Broadband Technology:

An Appraisal Of The Availability And Use By Small And Medium Sized Enterprises.

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ABSTRACT

Rapid advances in bandwidth specification have enabled a range of new working practices, such as home-working and hot-desking, and the creation of new e-businesses. Occupiers are now demanding high levels of broadband technology in their offices, providing fast and uninterrupted data connectivity. However, despite the well publicised advantages of broadband, there are a significant proportion of small and medium sized enterprises (SMEs) still not in a position to benefit from the new technology.

Broadband is now available to office occupiers in all of the major UK conurbations, and ducting channels for broadband cabling are now included as a standard item within the specification of a new Grade A specification office building. However, there are still areas of the UK where broadband is still not available, notably in rural areas and smaller towns. In addition, there appears to be little initiative being shown by landlords to provide broadband to existing smaller office buildings, thereby placing reliance upon the occupier to 'light up' their own building.

Smaller office occupiers, with a total number of employees of less than 25 people, who form a major share of the UK office market, are tending to be overlooked by the large broadband providers. The UK Government is aware of the limitations of the existing supply of broadband and is currently promoting a number of new initiatives to ensure a higher level of broadband coverage throughout the country.

This paper provides an overview of broadband technology and EU and UK government policy on e-business and broadband technology, with particular reference to SMEs. It will also examine the literature on the adoption of ICTs by businesses in the UK and the initiatives of the UK government and telecommunications suppliers to encourage and incentivise take up of broadband technology by SMEs. Also examined are the initiatives that are being undertaken by statutory authorities and broadband providers to increase broadband supply across the UK. This paper presents the results of a comparative analysis of the impact of broadband technology upon the working practices of SMEs in urban and rural areas in the Thames Valley region of the UK. Within this framework, the availability of broadband technology and the impact upon business practices of SMEs will be examined.

Keywords: Information and communication technology, broadband, office occupiers, small and medium sized enterprises, working practices.

The Internet, Broadband and SMEs

Over the last two decades, Information and Communications Technologies (ICT) (including the internet) has fundamentally altered the way in which businesses are created, operated and managed (Keen and McDonald, 2000). ICT has literally transformed the business environment, so much so that it is now suggested that every business today competes in two worlds; a physical world of tangible resources and a virtual world of information (Rayport and Sviokla, 1996). The use of ICT has pervaded every area of day to day business, from finance, accounting and personnel, to production, servicing and marketing decisions. In such a virtual world, ICTs, e-commerce and e-business are becoming increasingly imperative for companies of any size aiming at improving their competitiveness in a constantly changing market (Chaumont et al., 1998; OECD, 1995)

In the 1990s, the US became the world leader of the "digital revolution", the result being that US businesses became much more competitive and the economy revelled in spectacular and unprecedented growth (EU, 2002a). In the face of this success, and developments towards economic globalisation, many governments, (especially those in the developed world) are now seeking to promote the "New Economy" *cum* "Knowledge Economy" as a way of building international competitive advantage and generating economic dynamism, growth and jobs (EU, 2002b; DTI, 2001a). The premise behind this is that greater use of ICTs boosts economic growth and competitiveness which lead to the Knowledge Economy (EU, 2002a). Taylor and Murphy (2004) claim that governments have become besotted with ICTs and their associated benefits, with various national and supra-national policies being implemented since the mid 1990s. For example, the EU has set new goals to not only follow America's lead in the development of this sector but aims to surpass this by becoming the most competitive knowledge-based society in the world by 2010 (EU, 2002a).

The vision of the Knowledge Economy is strongly aspirational; Thift (2001) identified that it consists of strong non-inflationary growth arising from the increasing influence of ICT and the associated restructuring of economic activity. He stated that this approach embraces features as the growth of small high-tech firms, the increasing importance of mobile and highly skilled workers and the rise of entrepreneurship. Such advancements present both threats and opportunities to 4.0 million UK small and medium-sized enterprises (SMEs). These potential threats derive from several interrelated areas. For example a lack of knowledge about the real advantages these technologies could bring to their business (Buonanno et al., 1998; OECD, 1998), a possible unwillingness to recognise and act on such changes (due to a resistance to change that characterises small entrepreneurs (Bedeian, 1980; Huczynsky and Buchanan, 1991; Julien, 1998; King and Teo, 1994; Palvia et al., 1994; Vidal, 1991)), a shortage of appropriate skills (DTI, 2002a). A final threat is derived from the sheer scale of the challenges faced, since if many businesses do not fundamentally rethink their business processes with ICT as the core enabler, they may not survive (Taylor and Murphy, 2004). In this environment, it is clear that SMEs which do not have access to broadband are at a distinct disadvantage to those that do.

Significant opportunities exist for companies to use ICT (through broadband) to improve their performance (Tetteh and Burn, 2001) and to become more competitive and enhance their prospects for growth (Chadwick and Rumfitt, 2002). Many of these benefits are unique to this medium (MacGregor and Vrazalic, 2004); these include new customers and markets (Ritche and Bringley, 2001; Quayle, 2002; Raymond, 2001; Vescovi, 2000), improved marketing techniques (Sparkes, and Thomes, 2001) and improved relations with business partners (Poon and Swatman, 1997). More generally, e-business and ICTs can be expected to bring significant productivity gains and higher economic growth resulting from the more efficient allocation of resources throughout the economy (Alston, 2001).

In order to meet the goal set by the EU to become the most competitive knowledge-based society in the world by 2010, there is mounting pressure being placed on SMEs to more fully embrace ICT and e-business techniques. SMEs are seen as the means to achieving the competitive

knowledge-based society because, in aggregate, they are big buyers, big innovators and, most important politically, big employers (Taylor and Murphy, 2004). Politicians and policy-makers pressing for economic competitiveness have linked the take-up of ICTs with competitive gains and economic growth for small firms, and subsequently the economy. Although ICTs are but one aspect of this, they are pursued vigorously through UK initiatives and many types of funding, both national and international (Fuller and Southern, 1999). At the same time, technology suppliers view small firm use of ICT as an emerging market opportunity (Southern and Tilley, 2000).

While there are now some two thirds of UK businesses online and further growth is expected, at present it is the larger companies who are the most active, with almost twice as many e-commerce activities as SMEs (Haig, 2002). The UK Government acknowledges there is a slow take-up of e-business techniques amongst SMEs (UK Online, 2002). The problems of the engagement of SMEs in ICT have been documented as two fold. The first problem lies with defining the characteristics of SMEs. There have been many studies in the literature that have attempted to do so; central to these is the underlying realisation that many of the processes and techniques that have been successfully applied in large businesses do not necessarily provide similar outcomes when applied to SMEs. This was best summed up by Barnet and Mackness (1983) and Westhead and Storey (1996) who stated that SMEs are not "small, large businesses" but are a separate and distinct group of organisations.

A second problem is encountered in the diversity of businesses within the SME sector itself. SMEs are not a homogenous set of businesses. They vary significantly by size, age, sector, motivation, mode of organisation, ethnic background, location, knowledge base, power and control of resources, innovative capacity and so on. Fundamentally, what works for one firm does not necessarily work for another. All these characteristics can play directly on their need and opportunity to engage with e-business (Taylor and Murphy, 2004). The diversity of SMEs engaged in e-business is encapsulated by Buckley and Montes (2002) who suggest that a venture capital funded application software development start-up in Silicon Valley that has five people on staff is a fundamentally different type of firm that a 15 year old town antique shop with a five person staff. But the authors proposed that both firms have the potential to use and benefit from the engagement with ICTs and e-business, but that they face different opportunities and different constraints in doing so.

ICT and e-business has become the subject of much government attention, both nationally and supra nationally, in recent years. SMEs are seen as the key to the knowledge economy. The central tenet of policies to promote the Knowledge Economy is the technologically deterministic, almost Orwellian contention, "All ICT good. No ICT bad". In line with this contention governments see SMEs engaging with the Knowledge Economy through a progressive continuum from their engagement with broadband technology (for example linking to the internet and use of brochure web pages), through their establishment and use of transaction-capable websites (engagement with e-commerce) to the transformation of business organisation and operations and the full integration of websites and back office computing operations (engagement with e-business) (Taylor and Murphy, 2004). The main focus of this paper is the first step to engagement with the knowledge economy, the linking of SMEs to the internet using broadband technology.

This paper will provide an overview of broadband technology and EU and UK government policy on e-business and broadband technology, with particular reference to SMEs. It will also examine the literature on the adoption of ICTs by businesses in the UK and the initiatives of the UK government and telecommunications suppliers to encourage and incentivise take up of broadband technology by SMEs. The paper builds on earlier work by the author in respect of the perception and needs of office occupiers in respect of broadband technology and the potential impact upon the UK office market (Spurge, 2002).

Broadband Technology

Broadband has a major role to play in modernising economies and societies through the use of ICTs. Broadband refer to high-speed 'always-on' connections to the Internet that support the delivery of innovative content and services (EU, 2002a). Compared to traditional narrowband connections, broadband access is immediate. Large volumes of data can be instantly transmitted, waiting times are reduced and efficiency for users is improved. Narrowband connections require users to wait while a dial-up connection is made before they can access the Internet. Internet use when connected is also slow – it is estimated that one third of user time online is spent waiting (DTI, 2004). A 1M byte file that would take three minutes to download with a modem takes less than 20 seconds with a broadband of 512 Kilo bytes per second (Kbps).

There are currently a number of options available for the delivery of broadband, as follows:

- Asymmetric digital subscriber line (ADSL) technology (enabling an existing telephone line to be upgraded to offer a broadband access connection). This is the most widely available form of broadband. However ADSL is only available within 6 km of a local telephone exchange which has been upgraded.
- Fibre optics, to connect users to a national telecommunications network.
- Cable leased lines, using coaxial copper cables, to also connect users to a national telecommunications network, using a private reserved telephone line. This can be quite costly to install and is subject to geographical restrictions.
- Wireless, to allow users to use radio signals to link computers. The technology in this area is still in its infancy so availability is limited.
- Satellite, to send and receive information via a dedicated satellite dish. This option is particularly suited for rural areas, but is costly to install.

