

## Understanding take-up of broadband by small and micro-enterprises: a case study

Liz Price  
Research Fellow  
Faculty of Business and Law  
University of Lincoln  
Brayford Pool Campus  
Lincoln, LN6 7TS  
[lprice@lincoln.ac.uk](mailto:lprice@lincoln.ac.uk)

Dr Don White  
Dean of Faculty of Business and Law  
University of Lincoln

Professor Andrew Atherton  
Pro Vice Chancellor – Strategy and Business Development  
University of Lincoln

Dr Hannah Noke  
Lecturer  
Nottingham University Business School

**Objectives:** The paper examines patterns of broadband take-up, implementation and effects within small and micro-sized enterprises. The research focuses on the 'onlincolnshire' initiative, a local government-led programme which aims to encourage broadband take-up through provision of connection subsidies to SMEs in rural areas of Lincolnshire.

**Prior work:** There is a well established and relatively mature literature on the adoption of ICT by SMEs, dating back to the information revolution of the 1980s. Much of the early literature identifies the drivers for and barriers to 'taking up' these technologies for smaller enterprises, and many propose that the nature of the smaller, owner-managed enterprise can reduce the propensity to deploy and invest in new technology.

**Approach:** The findings presented in this paper are based on primary research with companies that have adopted broadband as a result of the 'onlincolnshire' initiative. The research approach combined 40 qualitative interviews to explore how broadband had been adopted and implemented within the companies with a quantitative telephone survey of 150 companies to assess the effect of broadband on key output measures, such as turnover and employment.

**Results:** Three patterns of broadband adoption were identified: (1) efficiency gains within current activities; (2) to expand or enhance an existing business model; and (3) to change the business model and re-position the enterprise. Broadband take-up to fundamentally re-position the enterprise was the least common pattern, indicating that adoption of this technology medium occurred to enhance established trading and operating patterns. The findings suggest that, although few businesses used broadband technology to change their business model, the majority reported improvements in efficiency, productivity, and profitability.

**Implications:** There is little indication that broadband connection stimulated or produced new business models. This implies that current government policies to encourage the development of new business models through promotion of ICT do not reflect the experience of new technology adoption by small businesses. The findings are relevant to policy makers, practitioners, and researchers in the field of e-business.

**Value:** The paper outlines a data-driven and, therefore, grounded conceptual framework of broadband adoption, which outlines both uses and effects of broadband at the level of the firm. The findings and model are generated from, and driven by, in-depth fieldwork with small and micro-sized firms.

## Introduction

Information and Communications Technology (ICT) and, specifically, broadband internet access are recognised as being key contributors to business competitiveness and the development of a knowledge society. The European ICT Policy, which sets out priorities for the promotion of and investment in ICT in Europe up to 2010, highlights the importance of ICT to the European economy and states that “differences in economic performances between industrialised countries are largely explained by the level of ICT investment, research, and use”. In 2003, the UK action plan to facilitate roll out of broadband services – UK Online: the Broadband Future - emphasised that, “internet connectivity is having a profound impact on business competitiveness” and that ecommerce is associated with “lower costs – in procurement, production, and selling and distribution – as well as stimulating the development of new markets and services”.

The last five years have seen major changes in availability and usage of broadband both for domestic households and businesses. The UK now leads the OECD countries for availability of broadband at speeds of up to 8mbp/s, having ranked 21<sup>st</sup> in 2001 (DTI, 2006). This growth in broadband availability is partly a result of intervention by regional development agencies and local government authorities to encourage broadband deployment in remote and rural areas of the UK. These are areas where there has traditionally been little incentive for private broadband infrastructure providers to upgrade telephone exchanges and invest in new technology due to low population densities and, therefore, comparatively low levels of demand.

Examples of such initiatives include ActNow in Cornwall, the Northern Ireland Broadband Initiative, and Project Access in Cumbria. The Lincolnshire Broadband Initiative, ‘onlincolnshire’, is another example of a local government-led initiative which aims to promote broadband deployment and take-up in a rural and sparsely populated area.

Broadband access in rural areas poses a particular challenge for both policymakers and broadband infrastructure providers. At the same time, broadband and applications enabled by broadband offer businesses in rural areas the opportunity to work in innovative ways, using remote and home working, video conferencing, and email.

This paper focuses on the experiences of SMEs and micro-businesses in Lincolnshire that have received subsidies to connect to broadband as part of the ‘onlincolnshire’ initiative. The paper explores drivers for broadband adoption, and patterns of broadband take-up, implementation, and its effects within firms. A number of detailed case studies are used to illustrate the experience of broadband adoption and use from the SME perspective. The paper concludes with a discussion of the barriers and enablers that prohibit and drive use of broadband to enable more advanced and sophisticated use of ICT within firms.

