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Innovation in the digital economy: The impact of high-speed broadband on innovating SMEs

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Abstract

Small and medium enterprises (SMEs) have been recognised as engines for innovation, which is critical for economic growth. Limited studies have examined the impact of information and communication technologies (ICTs) on innovation in SMEs despite the critical importance of making sound ICT investment decisions to transform innovation in the digital economy. This paper examines how technological capabilities can be shaped to achieve organisational innovation outcomes. It uncovers important drivers including innovation orientation, applications that can enhance a firm's capability to be flexible in its innovation endeavours which in turn can influence innovation impact through innovation process performance and service innovation quality.

Keywords

Innovation, digital economy, dynamic capabilities, broadband, case study.

INTRODUCTION

Innovation in the digital economy is essential in transforming the economic outlook of nations. In response to present financial challenges, the European Commission has launched Horizon2020, an €80B program to foster innovation in Europe between 2014 – 2020. The importance of innovation as a critical means for emerging from economic downturns and for achieving sustainable competitiveness also features strongly in key policies of many other countries including Australia, the US, and developing economies including India and China (Rampersad and Troshani, 2013). Small and medium enterprises (SMEs) are universally acknowledged to have a significant role in contributing to innovation and growth. However, whilst SMEs are characterized by many advantages including agility, efficient internal communication systems, lack of bureaucracy and cumbersome organisational systems, and adaptability which place them in a unique position for fostering innovation, evidence indicates that they innovate less than their larger counterparts (Freel, 2000, Romijn and Albaladejo, 2002). In fact, recent surveys have shown that SMEs are underachievers in innovation. For example, some have used the term digital divide to describe the gap in ICT-driven innovation between large organisations and SMEs (Arbore and Ordanini, 2006).

Innovation can be defined as 'the process of turning opportunity into new ideas and of putting these into widely used practice' (Lin and Ho, 2007, p. 3). Using new product development as a measure of innovation, Freel (2000) points out that only 50% of surveyed SMEs introduce new products in the UK. In Australia, the number of SMEs that innovate has remained unchanged at one in three for many years and "innovative businesses are still the exception rather than the rule" (DIISR, 2009). Supporting this further, a survey of manufacturing SMEs in Australia found that manufacturers are not innovating sufficiently (Dodgson and Innes, 2006). Extant literature indicates that SMEs that wish to innovate might be constrained in their innovation generation activities by barriers including lack of skilled labour, lack of additional funding, cost of development and implementation which are related to the use of ICTs (Freel, 2000, DIISR, 2011). In fact, even the adoption rate of ICTs as innovation enablers amongst SMEs is not as fast as their larger counterparts (Jungwoo, 2004). Whilst much attention and research has focused over the years on the successful use of ICTs in facilitating innovative endeavours in organisations generally, SMEs remain under-researched in this area (Fink and Disterer, 2006). Furthermore, despite the rhetoric around the anticipated impact of ICT on innovation, extant research has also challenged such claims (Patel et al. 2012). Therefore, research is needed to examine how ICTs can be effectively used by innovative SMEs to innovate (Edwards et al., 2007).

Thus, to address this shortcoming our objective is to determine how ICTs influence innovating SMEs. To achieve our objective we focus on Australian SMEs that are using high-speed broadband (HSB) to innovate. HSB is an ICT communication infrastructure that offers high-speed always-on un-metered access enabling users to connect to the internet (Irani et al., 2009). It offers key advantages including efficiency and cost savings which can stimulate innovation and productivity, ultimately resulting in economic growth and social well-being (Choudrie and Dwivedi, 2006). Bradley et al. (2013) estimate that the Internet of Everything (IoE) creates \$14.4 trillion in value and is anticipated to be the next phase of dramatic Internet growth connecting data, process, people and things which builds on ICT innovation trends such mobile computing, bring your own device (BYOD), Big Data, cloud computing and social media. However, whilst HSB is becoming increasingly significant in today's knowledge economy, many SMEs are either "unaware of or unappreciative of its benefits" (Oni and Papazaferiopoulou, 2011). For example, in Australia, e-commerce which leverages HSB continues to manifest emerging market characteristics including rapid growth and adoption of products, and relatively high transaction costs (DIISR, 2011). Additionally, Australian retail and content sectors lag behind their US and UK counterparts with a weaker online presence and a reluctance of both retailers to provide online services and consumers to use these services (DIISR, 2011, DIISRTE, 2012).