Broadband is at the core of the diffusion of the knowledge economy and of the development of information and communication technologies (ICTs). These technologies in turn are key drivers of growth (EU, 2004b). Broadband is readily available in urban areas across Europe through fibre optic links with very large capacity. However, infrastructure requires enhancing to bring high-speed services to residential users and SMEs outside these urban areas, by upgrading or building infrastructure to each premises (EU, 2004a)

Broadband is an enabling technology; it promotes progress towards an inclusive knowledge-based economy and ensures growth through improved competitiveness (EU, 2004). Its benefits are realised through the delivery of advanced applications and services expected to bring about productivity gains for business through their engagement with e-commerce and e-business. It should be noted that there is a difference between e-commerce and e-business. The former is the buying and selling of goods and services on the Internet and provides the ability to perform transactions involving the exchange of goods or services between two or more parties using electronic tools and techniques. Timmers (1999) along with Rayport and Jaworski (2001) see e-commerce as either the undertaking of business electronically or as an electronic go-between trading partners. UK Government literature defines e-commerce in two ways; the first is a broad definition to include e-mail and fax services and defines e-commerce as the exchange of information across electronic networks (DTI, 2001b). The second definition uses the narrower "transactional" definition to incorporate online trading and specifically the buying and selling of goods and services over electronic networks, whether between businesses or between businesses and consumers (DTI, 2002a).

E-business is more sophisticated than e-commerce, it has a much wider integrative purpose within an organisation (DTI, 2001b). It has implications that are inward as well as outward facing (Internet, Intranet and Extranet) to conduct business, including buying and selling, connects key
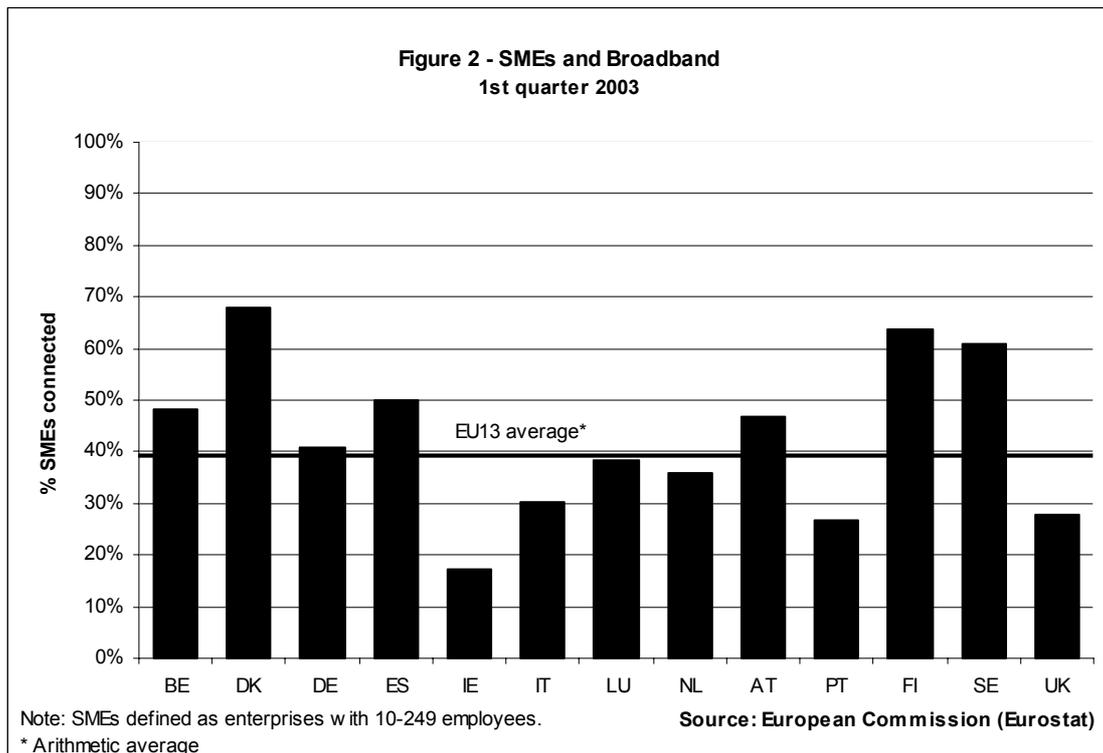
players to critical business systems and allows access to the information they need. Business transactions over the Web can be divided into two categories[1]:

- Business to consumer (B2C) involves mainly online transactions with consumers such as retailing; and
- Business to business (B2B) solutions increase the support between businesses while reducing the need for telephone calls and faxes.

In practice e-business may link to or incorporate other systems such as Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM) systems whereas e-commerce may only log and track transactions which then have to be dealt with manually (Simpson and Docherty, 2004).

Broadband has the potential to transform businesses and the way they work through enabling companies to engage with e-commerce and e-business and enabling them to become more productive and innovative. It is well documented that SME connectivity is lagging behind across Europe, this is shown in Figure 1. Relative to other EU countries, the UK's strategy for improving SME take-up has not proved successful, with the UK sitting well below the EU13 average. The slow take-up of broadband by European SMEs is often attributed to the shortage of appropriate applications and to the lack of awareness by SMEs of the potentials of ICTs for their performance. The EU and UK have implemented broadband strategies aimed at raising awareness and stimulating demand by encouraging SMEs to take advantage of the benefits of broadband (EU, 2004a).

Figure 1

Figure 2 - SMEs and Broadband
1st quarter 2003

Note: SMEs defined as enterprises with 10-249 employees.
Source: European Commission (Eurostat)
* Arithmetic average

(EU, 2004a)

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[1] Rayport and Jaworski (2001) suggest two other categories, that is customer to customer (C2C) and customer to business (C2B)..

Small and Medium Sized Enterprises

There are a number of definitions of what constitutes an SME; this is due to the diverse nature of the sector. Some definitions are based on quantitative measures such as staff numbers, turnover or assets whilst others utilise a more qualitative approach. Meredith (1994) suggests that any description or definition must include a quantitative component that takes into account staff levels, turnover, assets together with financial and non-financial measurements, but that the decription must also include a qualitative component that reflectsd how the business is organised and how it operates. Not only is there a myriad of views concerning the nature of SMEs but from a governmental standpoint there are a variety of definitions of an SME, depending on the country being considered.

Most working definitions of SMEs emanate from the Bolton Committee Report of 1971 which defines a small firm as independent, owner managed and with a small market share (Simpson and Docherty, 2004). The Bolton Report also adopted a number of different statistical definitions. It recognised that size is relevant to sector; that is, a firm of a given size could be small in relation to one sector where the market is large and there are many competitors; whereas a firm of similar proportions could be considered large in another sector with fewer players and/or generally smaller firms within it (DTI (SBS), 2004).

The SME Department of the World Bank works with the following definition:

- Micro enterprise up to 10 employees, total assets of up to $10,000 and total annual sales of up to $100,000;

- Small enterprise- up to 50 employees, total assets and total sales of up to $3 million;

- Medium enterprise – up to 300 employees, total assets and total sales of up to $15 million (World Bank, 2004).

The United States based its definition of SMEs on the position of the organisation within the overall marketplace. According to the US Small Business Administration (SBA) which is based on section 3 of the Small Business Act of 1953, an SME shall be deemed to be one which is independently owned and operated and which is not dominant in its field of operation.

The Wiltshire Committee, in a report commissioned by the Australian Federal Government suggested the following flexible definition of an SME (Meredith, 1994); a small business is one in which one or two persons are required to make all of the critical decisions (such as finance, accounting, personnel, inventory, production, servicing, marketing and selling decisions) without the aid of internal (employed) specialists and with owners only having specific knowledge in one or two functional areas of management. The Wiltshire Committee concluded that under usual circumstances, this definition could only be applied to enterprises with fewer than 100 employees.

The Singapore government defines an SME as a commercial establishment that meets the following criteria:

- At least 30% local equity;

- Fixed assets (defined as net book value of factory building, machinery and equipment) not exceeding $15 million; and

- Employment size not exceeding 200 workers for non-manufacturing/services companies (SPRING Singapore, 2004).

For statistical purposes, the Department of Trade and Industry usually uses the following definitions:

- micro firm: 0 - 9 employees
- small firm: 0 - 49 employees (includes micro)
- medium firm: 50 - 249 employees
- large firm: over 250 employees (DTI, 2004)

Section 248 of the UK Companies Act of 1985 states that a company is "small" if it meets a minimum of two of the following criteria:

- a turnover of not more than £2.8 million;
- a balance sheet total of not more than £1.4 million;
- not more than 50 employees.

A medium sized company can only be classified as such if it meets at least two of the following criteria:

- a turnover of not more than £11.2 million;
- a balance sheet total of not more than £5.6 million;
- not more than 250 employees.

In the same way that government definitions of SMEs vary, research initiatives apply a variety of definitions to the nature of SMEs. For example Martin and Matlay (2001) suggest SMEs are a heterogenous and complex mix of economically active units; Sliming (2003) used the following definition; employee size less than 200, fixed capital not more than 200 million baht, less than 25% owned by one or jointly several enterprise(s) and less than 50% owned by foreigners. In a study of SMEs in Canada, Mont semi (1988) took a simpler approach, basing the definition on the number of employees. Several other studies (Bradbard et al., 1990; Chen, 1993) have also taken this latter approach.

In recent years, a range of EU-level programmes were implemented, specifically with SMEs in mind. These have been designed to complement measures taken at national level. However, these programmes have not adopted the same approach to the definition of SMEs, with the result that a variety of definitions were used. These variations produced inconsistencies likely to contribute to a distortion of competition between enterprises. This situation was criticised by both the Court of Auditors, in its 1995 Report, and by the European Parliament which requested that the Commission address the question of exactly how to define an SME (UN-ECE, 2004).

In early 1996, the situation was resolved by the adoption of a Communication setting out a single definition of SMEs. The EU definition of an SME classifies businesses into three groups, micro, small and medium sized enterprises. To be classed as an SME or a micro-enterprise, a business has to satisfy the criteria for the number of employees and one of the two financial criteria stipulated; either the turnover total or the balance sheet total. In addition, it must be independent (UN-ECE, 2004). The level of independence is the ultimate criterion to justify enterprises to be an SME. Independent enterprises are those which are not owned as to 25% or more of the capital or the voting rights by one enterprise, or jointly by several enterprises, falling outside the definition of an SME[2] (EU, 1996b). The EU defines a SME based on the following criteria in Table 1.