### The ‘onlincolnshire’ Initiative

The Lincolnshire Broadband Initiative, ‘onlincolnshire’, was launched in 2003 by Lincolnshire County Council, using £15 million of European and matched funding. The aim of the initiative was to promote accessibility and take-up of broadband services for SMEs in rural areas of Lincolnshire. The initiative aimed to achieve this through delivery of the following services:

- (i) subsidies to encourage SMEs to connect to a basic ADSL broadband service (£200 per SME)
- (ii) subsidies to encourage SMEs to connect to an high-speed broadband service, delivered using wireless technology (£100 per month for the first year)
- (iii) free ICT diagnostic advice delivered to SMEs (30 hours per SME);
- (iv) funding of individual ICT projects to SMEs up to a value of £10,000 or at least 50% of the cost;

'onlincolnshire' provides a range of services which aim to encourage implementation of broadband and ICT solutions by SMEs, including connection subsidies, tailored business advice, and grants to cover 50% of the costs of ICT projects. For the purpose of this paper, the focus is primarily on firms that received subsidies to connect to a basic ADSL broadband service, rather than those that have received business support and grants to fund ICT projects.

## Literature Review

ICT technology is widely regarded as a major force of economic globalisation (Renuka and Venkateshwara, 2006; Meall, 2002). Internet and broadband technology, in particular, provide new media for access to international markets, and enable firms to broaden their activity away from local or national arenas. Broadband connection to the internet is identified in the wider literature as a main precondition to achieve the benefits of more sophisticated ICT adoption and usage (Arbore and Ordanini, 2006; Mehrtens et al. 2001; Prieger 2003).

There is much debate in the literature as to the appropriateness of e-commerce to SMEs. Ramsey et al (2003) emphasise the importance of e-business to all sizes of business, whether small or large, stating that it has "forced firms to experiment with new ways of marketing and to and doing business with existing customers". This, they suggest, has led to the emergence of "new network-based global e-business models". However, they also state that, for the majority of SMEs, "e-commerce remains a curious notion that has little significance for their own enterprises and business plans".

Renuka and Venkateshwara (2006) argue that SMEs are better placed to benefit from new technology than large firms. They state that SMEs have a number of strategic advantages in terms of "flexibility, informality, and adaptability". This, in turn, allows SMEs to "take advantage of rapid technological advantages for their survival and competitiveness in the present context of the global economy".

A number of models have been developed that seek to reflect the stages of ICT and e-adoption as experienced by firms, including the SOG (Stages of Growth) e-model (Nolan, 1973) and the DTI E-Adoption Ladder (2000). Both indicate that firms follow a linear pathway from basic to more sophisticated levels of e-adoption. According to Prananto et al (2001), the SOG e-model is regarded as the first attempt to describe, and develop an understanding of, the phases of IT use as firms move from basic towards more sophisticated levels of IT adoption and management. The original model comprises four stages, largely based around the development of traditional IT processes rather than internet-enabled applications.

Since the growth in internet use and broadband availability, models have been developed to reflect patterns and progression in IT use related to e-business. These include the E-commerce Maturity model (KPMG, 1997), the E-Adoption Ladder (DTI, 2000), and the Internet Adoption Model by SMEs (Mehrtens et al, 2001). The DTI E-Adoption Ladder is similar to the SOG e-model in that it sets out incremental stages of internet and IT adoption, from basic to mature use within the firm.

Most of the models outlined above are based on the notion that firms make a transition through different stages of e-business maturity. They assume, therefore, that a linear pathway of e-adoption occurs in an incremental fashion from lower to higher stages. Criticisms of these models centre on the *assumed* unilinear progression of firms from basic to mature forms of e-adoption, regardless of individual firm characteristics and the relevance of internet technology. Another criticism relates to what Prananto et al call the "partly descriptive and partly prescriptive" nature of the model which sets out the characteristics of each stage of transition, but also implies how the firm should or ought to progress.

The models also provide a rather simplistic picture of e-adoption which is of limited use to those seeking to support SMEs in their e-adoption strategies. The following questions remain unanswered: what conditions need to be in place to enable firms to progress from one stage to

the next; and how can businesses be supported to enable transition up the ladders and pathways that these models prescribe?

## Research Methodology

The findings presented in this paper have been developed from in-depth primary research with SMEs that had received assistance from the Lincolnshire Broadband Initiative. A number of research techniques were used:

- In-depth interviews with 40 SMEs to explore the experience of broadband adoption and implementation. A qualitative, semi-structured approach was adopted to develop a detailed understanding of the process of broadband access, adoption and implementation from the perspective of the SME. Interviews were undertaken at the SMEs' own premises and generally lasted around half an hour to an hour. The interviews explored the following issues: (i) drivers of broadband adoption; (ii) how broadband was being used within the business and the applications it supported; (iii) the effects of broadband adoption on the business in terms of productivity, sales, expenditure etc; and (iv) capacity issues, such as skills and knowledge of ICT, and the ability of SMEs to use new technology to its full potential.
- Follow-up interviews with 15 SMEs. At the time of the first interviews, some companies had been connected to broadband for as long as a year, but others for as little as a month. For this reason, longitudinal interviews were undertaken with a sample of the original interviewees after a period of at least 6 months to explore how SMEs' use of broadband had changed over time.
- A telephone survey of 150 SMEs to provide a quantitative assessment of economic impact of broadband and ICT on businesses. The survey pro forma was developed using themes and patterns identified in the qualitative interviews, and used mostly closed questions with pre-defined answer options to develop quantitative data on the take up and effects of broadband related technology. The survey explored the following themes: (i) take up of broadband and related services; (ii) how broadband had been used within the business; (iii) frequency of ICT use before and after broadband adoption; (iv) effect of broadband on a number of key output measures, such as employment, turnover, productivity and skills.