Hence, the research question of this paper is to determine 'how HSB can influence the innovation capability of SMEs?' Knowing this is critical and can benefit a wide range of stakeholders including SMEs that aspire to innovate, policy-makers, and application developers. The Australian setting, is conducive and adequate not only for providing insights concerning how innovative SMEs innovate using HSB, but also for offering an evidence-based contribution to the ongoing debate both in Australia and internationally concerning the economic and social impacts of HSB that are hoped to be achieved by way of major broadband infrastructure projects before the benefits of these impacts become broadly accessible (Dutta and Mia, 2011). This study also offers valuable insights to a range of stakeholders. Particularly, SMEs would find our findings valuable for developing strategies for taking advantage of HSB specifically and ICTs more generally. Government agencies would also find this research useful in both examining innovation outcomes through ICTs, and in informing policy-making. In this paper, we first discuss the gap in extant literature followed by the method used, a case study including in-depth interviews. Then, we present our findings and highlight managerial implications before discussing limitations and future research directions.

THEORETICAL BACKGROUND

Whilst existing research has examined the ability of firms to innovate using innovation capability models (Romijn and Albaladejo, 2002), these models fail to capture the dynamics of the current fast(er) and ever changing environment which is characterised by increasingly disruptive technology, shorter product lifecycles and lead times (Rampersad et al., 2010, Troshani et al., 2011, Rampersad et al., 2012b). That is, as innovation in new and improved production methods, products and services constitutes a key driver of productivity growth, it is, critical for SMEs to use ICTs to both develop innovation capabilities and to be able quickly reconfigure existing resource bases including technology, personnel, collaboration patterns, and decision-making if they are to compete effectively in today's highly dynamic environment (Edelman et al., 2005). It follows that flexibility in an SME's ability to innovate can be a critical success factor as it can help achieve three major advantages, namely, allowing for quick response to the changing environment, achieving superior levels of internal efficiency and gaining competitive advantage (Levy and Powell, 1998). Thus, SMEs that are characterised by a high innovation capability need also to be able to overcome innovation barriers effectively and efficiently in order to be flexible innovators. However, the need to be flexible, which at least in part is dictated by dynamic environments, is not captured in existing innovation capability theory.

Meanwhile, scholars in many disciplines have focused on the area of flexibility including strategic management, manufacturing management, economics and IT management, leading to various conceptualisations of flexibility (Sethi and Sethi, 1990). This study is consistent with the strategic perspective of flexibility which refers to organisational capabilities to respond quickly and effectively to environmental changes (Zhang 2005). In this vein, dynamic capability theory has emerged from the resource-based view (RBV) theory of the firm (Wernerfelt, 1984) as strategic management researchers consider strategic flexibility as a high-level dynamic capability that allows firms to transform themselves to maintain competitive advantage (Teece et al., 1997; Eisenhardt and Martin, 2000). Dynamic capability can be defined as the ability of a firm to purposefully create, extend or modify its resources and capabilities for improved effectiveness (Eisenhardt & Martin, 2000; Salunke et al, 2011). Dynamic capability theory has been applied from various lenses including the individual (Kelley et al. 2011); organisational structure (Zhang, 2011), alliances (Gulati, 1999) product and service development (Salunke et al 2011) and the global context (Chen and Jaw, 2009). However, there have been calls for further research on examining dynamic capabilities from an ICT innovation perspective as ICT's disruptive power can quickly build, erode or destroy a firm's competitiveness in increasingly hyper-competitive, volatile markets (Jiao et al 2013; Wiersema, 2013). Thus, the paper builds on and extends innovation capability theory by applying dynamic capability models from an ICT perspective.