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[2] This threshold may be exceeded in the following two cases:

- If the enterprise is held by public investment corporations, venture capital companies or institutional investors, provided no control is exercised either individually or jointly,
- If the capital is spread in such a way that it is not possible to determine by whom it is held and if the enterprise declares that it can legitimately presume that it is not owned as to 25% or more by one enterprise

Table 1
EU Definition of an SME

Enterprise category	Headcount	Turnover	or	Balance sheet total
medium-sized	< 250	≤ € 50 million		≤ € 43 million
small	< 50	≤ € 10 million		≤ € 10 million
micro	< 10	≤ € 2 million		≤ € 2 million

(EU, 1999b)

This definition has been uniformly applied across all subsequent Community programmes and proposals. The communication also includes a (non-binding) recommendation to Member States, the European Investment Bank and the European Investment Fund encouraging them to adopt the same definitions for their programmes (Slimani, 2003).

SMEs in the European Union

In Europe, SME engagement with e-business technologies is described as "critical" if the EU collectively is to become a dynamic and competitive knowledge-based economy. This is because there are 19 million SMEs in the EU (Taylor and Murphy, 2004). In most EU Member States, they make up over 99% of businesses, generate a substantial share of European GDP and are a key source of new jobs as well as a fertile breeding ground for entrepreneurship and new business ideas (EU, 2002b). As a result, SMEs have an important role to play in not only their own country's economy but also globally, contributing over 80% to a country's economic growth (Bodorick et al., 2002).

In March 2000, the European heads of state and government set a news goal for the EU; to become the competitive knowledge-based economy in the world by 2010. To meet this goal, the current European Commission DGXXIII has taken a lead in fostering new developments and has focused on accelerating deployment of new technologies to small and medium sized businesses by launching the eEurope initiative. The initiative is based on the premise that the Internet is essential to future economic growth, job creation and improvements in the quality of life. It aims to bring everyone in the EU online as quickly as possible so that using the Internet becomes commonplace, to create a digitally literate Europe and to ensure that the whole process is socially inclusive, building consumer trust and narrowing the gap between the haves and have-nots in European society (EU, 2002a). There have, so far, been two action plans since the outset of the initiative in 2000.

eEurope Action Plan 2002

The first Action Plan 2002 (endorsed by the EU leaders at their Feira summit in June 2000) cast it's net very wide and successfully put the Internet at the top of the European political agenda. The principle objective of the 2002 action plan was to increase Internet connectivity in Europe, to open up all communications networks to competition and encourage Internet use by placing emphasis on training and consumer protection. The measures were grouped according to three key objectives to be met by the end of 2002:

- A cheaper, faster and secure Internet;
- Investing in people and skills; and
- Stimulate the use of the Internet.

eEurope 2002 was reported to have delivered major changes and increased the number of citizens and businesses connected to the Internet. It reshaped the regulatory environment for communications networks and services and for e-commerce and opened the door to new generations of mobile and multimedia services. It has provided opportunities for people to participate in society and helped the workforce to acquire the skills needed in a knowledge-driven

economy (EU, 2002c). Table 2 shows the take up rates of different aspect of e-commerce by SMEs in a selection of EU countries and Norway in 2002. In these countries, between 86% and 96% of SMEs use ICT and over 60% have web access. A smaller proportion of SMEs have their own web sites, especially in Italy, and those percentages fall further for making e-commerce purchases and e-commerce sales.

Table 2

% SMEs	UK	Austria	Sweden	Italy	Neths	Norway
Using ICT	92	92	96	86	87	93
Web Access	62	83	90	71	62	73
Own Web Site	49	53	67	9	31	47
Making E-commerce Purchases	32	14	31	10	23	43
Making E-commerce Sales	16	11	11	3	22	10

(EU, 2002b)

eEurope Action Plan 2000

Following on from e-Europe 2002, the Action Plan 2005 was approved by EU leaders in Seville in June 2002. This initiative narrows the focus of the previous scheme, concentrating on the deployment of broadband access at competitive prices, the security of the networks and the development and use of information technologies by the public authorities (EU, 2002a). eEurope 2005 focuses on a more limited number of priorities. The main objectives to be achieved in the framework of eEurope 2005 are:

- Modern online public services:
  - e-government services;
  - e-learning services;
  - e-health services.
- A dynamic e-business environment;
- A secure information infrastructure;
- Widespread availability of broadband access at competitive prices;
- Benchmarking and the dissemination of good practice (EU, 2004c).

Broadband Access

Action Plan 2005 seeks to accelerate the rollout of broadband services across the EU. These networks include fixed-wireless, fibre optics and satellite links, and will also include third-generation mobile phones (UMTS) when these become widely used. The eEurope 2005 action plan calls for the stimulation of innovation and increased use of and investment in broadband communications. To achieve this, the action plan focuses on the following activities:

- Use of the new regulatory framework for radio spectrum policy to guarantee frequency availability for wireless broadband services;
- Support for broadband access in less-favoured areas;
- Increased provision by public authorities of their contents on different interactive technological platforms;
- Speeding up the transition to digital television (EU, 2004c).

Achieving these goals will help create jobs and make European industries more competitive. This is part of the EU's efforts to fulfil its obligation - enshrined in article 2 of the Treaty on European Union – "*to promote economic and social progress and a high level of employment*".

National Strategies

Although the eEurope initiative has been instrumental in giving the information society new political momentum at the highest level, it is clear that the success of eEurope depends not only on the European institutions but on national, regional and local government throughout the EU (EU, 2002a). The EU has repeatedly stressed the role and contribution of the regional and local authorities in promoting and exploiting the potential of broadband and e-business. All EU-15 Member States have now drawn up National Broadband Strategies which propose a series of initiatives to deal with these obstacles and to accelerate the deployment and take-up of broadband (EU, 2004d).

National broadband strategies recognise the primary role of the market for broadband deployment. They also recognise the role of public policy in complementing the effective functioning of the market, addressing both the supply and the demand side to stimulate a virtuous circle whereby development of better content and services depends on infrastructure deployment and vice-versa. Two key areas of focus include increasing deployment in under-served areas, with public support foreseen in areas where market forces do not deliver the necessary investment, and aggregating demand from public administrations.

Areas of focus on the supply side of the national strategy include:

- The importance of competition and convergence across alternative platforms, to be stimulated through the consistent implementation of the new regulatory framework for electronic communications.

- The role of public policy in extending coverage of under-served areas, with particular care not to distort competition, nor to inhibit private investment, and on the basis of a technology-neutral approach.

- The need for an assessment of broadband availability and take-up through a continued monitoring of the market.

- The importance of R&D for the development of next-generation broadband, cost reductions and innovative applications and services.

On the demand side, areas of importance are:

- The relevance of demand-aggregation policies that improve certainty for investors and increase use by public administrations, educational and healthcare establishments.

- The importance of the development of broadband-enabled open and interoperable applications and services for businesses and administrations.

- The need of overcoming barriers to the development of new innovative content, progressing in areas such as IPR protection, DRM systems and m-payments.

- The role of security and trust to stimulate broadband use (EU, 2004b).

SMEs and UK Broadband Policy

SMEs have an important role to play in any country's economy (Beaver, 2002). Not least in the UK where there are 4.0 million businesses and 99.2% of them are classified as SMEs, with between 0 to 49 employees (DTI,2004). It is reported that SMEs in the UK employ 58.2% of the workforce (DTI,2004). These businesses produce 40% of GDP, and have an annual turnover of

approximately one trillion pounds. SMEs in the UK employ 12 million people, they account for some 55% of the private sector workforce (Dixon, et al., 2002a).

The Government's broadband strategy is part of the wider UK Online strategy lead by the Office of the e-Envoy (OeE). The Government's programme to ensure the UK is a world-leader in the new knowledge economy is the UK Online Strategy. The UK Online Strategy as set out in the UK Online Annual Report 2001, includes 113 detailed recommendations covering 26 commitments to ensure that the UK is at the forefront of the knowledge economy revolution. The OeE is leading the drive to get the UK online, to ensure the country, its citizens and its businesses derive maximum benefit from the knowledge economy.

To support this aim, the OeE has four core objectives:

• To develop the UK as the best environment for electronic business
• To ensure that everyone who wants to can access the Internet by 2005
• To deliver electronically, and with key services achieving high levels of use by
  all Government services by 2005
• To co-ordinate the Government's e-agenda across different departments.

The UK Government set a target for the UK to have the most extensive and competitive broadband market in the G7 by 2005 with significantly increased broadband connections to business and consumers, as well as public sector organisations. Extensiveness means extending broadband networks to households and businesses throughout the country, including those in rural and remote areas. Competitiveness means providing consumers with value for money, and a wide variety of product choice in the market (DTI, 2004). Responsibility for the development of broadband services and technologies in the UK is shared between the Department of Trade and Industry (DTI) and the Office of the e-Envoy (OeE).

The UK government recognises the importance of SMEs in spearheading the growth in broadband, e-commerce and e-business in its broadband policy which is designed not only to nurture and promote the SME sector, but also the connectivity of the sector. The Government developed three goals for e-business that by 2005:

- 1.5 million SMEs were online;
- 1 million SMEs were trading online; and
- The UKs' SMEs reached the level of the international best in use of e-business (Dixon et al., 2002a).

The main strategies used to help small firms overcome some of the barriers to ICT adoption are awareness raising initiatives (Lacovou et al., 1995) and the provision of suitable training (Chen and Williams, 1993; Pollard and Hague,1998; Fuller, 1996; Lymer et al., 1998). Also consulting services providing help to transfer business models to the Web has also been identified as one of the key strategies that will encourage small firms to go online (Charlton et al., 1997; Fuller and Jenkins, 1995; Zalud, 1999.

The UK Government has made available a £30m Broadband Fund via the Department of Trade and Industry to the Regional Development Agencies (RDAs) in England and the Devolved Administrations to fund pilot projects and innovative schemes to help develop broadband networks and to help SMEs overcome the barriers to ICT adoption and e-business, provide training and consulting services. There is significant activity taking place at a regional/devolved level contributing to the development of broadband in the UK. Projects are being run on a large scale, (such as the Remote Area Broadband Inclusion Trial (RABBIT)) and on a small, local scale.

