Broadband adoption/non-adoption by remote-rural micro-business owner-managers in Scotland

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ABSTRACT

This paper explores broadband adoption-non-adoption within remote-rural businesses. Based on a review of the current literature, the paper examines definitions of business sizes, rural areas, broadband adoption and existing research on broadband adoption by rural businesses. The findings of the paper reveal a gap in existing knowledge relating to the area of broadband adoption/non-adoption by owner-managers of Scottish remote-rural businesses. Avenues for future research are identified.

KEYWORDS: Broadband, adoption, non-adoption, owner-managers, remote-rural, micro-businesses and Scotland.
**Introduction**

Broadband is a form of telecommunication which allows fast and efficient transfer of data which can include information, images and videos (Rouse, 2007). After household utilities (eg water, gas and electricity), broadband is one of the most valuable services which are adopted by people all around the world (Brunton, 2013). Broadband allows users to save time and money on various tasks which would never have been possible in the past, eg online shopping, medical and banking services save customer’s time from travelling to the service’s location (Leiner et al, 2013). Along with individuals, businesses all over the world have greatly benefitted from online business where it has transformed business of all sizes (Leiner et al, 2013). Broadband adoption by smaller businesses in the United Kingdom (UK) is crucial as they play a major role in the country’s economic growth (Brunton, 2013; Combe, 2006 and Rouse, 2007). However, it is difficult to understand how broadband affects businesses of various sizes (eg micro to large businesses) as well as different locations (eg urban, accessible rural and remote rural) (Bates et al, 2012). Previous broadband adoption research (Doherty, 2012; Irshad, 2010 and Marlin and Bruce, 2006) including that carried out in the UK (Tooke et al, 2006 and Warren, 2004) does not clarify factors which may act as drivers or barriers for the specific context of micro-businesses. This gap in the literature may be important as micro-businesses comprise over 95% of all UK businesses (Gibbons and Parker, 2012). This paper explores the interwoven concepts of business size, importance of micro-businesses, classification of rural areas, the nature of broadband adoption/non-adoption and related theoretical models and existing international and UK research on rural business broadband adoption. The key output of the paper will be to suggest appropriate theoretical model(s) for remote-rural broadband adoption/non-adoption research.
Overview of Methodology

This paper is based on a literature review. A systematic and replicable approach (Greenhalgh et al, 2009) was adopted during the literature review. The terms ‘broadband adoption’, ‘broadband non-adoption’, ‘remote-rural micro-businesses’ and ‘remote-rural Scotland’ were individually as well as in various combinations inputted in to the search engines of Google Scholar and Google in order to generate results (Greenhalgh et al, 2009). This approach has been regularly adopted from October 2011 onwards in order to initially find studies on broadband adoption. After focusing on the area of Scottish remote-rural micro-business broadband adoption, the systematic approach was adopted to monitor ongoing research in the area in order to ensure that the target research area enhances existing knowledge rather than merely replicating existing research studies.

Size of Businesses

The European Union definition for business sizes is given in Table 1 (Europa, 2007).

<table>
<thead>
<tr>
<th>Business Size</th>
<th>Micro</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Employee Number</strong></td>
<td>1-9</td>
<td>10-49</td>
<td>50-249</td>
<td>250+</td>
</tr>
<tr>
<td><strong>Yearly Turnover (Euros)</strong></td>
<td>Up to 2 million</td>
<td>2-10 million</td>
<td>10-50 million</td>
<td>50 million+</td>
</tr>
</tbody>
</table>

Table 1: Business sizes.


There are different definitions for business sizes all over the world (eg in Australia a small business has no more than 15 employees (Fair Work Commission, 2013) whereas in the
United Kingdom the threshold is 50 -249). As this paper focuses on rural Scotland which is in Europe then the definition by the European Union will be used to classify business sizes.