Innovation Flexibility

We argue that SMEs that innovate and wish to remain competitive need to possess a flexible innovation capability, or simply be characterised by innovation flexibility. By extending existing definitions of innovation capability to include dimensions of flexibility, we define innovation flexibility as the firm's ability to pursue new courses of action and change directions in the development and commercialization of new products, services, and processes (Eardley et al., 1997). Accordingly, innovation flexibility can be a desirable characteristic for innovating SMEs for a number of reasons. First, the ability to innovate flexibly in turbulent environments can help SMEs survive (Avison et al., 1995). Second, it can help SMEs generate superior levels of internal efficiencies (Hammer, 1990). Third, it can help SMEs improve their ability to enhance existing performance levels and access first-mover advantages leading to competitive advantage (Van de Ven, 1986). Since innovation in SMEs is driven by information (Lefebvre and Lefebvre, 1992), HSB can "be key to the future flexible organization" [p. 183] generally, and SME innovation flexibility, in particular.

Antecedents of innovation flexibility

Connectedness Resources available to SMEs in their environment including access to HSB often determine their ability to innovate and do so flexibly (Arbore and Ordanini, 2006). Generally, no single organisation has access to all of the resources necessary to innovate. Innovation is becoming increasingly the result of intense interactions amongst heterogeneous organisations. This is relevant for SMEs. In fact, the importance of access to a high-speed communication infrastructure such as HSB is a critical enabler and a prerequisite for innovation (Corrocher and Ordanini, 2002). Lack thereof can create a digital divide between SMEs that have access to such infrastructure and those that do not (Corrocher and Ordanini, 2002). Specifically, HSB is becoming increasingly significant in today's knowledge economy since it offers key advantages including efficiency and cost savings which can stimulate innovation and productivity (Dwivedi et al., 2009).

Innovation orientation can be defined as the openness of an organisation to new ideas and its capacity to change through the adoption of new technologies, skills, resources, and systems (Chen et al., 2009a; Hurley and Hult, 1998). Hurley and Hult (1998) outline a conceptual framework for incorporating constructs that relate to innovation in market orientation research, distinguishing that market orientation promotes organisational learning and the organisations' ability to learn and to enhance performance. Innovativeness can be defined as the 'notion of openness to new ideas as an aspect of a firm's culture' (Hurley and Hult, 1998) and can be used as a measure of the organisation's orientation toward innovation. It includes characteristics such as emphasis on learning, participative decision making, support and collaboration and power sharing (Hurley and Hult, 1998). Internally firms may need to become flexible, open and interconnected, and externally, they may need to be more agile to connect as needed to external parties (Chen et al., 2009a). Innovation orientation is identified as an organisational resource and innovation orientation and IT capability are recognised as key drivers that lead to service delivery innovation (Chen et al., 2009a).

Innovation Impact

We argue that innovation flexibility will have an **impact on innovation outcomes**. However, the notion of innovation impact is under researched since existing innovation performance metrics in innovation literature are skewed towards technical measures including patents, and scientific training levels (Rampersad et al., 2010). Financial measures also exist but are generally geared towards input factors such as tax incentives and R&D funding rather than innovation impact measures. While existing innovation impact measures offer some indication of innovation activity particularly associated with the hard sciences and technological innovation, they do not provide a measure of the wider range of innovation processes such as innovation in services including business electronic services that can be enhanced through ICTs including HSB. The service sector is the largest exporter and employer internationally (Kleinaltenkamp, 2007). Recognising this, governments in the UK and Finland have even developed policies on service innovation. Additionally, an international institute, the Service Research Innovation Institute (SRII), has been established comprising organisations such as IBM, HP and Microsoft which call for universities to do more research in service innovation, given its strong potential to increase value to customers, revenues to firms and exports for countries (Rampersad et al., 2010). Consequently, research is needed to develop better innovation impact measures that incorporate critical areas such as service innovation.