Current UK Schemes to Provide Broadband to SMEs

The following section aims to provide a summary[3] of the broadband schemes and programmes across UK regions that have been carried out to date in the area of SMEs, as provided by the DTI, (2003). It is an intention of the second stage of this research project to investigate and evaluate a selection of the schemes. Whilst many of the initiatives are Government sponsored, the role of the business and residential community in convincing a broadband supplier to an area has been quite significant in many instances across the UK.

The Remote Area Broadband Inclusion Trial (RABBIT)

The RABBIT project has been set up to promote the use of broadband to SMEs in remote areas and to evaluate the viability of the available solutions. The RABBIT project is supported by the South West of England Development Agency, East Midlands Development Agency, Advantage West Midlands, South East England Development Agency, East of England Development Agency and the Department of Enterprise, Trade and Investment (Northern Ireland) and is financed through the DTI UK Broadband Fund.

The aim of the trial is to stimulate the market, increase competition and to provide a public information source of the available suppliers and technologies for "ADSL equivalent" products. The project is aimed at SMEs in areas that cannot receive ADSL or cable modem solutions, but are interested in trying out alternative solutions. The trial has gathered information on a range of solutions from 87 different suppliers that meet the needs of differing sizes and types of business.

Projects in the South West
Broadband Fund Projects:

- The Outreach project seeks to establish broadband communication hubs in Wiltshire for remote workers. The research phases of the project have been completed and contact made with complementary broadband initiatives in the county.

- Informative Action aims to capture, collate and disseminate information on broadband and ICT related projects in the South West. ConnectingSW.net will lead to better project co-ordination and better planning for broadband development in the South West.

Other Broadband Initiatives

- E-Mapping and Strategic Review on Infrastructure – BT and 9 other telecommunications companies are making their broadband/telecommunication information available for the construction of maps portraying networks in the South West region.

- Pathfinder & Digital Divide - work undertaken on behalf of the SWRDA indicates that an economically viable and sustainable broadband delivery solution can be developed and deployed in the currently un-served market and coastal towns of South Devon.

- The £12.5m Cornwall ActNow[4] project was launched in April 2002 with the help of £5.25m Objective One funding. Under this scheme, 13 BT exchanges in Cornwall have been upgraded to deliver ADSL technology. To date, the total number of broadband connections has risen to over 5800 (1600 of which are SMEs). The project is a partnership involving the South West Regional Development Agency, Cornwall County Council, Cornwall Enterprise,

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[3] Complied from the DTI synopsis of activity in the English regions and devolved administrations (Quarterly report 4/03-6/03). Available at
http://www.dti.gov.uk/industry_files/pdf/synopsis.pdf

[4] Access for Cornwall through Telecommunications to New Opportunities Worldwide

Business Links, Cornwall College and BT who were appointed through an open tender to be part of the public sector led partnership offering the ADSL packages. Its ultimate aim is to provide a full package of broadband start-up services for 3,300 small and medium sized enterprises backed by a commitment from BT to a roll out scheme for the enabling of exchanges.

Projects in the South East

- A commercial demand analysis was undertaken in 2003 to investigate the potential demand for broadband connectivity using fibre-optic networks linking the coastal towns of Kent and East Sussex with London and Brighton. The aims of the study included an investigation of the demand for high-capacity connectivity in the Region. The first coastal superhighway was to be operational by October 2003. The expected outcomes are to; encourage regional investment by large corporate companies, to attract operators to offer mass-market broadband solutions in the region and to ensure the provision of more Points of Presence (POPs) in the network.

Satellite Programmes

- SEEDA developed a Satellite Broadband Pilot in Hastings and Rother aimed at SMEs where current transport infrastructure and lack of broadband access undermined future prosperity. The pilot study looked at the role of satellite broadband in regenerating remote communities and provided low cost access to broadband services in rural parts of the region where ADSL or cable modem services were not available.

Non-Broadband Fund Projects

- SEEDA is creating a duct network in 2003, which will be owned by the public sector and available for use by private sector carriers to support fibre development in Hastings by the second half of 2003. The objective of this project is to reduce the cost of leased lines and promote access to competition by encouraging local loop unbundling (LLU) operators to enter the town.

- SEEDA allocated grants to every county and Unitary Authority in the Region to support rural broadband wireless pilots. SEEDA ran a number of programmes (breakfast road shows) with Institute of Directors and Business Links to encourage take-up by enterprises. SEEDA is producing online web content to provide support for community broadband organisations.

- SEEDA has initiated promotional activities aimed at raising awareness of the benefits of broadband in partnership with Business Links, IoD and Economic Partnerships.

Projects in London

- A £1.5 million project commissioned by the LDA, e-Start, seeks to assist SMEs, especially minority ethnic businesses to harness the potential of broadband. The project involves promotion, research, training and implementation support.

- VET Broadband seeks to demonstrate the benefits of broadband to SMEs in the media and creative sectors in London's City Fringe.

Projects in the West Midlands

- A project is being developed with Imagination and BT to investigate the impact of marketing broadband within various sectors of the community. Advantage West Midlands are now

working with BT to increase demand for broadband in targeted communities, enabling BT to invest with confidence in rolling out Broadband across the West Midlands.

- Rural Pilots - there are 5 pilot projects being planned in rural areas to demonstrate the impact of marketing and initial funding in establishing broadband; Bridgnorth in Shropshire was the first town to test this approach successfully. This was followed by Leominster in Herefordshire and Bredon Hill in Worcestershire. Other pilots are being undertaken based around a large industrial estate in Staffordshire and a small remote industrial estate in Shropshire and a village in Worcestershire.

- An E-portal has been developed to showcase the SMEs of the West Midlands and to give them the tools to contact customers and finance. This will receive further investment next year to extend the facilities it provides.

Projects in the East Midlands
DTI Broadband Fund

- The Broadband Innovation Project is a regional broadband awareness programme developed with UK online for business, East Midlands Network and Metafocus. Several hundred SMEs have received advice and guidance.

Other projects

- Lincolnshire Broadband Initiative has been developed by Lincolnshire Development. The scheme has two parts, the first is an infrastructure project seeking to deliver broadband to key employment sites and the second part is the ICT Action Plan which promotes and facilitates use of the infrastructure. The project seeks to achieve 3,000 additional SMEs trading online via Broadband by the end of 2005.

Projects in the East of England

- The Broadband Brokerage was established in June 2002. A website (www.demandbroadband.com) allows companies, public sector organisations, communities and individuals to register their interest in using broadband. Where a pattern of demand for a particular area has reached critical mass a Local Partnership is formed, fronted by the Local Authority, which would own their community network. Each of the Telecommunications companies is approached to identify the most cost effective solution.

- The Business Centre/ Incubator Programme aims to assess the costs and benefits of connecting the existing Business Centres and Incubator units in which EEDA has a financial stake. As many of these as is commercially viable will be connected, using as many combinations of technologies as practicable.

Projects in the North West
Broadband Fund Pilot Projects

- Broadband LAND Project (Cumbria Tourist Board) plan to develop a mobile location-based information and navigation service aimed at the tourism industry and Cumbrian residents. A wireless broadband network will allow access to geographical, tourism and transport information.

- Speke & Garston Broadband Pilot Project (South Liverpool Housing) seeks to provide broadband connections and multimedia content to a target of 150 homes and SMEs, employing a portal and set-top box approach.

- Increasing business competitiveness by the effective use of broadband (Netshopper UK Ltd) aims to assist 75 SMEs in Greater Merseyside to use online website products and services through the provision of broadband access and will act as a demonstrator of broadband benefits to SMEs.

- Increasing Marketing Effectiveness of SME's using Broadband (Multimedia Marketing.Com) will stimulate the take up of Broadband by 200 SMEs who will benefit from an online marketing programme which is designed as introduction to marketing for SME's and aims to tangibly increase their business effectiveness.

Projects in Yorkshire and Humberside

- Business Insight consists of two related projects: *Proof of Concept* and *Satellite Broadband*. The Proof of Concept project has facilitated the central Business Insight hub where local participants can log-on and learn about the benefits broadband can bring. Business Insight members can access ECDL content, participate in forum debates, search White Papers and other information and research, read case studies, and contact other Business Insight members. The Satellite Broadband project provides 450 SMEs (200 of which are rural) with a satellite broadband connection, free for one year, with the option for renewal after the free period. 450 SMEs have been successfully connected to the Satellite Broadband service.

- North Yorkshire County Council Wireless WAN - NYCC have proposed a proactive solution with the creation of a sub-regional Broadband network that will service both public and private sector needs. This network will be built

Projects in the North East

- Market Towns ICT Initiative has introduced over 4,700 rural businesses to broadband via 11 Market Town Portals, over 100 of which are now operating e-commerce solutions via broadband.

- A Broadband Awareness campaign has seen reduced trigger levels on 22 BT exchanges, the enabling of 6 exchanges, the creation of 21 virtual business clusters, and the introduction of Broadband via satellite to Wear Valley.

- Grow Your Business is a £5 million project to deliver broadband and e-commerce to rural and urban SMEs. Over 100 businesses have signed up to participate in this programme in its first week of operation.

Projects in Wales

- eFro Broadband Wireless Project (http://www.e-fro.cd/) has been allocated £100,000 has been allocated as part funding to support the development of the eFro Broadband Wireless Project. This uses 802.11b broadband wireless spectrum to provide broadband access to a community in rural North West Wales. As a result, people have been able to get broadband in Dyffryn Ogwen who could have not otherwise have done so.

- The remaining £2.57 million funding was allocated to support the lifelong learning network. This is a multi million pound project initiated by the Welsh Assembly Government in October 2001 to provide broadband connectivity and multi media equipment to schools, learning centres and libraries in Wales. The Broadband Fund money is being used specifically to extend general public access to libraries, ICT Learning Centres and schools that open to the public after hours.

Projects in Scotland

- Highlands and Islands Enterprise (HIE) have set up the Community Wireless Network Demonstration project as part of a major investment to bring broadband to communities that are not covered by ADSL. Wireless Networks are being set up in six communities across the Highlands and Islands and are intended to demonstrate wireless broadband technologies and to test the process of rolling out to the most remote communities throughout the Highlands and Islands. ERDF funding has been awarded and following the demonstration projects wireless networks will be rolled out to a further 150 communities in the Highlands and Islands over the next 18 months. The aim of this is to take broadband coverage in the Highlands & Islands beyond 70 per cent.