The importance of Micro-Businesses

Smaller businesses which also include micro-businesses make up 99.3% of all businesses in the UK where they employ 58% of the British workforce in the private sector as well as contribute 53% towards the UK GDP (Fisher, 2013; Gibbons and Parker, 2013). Twenty five million of the current British workforce is self-employed (1 in 8 people) and 90% of these smaller businesses employ less than 6 people (Price et al, 2013). The majority of business startups in the UK are smaller businesses who are crucial to the growth and sustainability of the British economy as they eventually grow into large businesses (Fisher, 2013; Price et al, 2013). The ratio of micro-businesses to larger businesses is higher in rural areas within the UK (Bosworth, 2011).

Classifying rural areas in Scotland

There are various definitions of rural areas (Hall et al, 2006). The Scottish Government (2013) defines rural areas as a settlement of 3,000-10,000 people within a 30 minute drive from a 10,000 plus population area; or a settlement of below 3,000 people over a 60 minute drive from the nearest 10,000 plus area. Thus a rural area can be defined as the outskirts of a major city like Glasgow or it can also be an isolated, remote area like the Hebrides, however, there is a big difference in the level of remoteness (eg is the area accessible-rural or remote-rural?) between the two rural areas (Scottish Government, 2013). Therefore there may be a distinction between remote-rural and accessible-rural areas.
Adoption or non-adoption of technology

Hall and Khan (2002) define adoption/non-adoption of a technology as an individual or a group of individuals (eg private businesses or universities) either making the choice or refusing to acquire and use a technology. Horrigan’s (2009) definition of adoption/non-adoption matches Hall and Khan’s (2002) definition where he describes broadband adoption/non-adoption as either any type of broadband use (eg daily, once a week or once a month) or complete non-use. Other authors follow Horrigan’s definition of broadband adoption (for example Dwivedi et al, 2006; LaRose et al, 2007; Sim et al, 2012; Tookey et al, 2006).

International and Scottish studies on broadband adoption by businesses

A literature review on broadband adoption in rural areas within Canada, UK, United States of America (USA), New Zealand, Australia and Europe was carried out by Irshad (2010) who found that broadband has a positive impact on rural businesses that can access information easily. However Irshad highlights the importance of broadband awareness and technology training created for the residents of the remote-rural areas if adoption is to proliferate. Bagchi (2013) adds to Irshad’s (2010) findings through his findings based on the Assocham-Yes Bank study in India where he highlights that there are major opportunities for rural business growth through adopting broadband due to the presence of social media websites like Facebook and Twitter which have over 1 billion worldwide users.

Unlike Irshad (2010) and Bagchi (2013), Marlin and Bruce (2006) carried out a primary research study consisting of interviews with varying levels of management as well as other stakeholders from organisations in the education, government and healthcare sectors within New Brunswick in Canada to highlight factors of broadband adoption/non-adoption. Marlin
and Bruce (2006) found lack of funding (incentives to adopt broadband), training, infrastructure to accommodate more advanced broadband versions of WIFI and rural attitudes (the majority of employees within a rural business are likely to be rural residents) as barriers towards rural businesses adopting broadband. However, as with Irshad (2010) and Bagchi’s (2013) research, Marlin and Bruce do not specify the number of interviewees, level of remoteness of business location (accessible or remote rural) or the size of the businesses targeted by the study (eg micro, large or mixed). Similarly, Doherty (2012) does not clarify the business or sample size included in her research. However, she adds an additional dimension to her research (compared to Marlin and Bruce (2006)) by distributing questionnaires along with conducting face to face interviews amongst small-medium business owners within the Republic and Northern Ireland areas. Docherty (2012) found that small-medium businesses experience cost saving and higher profitability through broadband adoption where the location of a firm and the period of broadband adoption determine how the technology is being used and how much benefit a business is gaining. She notes that her findings may be location specific.

