson and Kahin 2000) and there is ongoing debate surrounding methodology and availability of meaningful, timely input data.

“The irony is by the time they’ve finished the debating [methodology] the economy shifted,” further, “at the macro level, the data is somewhat meaningless” (dig_p_306, p18-20).

With regard to the challenge facing economists, the OECD reports:

“Significant changes are underway in the Internet – to enable mobility, cloud computing resources, social-networking, and sensor networks – imply that tomorrow’s critical internet components are not well-measured by today’s Internet metrics. Line counts, fibre miles, megabytes of traffic, or IP addresses alone are not good proxies for assessing the intensity of the trends identified.... To reiterate, it is extremely difficult to provide a single measure to capture the whole Internet economy” (2013, p17).

As a research priority, there was mixed interest among interviewees in measuring the size of the digital economy at the macroeconomic level. There was more interest in measuring digital maturity of industries, firms and citizens.

“There is a need for a tool, a measurement benchmarking tool, that we can actually compare and contrast the relative maturity levels of industry sectors and businesses within those industry sectors” (dig_g_301, p17).

It is fortuitous that the ABS is currently reviewing their information and communications technology (ICT) statistics. Two of their tasks are: identify information requirements for digital economy policy and “develop a proposal to effectively measure the contribution that ICT makes to the Australian economy and productivity across all industry sectors” (ABS 2015)⁹. The review is expected to be completed in mid-2015. The Acting PwC Chair’s submission to the review asks the panel to make provisions for measuring ICT statistics at the ‘state’, ‘city’ and ‘regional’ level as this will assist the Chair’s researchers compare Queensland and Brisbane to the rest of Australia.

2.3 Expansion Cycles of the Digital Economy

Table 1 overleaf, Expansion Cycles of the Digital Economy Model, describes the three main cycles of expansion in the digital economy. These cycles are:

- Cycle 1: Business Economy;
- Cycle 2: Economy of People; and,
- Cycle 3: Economy of Things.

In preparing this model, we sought to delineate elements of the digital economy that are common themes in literature and everyday discourse. The main benefit of this model is that it allows us to identify aspects of the digital economy that are well understood by businesses and academics, i.e. digitisation of information (Component 1), online buying and selling (Component 2), and digital innovation in existing ‘bricks and mortar’ firms (Component 3). Those three components are strongly characterised by Industrial Age thinking.

The table assigns recent topics and events, such as sharing economy, digital disruption, IoT and knowledge work automation to Components 4, 5 and beyond. Several commentators, such as Don Tapscott and Erik Brynjolfsson, who have been documenting and theorising the evolving digital economy for two decades, describe the need for organisations “to fundamentally rethink everything about themselves and their future” (Tapscott, 1996, p11). That is what components 4 and above are about.

During the interviews, comments were made pertinent to the development of the model. For example, the

⁹ ABS <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/8179.0.55.001main+features12014-15>

broader socio-economic and consumer impacts of the digital economy needed to be captured in the model. Language was identified as important and the term 'e-commerce' was suggested to be outdated and instead 'digital marketplace' better captured what is currently occurring. Overtime and with further feedback, it can be modified, but as it stands, it offers a visual way of seeing where the focus of the Chair's activities could and will lay.