- Corporate Demonstration Centres designed to bridge the awareness, education and skills gap related to the use of broadband for key business applications by SMEs e.g. e-procurement, distributed design, video conferencing. Large corporates will host and demonstrate the relevant applications.

- The Wireless pilot will provide a pilot demonstrator broadband network capable of supporting a community spread across a number of populated islands in the Western Isles using a range of technologies, primarily wireless.

- The Highlands and Islands Enterprise and three Scottish Enterprise Local Enterprise Companies have piloted schemes that offer assistance with the installation costs of satellite-broadband technology. Business benefits have been monitored as have several issues associated with satellite broadband, such as signal loss in bad weather and its position relative to tariffs for other fast Internet technologies.

**Projects in Northern Ireland**

- Westernconnect Ltd, an ICT company based in the North West of the province, has received funding to trial a state of the art broadband access network using the latest wireless technology. This "first of its kind" network is being piloted for a period of 12 months in Londonderry and will be offered to 40 businesses in the area. The pilot will examine how users in regional locations can avail of broadband offerings which otherwise may not be possible through their existing service provider.

- Belfast-based StreamOn.net Ltd has been awarded funding to develop a Virtual Trade Fair and Business Broadcasting Channel tailored for broadband which will allow small businesses to showcase their products and services 24 hours a day, seven days a week. It is anticipated that this pilot will stimulate both the creation of broadband content and the take-up of broadband access by small businesses and, ultimately, demonstrate the potential for improved profitability for the small business sector in Northern Ireland.

SMEs Engagement with Broadband Technology

The engagement of businesses with the technology of e-business is reported to be sequential and progressive. The sequence begins with the use of email and progresses through website development to the buying, selling and payment mechanisms of e-commerce, to the supply chain management of e-business and the new business models built on full immersion in the technology. This adoption ladder approach is favoured by the Department of Trade Industry; shown in Figure 2. It details the elements of organisational sophistication at the heart of the UK governmental understanding of the adoption of ICTs by existing small firms (Sargeant, 2000). The adoption ladder implies that business benefits derive directly from the organisational change and increasing ICT sophistication that the Internet facilitates. The greater sophistication derives from

the unique qualities of the Internet; ubiquity, interactivity (that permits collaboration), speed (that allows business to build quickly) and intelligence (endowing the ability to retrieve, store and process information) (Taylor and Murphy, 2004).

Figure 2
The DTI adoption ladder
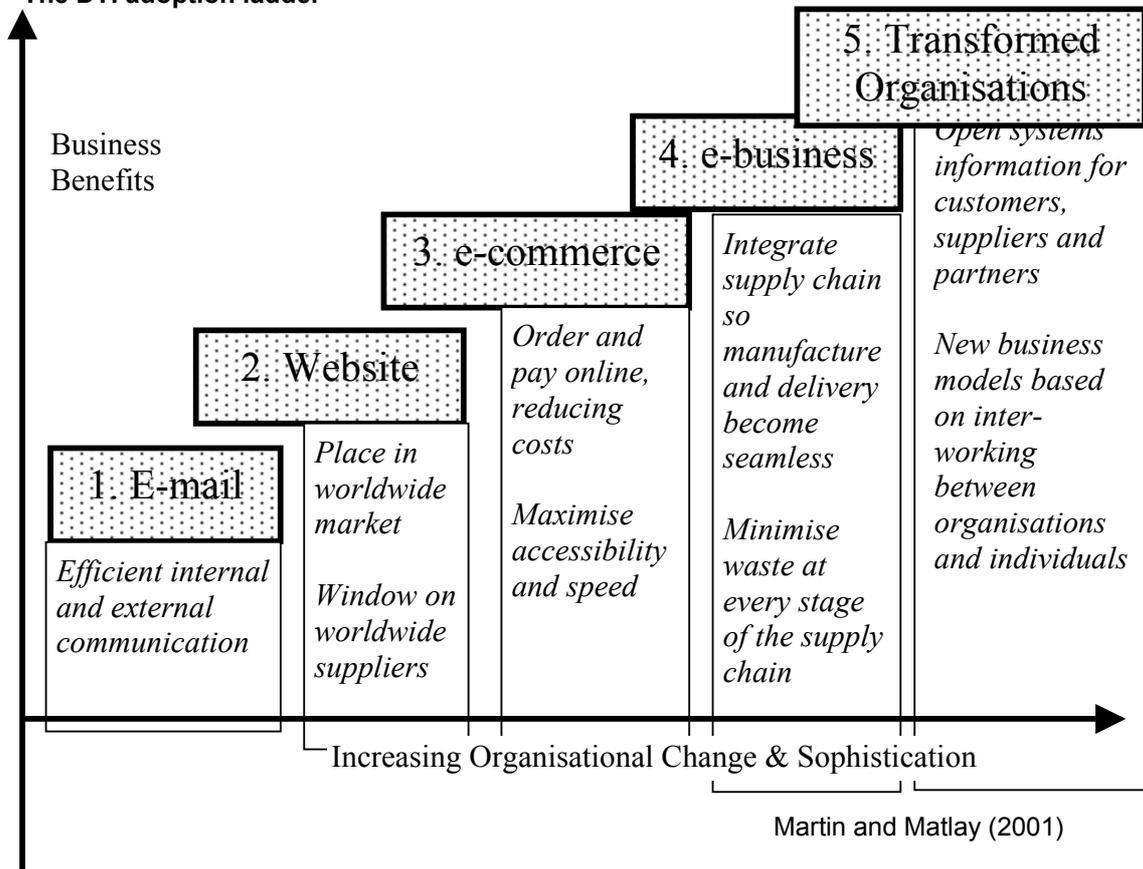
These qualities, it is argued, offer new ways of organising value chains and allow new forms of marketplace to emerge (Kenney and Curry, 2001). But to achieve the goal of becoming an e-business, the Local Futures Group (2001) suggest that firms must traverse two digital divides. The first divide involves acquiring basic ICT skills and technology, for example learning to operate e-mail and websites. The second is the threshold to e-business proper, and requires advanced technology and IT skills (including R&D) and a wide range of specialist business skills and knowledge in areas such as management strategy and marketing. Taylor and Murphy (2004) suggest that this remains a profoundly and problematically deterministic view of change, implying that all SMEs have the need and opportunity to follow one prescribed course. Martin and Matlay (2001) also criticise the implicit assumption in the adoption ladder that all businesses can somehow subscribe to a linear development in ICT. In their view, this generalist view of small firms operations fails to distinguish between businesses of various sizes, ethnic origin, stages of adoption and so on.

A more appropriate way to view and interpret the take up of e-business techniques among SMEs is provided by Foley and Ram's (2002) PITs model (see Appendix 1). This model accommodates the diversity of application and adoption of ICT and e-business approaches amongst SMEs. It incorporates two elements; determination of the areas in which ICT can be utilised and what activities it can usefully be applied to. Foley and Ram (2002) identified three increasingly sophisticated areas where ICT and the Internet can be used by SMEs:

- To publish and publicise information in a website, such as product and contact details, terms and conditions or delivery schedules;
- To interact with customers and suppliers through automated communication systems that are more than a simple exchange of emails and, for example, verify credit card details or recognise returning customers; and
- To transform the way a business undertakes its activities, allowing customers to specify delivery times and places or enabling real time tracking of deliveries.

This progressive e-business sophistication can be applied to some (or even all) of a number of areas of business activity within an SME. Foley and Ram (2002) recognise six of these areas of activity in SMEs:

- Logistics and delivery;
- Finance;
- Purchasing and procurement (including the management of infrastructure and support services);
- Operations, processing and assembly (including process, product and services R&D);
- Marketing and sales; and
- After sales service.

Taylor and Murphy (2004) suggested the addition of human resource management.

The use of the internet or the progression from the use of narrowband, dial up technologies to broadband technology indicates the overcoming of initial barriers to entry into the digital economy. These barriers are well documented in the literature (Dixon et al., 2002a, EU, 2002b; Buckley and Montes, 2002). The principle barriers for SMEs have been identified as a lack of awareness of the potential of ICT to enhance business operations or a lack of understanding of the applicability of ICTs to the products and services they offer. Other barriers have also been identified; for example perceptions of unresolved security and privacy issues associated with use of the internet, particularly with respect to online payments; a lack of the necessary IT skill-base; high initial set-up costs and a restricted ability to evolve ICT provision due to a legacy of IT sunk costs.

During the past three years, the UK Government has spent more than any other country (£67 million) on a comprehensive programme to get UK businesses online with the added aim of increasing the e-business readiness of SMEs (Booz Allen Hamilton, 2002). The result of this investment is that by 2002, 1.9 million SMEs in the UK were connected to the Internet (surpassing the government's original 2002 goal of 1.5 million) (DTI, 2002b). In the same year, OFTEL (2002a) reported that 63% of all UK SMEs were connected to the Internet.

A survey by the Federation of Small Businesses (2002) revealed that three quarters of small businesses and one third of medium sized enterprises use ordinary dial up access to connect to the internet. A survey by the Institute of Directors (IOD) found that just 16 per cent of small businesses have a broadband Internet connection, despite a wealth of evidence that suggests high-speed Internet access has a profound impact on business competitiveness. The reason, according to communications watchdog OFCOM, is that getting a broadband connection remains a "postcode lottery". In other words, access to broadband depends on where you live in Britain. The root of this problem, according to the IOD, lies in what it believes is the Government's laissez-faire approach to building the nation's telecommunications infrastructure (IOD, 2004).

The level of broadband penetration in the UK, measured as subscribers per 100 population, is now comparable to most European countries although it is still behind the USA, Japan and most notably Korea. At the end of June 2004 there were 4.4 million broadband users in the UK, but no statistics are available to differentiate between business and household users (OFCOM, 2004).

About 87% of UK homes and businesses now have access to broadband via ADSL (OFCOM, 2004). 2003 saw a steep increase in the proportion of businesses in the UK with a broadband connection.

According to the latest market research survey commissioned by OFCOM in February 2004, 68% of UK SMEs are connected to the Internet, of which:

- 37% use broadband as their main connection method

- 40% use narrowband as their main connection method

- 23% connect mainly using ISDN (medium band)

The availability of broadband in rural areas is still quite limited and whilst 87% of UK households can already subscribe, the challenge is greatest for those in rural areas (DEFRA, 2004).