Interviewees were selected using a random sample from the 'onlincolnshire' database. The samples for both the interview and survey phases included a broad representation of SMEs from different user groups, geographical areas, company sizes, and industrial sectors.

## Results

### Drivers of Broadband Adoption

SMEs that took part in the qualitative interviews were asked why they had decided to implement broadband within their business. The most frequently cited drivers of broadband adoption related to increasing the internet connection speed (18 firms), improving efficiency (10), and improving marketing (10).

What is clear from the interview feedback is that, for the majority of businesses, broadband adoption was regarded as a common sense or necessary step for the business. The alternative means of accessing the internet – dial up – was regarded by most as no alternative at all, particularly in rural areas. For example:

"the main driver was internet access for looking things up and emailing, obviously because prior to this we didn't have any internet connection at all...well, it was a really bad connection" (Company 26)

“dial up was pure trivia so the first reason for applying for broadband was speed and secondly, we do a lot of research on prices and bits and pieces like that, as well as banking online” (Company 10)

A small number of companies, four, stated that they would not have applied for broadband if funding had not been available. For these companies, the ‘onlincolnshire’ initiative enabled them to have access to a service that they may not have otherwise been inclined to implement or been able to afford. For example, Company 14 stated,

“the main attraction was that it was paid for by someone else and the fact that someone else offered to install it for us”

Two companies had adopted broadband in order facilitate home working and working from more than one site, which would not have been possible using a dial up connection.

The qualitative interview findings are complemented by the findings of the telephone survey, shown in table 1 below. Increases in efficiency and increasing the speed of internet access were cited as the key reasons for adopting broadband by 30.1% and 26.5% of respondents respectively. For the vast majority of companies, the appeal of broadband seemed to relate to anticipated improvements in internet and email use and the potential efficiency gains that these might bring about. Only a minority of companies anticipated more advanced use of broadband within their business. For example, a very low proportion, 3.6%, adopted broadband in order to develop new systems.

**Table 1 – Drivers of Broadband Adoption**

Drivers	% of respondents
Marketing opportunity	13.3
Increase efficiency	30.1
Improve sales	4.8
Speed of access	26.5
Essential for business	9.6
Because funding available	12.0
To develop new systems	3.6

### Uses and Implementation of Broadband Technology

Interviewees were asked how broadband had been used within their business; what existing uses and applications it had been used to support, and whether it had enabled the business to use ICT in a new or different way.

The most widely reported use of broadband technology – identified by almost all companies in the sample – was increased email and internet access. There was felt to be a big difference compared with the experience of using dial-up, particularly for businesses in rural areas. For example, Company 37 commented, “using broadband is so much better than dial-up – it was so frustrating”. Company 27 stated, “prior to broadband we had a dial-up connection, which was an absolute nightmare, and used to literally plug in and unplug it was we needed it”.

An improvement in the speed and accessibility of the internet had led – for 24 companies – to an increase in the use of the internet to conduct research and to source and purchase goods and services. Just under half of the interviewees (18) purchased goods directly over the internet.

Conducting research – for a variety of purposes – was cited as a key benefit of improved internet access. More than half of the interviewees had used the internet to compare their services with other, similar businesses in the area. Other purposes of online research included

looking up telephone numbers, researching government legislation, and downloading forms. For example, Company 14 commented, "it is my first port of call for everything now".

Website development was identified as something that broadband facilitated, partly because of the faster internet connection, which made website development and maintenance more feasible, but also because the one-off monthly payment enabled businesses to devote time to their websites without considering the cost of being online. Some companies found that the opportunity for website development had enabled them to develop new IT-related skills. For example, Company 15 stated, "doing the website ourselves is the best thing we ever did, because now we can take photographs and update the websites ourselves".

Of the companies that had developed a website, the majority (23) had a basic site which enabled them to have a web presence. A small proportion of the companies, eight, had ecommerce sites which enable them to sell goods and services over the internet. These comprised mainly retail and manufacturing companies, with products ranging from gifts, golf products, textiles, footwear, and digital images.

Other uses and applications that companies had identified as being supported by broadband included advertising on online directories (5), finding new suppliers (5), use of video conferencing and internet phones (3), and using broadband technology to enable better ways of working such as shared services and ftp files (2).

### Effects of Broadband Implementation

The interviewees were asked whether the adoption of broadband had brought about any improvements to their business, or any changes to the way their business operated. The results from the qualitative interviews are shown in Table 2.

**Table 2 – Effects of Broadband Implementation**

Effects	Number of Firms
Time savings	28
Cost savings	14
Improve communication with clients/ suppliers	14
Access new customers	7
Remote working	6
Increase in sales/ enquiries	6
Improved IT skills	5
Appear more professional	5
Provide new services	4
Access international markets	3
Wholesale to retail	2

The most frequently reported effects of broadband implementation, cited by 28 companies, related to time and cost efficiencies. A number of examples were given by respondents which showed how broadband contributed to improved efficiency, including the increased speed of internet and email access, being able to use the telephone and internet at the same time, the ability to work online at any time without consideration of the cost, and savings to telephone bills. Several companies that used email to send files noticed that time was freed up for other activities. For example, company 7 stated, "it's really speeded up the process of sending and receiving electronic drawings – it now takes 5 minutes rather than 40 minutes."