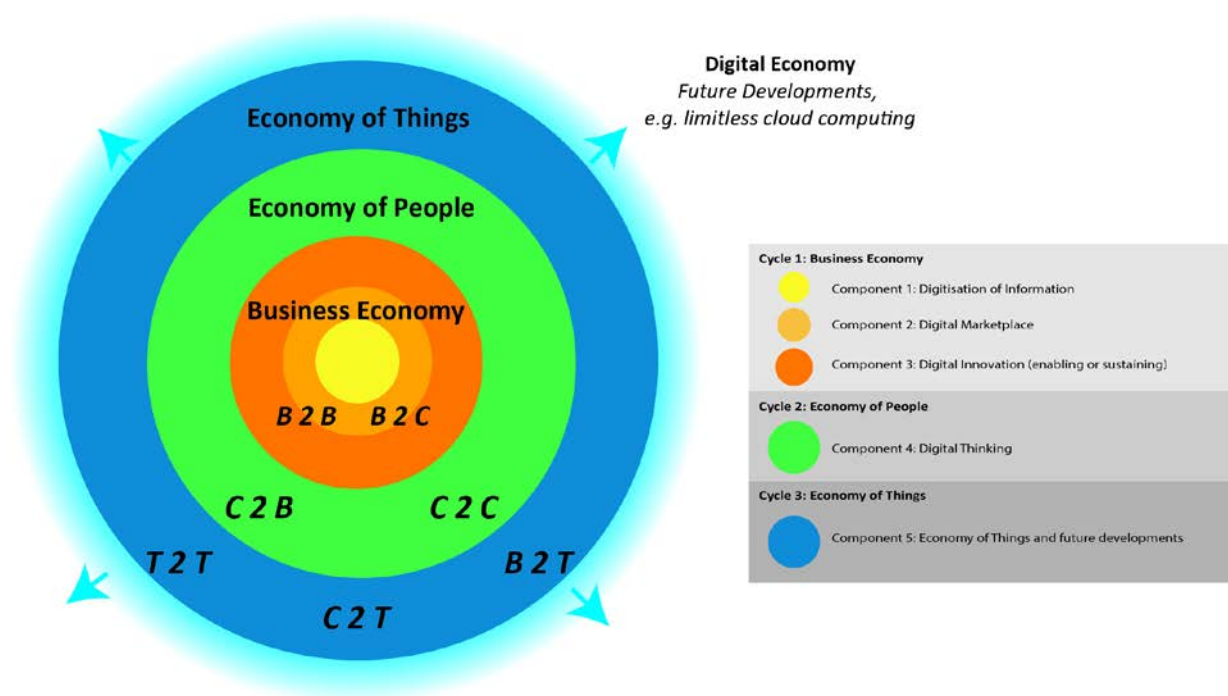
Table 1 Expansion Cycles of the Digital Economy Model

Cycle 1: Business Economy				Cycle 2: Economy of People	Cycle 3: Economy of Things
	Component 1	Component 2	Component 3	Component 4	Component 5 and beyond
	Digitisation of Information	Digital Marketplace	Digital Innovation and Growth in the Business Economy (Industrial Age business models)	Digital Thinking (Digital disruption by New Firms and Existing Firms)	Economy of Things (i.e. Internet of Things - "things that think")
Description	Delivery of text, images and audio in digital format via internet. This includes the web, social media, VoIP, collection of big data, etc.	Buying and selling goods and services online.	Creating and/or using digital technologies and solutions to improve existing products and services in existing firms and industries (digital enablement).	Re-imagining products and services that disrupt Industrial Age business models and penetrate larger markets. Includes sharing economy and related phenomena.	We move to an economy where things that think are part of our daily lives. Advancement in cloud computing and other new digital technologies and applications will also expand the reach of the digital economy.
Examples	<ul style="list-style-type: none"> * Websites, blogs, emails, SMS etc. * Social media (Facebook, Twitter, Instagram) to record information, communicate, advertise, publish *VoIP (Skype) *Big Data is collected through beacons, sensors,RFID and the Internet 	<ul style="list-style-type: none"> * Retailers selling goods and services online * Business-to-business trading * Investors purchasing securities online 	<ul style="list-style-type: none"> * New applications for 'Big Data' across economy * Advancing delivery of health services through digital solutions (i.e telehealth) *Includes new digital firms like software developers, creative digital firm development, and digital-start ups with legacy-economy models *Application of new technology, such as 3D printing, that allows firms to bypass traditional distribution channels 	<ul style="list-style-type: none"> * Uber, AirBNB - these firms are re-thinking the digital marketplace * Promotion of new firms that completely disrupt legacy economy business models * Big data is applied and/or used to inform changes to business decisions *Application of new technology, such as 3D printing, that disintermediates value chains and bypasses the legacy firm in the delivery of goods and services. 	<ul style="list-style-type: none"> * Driverless cars that interact with fuel providers and passengers * Computers that automate knowledge work processes previously undertaken by humans (i.e. rules-based accounting, medical and legal activities) * Big data is applied and/or used to inform new models

2.3.1 Describing the Expansion Cycles of the Digital Economy Model

Another way to view the cycles is illustrated in Figure 2. This diagram shows how the digital economy has expanded as digital technologies, notably the internet, integrate into our daily lives and increasingly our 'things'.