METHOD

Case Study Setting: Given the exploratory nature of this research, a case study was deemed to be appropriate. A case study allows "the capture of 'reality' in considerable detail (Galliers, 1990). The National Broadband Network (NBN) constitutes the deployment of HSB throughout the Australian mainland. This case takes place at one of the first NBN HSB deployment sites, a town called Willunga in the State of South Australia. All the businesses within this region are SMEs, making a suitable setting case for this study. Furthermore, prior to the NBN, internet was too slow or unreliable. Willunga is located 47km from Adelaide, the capital of South

Australia and is a tourism-based town (with festivals, a well-known farmers market, and participation in the cycling Tour Down Under).

Sample Selection: Data for this case were collected between March and August 2011 via in-depth face-to-face interviews with key informants. Interviews were seen as a valuable data collection tool as information sourced by them was expected to vary considerably (Ticehurst and Veal, 2000). Moreover, interviews are flexible, in that they empower interviewers to control the sequencing and wording of questions, while also providing opportunities for seeking clarifications (Walsham, 1995). To provide a general focus for the interview, participants were given a list of topics prior to the interview. These topics included the role of HSB technology on innovation in SMEs, and the ways in which impact could be measured. In particular, using existing innovation literature as a basis, we identified innovations as any of the following: i) new products; ii) new services; iii) new methods of production; iv) new processes; v) opening new markets; vi) new sources of supply; and vii) new ways of organising (Johannessen et al., 2001). Interviews lasted approximately 60 minutes. Snowball sampling was used to identify interviewees whereby leading government officials focused on SME development in the region's Economic Development Board and local councils, and subsequently the interviewees themselves referred the researchers to key informants in the region including leaders of business associations, SMEs involved in food and wine, manufacturing, medical equipment and real-estate. Interviewees were selected based on their reputation of being prominent, influential, knowledgeable and successful in relation to this study's objectives within the region as identified by top local government officials, industry associations, and other interviewees. Websites and reports from government and industry associations were also used as a source of data and also to triangulate both the identification of interviewees and findings. Interviews were completed when stability was reached in findings, consistent with extant qualitative research approaches (Yin, 2009). Table 1 provides the list of interviewees including their roles and areas in which their organisations operate.

Table 1. Interviewee Details

Interviewee #	Organisation type	Business Size	Position	Background (years of experience)	Area
1	Government	small/micro	General Manager	30+	Exports
2	Government	small/micro	General Manager	30+	Small business development
3	Government	small/micro	General Manager	20-25	Industry development
4	Government	small/micro	Director	20-25	Economic Development
5	Government	small/micro	Officer	10-15	Economic Development
6	Government	small/micro	Officer	10-15	Economic Development
7	Government	small/micro	Coordinator	10-15	ICT
8	Government	small/micro	General Manager	30+	ICT
9	Government	medium	Coordinator	25-30	ICT/ e-learning
10	Government		Officer	10-15	Policy
11	Government	small/micro	Business Partner	10-15	Business development
12	Business	small/micro	Managing Director	20-25	Manufacturing
13	Business	small/micro	CEO	30+	Science and Engineering
14	Business	small/micro	Proprietor	30+	Wine / Hospitality
15	Business		CEO	15-20	Consulting and Training
16	Business	medium	Managing Director	30+	ICT
17	Business	small/micro	Proprietor	30+	Real-estate
18	Business	small/micro	CEO	20-25	Consulting

Due to the novelty of the research, interviews were recorded and transcribed to produce a readily accessible comprehensive set of verbatim comments (Ticehurst and Veal, 2000). This allowed the researcher to focus on integrating the discussion, probe effectively and build a rapport with interviewees (e.g. by establishing and maintaining eye contact) (Blaxter et al., 2001).