Interviewees identified that sourcing and procuring goods over the internet sometimes led to savings in costs and time. Online ordering was perceived to take less time than ordering over the phone, and several companies commented on the cost savings made by using the internet to make price comparisons and for ordering goods and services. For example, Company 14

stated, "I will never pay more than I have to now", as she was able to compare suppliers' websites and ensure she was paying the lowest price.

Fourteen companies stated that broadband adoption had made a difference to the way they communicated with their clients and/or suppliers. Company 4 was able to relocate its offices to Lincolnshire and continue working with existing customers in the South East by using email and video conferencing. Other companies found that use of email reduced problems associated with communicating with customers in different countries. For example, Company 17 commented "we're involved in exporting some of our products and email makes it so much easier – you don't have to worry about the language barriers".

Use of broadband, and in particular websites, to access new markets and new customers was identified as being a benefit of broadband adoption by at least seven companies. For example, as a result of developing a website, company 7 had received enquiries and sales from other areas of the UK and had started to attract customers from younger age groups. Company 33 found that they were attracting customers from outside Lincolnshire as a result of their website.

A small number of companies identified that broadband had enabled them to provide new services (4 companies), access international markets (3), and change the nature of their business (2). For example, Company 1 found that having a good website had enabled him to reach new international markets. The owner commented,

"I've been able to secure a deal with a US company that were looking for a UK company to act as an agent. Because they contacted me via the website, they thought I was a big multi-national".

Companies 15 and 17 had developed ecommerce websites which enabled them to move from being solely wholesalers to retailers. In other words, they were able to use their websites to sell directly to domestic customers. For both companies this led to an increase in sales turnover and profit. For example, Company 17 stated,

"It was a conscious decision to become more web-based because we have a small customer base, with two main retailers who sell our products at very good prices, but we can't rely on their business forever. The website has done a good job – most of the orders via the website have been small but we're starting to get repeat orders".

### **Wider Outcomes and Impacts on SMEs**

Using a list of key output indicators, telephone survey respondents were asked whether they felt that adoption of broadband had had any wider impact on their business. The results are shown in Table 3.

The findings suggest that broadband and applications enabled by broadband brought about improvements in productivity (75% of companies) and turnover (71%) to the vast majority companies involved in the telephone survey. During the period of the 'onlincolnshire' initiative, the companies in the sample experienced a mean growth in turnover of £133,573, of which £11,659 was directly attributable to broadband.

More than half of companies experienced benefits associated with broadening customer profiles and increases in sales. Sixty three percent experienced a growth in customers. Increases in profit were identified by 62%, and 54% had experienced an increase in sales. Just under half of companies, 46%, felt that broadband had led to new market opportunities. A low proportion of companies, 12%, experienced an increase in exported sales, which suggests that the growth in customers and sales experienced by the majority of companies were from within the UK.

Businesses were less likely to report changes to their staff, with 44% reporting an increase in salaries costs, and 35% increasing their workforce. Only 5% experienced a growth in staff specifically involved in ICT, and just 2% had employed more graduates. During the programme

period, the companies in the telephone sample experienced a mean employment growth of 1.3 full time equivalent staff; of which 0.1 was directly attributable to broadband.

**Table 3 – Wider Effects of Broadband on SMEs**

Outcome	% reporting increase
Productivity	75%
Turnover	71%
Customers	63%
Profit	62%
Sales	54%
Level of investment	51%
Number of products/services	50%
Increase ICT in the business	47%
New market opportunities	46%
Cost of salaries	44%
Number of employees	35%
Increased skills of workforce	34%
Supply chain management	31%
Company net asset value	20%
Number of exported sales	12%
Increased ICT employees	5%
More involvement with HEIs	3%
More graduate employment	2%

### Developing a Framework of Broadband Use and Outcomes

From the qualitative interviews and telephone survey, a broad typology was developed which set out (i) the range of uses that broadband had enabled and (ii) the benefits that could be attributed to broadband implementation.

The interview findings suggest that, for the largest group of businesses, the principal benefits of broadband adoption relate to efficiency gains, such as reduction in costs, and the time taken to complete tasks. A slightly smaller number of businesses had used broadband technology to broaden their customer profile, reach new markets and increase sales. For a small number of SMEs, broadband had brought about significant changes to the way the business operated. The effect of broadband on businesses can be summarised under the following three broad headings:

**Efficiency Gains:** general savings in time and costs brought about by faster email and internet access, the ability to download and email files, and conducting research over the internet. Other efficiency gains relate to the use of the internet to source goods and services, which can result in cost savings, and online banking.

**Enhanced Model:** improvements made to the way the business operates as a result of broadband adoption, and the use of broadband to lead to new customers or markets. Ways in which businesses have used broadband to enhance their business model include: developing a website to give the company a web presence and promote services to new and existing customers; use of online directories to market goods and services; use of the internet to find new suppliers, an increase in online purchasing, and use of innovative methods of electronic communication such as video conferencing and skype.

**Transformed Model:** changes in the way the business operates, or the business model, as a result of broadband adoption. Examples of how broadband has been used to bring about such changes include: the development of an ecommerce website which allow companies to sell in



new and different ways; use of broadband technology to allow relocation, home working, or working from more than one site; providing new services, such as hosting of others' websites or developing an additional stream of business.