Figure 1 Expansion Cycles in the Digital Economy



Cycle 1: Business Economy

In Cycle 1, digital innovations are increasing, however their function is predominantly enablement and the level of innovation is mostly incremental. In other words, digital technologies have made existing processes better or replaced existing processes, but there has been no radical change of business models to meet the needs of customers or society.

Cycle 1 includes:

Component 1: Digitisation of information – Delivery and presentation of digital information is the beginning of this model. The internet has been a fundamental, transformative technology that has amplified the power and influence of information in all aspects of our economy and daily lives. This component captures our use of the web, e.g. websites, blogs, social media, VoIP. Component 1 may also be viewed as a requirement or precursor for 'big data', knowledge work automation and IoT.

Component 2: Digital marketplace - Taking orders and paying for goods and services online. As discussed in the literature review, buying and selling online has been part of our daily lives since the late 1990s.

Component 3: Digital Innovation and Growth in the Business Economy (Industrial Age business models) - It could also be argued that existing industries have been innovating with ICT and digital

solutions since the advent of computers in the middle of the 20th Century. As discussed in the literature review, most digital innovation has been deployed to satisfy the existing product/service value demanded by the market. This includes critical innovations such as mobile technologies and IoT that have enabled better productivity within existing, Industrial Age business models. Governments and firms have a strong focus on boosting productivity, jobs and wealth creation through digital solutions, however, greater opportunities for improving socio-economic outcomes is likely to come through setting aside Industrial Age or legacy economy models and re-imaging new services and products.

An important characteristic of Cycle 1 is the firm has an intermediary role and traditional forms of capital, including human and organisation capital, are necessary for retaining that intermediary role. We know that phenomena such as crowd sourcing and automation of knowledge work have started to diminish the value of these forms of capital. The ubiquitous access to the internet in our modern society has allowed people to connect with each other easily leading to a digital sharing economy and the emergence of social capital as a new asset.

2.3.1.1 Cycle 2: Economy of People

The drivers for change mentioned by interviewees (see Section 2.2.1) are highly relevant to Cycles 2 and 3 of the digital economy.

Component 4: Digital thinking (digital disruption by new firms and existing firms)

In the realm of the Digital Economy an area of significant interest is ‘digital disruption’, in other words, the disruptive change that is brought about by the implementation of digital technologies in the creation of new products and services. Following the framework of disruptive change (Christensen 1997), there are two salient issues that pertain to digital disruption.

1. First, from the perspective of incumbent or legacy organisations, it is important to forecast and negotiate the encroachment of technological changes that are (potentially) disruptive in their nature.
2. The second issue that carries greater importance to the future of the local economy relates to new entrant organisations (e.g. start-up ventures, young firms, and micro-entrepreneurs), which may have the possibility of developing innovations to disrupt existing markets and industries, with the prospect of penetrating larger markets beyond the local, potentially on a global scale.

The sharing economy (defined in Box 2) is a key element of Cycle 2: Economy of People, where individuals are driving change and seeking new opportunities to connect, work and live. In the interviews, there was strong interest in learning how models from the sharing economy could be adopted by incumbent organisations.

Box 2 Sharing economy

The sharing or shared economy is sometimes described as involving “*new business models (‘platforms’) that uproot traditional markets, break down industry categories, and maximise the use of scarce resources. The best known services are the ridesharing system Uber and the accommodation service Airbnb*” (Allen and Berg, 2014, p2). A financial transaction is an important descriptor for such shared economy models – people still buy a service or product, however they no longer are required to buy from a company that owns that particular good or service. Eckhardt and Bardhi (2015, para. 4) suggest that commercial operations such as Airbnb, Zipcar and Uber should not be viewed as part of the sharing economy. Instead, they should be viewed as part of the ‘access’ economy where consumers use these companies to find low cost and convenient services.

Eckhardt and Bardhi describe sharing as “a social exchange that takes place among people known to each other” (2015, para. 2). Thus, the sharing economy is more about people offering spare capacity or a good or service without requiring financial compensation, e.g. landshareaustralia.com.au, au.zilch.com, and mealsharing.com.

Cycle 3: Economy of Things

In Cycle 3, we introduce the **Component 5: “Economy of Things”** – Knowledge-work automation and IoT expands into our daily lives in a disruptive manner. Digital technologies no longer need to be operated by humans – rather digital technologies can solve problems and create new artefacts without direct human involvement.