A longitudinal study was carried out by Warren (2004) in rural England which consisted of questionnaires being sent out to 337 farm businesses. During Warren’s (2004) research, a series of interviews with seven farm business owners were also conducted where family members were found to be influential in terms of farm business owners adopting broadband (Warren, 2004). Unlike other research (eg Bagchi, 2013; Doherty, 2012; Irshad, 2010; Marlin and Bruce, 2006), Warren’s (2004) research clearly defines the sample size but there is no reference to the actual size or remoteness of location for the businesses in the research.
Literature review research carried out by Tookey et al (2006) in rural Scotland highlighted a large number of remote–rural micro-businesses like farms having low broadband adoption due to dissatisfaction with a slower service. Barriers to adoptions in addition or related to speed included a lack of IT literacy (confidence and ability to use hardware associated with broadband adoption), poor infrastructure and a limited awareness campaign by the government. Tookey et al (2006) highlight the size of the businesses included in their research to be micro-businesses. However, Tookey et al’s (2006) research is based on secondary data and there is no clarity on the level of remoteness of location for businesses discussed.

A systematic review carried out by Deakins et al (2004) highlighted smaller businesses benefitting greatly from broadband adoption and also concluded that Scottish rural micro-businesses have major growth potential through broadband adoption. Deakins et al’s (2004) findings greatly inform readers of the benefits of broadband adoption by Scottish rural micro-businesses. However, the findings are not based on primary research. Galloway and Mochrie (2005) adopted the same systematic review approach as Deakins et al (2004) to find that there is was a slower uptake of broadband in rural areas in comparison to urban areas. The main reason highlighted by Galloway and Mochrie (2005) is supply and demand failures (eg inadequate rural infrastructure to deliver broadband and the lack of demand for broadband service acquisition by rural businesses) by small-medium sized businesses. Galloway and Mochrie’s (2005) research aids the understanding of current research towards broadband adoption by small rural Scottish businesses. However, this research mirrors the same limitation of a reliance on secondary research as was the case for Deakins et al (2004) where Galloway and Mochrie (2005) suggests future primary research within the area of rural business broadband adoption. Deakins et al (2004) and Mochrie (2005) do not clearly identify
the actual size of the businesses and the level of remoteness of the area they are based in (eg, remote-rural or accessible-rural) which further inform future research in the area of micro-business broadband adoption/non-adoption in remote-rural Scotland.

Findings from Galloway’s (2007) systematic research study challenged the findings from Deakins et al (2004) and Galloway and Mochrie’s (2005) research where Galloway (2007) highlights current broadband infrastructure as being insufficient in allowing rural businesses to gain benefits from broadband adoption. However, Galloway’s (2007) study also adds that there is no guarantee that sufficient infrastructure will aid the growth of Scottish rural businesses. Despite Galloway’s (2007) findings aiding existing knowledge on broadband adoption by rural businesses, she does not clarify the size of businesses included in her research and she does not carry out primary research which once again highlights the requirement for future primary research of broadband adoption/non-adoption by remote-rural Scottish micro-businesses. Galloway et al (2011) carried out primary research that was not included in most previous research within the area, eg Galloway (2007), Irshad (2010) and Bagchi (2013). The primary research consisted of interviews with Scottish rural business owner-managers and internet portal owners. Galloway et al (2011) found that the rural business owners used the internet to target international customers where internet portal owners highlighted that the business owners did not give the local markets the same focus. Galloway et al (2011) greatly informs existing knowledge in broadband adoption by rural businesses in Scotland, however, they do not highlight the size of the business that the interviewed owner-managers were associated with. Galloway et al (2011) as well as past research (Deakins et al, 2004; Galloway and Mochrie, 2005; Galloway, 2007 and Galloway et al, 2010) do not clarify whether or not the area of focus within Scotland is remote-rural or accessible-rural in accordance to the Scottish Government (2014) guidelines.
The Scottish Government (2011b) also carried out research consisting of broadband adoption by rural businesses in Scotland. The research consisted of a telephone survey with 1,000 small-medium businesses with owners/managers which found that over 95% of all Scottish businesses connect to broadband but only 72% of micro-businesses were highlighted as being connect to broadband. Amongst remote-rural businesses, 39% are micro-businesses whereas in accessible-rural and urban areas micro-businesses are 28% and 12%, respectively (Scottish Government, 2011a). Therefore, the research study carried out by the Scottish Government (2011b) has led to the research question of why is broadband adoption amongst rural micro-businesses lower than other business? The Scottish Government (2011b) research was based on primary research through the telephony survey, where the sample size and business sizes were clarified. However, no interviews with micro-business owner-managers were conducted which highlights a gap in existing research and informs future research consisting of interviews with remote-rural Scottish owner-managers of micro-businesses regarding broadband adoption/non-adoption.