Data Analysis and Validity: Thematic analysis was used to code the transcripts. Codes based on recurring themes were identified (Carson et al., 2001). There were three stages of data analysis and interpretation including (a) data reduction, (b) data display, and (c) conclusion drawing/verification (Huberman and Miles, 1994). With data reduction data summaries, clusters, and codes were developed which provided the basis for data display, that is, data belonging to emerging themes were incrementally condensed in an assembly of information, including synopses and diagrams (Huberman and Miles, 1994). Data relevant to each theme were subsequently assembled incrementally and triangulation with extant broadband literature was carried out and representative quotations short-listed for argument support. Consequently, conclusions were drawn and verification undertaken. Moving

back and forth hermeneutically between the data and relevant literature, comparing, contrasting and triangulating the identified theme patterns, allowed meanings and interpretations to be drawn from the data. A thorough understanding of the phenomena represented in the data related to our objective was achieved through continuously amending the structure and analysis of the findings (Huberman and Miles, 1994). Construct validity has been adequately addressed. The chain of evidence, tracing conclusions to the collected data was also maintained (Yin, 2009). This measure has enhanced research reliability, thereby improving its overall quality.

RESULTS

In this section we discuss our findings in relation to innovation flexibility and its environmental and organisational antecedents and impact. We have summarised this discussion in Figure 1.

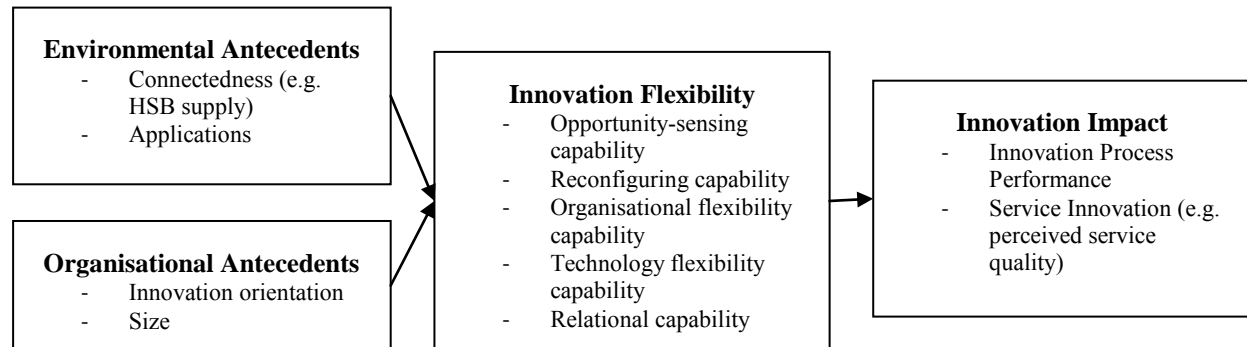


Figure 1. Conceptual Framework: innovation flexibility in SMEs

Innovation Flexibility

Interviewees described how HSB contributed to their dynamic innovation capabilities in addressing barriers facing SMEs such as financial resources, management and marketing, skills and networks (Freel, 2000). Such findings validated dimensions in the dynamic capability literature including opportunity-sensing, reconfiguring, organisational flexibility, technological flexibility and relational capabilities (Jiao et al. 2013; Salunke et al. 2011).

Opportunity-sensing capability: Interviewees discussed the importance of HSB in sensing opportunities which was consistent with dynamic capability theory which advocates the need for firms to recognise market development opportunities and trends (Jiao et al. 2013): *I'm working on a product at the moment. It's a filter and it's for wine making. Lots of industries use filters and it's such a completely different way of filtering, so I think someone must have done this before. I get on the net and I just Google, and if I can't find it on the net, it ain't there. (Interviewee#12)*

Reconfiguration capability: Interviewees also expressed how HSB assisted with their reconfiguration capabilities. Reconfiguration capability involves the ability of a firm to redevelop, integrate and update resources, knowledge and processes (Teece et al. 1997). This ability mitigates financial resource barriers facing SMEs. There was unanimous support across interviewees: *We wouldn't have a presence without the Internet. Our previous form of traditional advertising was very expensive. I find that you get a lot more mileage out of internet or websites. Only about three months ago I listed with a US company. (Interviewee#12)*