“Computers, for example, can now act on “unstructured” commands—answering a question posed in plain language—and even make subtle judgments. They can sift through massive amounts of information to discern patterns and relationships. They can “learn” rules and concepts based on examples or simply by crunching data. And, with advanced interfaces and artificial intelligence software, they can understand and interpret human speech, actions, and even intentions from ambiguous commands. In short, computers can increasingly do many of the tasks that are currently performed by knowledge workers” (Manyika et al. 2013, p40).

Also in Cycle 3, we allow for further advances in digital technologies, solutions and events.

2.3.2 Summary

In Cycle 1, many of the issues relevant to these components (i.e. digitisation of information, selling goods and services online and digital enablement in existing industries) are considered well researched and understood by the business community and government. Current government policy and strategies are largely targeted at bringing slow adopters up to speed in Cycle 1 activities. The Chair’s approach to this cycle will be applying research to help organisations use their existing knowledge-base and combine these with new digital technologies to develop improved offerings to their customers.

In Cycles 2 and 3 there is greater uncertainty and risk as well as significant opportunity for generating wealth for people, organisations and the Queensland and Australian economies. There is a need to foster new ventures with the possibility of conquering new markets through disruptive innovations built upon digital technologies.

By adopting both applied research and exploratory research, the Chair hopes to derive benefit for existing organisations while investing in the future of the local economy.

3 Role of the Chair

3.1 Research topics – Interview Findings

At interview, participants were presented with a list of research areas that are discussed in digital economy literature and align with QUT's faculties. Interviewees were asked to comment on what topics/areas should be prioritized by the Chair.

The following list of priority research areas and the preceding discussion on what the digital economy is will support the development of the research agenda.

High Priority:

1. **Firm-level research** (Business/Economics/Social Sciences/Creative Sector)

For example, one interviewee said:

"How do organisations build digital capabilities and how do they build processes that can quickly capitalize on these digital capabilities?" (dig_u_303, p25-26)

2. **Productivity and labour force adaptation**

For example:

"What's the future role of the teacher? How many teachers per classroom? ...do their jobs actually shift to something of greater value-add or do they just decrease?" (dig_p_306, p21)

3. **Delivery of Health and Education via the internet**

For example:

"How will partners for physical (health services) and educational wellbeing interact with their customers when emerging private digital capital in the form of sensors and digital identities allows related providers to take part in the lives of their customers?" (dig_u_303)

4. **Adaptation of new ICT networking, hardware and software solutions for business innovation**

For example, one interviewee mentioned:

"I'd love to think about how technologies might disrupt positively or negatively traditional industries and approaches to doing business" (dig_p_306, p24).

Medium Priority:

5. **Societal impacts are medium-to-high priority.**

For example:

"Social sciences through to changing the delivery of healthcare and education. To me, that's kind of now we're getting to the core of it. These are mass changes in the economy both enablement and also great examples of job shift" (dig_p_306, p21).

6. **The implication of 'big data' for business, government and individuals.**

For example:

"How will the digital economy facilitate and guide trading data and related data market places?" (dig_u_303)

7. **Cyber security** – this topic was mentioned as an area of research, however it was noted by one of the interviewees that QUT has the Information Security Institute that undertakes multi-disciplinary

research in information security.

8. **Economics** – measuring the value of digital economy is a medium-low priority, however there was some interest in measuring the digital maturity of firms and industries. For example:

“There is a need for a tool, a measurement benchmarking tool that we can actually compare and contrast the relative maturity levels of industry sectors and businesses within those industry sectors” (dig_g_301, p17).

Note: Several proprietary tools have been developed for this purpose (See Westerman *et al.* (n.d))

Low Priority

9. Development of ICT Networking Infrastructure
10. Development of ICT Hardware and Software

Interviewees posed some questions/issues they would like to see the Chair pursue. A few of these are captures in Box 3.

Box 3 Sample of Research Questions/Projects

How do we help existing firms develop revenue resilience?

“How do you make sure that whatever is your current stream of revenue survives in the digital economy? We study what sort of capital literally disappears in front of your eyes?”

You’re a consulting company, it drives you nuts that people crowd source expertise when you have people on your payroll” (dig_u_303, p8).

From worker to CEO: how human capital has transformed.

“So, if you think about yourself as a CEO and you could say: what sort of digital assets do I have? Where can I take part? and wherever you transfer, “Can I co-create, co-produce?” (dig_u_303, p10)

Queensland and Brisbane - exporting products and services.