From the qualitative interviews it was found that 16 companies had experienced efficiency gains, 15 had enhanced their existing business model, and 7 had developed a new, transformed business model.

## Case Studies

The following case studies provide a detailed illustration of three SMEs' experiences of taking up and using broadband within their business. The case studies exemplify adoption and use of broadband that is characteristic of the three types of effects: efficiency gains, enhanced model, and transformed model.

Case study 1 provides an example of a company that used broadband adoption to bring about broad efficiency gains to the operation of the business. The owner of the company, which provides architecture design services, used broadband to improve the way he communicated with clients and with an assistant who worked from home. He also found that he was able to find details of building materials online and get feedback on the materials from clients by email.

The owner used his broadband connection for a limited range of applications – such as email communication with co-workers and clients, sending and downloading files, and researching products on the internet. The broadband connection was not used to facilitate more advanced use of ICT – such as the development of a website or online purchasing, for example. Despite this, the company experienced noticeable savings in time which led to more time being available for other tasks, and brought about a decrease in stress experienced by the owner.

### Case Study 1: Efficiency Gains

#### Company 7

**Type of Activity:** architectural design services

Company 7 has been in operation for 13 years and comprises one owner manager and a part-time assistant. The company undertakes commercial and domestic architectural work, mostly for customers in the local area.

The main effect of broadband adoption has been an increase in the speed of the internet connection. The owner sends autocad drawings to clients, and this used to take a long time when the company used dial up. The owner communicates by email with his part-time assistant, who works from home, up to 8-10 times a day. According to the owner, broadband has made this a lot quicker, *"it has speeded it up brilliantly and has made a big difference to me actually"*.

The owner has noticed that broadband has made checking emails easier, *"when you are online all day you can check it periodically and I suppose that must be saving a bit of money on phone calls"*. He has also found that he can download colour sheets and drawings of materials and email these to clients to get instant feedback. This was not something he had anticipated when he first applied for broadband. The company has not developed a website, mainly because it attracts most of its business by word of mouth.

Overall, broadband adoption has led to improvements in efficiency for the company and, from the owner's perspective, had made everything a bit easier, *"from a personal perspective I am a bit less stressed because I know I can get things done quicker and the relationship between me and my assistant has improved"*.

Case study 2 provides an example of a company that used broadband to bring about significant improvements to the existing operation of the business, and reach new customers and markets.

The broadband connection enabled the owner to experiment with her website and use it to showcase new products and to advertise additional streams of her business, such as yoga classes. Although the website was not ecommerce enabled, the company received enquiries and sales over the phone from customers in different areas of the UK. The website generated custom from demographic groups that were different from the company's previous 'typical' customer profile. The owner has started to make savings by purchasing materials over the internet from suppliers outside the UK. Although broadband adoption did not bring about significant changes to the way the business operates, the implementation of a website and use of online purchasing enabled the owner to expand her business into new markets and to become more sustainable as a result.

**Case Study: Enhanced Model****Company 8**

**Type of Activity:** fabric design and sports clothing

Company 8 has been in operation for twenty five years, at first specialising in fabric printing before moving on to designing yoga clothing. It is owned and managed by one person, who works from premises at home.

The owner feels that the broadband connection has enabled her to spend more time developing her website. The one-off payment means that she has been able to spend time updating the site without consideration of the cost of being online. The website is used as an electronic brochure to showcase products and test out new styles, "*having the website is like having a shop window to test products out and they can be put up there very quickly*". Compared to when the products were advertised solely through a printed brochure, the website has enabled the company to attract customers from younger age groups and from a broader range of geographical areas in the UK. The website is not ecommerce enabled, because the owner prefers customers to order over the telephone, so that they can provide a more personal service and discuss measurements.

Since adopting broadband, the owner has found that she sources a higher proportion of materials online, and now purchases t-shirts from Holland and fabric from Denmark. She has also started to use the website to advertise yoga classes, which have been fully subscribed as a result.

Case study 3 provides an example of a company that used broadband adoption to transform their business model, i.e. make significant changes to the way their business operates. The company, which imports and sells footwear products, had previously operated as a wholesaler for a small number of customers in the UK. After connecting to broadband, the company developed an ecommerce website which enabled it to sell directly to domestic customers.

The implementation of the website led the company to change the focus of its business. Prior to the website, the company dealt solely with retail suppliers and shops. After the development of the website, the company sold to both wholesalers and domestic customers and the owners estimate that, within the next year, internet sales will account for 70% of total sales.

**Case Study: Transformed Model****Company 15****Type of Activity:** wholesaler and retailer of footcare products

Company 15 has been in operation for 23 years. It imports and sells footcare products, such as insoles and shoe laces. It is owned and managed by a husband and wife partnership, who run the company from home.

As a result of the diagnostic and grant, Company 15 has developed a website which enables it to sell products online and control stock. The development of an ecommerce website was recommended by the diagnostic report, and the company decided to go with the cheapest of the three quotes they received as part of the grant process. The owners were pleased with the website but, at first, were concerned that the web developer had left them to put items on and take them off without any support. The owners since feel it was the best thing he could have done, adding, *"it is brilliant – it is the best thing he could have done - because we take photographs ourselves and put them on the site, and when things are sold we take them off"*. The company was, therefore, able to learn new computer skills as they became more familiar with managing the website.