Organisational flexibility capability: The impact of HSB on improving organisational flexibility capability (the organisational structure attributes including duty configuration, information flow) in addressing management barriers as also discussed by interviewees resonating with the literature (Jiao et al. 2013). Interviewee#12 explained how broadband can facilitate the flexible organisation in the commercialization of new products. For example, its factory is located in Thailand which can cater for production to be scaled up depending on customer orders. The managing director in Australia communicates ideas to the design engineer in his factory in Thailand to create technical specifications for new products. The firm uses interactive animation on its websites that allows clients to visualize product benefits and use: *So they can just pop it on their counter or on a wall and when their customers are waiting to be served, they don't have to read, and then they're getting something drummed in to them: it's the perfect opportunity. (Interviewee#12)*

Technology flexibility capability: Interviewees discussed how HSB helps in increasing their technology flexibility capability which addresses skill barriers facing SMEs. Technology flexibility capability refers to the firm's ability to draw technical knowledge to compete at a new level of technology (Iansiti and Clark, 1994). Interviewee#12 discussed how someone from overseas can design the product and developers can create the product physically based on those exact specifications. Thus, HSB facilitates connection and communication with a wide international pool of expertise to enhance R&D efforts towards effective product development. However, currently, Australian SMEs lack the necessary skills to use HSB adequately for innovation purposes:

And that's exactly how I feel about the application of broadband itself... You actually need to address the skill set shortage ... (Interviewee#12). Additionally, Interviewee#13 described other advantages of HSB for innovation pertaining to R&D firms. He explained how internet technologies such as laser centering can be used for prototyping. It involves rotating the product virtually to develop a technical specification. Therefore, someone from overseas can design the product and firms can develop the product physically based on those exact specifications. Thus the internet facilitates connection with a wide international pool of expertise to enhance R&D efforts.

Relational capability: Interviewees discussed the importance of HSB in building relational capability, which is an important dynamic capability in contributing to marketing efforts (Plewa et al. 2013; Salunke et al 2011). Interviewee#13 described how the internet contributed towards building relationships with customers through video conferencing and demonstrating product use: *There's nothing like seeing it you know and it gives you that face to face connection which is what I want. I know every single one of my customers. I know them. We only have about 250 machines out in use every day, but I know every single one of the users and there's something kind of nice about that (Interviewee#13).* Additionally, interviewees spoke about the impact of HSB technology on providing network linkages through social networking, for example, with stakeholders including suppliers, customers, government agencies and industry associations. One interviewee illustrated the importance of networking by providing survey statistics by Ernst and Young on SME exporters in the region. For example, the Onkaparinga Exporter's Club: Member's Survey 2009/2010 found that that 26% of members of the Onkaparinga Exporter's Club use social networking sites (e.g. Facebook) as a means to network with business partners (ExportersClub, 2010a). These results are similar to the North West Adelaide Exporter's Club whereby 24% of those members use social networking (ExportersClub, 2010a). Of the 26% of members from the Onkaparinga Exporter's Club, the commonly cited purposes for using social networking were to become part of establishing and new networks, learn about up-coming events, and receive industry specific news. In the North West Adelaide Exporter's Club survey the majority of respondents (45%) identified establishing new networks as the main reason for using social networking followed by 22% who used it to learn about up-coming events and 22% to receive industry specific news (ExportersClub, 2010b). 11% used social networking for reconnecting with overseas business partners and to market their business online (ExportersClub, 2010b).