“So what are the industries that are going off in Asia that we can tap into with a stronger digital capability or understanding or framework?” (dig_g_308, p4)

How will structural unemployment arise from digital disruption?

Will the “next big automation or digitalisation wave... destroy jobs in a speed that is much faster than we generate new jobs.... We don’t know yet” (dig_u_303, p14). Another interviewee described digitalisation as *“a job destroyer before it’s a job creator”* (dig_u_304, p14).

Investigate how to facilitate the participation of marginalized people who have difficulties engaging in the digital economy, such as disadvantaged, disabled, aged, non-English speaking people (dig_g_302, p9).

The rationale behind this is that these groups represent a minority (say 20 per cent) of the population, however they absorb more than 50 per cent of government expenditure.

3.2 Chair purpose and activities – Interview findings

During the interviews, the representatives from the funding partners discussed what they were looking for in the Chair. Their collective requirements are summarised as follows:

1. Pursue globally recognized, credible academic research. The role of the Chair (from a research perspective) should be *“to reflect, theorise and not just create the next artefact but really try to explain what we see”* (dig_u_303, p15).

“Where might value shift in the economy and what can Australia do about it to protect the future of Australia but also build some economic growth and value for the country” (dig_p_306, p6).

2. Promote ‘co-innovation’ between the Chair and its partners/customers.
3. Focus research on developing business models that guide existing firms and governments away from legacy economy business models to post-digitised economy models.

“I’d love to think about how the technologies might disrupt positively or negatively traditional industries and approaches to doing business” (dig_p_306, p24).

4. Pursue complex, long-term research topics such as Internet-of-things, big data and knowledge work automation rather than trying to cover all hotspots.
5. Undertake research that investigates what levers government can move to boost investment, increase and importantly, retain economic value.
6. Develop *“a highly, innovative engagement model... to sell contemporary research-informed innovation service outside industries”* (dig_u_303, p19).
7. Increase the number of graduates (new school leavers and non-school leavers) with:

- a. Science, Technology, Engineering and Mathematics (STEM) skills as these are increasingly in required to deal with challenges such as ‘big data’ manipulation, knowledge work automation, etc.; and,
- b. Digital solutions management skills that can be absorbed into existing industries (not necessarily digital product firms).

“This is where the Chair comes into building those bridging courses. That you don't need to be an ICT expert or you don't need to be a digital marketing expert. But you need to know how to use those capabilities to run a business. It's the MBA of the digital world. I think there is a gap in the marketplace for [these courses] - this chair fills that” (dig_g_302, p15-16).

8. Lead the digital economy discourse that engages senior business leaders and entrepreneurs.

“It's to build the capability. It's to build the understanding. It's to understand what levers we need to push and pull in the city's economy to ensure that we are a strong player on the world stage” (dig_g_308, p2).