The results of many surveys of SMEs and their use of the internet have been documented in several studies. Communication have been found to be the most important use of the Internet (Fuller and Jenkins, 1995; Poon and Swatman, 1999; Senn, 1996) and searching for information been cited as the next most useful activity (Holtz, 1995; Fuller and Jenkins, 1995). In a later study respondents described the potential of the Internet for new business opportunities and information gathering. (Poon and Swatman, 1999). As yet, few SMEs were found to consider the internet an important marketing tool or direct selling mechanism despite predictions that for entrepreneurial small firms the online economy presents opportunities to reach niche markets (Angelides, 1997). 54% of respondents to a survey of SMEs located in the City of London considered that broadband is either vital or important for expanding business (Dixon et al., 2002b). A further report examining the impact of eBusiness on the City of London Office Market in 2004 confirmed that all respondents had Internet connections and broadband was used by 87% of companies. The 'digital divide' between the large companies and SMEs in the City had diminished since the previous survey (Dixon and Marston, 2004).

Although some 540,000 businesses are now selling online (DTI, 2001a), the use of the web by small business has been found to be relatively undeveloped. SMEs still tend to use the internet to send emails, transfer files or documents or gather information. There are still many small businesses still do not own a computer and cost is still a major barrier for those companies with a turnover of less than £50,000 (FSB, 2002). Even though take up rates amongst SMEs in Europe are impressive and equate well with US take-up rates for all types of business enterprise (Buckley and Montes, 2002), Taylor and Murphy (2004) claim these figures massively overstate the level of e-commerce engaged in by SMEs. Table 3 presents figures for the UK that demonstrates the level of overstatement.

Table 3

E-Purchasing and E-Sales of Small and Micro Firms in the UK

kE-purchasing Small Firms Micro firms	Small firms (%)	Micro firms (%)
Businesses that order online	13	22
Value of purchases made online	5	6
Value of purchases paid for online	2	3

E-Sales		
Businesses letting customers order online	30	38
Businesses letting customers pay online	17	15
Value of orders online (% total orders)	3	4
Value of sales online (% total sales)	2	2

(Foley and Ram, 2002)

Firstly looking at SMEs' purchasing activity, 22% of UK micro businesses make purchases online and 13% of UK small firms; however problems arise in the actual value of goods ordered online and paid for online. Taylor and Murphy (2004) claim this is as low as 2% and no higher than 6%. The disparity revealed for sales is even greater. Although 38% and 30% of small and micro firms respectively enable customers to order goods on line, and 17% and 15% of small and micro firms let customers make payments online, as little as 2% and no more that 4% of the value of orders and sales are made online. Making allowance for the generally accepted lesser involvement of SMEs in e-commerce, these figures for the UK are in broad agreement with online sales information for sectors of the US economy (Buckley and Montes, 2002) and for e-commerce sales for the OECD countries more generally (OECD, 2002, p. 661).

Further to this, a study in the USA reported that only 19 per cent of small firms using the Internet accepted payments online while only 28 per cent had implemented online ordering (Zalud, 1999). A study of small firms in Northern Ireland, with their own Web sites, concluded that the Internet was being underutilised (Webb and Sayer, 1998). Taylor and Murphy (2004) suggest that although current levels of engagement with these new technologies may be relatively extensive, they are also rudimentary. E-business that goes beyond email and setting up websites is barely on the agenda of most SMEs. They also postulate that the extent to which e-commerce, let alone e-business, has penetrated the SME sector to date is very much an open question.

Broadband services potentially create new markets, increase workers' productivity, and add value to business performance, public efficiency and quality of life. Harnessing the broadband benefits is crucial to consolidate progress towards a knowledge-based economy and ensure growth through improved competitiveness. The successful deployment, take-up and use of broadband are therefore of central importance to the future prosperity of the European economy and the knowledge economy is seeks to develop. The benefits of the knowledge economy could be considerable for SMEs. The introduction of low cost new technologies such as the Internet and the falling cost of information services could erode the traditional barriers that have prevented smaller companies from becoming sophisticated users of information. It is open to SMEs to play a pioneering role in adopting the tools to achieving the Information Society will be through winning the hearts and minds of SME management (DTI, 1997).

Primary Research

Research Methodology

The aim of the primary research was to provide empirical evidence to assess the take-up of broadband by SMEs, to evaluate its effectiveness as a business tool and to understand occupier perceptions of the benefits and implications upon their working practices.

The town of Reading, Berkshire in the Thames Valley Corridor was selected as the geographical area for the sample. The first stage of the primary research was to undertake a postal questionnaire survey of SMEs located within a 10 mile radius of Reading town centre. A database of occupiers' names and addresses, together with the appropriate contact details was prepared using a Thames Valley Chamber of Commerce database. Office occupiers located in the town centre of Reading and also from office occupiers located in a number of rural areas and villages to the outskirts of the town were targeted in order to carry out a comparative analysis of the availability and use of broadband across urban and rural conurbations in the same area of the UK.

This area is located to the west of London, in the Thames Valley Corridor; it is an established office location and in recent years the Thames Valley Corridor has attracted a wide range of new office occupiers to include existing occupiers either relocating from Central London or multi-national companies setting up new UK headquarters. Whilst the Corridor has suffered from an oversupply of offices over the last few years, the market is now beginning to improve with an increase in the level of enquiries for office accommodation (Lambert Smith Hampton, 2004).

480 questionnaires were sent out in October 2004 to the selected office users and 81 valid responses were received, representing a 16.8% response rate.

The second stage of the primary research undertaken was to conduct telephone interviews with respondents who had indicated that they were prepared to participate in an interview for the second stage of the research. A total of twelve telephone interviews were undertaken, in order to expand upon the points they made in the questionnaire.

The results that follow are based on their combined responses. The first question explored the nature of the office occupiers canvassed.

Question 1- What is the nature of the business or organisation canvassed?
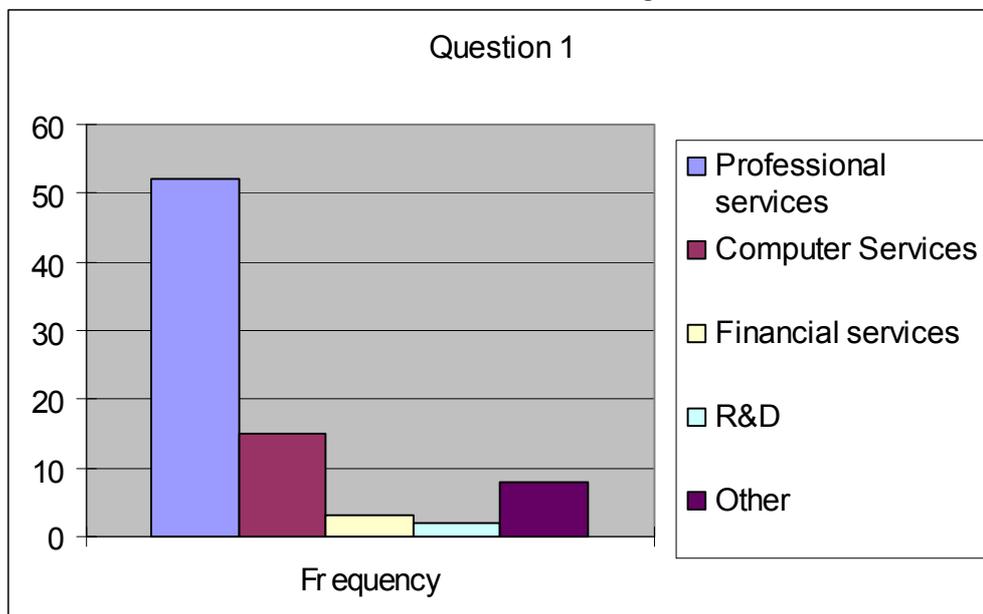
The range of businesses targeted was not unexpected, roughly reflecting the office occupier profile of the Thames Valley Corridor. The professional services companies canvassed comprised mostly law, financial services, marketing services, accountancy and other professional consultants.

Whilst it had been intended to only target the research at office occupiers with less than 25 staff, the size of the companies in the sample range is shown in question two.

Q2 - How many staffs are employed within your organisation?
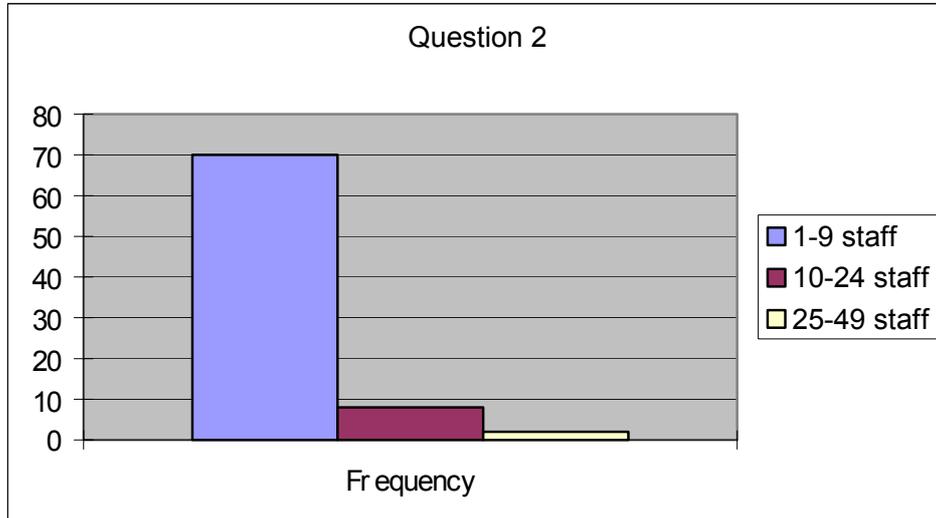
 The questionnaire achieved its objective of targeting small office users in the area. The next question was aimed at establishing the situation of their office.