Before developing the website, Company 15 operated entirely as a wholesaler of footcare products. The business wasn't doing very well, and a number of customers had been lost due to bankruptcy. The website enabled the company to diversify into retail, and sell directly to domestic customers. The owners have been surprised by the amount of business generated through the website, which included one order for 7,500 pairs of shoe laces. Supplying to domestic customers has meant that the company deals with smaller volumes, but generates more profit. The owners feel that diversification into retail has enabled the company to increase its sales turnover, and become more sustainable.

### A Framework of Broadband Adoption and Outcomes

Table 4 outlines the three broad levels of impact identified through the qualitative interviews – efficiency gains, enhanced model, and transformed model. The table sets out the uses and outputs that typify and are characteristic of the three levels of impact experienced by SMEs. Analysis of the drivers of broadband adoption suggests that that these do not necessarily determine how SMEs go on to use broadband, nor the effects of broadband adoption. For this reason, the drivers are not directly correlated to the level of impact experienced by SMEs, but are presented as ‘generic’ factors that that influence broadband adoption.

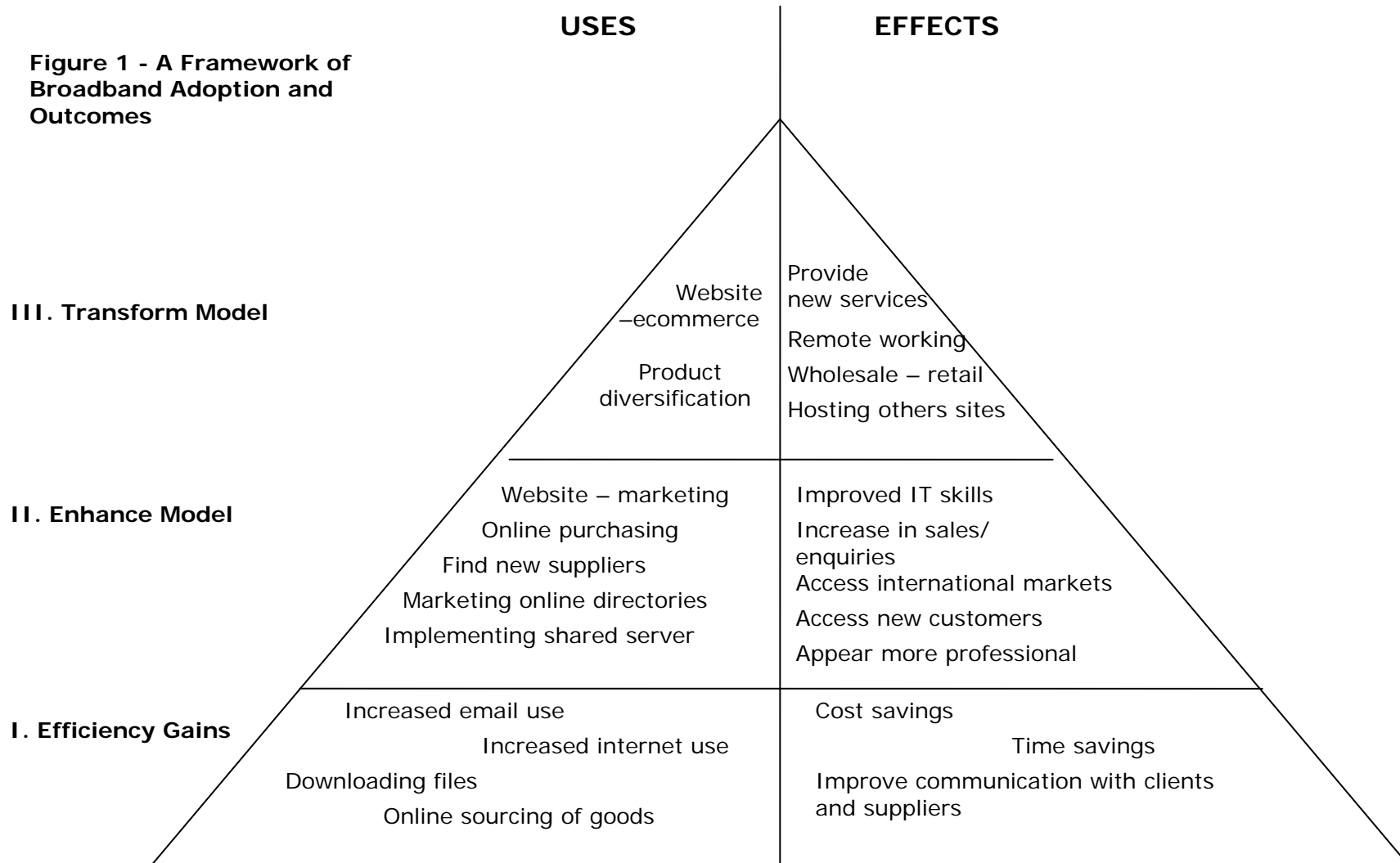
**Table 4 – Drivers, Uses, and Outcomes of Broadband Adoption**

	<b>I. Efficiency Gains</b>	<b>II. Enhance Model</b>	<b>III. Transformed Model</b>
<b>Drivers</b>	Funding available  Improve access speed	Improve efficiency  Reduce costs  Increase sales	Relocation  Develop new systems
<b>Implementation/ Use</b>	Increased email use Increased internet use Downloading files Online sourcing of goods Online research	Video conference /Skype Implement shared server Website – marketing Online purchasing Finding new suppliers Marketing on online directories	Website ecommerce Product diversification
<b>Outcomes</b>	Cost savings Time savings Improve communication with clients/suppliers	Improved IT skills Increase in sales/enquiries Access international markets Access new customers Appear more professional	Move from wholesale to retail Offer new services Develop an additional business Remote working

Figure 1 sets out a proposed framework of broadband adoption and outcomes, which outlines uses and effects at the level of the firm. The pyramid format reflects the proportion of SMEs that – from our qualitative interviews – experienced each type of impact.