The key conclusion from the literature reviewed is that although a significant body of literature exists around the adoption of broadband by rural businesses there is a gap in existing knowledge in relation to exploring barriers for broadband adoption/non-adoption by remote-rural Scottish micro-business owner-managers through the collection of primary data. The next section will discuss theoretical frameworks relating to adoption/non-adoption of technology/broadband considers their suitability for research regarding the remote-rural Scottish micro-business context.
Theoretical frameworks for broadband adoption/non-adoption

Various theoretical frameworks have been adopted in past broadband adoption studies. For example: Tookey et al (2006) adopted the Bass diffusion model in their Scotland based research; Dwivedi et al (2006) modified the Technology Acceptance Model (TAM) model. LaRose et al (2012) adopted Roger’s (2003) Diffusion of Innovations theory, Unified Theory of Adoption and Utilization of Technology (UTAUT) and Model of Adoption of Technology in Households (MATH) in their USA based research.

As the Bass diffusion model, Diffusions of Innovations theory and TAM have been adopted in multiple broadband adoption studies in the past, then this section will focus on these frameworks in order to determine the most suitable framework that can be implemented for research relating to the drivers and barriers for broadband adoption/non-adoption by remote-rural Scottish micro-business owner-managers.

The Diffusion of Innovations theory

The Diffusion of Innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread through cultures (Rogers, 2003). The difference between adoption and diffusion as highlighted by Rogers (2003) is that adoption is an individual process detailing the series of stages an individual undergoes from first hearing about a product to finally adopting it, whereas, diffusion is a group of phenomena which suggests how an innovation spreads amongst adopters (‘adopters’ represent all types of broadband users whereas the term ‘consumers’ will be restricted to broadband users that acquire broadband services).
A key benefit of adopting Rogers’ diffusion theory as highlighted by Godin (2003) is that the theory underlines the importance of adopter segment differentiation where it depicts the need to convince innovators and early adopters in order to make an innovation successful. Godin (2003) believes that the theory’s ideal types and percentages can be used as a template to estimate target groups for communication purposes. Moore (1991) adds that the theory shows patterns of adoption at each of the various stages during a product's life cycle through focusing on different characteristics of each adopter categories in terms of socio-economic status, personality, values and communication behavior. This suggests that segmentation of remote-rural owner-managers within Scotland based on geographic location and industry (eg businesses can be based in the Hebrides or Argyll and Bute and also associated with industries such as fishery and farming) may be valuable.

There are, however, criticisms of the diffusion of innovations theory. Moore (1991) argues that the diffusion theory is an overly simplified representation of a complex reality as adopters can possibly fall within different categories for different innovations, eg a current laggard can be an early adopter the next time around. So there is a need to be careful in identifying and understanding drivers and barriers for owner-managers in adopting/not adopting broadband as it cannot afford to mis-categorise adopters, non-adopters, un-adopters (Past adopters that have decided to stop adopting broadband). and potential adopters. Moore (1991) adds that the theory is not predictive as it does not provide insight in to how well a new idea or product will be received before it has gone through its adoption curve.
Technological Acceptance Model (TAM)

The TAM is the theoretical model based on the interactions of a number of factors influencing potential users’ decision in how and when they adopt a technology (Davis, 1989). Perceived Usefulness (PU; the degree to which the user believes that using a particular technology will enhance their performance) and Perceived Ease of Use (PEU; The degree to which a user believes that using a particular technology would be free from effort) are universally recognised as the most prominent factors within TAM (Davis, 1989). Although a key model in technology adoption studies, the TAM is not without its critics. It may be that TAM has limited explanatory power (Chuttur, 2009) in understanding adoption processes and may be of limited practical value. Amendments to the TAM by different researchers in order to adapt to a changing IT environment have led to a state of theoretical chaos and confusion (Benbasat and Barki, 2007); and the social processes associated with implementation and development after adoption of a particular technology by a population (Bagozzi, 2007). However, a modified version of the model focused on broadband adoption research was adopted by Dwivedi et al (2006) for research in England. The TAM may be relevant for this research as it takes account of social constructs underpinning adoption such as perceived ease of use.