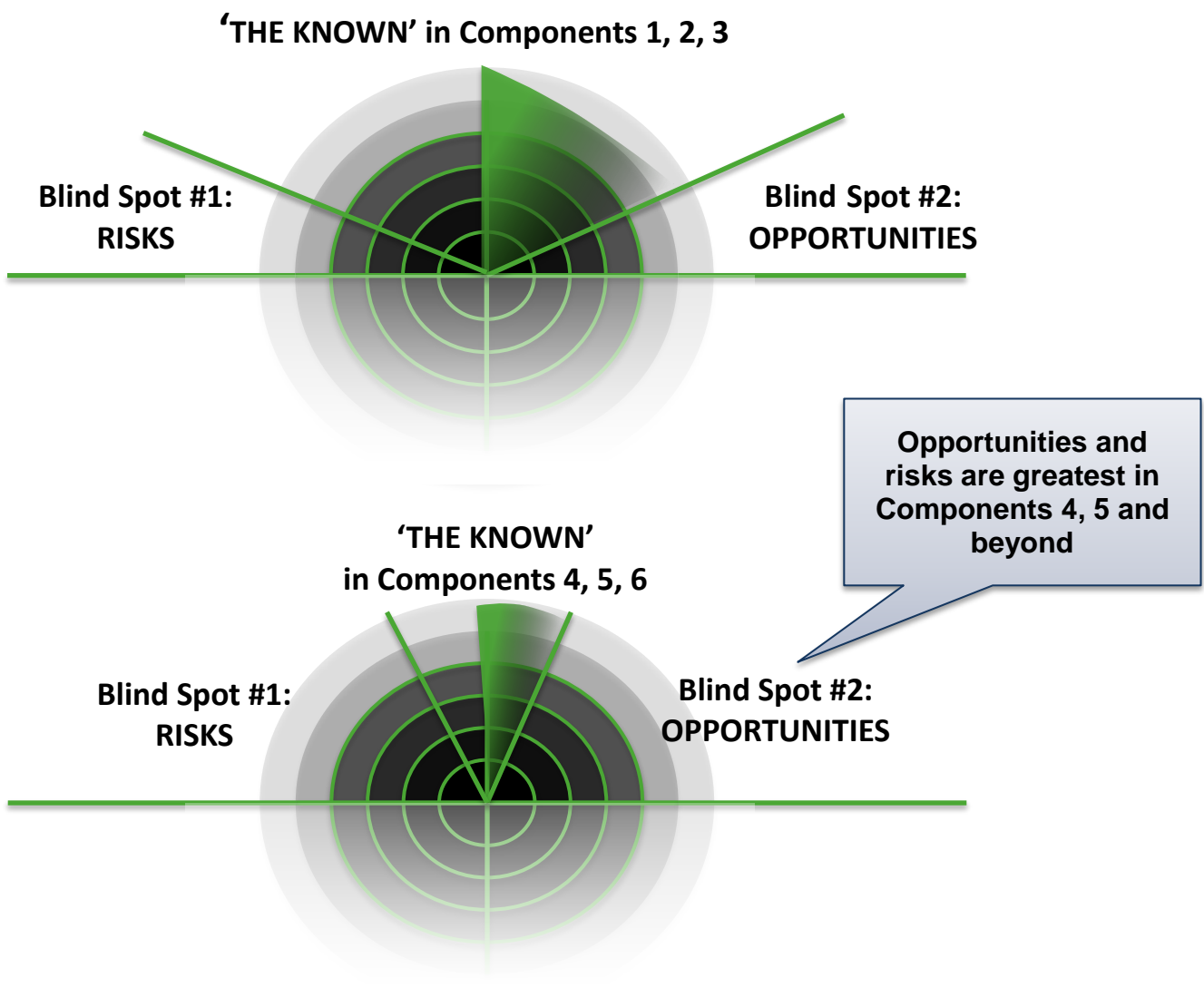
9. Build confidence and advocate increasing in digital competencies within existing small to medium businesses and residents
10. Undertake research that takes into account regional, rural as well as urban challenges.

3.3 PwC Chair in Digital Economy Focus

Clearly these interviews suggest there are varying degrees of ‘what is known’ regarding digital technologies and solutions and ‘what is unknown’ (or future risks and opportunities). As technologies advance and digital disruption is more commonplace, ‘what is known’ narrows and the range of risks and opportunities increase.

With regards to the model of the Expansion Cycles of the Digital Economy Model, Components 1 and 2, and to some degree Component 3, are largely known and understood by business and academia. There is greater uncertainty and more opportunities and risks in Components 4, 5 and beyond. These are represented in Figure 2.

Figure 2 Comparing ‘the known’ with future risks and opportunities in Components 1, 2, 3 against Components 4, 5 and beyond.



In addition, the main observation from the interviews with representatives from the funding partners is that there is a desire to improve productivity and growth in existing industries and firms **as well as** promote step change or radical change in service delivery and new products.

The PwC Chair in Digital Economy will focus on research and activities primarily in Components 3, 4 and 5 and beyond in the Expansion Cycles of the Digital Economy Model. The goal will be to research areas of greatest uncertainty and opportunity – including what will come in the future.

3.4 Research Agenda

This working paper underpins the research agenda to be pursued by the Chair. The agenda will be progressed through further consultation with the funding partners and other organisations that are interested in co-innovating with the PwC Chair in Digital Economy.

Working papers that progress our understandings of the digital economy, locally, regionally and internationally, will be part of the outcomes produced by the Chair.

The digital economy is amorphous, continuously expanding and conceptualised in different ways by different people. The purpose of this paper is to outline the Chair's funding partners' collective views of the digital economy; and therefore, the focus of the Chair's activities. New topics and digital phenomena will change thinking, but as a thought leader, the Chair will bring informed intelligence and a new perspective on how to advance research and programs that will benefit individuals, firms and society.