The framework reflects our finding that, for the vast majority of SMEs, broadband adoption brings about efficiency gains (as a result of faster connection speeds and increased email use) and improvements to their business model (as a result of, for example, website development and reaching new customers and markets). Only a very small proportion of SMEs use broadband to bring about significant changes to their way their business operates.

**Figure 1 - A Framework of Broadband Adoption and Outcomes**



## Barriers to Broadband Adoption

Feedback from the companies that took part in the qualitative interviews suggests that there are a number of factors that drive and inhibit SMEs' propensity to embrace broadband technology and use it to its full potential. These barriers and enablers are important to understand, particularly for policymakers and business support providers that seek to assist SMEs in their take-up of broadband and ICT technology.

Barriers to realising the full benefits of broadband adoption include: limited computer skills; loyalty to existing suppliers and distributors; fear of online purchasing and internet security; preference for face-to-face contact; lack of relevance to the business; loyalty to the concept of shop fronts; and the ambition or enthusiasm of the owner.

Computer skills were found to be a key determinant of broadband adoption and use of broadband enabled applications. Several respondents felt that their ability to maximise the benefits of broadband was limited by their lack of computer skills. This was emphasised, in some cases, by a lack of confidence or slight fear of new technology. The vocabulary and 'jargon' associated with ICT technology was also considered alienating by some interviewees. For example, Company 29 commented:

"it is the wrong generation...you see other people do it so easily and it comes natural to them – I'm trying to write it all down".

While the majority of interviewees used the internet to research and purchase goods, a small number showed a reluctance to purchase online. Distrust of internet security was one factor that prevented online purchasing using credit cards. For example, Company 21 stated:

"this sounds very stupid but I am still scared (of online purchasing). I have only ever made one purchase online and that was for some software that had to be bought over the internet and it is the only one I have done, but I do find putting the credit card details in scary".

A further reason for resistance to online purchasing was a preference for traditional methods of ordering – such as in person or over the phone. Online ordering was not always regarded as reliable. For example, Company 10 commented:

"to be honest, even though we are in the 21<sup>st</sup> century and we are meant to be a country full of technology, to put your orders on line is actually more difficult and more hassle than it is worth because by the time they picked them up and the order has been placed you are not aware of stock problems"

Other companies had an established supplier base which they preferred to use rather than searching for cheaper prices and alternative suppliers online. Companies 20 and 24, for example, both stated that they had suppliers that visited every month. For these companies, face-to-face contact and trusted relationships with suppliers were considered more important than the cost savings that might be achieved through online transactions.

For some companies involved in wholesale and retail, there was a feeling that internet technology posed both an opportunity and a threat. For example, company 21, which provided display stands for shop floors, commented:

"there is no doubt that I will come round to it eventually (selling online) but I am hoping that it doesn't go too much that way or else it will do my business in if nobody goes to the shops anymore"

Company 3 was concerned that, by selling her products directly to the customer, she would be taking custom away from the shops that she supplied:

“I’m not sure I want to sell my products online because it might detract from the business of my customers who sell through their shops”

Company 3 also felt that internet selling would reduce the ‘exclusivity’ and desirability of her products which were currently only available through a small number of outlets.

Several companies felt that certain applications enabled by broadband were not appropriate to their business. For example, two businesses felt that a website was not appropriate because they provided specialist services aimed at a small number of customers. Of those that had developed websites, three SMEs found that they had attracted a high volume of enquiries from potential customers that misunderstood the nature of their products. One of these had withdrawn his website as a result.

The ambition of the owner was also found to be a key determinant of the extent to which new technology was implemented as a result of broadband adoption. Lifestyle businesses appeared to be less likely to use broadband to its full potential. For example, company 24 stated:

“I don’t know if we want to go on to the internet to sell our products. We might look at it but I don’t want the business to get big – I am quite happy with the work I can cope with”

### **Enablers of Broadband Adoption**

Enablers of broadband identified through the interviews with SMEs include: the ambition and enthusiasm of the founder; ICT skills and knowledge; tailored business advice and support; and changes in the purchasing/selling methods of buyers and suppliers.

Just as some lifestyle businesses were found to use broadband technology for a limited range of its potential use, the interview findings suggest that companies with ambitions to grow were more likely to embrace broadband technology. For example, company 28 was asked what they hoped to use their broadband connection for. They stated:

“Hopefully to go on the world wide web so that people in Canada or wherever who have relatives here can order a hamper and have it delivered here in the UK. We want to conquer the world, we want to go world wide”

Companies with computer knowledge and skills were found to be more likely to use broadband to develop more sophisticated uses of ICT. For example, company 4, a media design company with expertise in web design and data management, used the broadband connection to facilitate many different ICT applications including video conferencing, off-site secure data storage, and remote working.