Bass Diffusion Model

The Bass diffusion model focuses on how new products are adopted by a particular population and on the interaction between users and potential users (Bass, 1969). Radas (2005) highlights that the model can be used effectively in marketing for capturing the life cycle dynamics of a new product and as a decision aid in making pre-launch, launch and post-launch strategic choices for new products. However both Radas (2005) and Dekimpe et al (1998) have concerns regarding the reliability of the model. An adjusted version of the Bass
model suggested by Dekimpe et al (1998) may aid the research in looking at the early stages of broadband adoption by micro-business owner-managers which can be crucial in forecasting whether they carry on adopting or they simply un-adopt the product. However, the aim of the research is not to predict or forecast broadband adoption/non-adoption by owner-managers and the model does not consider social constructs towards adoption/non-adoption which are important for understanding the drivers and barriers for owner-managers in the research.

After critically reviewing the Diffusion of Innovations, TAM and Bass’ model, this section has found that given their focus on social constructs and processes, the TAM and Roger’s theories may be relevant to future research regarding drivers and barriers for broadband adoption/non-adoption by remote-rural Scottish micro-business owner-managers. The next section will discuss the key findings of this paper.

**Conclusion**

The advent of broadband has opened up a number of opportunities for business (Leiner et al, 2013) including those in rural areas (Bagchi, 2013; Deakins et al, 2004; Irshad, 2010). However, in Scotland, there may be a slower uptake of broadband in rural areas in comparison to urban areas (Galloway and Mochrie, 2005). Although there have been a number of studies on broadband adoption/non-adoption (not limited to Scotland) these studies have certain limitations. For example: focusing on normative behavior ie what SMEs could/should do regarding broadband adoption rather basing their work on primary data to describe what SMEs actually do/do not do; and why. In some cases sample size or business size are not clarified. Using the European Union definition of SMEs (Europa, 2007), a micro business is many times smaller than a business at the medium-large business threshold so
even within the SME category there is significant variation in terms of size, financial resources, expertise and so on. So clarifying the size of business in studies is important. With regards to rural businesses in particular, a distinction made by the authors of this paper (based on Scottish Government, 2013), regarding the remoteness of rural areas/businesses from larger more urban areas. Within a Scottish context, accessible-rural areas may still have comparatively straightforward access to larger urban centres. However remote-rural areas may not be comparatively remote ‘as the eagle flies’ but due to (for example) their island location, accessing urban centres may be significantly more difficult (eg involving a ferry crossing and a drive requiring an indirect route to take account of the geography of the area). This accessible-remote distinction requires further development.

Taking together the previous literature and their ‘gaps’ in terms size of business, geographical location and in particular ‘remoteness’, the authors suggest that there is an opportunity for future research which focuses specifically on drivers and barriers of broadband adoption/non-adoption by remote-rural micro-businesses in Scotland. How to approach such research? The second half of the paper reviewed a number of theoretical frameworks which have been used by other studies to understand the adoption of technology, particularly broadband. The three frameworks reviewed were: Rogers’ Diffusion of Innovation Theory, the Bass Diffusion Model and the Technology Acceptance Model (TAM). From this review, TAM and Diffusion of Innovation Theory (or a combination of the two) appears to be potentially most suitable.

In conclusion, this paper highlighted a potentially important gap in existing knowledge relating to understanding the drivers and barriers regarding the adoption/non-adoption of broadband within micro-businesses in remote-rural Scotland. Future work will be to extend
and refine the arguments and concepts presented in this paper; and to conduct appropriate primary research on this topic.

References