Q3 - Is your organisation situated in urban business location or rural office location?
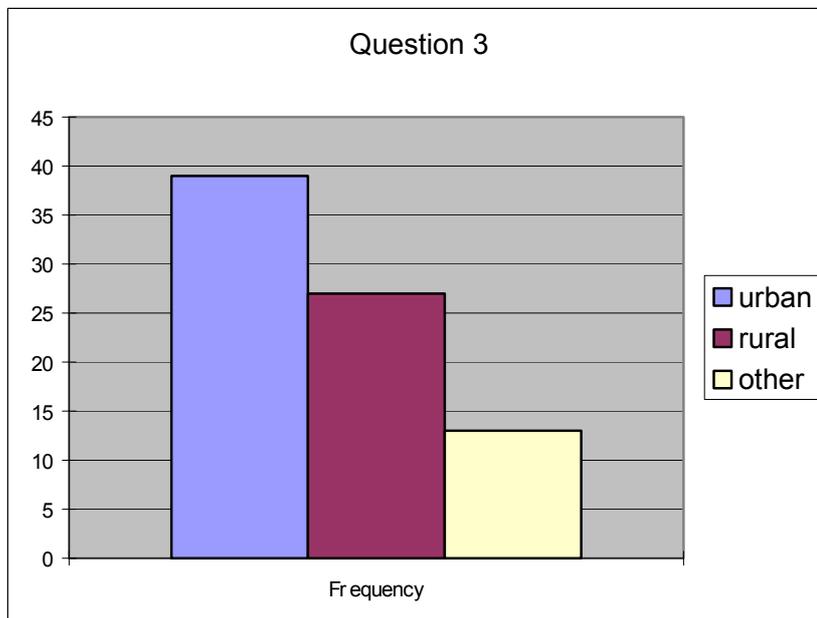
As above, the research was targeted at a range of businesses located both in the town of Reading and the outlying village locations. Other locations were categorised by semi rural / suburban areas where respondents appeared to be undecided as to whether they were in a solely rural or urban area.

There appears to be little published empirical evidence relating to the perceived importance of the speed of the transmission of electronic data, so the following question was posed.

Q4- How important is the high speed and high capacity transmission of electronic data to your organisation?
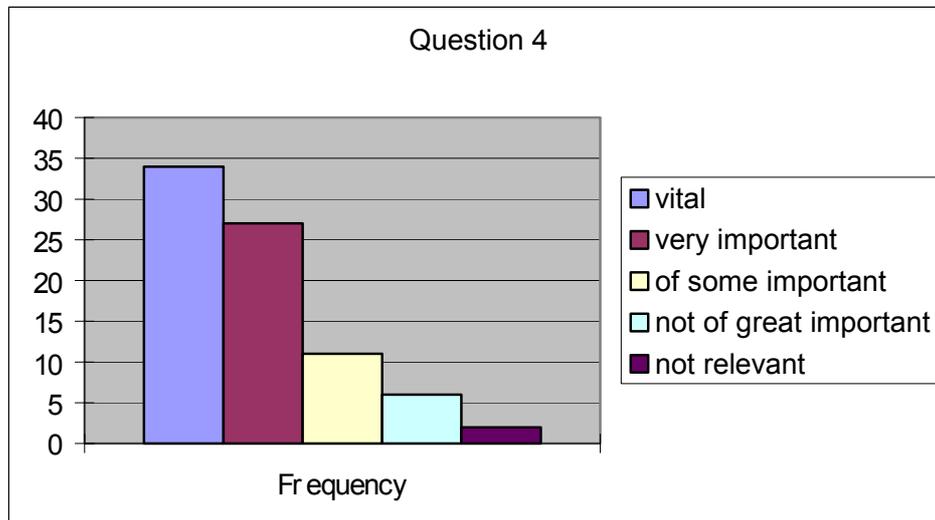
This question was aimed at establishing the relative importance of broadband to the organisations canvassed. The response indicated the extent to which broadband technology is now being used by office occupiers, with over 75 % of the respondents considering it to be vital or very important. There is of course an argument relating to bias, in so far that it could be argued that the questionnaires were mostly returned by the respondents who had an interest or experience in the use of broadband.

Comments written against the answer reinforced the vital importance of high speed connectivity:

"....*our business could not function without broadband- we are now totally reliant upon it".*

" *.... the business was set up to use the internet for all trading functions"*

" *.....in the two years that we have had broadband, our working practices have changed to adopt the flexibility and speed of the transmission of data and other information".*

*".....very happy with broadband but would always like additional bandwidth increase".*

The next question aimed at establishing the current bandwidth utilised by the sample group.

Q5. - What is your organisation's current IT bandwidth specification in respect of internet connectivity?
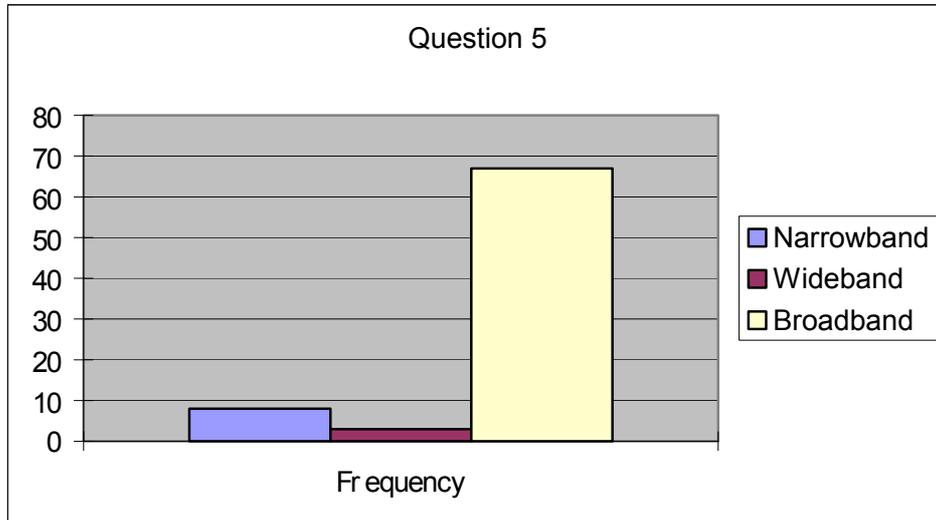

85% of the respondents have broadband technology. Six of the eight respondents who were working with narrowband were based in rural areas and did not have access to broadband. The remaining four respondents without broadband did have access to it but had not yet decided to connect to it.

Q6- If you currently have broadband, please state what type it is:
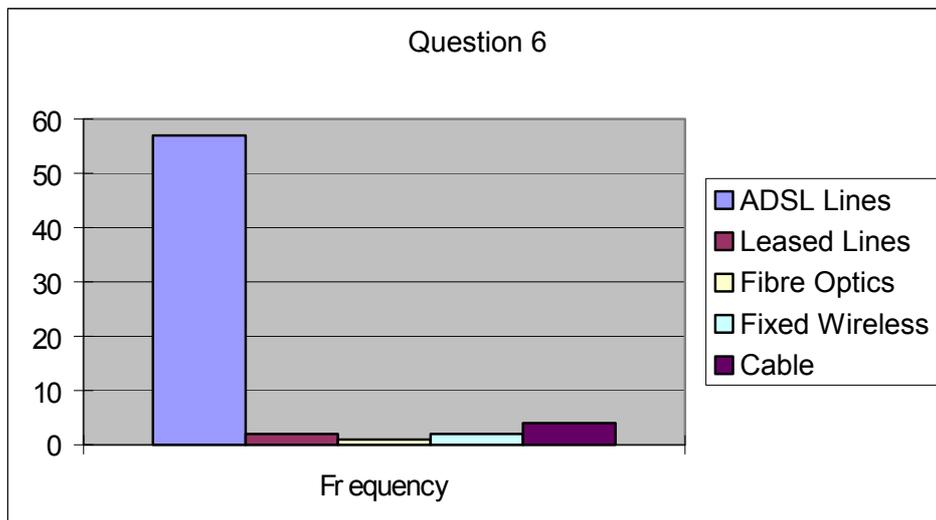
The sample confirmed the overriding use of ADSL lines. The telephone interviews conducted to date have confirmed that the minimum bandwidth capacity is 2 Mbps and that three companies have a current bandwidth capacity of 8-10 Mbps.

Q7- Are you currently satisfied with the internet technology you have in place?
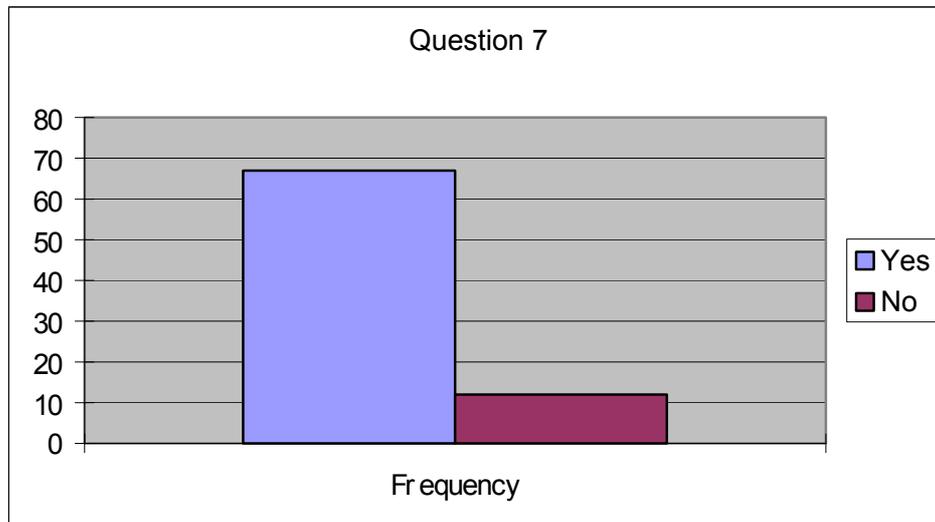
This question generated a large number of comments from respondents.

Whilst 86 % of the respondents were satisfied by the internet technology and bandwidth that they have in place, the negative responses included the following comments, which mainly centred upon the level of customer care provided by the internet provider:

"….broadband is too expensive and still too slow for our needs"

" ….the installation of broadband took ages to get right and caused a huge amount of disruption to our business. Little support was provided by our internet provider"

"…..we seem still to have problem with server connection, unable to connect on some occasions. The back up from the provider is very poor".

"…..it has taken us a long time to get the service we require, at a reasonable cost."

"….. we have only had broadband for 9 months and already we need additional bandwidth, which is not yet available from our supplier"

"…..security is our big issue; we have had our site vandalised by hackers and we are not confident that our firewall is working well"

*"…..there have been advantages with broadband connection, but there have been disadvantages - too much spam, an increasing number of viruses and the need more anti-virus software"*

"……we have accounting services online and fast internet access is vital to the operation of our web based product so access can never be fast enough''.