4 Glossary

Term	Meaning
Access economy	Eckhardt and Bardhi (2015, para. 4) suggest that commercial operations such as Airbnb, Zipcar and Uber should not be viewed as part of the sharing economy. Instead, they should be viewed as part of the 'access' economy where consumers use these companies to find low cost and convenient services.
Born digital	Organisations that start as digital firms, e.g. Facebook, Google.
Digital disruption	Digital Disruption is <i>"about innovating to break the ranks of status quo, it redefines the norm, and changes the markets and competitors around us. This comes through a relentless focus on the customer and offering new business models and new ways of applying technology"</i> (Girn, 2014, para. 9). Fishenden and Johnson (2014) offers a similar definition of digital disruption designed to suit government organisations: <i>"the transformation of the organisational model and culture, radical process change, accountabilities for citizens' experience, new models of service delivery, real-time feedback, tangible operational efficiencies, measurable business value, and the use of data driven insight to improve and inform policy formulation"</i> (p7).
Digital Economy	"The global network of economic and social activities that are enabled by digital technology, such as the internet, mobile and sensor networks" (Australian Government, 2009, p2).
Internet Economy	Defined as "the value of all economic activities that are undertaken on or supported by the Internet" (OECD 2013:6). The internet economy can be identified as a large subset of the digital economy.
Internet of Things	<i>"The Internet of Things refers to the use of sensors, actuators, and data communications technology built into physical objects—from roadways to pacemakers—that enable those objects to be tracked, coordinated, or controlled across a data network or the Internet.... The Internet of Things can be used to create value in several ways. In addition to improving productivity in current operations, the Internet of Things can enable new types of products and services and new strategies: remote sensors, for example, make possible pay-as-you-go pricing models such as Zipcar"</i> (McKinsey 2013, p52).
Knowledge Economy (or knowledge-based economy)	<i>"The term "knowledge-based economy" was coined by the OECD and defined as an economy which is "directly based on the production, distribution and use of knowledge and information" (OECD 1996). The Asia-Pacific Economic Co-operation (APEC) Economic Committee extended this idea to state that in a KBE "the production, distribution and use of knowledge is the main driver of growth, wealth creation and employment across all industries"</i> (APEC 2000). Cited in ABS, 2002, para. 8.
Knowledge work automation	Advances in computing and other digital technologies have enabled some forms of structured, rules-based knowledge work to be automated. For example: <i>"Computers, for example, can now act on "unstructured" commands—answering a question posed in plain language—and even make subtle judgments. They can sift through massive amounts of information to discern patterns and relationships. They can "learn" rules and concepts based on examples or simply by crunching data. And, with advanced interfaces and artificial intelligence software, they can understand and interpret human speech, actions, and even intentions from ambiguous commands. In short, computers can increasingly do many of the tasks that are currently performed by knowledge workers"</i> (Manyika et al. 2013, p40).
Prosumer	"They are customers who also produce" (Tapscott, 2015, p84) <i>A person who "co-innovates and co-produces the products they consume. In other words, customers do more than customise or personalise their wares; they can self-organise to create their own. The most advanced users, in fact, no longer wait for an invitation to turn a product into a platform for their own innovations. They just form their own prosumer communities online, where they share product-related information, collaborate on customised projects, engage in commerce, and swap tips, tools and product hacks"</i> (Tapscott and Williams, 2011, p208).
Sharing economy	The sharing or shared economy is sometimes described as involving <i>"new business models ('platforms') that uproot traditional markets, break down industry categories, and maximise the use of scarce resources. The best known services are the ridesharing system Uber and the accommodation service Airbnb"</i> (Allen and Berg, 2014: 2). A financial transaction is an important descriptor for such shared economy models – people still buy a service or product, however they no longer are required to buy from a company that owns that particular good or service. Eckhardt and Bardhi (2015, para. 4) suggest that commercial operations such as Airbnb, Zipcar and Uber should not be viewed as part of the sharing economy. Instead, they should be viewed as part of the 'access' economy where consumers use these companies to find low cost and convenient services. Eckhardt and Bardhi describe sharing as "a social exchange that takes place among people known to each other, without any profit" (2015, para. 2). Thus, the sharing economy is more about people offering spare capacity or a good or service without requiring financial compensation, e.g. landshareaustralia.com.au, au.zilch.com, and mealsharing.com.

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