Environmental Antecedents of Innovation Flexibility

Connectedness offered by access to HSB emerged as critical in harnessing innovation. This was particularly important and relevant for remote and regional areas where high-speed broadband access is currently unavailable. Interviewee #12 expressed that simple transactions such as online banking previously took an hour and that activities such as stock trading that his neighbor participated in will be impossible without a reliable internet connection. Connectedness constitutes the ability to connect and participate in innovation networks. According to the interviewees HSB facilitates connectedness, though HSB itself entails expensive underlying infrastructure and fiber optics or wireless networks that enable it. Many have been using HSB-enabled connectedness as a way of offering new products or services. Interview 15 operating in the Training Sector argued that: *Two thirds of my business would be gone overnight if I didn't have broadband. (Interviewee#15)*

Applications The interviewees were also consistent at highlighting the need for applications as an antecedent for innovation flexibility. That is, available applications are likely to enhance creativity and novelty and spur innovation as a result. For example, in relation to this point Interviewee#15 argues: *You don't know what you don't know. So until somebody said, "Why don't you use Skype?" and I went, "What's Skype?" and so this was a number of years ago. I saw Skype – with e-learning, we use a number of technologies over the Internet for our students in regional areas.... I don't think broadband is the sell for them [adopters]. It's the applications. Broadband is just the vehicle. Broadband is the petrol in the tank of the car. It's, "So why do I need a car?" "Well, 'cause you can do all these things if you have it." You have access to things you didn't have before, so I think – and then again, it's about pitching the application to the group. (Interviewee#15)*

Organisational Antecedents of Innovation Flexibility

The impact of **size** on innovation flexibility was stressed by all interviewees, confirming the findings in the literature (Perez-Cano, 2013). All SMEs interviewed were small family-owned firms. They expressed that this size helped them in being agile, launching new product lines and pursuing new markets: *Our business comprises of my wife and me. We do liaison with a factory in Thailand for production outsourcing. We started off with one product in Australia. That quickly changed and we have now launched a wide range of products in countries in North America and Europe. (Interviewee#13)*

Interviewees also confirmed their level of **innovation orientation** and the impact of HSB technology on harnessing this orientation towards innovation outcomes. For example, Interviewee#13 first uses the internet to research technologies and develop ideas for new products: *I'm interested in making new products. What I do find terrific on the internet is that if I want to research technology, no matter what depth I want to go to, I can get it on the net... If I think, oh that's good let's look on a bit further. So if you're creating new products and*

that's what we have to do in Australia, you know niche market products and you know with only 20 million people, it wouldn't be too hard to employ, doing that sort of work and it pays well and big companies are not interested in doing it, because it's not big enough. (Interviewee#12)

Innovation Impact

Innovation process performance emerged as an important factor in the interviews resulting from innovation flexibility. Interviewees used innovation process performance to specifically refer to the commercialization pace, development, profitability and investment towards new products or services as well as the capability to establish and manage relationships to accelerate innovation which is consistent with extant literature (Troshani *et al.*, 2011, Rampersad *et al.*, 2012a). Interviewee#15 in particular discussed the impact of HSB in commercializing new services by reaching new markets as it facilitates the delivery of education and consulting services to regional areas in South Australia. HSB has enabled this organisation to provide innovative e-learning solutions and carry out other operational aspects of the business including accounting and banking: *We use the Internet on a daily basis to run our business. We use it for, obviously, contacting our clients, running our website, doing our accounting and banking. We are probably – I think we're probably premium users of the Internet in terms of our business. Well, we optimise the use of broadband. (Interviewee#15)*

Additionally, interviewees articulated how HSB contributes to improved innovation impact through increased commercialization pace and profitability. Three of the SMEs interviewed exported a significant percentage of their products and services. In the case of interviewee#12, the firm flourished despite periods of global economic recession (e.g. GFC) and now over 60% of its sales are coming from exporting to countries including the US, Canada and England. Likewise, interviewee's #13 firm enjoys 70% of its income through exports to Asian, European and US markets. In the case of Interviewee#14, all accommodation bookings for the Bed-And-Breakfast (BnB) accommodation were done completely online with many clients coming from Europe. Both of Interviewee#14's businesses (the winery and BnB) had websites to market services provided. The business also had iPhone and iPad apps so that customers could make bookings online using these devices.