For those without advanced ICT skills, an enthusiasm to learn was found to be important. For example, before broadband adoption, Company 36 rarely used their computer. After connecting to broadband they were able to spend more time on their computer and developed an interest in computing. The company went on to use the broadband connection for a range of uses – such as emailing clients, online booking, and advertising with online directories. The owners commented:

“we went out and bought a new computer in January because we’d got the broadband and we’d done the computer course and we are now using our computer a lot more”

Business advice and support was identified as a key determinant of ICT adoption. Companies that had received some form of business support in the early stages of broadband adoption appeared better able to understand and implement the range of uses it could be used to support. Business support was most effective where it was tailored to the needs of the business, and where it addressed business-focused rather than solely ICT-focused solutions. Several companies that had received advice from IT consultants complained that they found the experience alienating and frustrating. For example, Company 9 commented,

“a consultant came to see me, but I was out of my depth. He talked me into oblivion and I lost concentration after probably about an hour and I just wanted him to go to be honest. I found it really really tiring and I couldn't understand him and I felt stupid.”

The purchasing and selling methods of companies' buyers and suppliers were found to be a driver of internet use and online purchasing. Several companies stated that their suppliers were increasingly using the internet to sell products and that, in some cases, purchases could only be made over the internet. This meant that companies were effectively forced into online purchasing. Company 17 also found that the only way to find new suppliers was via the internet, as suppliers for the products they needed no longer held buyers events and seminars.

## Conclusions

The findings suggest that take-up of broadband by SMEs is characterised by three patterns of impact: efficiency gains to the businesses' current activities; expansion of the existing business model; and transformation of the business model and re-positioning of the enterprise.

Use of broadband to bring about efficiency gains and to enhance business operations were the most commonly observed patterns. Broadband take-up to fundamentally re-position the enterprise was the least common pattern, indicating that adoption of this technology medium occurred to enhance established trading and operating patterns. The anticipated effects of broadband take-up as outlined in the academic and policy literature, such as access to international markets and adoption of new ICT systems, were not realised by the majority of SMEs.

The process of broadband adoption as experienced by SMEs suggests that firms do not necessarily take a linear path from basic to more advanced stages of ICT adoption and proficiency. The majority of SMEs use broadband for a small proportion of the potential applications it is able to support. However, for many of these, more advanced applications are considered neither relevant nor desirable. A number of factors are shown to promote and inhibit the propensity of SMEs to embrace ICT, including the size of the business and its ambitions for growth, ICT skills and knowledge, and the selling/buying methods of suppliers and buyers.

The results have a number of implications for policy makers and business support providers. These include:

- (i) broadband connection to the internet does bring about broad benefits to SMEs - these are more likely to be related to improvements in efficiency and productivity than adoption of new ICT systems and access to international markets.
- (ii) awareness raising and access to training are key to ensuring that SMEs are aware of the relevance of broadband to their business and have the skills to implement broadband-enabled applications;
- (iii) tailored business support that focuses on ICT and its role in small business development, rather than generic ICT development, is an essential element of any government programme that aims to promote broadband take-up by SMEs.



## References

- Arbore A and Ordanin A (2006)** *Broadband Divide among SMEs: the Role of Size, Location and Outsourcing Strategies* International Small Business Journal, 24 (1), p 83
- BMG Research (2006)** *The Challenge of E-Adoption in the East Midlands: East Midlands Small Business E-Adoption Survey*
- Broadband Stakeholder Group (2007)** *Predicting Bandwidths Report*
- DeZoysa (2001)** *SMEs – Not Just a Number* Telecommunications International, 35 (10)
- DTI (2005)** *i2010: Responding to the Challenge*
- KPMG (1997)** *Electronic Commerce Research Report* London, UK
- Meall, L (2002)** *Broadband Technology – the Trouble with Broadband* Accountancy 130 (1312) p 58
- Mehrtens J, Cragg PB and Mills AM (2001)** *A Model of Internet Adoption by SMEs* Information and Management, 39, p 165 - 176
- Nolan (1973)** *Managing the Computer Resource: a Stage Hypothesis.* Communication of the ACM (16:7), p 3990406
- Ovum (2006)** *International Broadband Market Comparisons Update*, March 2006, A report for the DTI
- Prananto A, McKay J and Marshall P (2001)** *Frameworks to Support E-Business Growth* The 9<sup>th</sup> European Conference on Information Systems, Slovenia
- Prieger J E (2003)** "The supply side of the digital divide: Is there equal availability in the BB internet access market?" Economic Inquiry 41 (2) 346-63
- Prime Minister's Strategy Unit and DTI (2004)** *Connecting the UK: the Digital Strategy*
- Ramsey E, Ibbotson P, Bell J, Gray B (2003)** *E-opportunities of service sector SMEs: an Irish cross-border study* Journal of Small Business and Enterprise Development, 10 (3)
- Renuka SD and Venkateshwara B (2006)** *A Comparative Study of Human Resource Management Practices and Advanced Technology Adoption of SMEs with and without ISO Certification* Singapore Management Review, Volume 28, No 1
- UK Online (2003)** *The Broadband Future* produced for the Cabinet Office