Interviewees also stressed the impact of innovation flexibility on **service innovation**. This confirms findings in the literature that innovation flexibility and its associated dynamic capability dimensions impact on service innovation (Salunke *et al.* 2011). Consistent with extant literature (Cristobal *et al.*, 2007), interviewees agreed that perceived service quality representing the overall attitude towards the products or services offered by the SMEs is a source of competitive advantage (Bitner, 1990) resulting in service or product loyalty (Bitner, 1990), word-of-mouth intentions (Zeithaml *et al.*, 1991), service acceptance (Olorunniwo *et al.*, 2006) and even willingness to pay more (Zeithaml *et al.*, 1996): *We're a registered training organisation and we use - our online learning services for our students are another critical part of our service delivery for education, so more so – obviously, their downloading of that is an impact for them, some of our clients, though, we've got 60 – at the moment, we've got 65 students in Port Pirie. So in Port Pirie, their ability to access our online systems is critical and their systems are very slow, so they have the same issue. The issue I've got my end is being able to upload e-learning once we've built it and the time that that takes and how fast that replicates and whilst it's probably better than it is in some parts of regional Australia, it's still far too slow. (Interviewee#15)*

CONCLUSION

This study contributes a conceptual framework to assess the impact of ICTs on innovation flexibility in SMEs. We validate the proposed framework using qualitative evidence collected from Australian SMEs that are using HSB. The proposed framework addresses our objective of determining how ICTs can influence innovating SMEs by enhancing their innovation flexibility. The research contributes to theory development by building on and extending innovation capability models by applying dynamic capability theory and validating the proposed model within an ICT innovation context. Our findings uncovered the critical role of HSB, innovation orientation, organisation size and applications in driving innovation flexibility and in turn innovation outcomes of improved innovation process performance and service innovation. The study builds on and extends the innovation and technology management and information systems (IS) literatures by modelling how businesses can improve their ability to innovate through the use of technology. The conceptual framework may be of interest to organisations including government agencies and businesses seeking to leverage the increasing capacity of ICTs. At the government level, for example, this research can help in determining interventions for optimising ICTs such as HSB for regional outcomes pertaining to innovation as a way of addressing increasing digital divide concerns in relation to access, opportunity, and proficiency of usage of HSB applications. This research examines the innovation flexibility of businesses and how it can be leveraged by HSB, in response to the growing need for developing adequate robust and sophisticated measures for capturing the impacts of HSB on businesses (DBCDE 2009; OECD 2008). The research is significant as it focuses on the under-researched, yet critical area by determining how innovation flexibility can be achieved by business through HSB. Internationally, the European Commission (2009), the United States broadband plan (2010) and Australia (DBCDE, 2011) have called for more research to understand the impact of HSB on innovation and more broadly on the economy. Insights are

also offered to businesses for developing strategies for taking advantage of opportunities stemming from HSB and ICTs more generally. By assessing the impact of HSB, this research can also help ICT firms identify key growth opportunities for developing HSB services and applications. Hence, this study can provide valuable insights to both government and business for developing strategies for leveraging technology by assessing its impact to identify opportunities and pitfalls for realizing its anticipated benefits.

While this study offers important insights, these should be interpreted in the light of its limitations. This study is based on a single case and was conducted in a specific context of a region in Australia where HSB has been deployed and is currently being used. Whilst this context is well suited for our purpose in capturing the perspectives about innovation flexibility in SMEs (Arbore and Ordanini, 2006), our findings may be limited to the case in question, and therefore of limited generalisability. Thus, we call for further research to address generalisability concerns and examine the proposed conceptual framework in other settings. Additionally, the study focuses on the important role of ICTs in contributing to dynamic capability, yet the development of this capability is dependent on the perception and attitude of SMEs in capitalising on the technology and therefore, further research should explore this area. Nevertheless, overall, this study is an important first step in identifying relevant innovation impact factors in assessing the impact of ICTs on innovating SMEs. It is a pivotal first step in equipping policy makers and managers with additional insight for developing comprehensive analytical frameworks to aid decision-making concerning investments and strategies to leverage on technology opportunities.

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