"…..we are especially aware of the sustainability issues concerning broadband– for example we now deliver our report primarily electronically to client around the world rather than using courier services"

"…..broadband is still expensive, I do not see any benefit in any always on connection. Dial-up is more secure, as the opportunity for hacking is a lot less''.

Q8- Are you considering the upgrade of your internet connectively /bandwidth systems within the future?
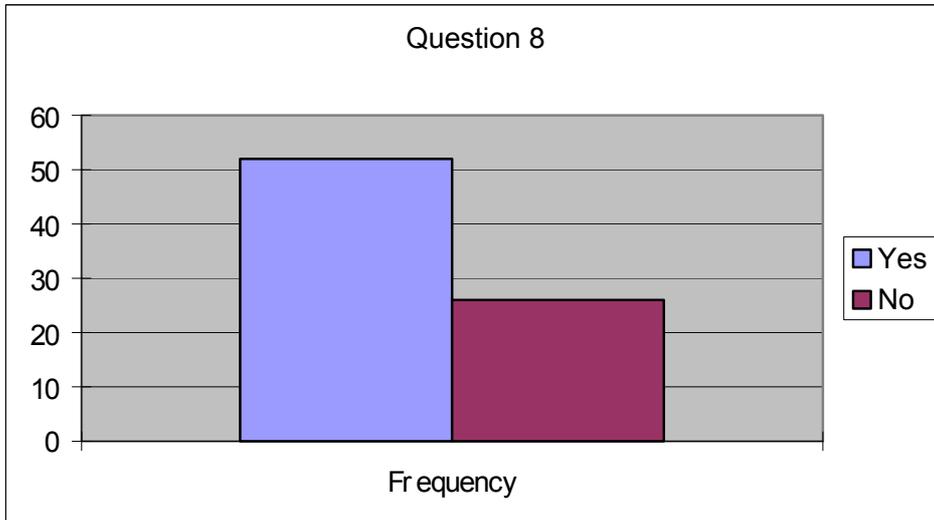

 The common theme was that users still wished to raise the speed of the broadband, to in some cases in excess of 10Mbps. In addition several respondents wished to consider a change of their internet provider due to such issues as poor customer care, too many interruptions to the service or high cost.

**Q8a.- If yes, when is this likely to be within the next year?**
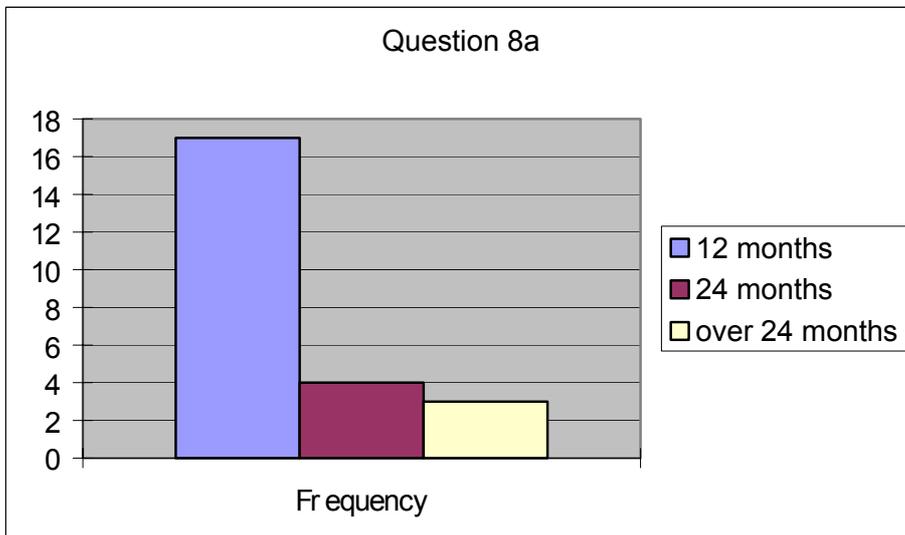
Q9- If you currently do not have a broadband supply, is broadband available to your office location by a provider?
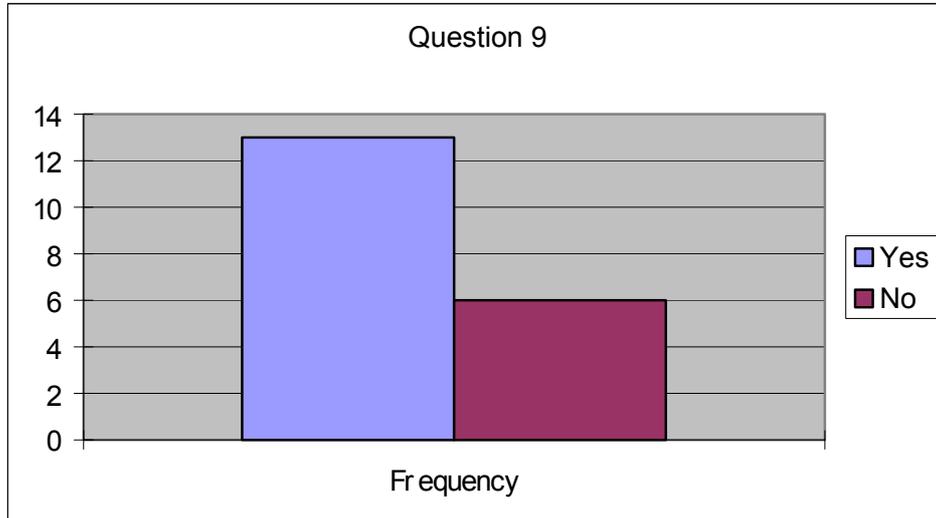
It is interesting to note that whilst broadband is available to some occupiers; they have chosen not to "light up" their buildings as they do not have a need for this supply.

One respondent stated that he was aware that satellite broadband is available to all users, if there are no other forms of broadband available.

Q10- Have you undertaken any lobbying in order to obtain a broadband supply?
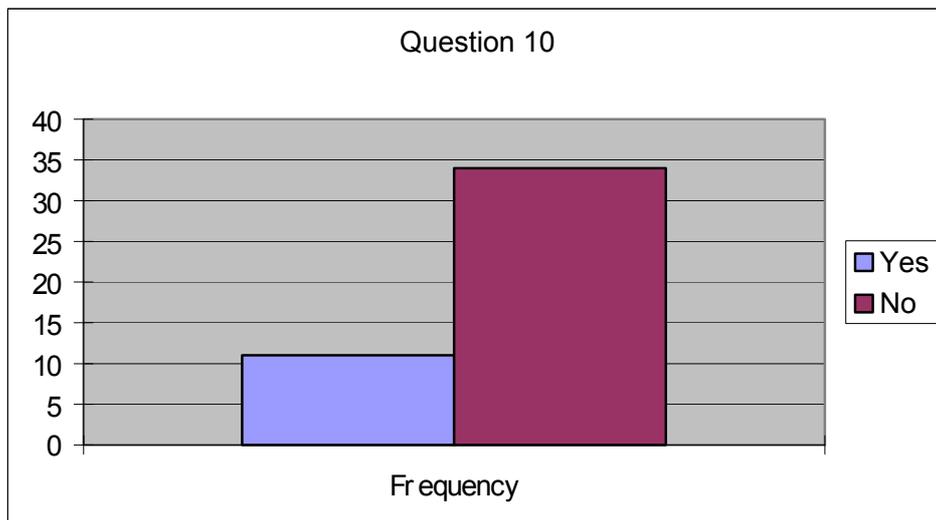
This question generated a large number of comments as it would appear that a number of broadband users had actively petitioned for a broadband supply. In 3 instances parish councils or villages had formally lobbied British Telecom and / or other suppliers.

Q11- Are you aware of any Government or Statutory Authority initiatives aimed at small office users wishing to obtain a broadband supply?

Question 11
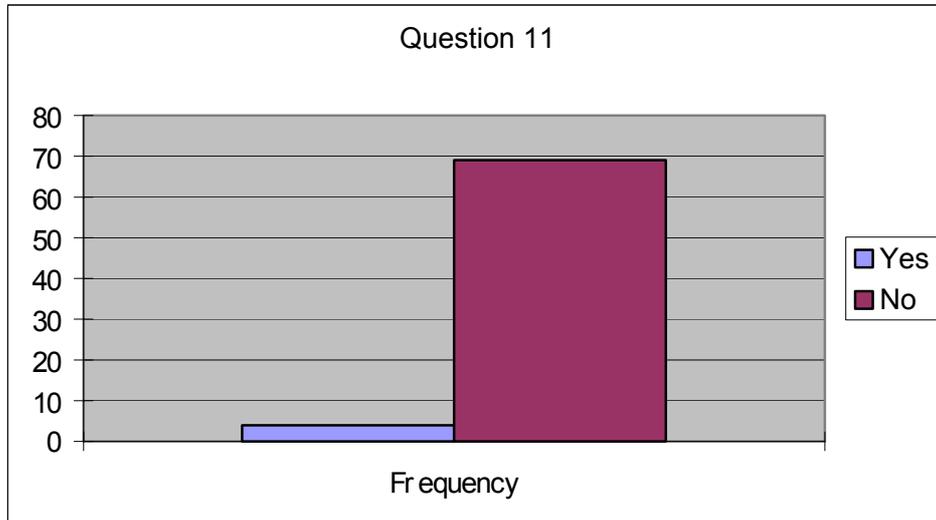
It would appear that some government initiatives as described earlier in this paper had not appeared to be well publicised. Indeed only 4 respondents were aware of any statutory initiatives aimed at a greater supply of broadband. None of the respondents mentioned the any of the initiatives undertaken by their local development agency, the South East of England Development Agency (SEEDA) in order to achieve a higher level of connectivity, particularly in the rural areas of the South East of England.

One respondent was aware that Business Link, a government enterprise agency did have grants available for satellite broadband in his rural area.

The general view of the respondents was that any initiatives available were not sufficiently well publicised to the small business community.

The final two questions were aimed at establishing whether office occupiers perceived that the new bandwidth has had a positive effect upon the efficiency of their business, the choice of location of their premises and their working practices.

Q13- If you already have broadband, please could you state whether you agree or disagree with each of the following statements?

It has had no impact upon business efficiency
The cost has proved to be value for money
It has had a significant impact upon working practices of employees
Broadband availability is a fundamental to the choice of location for my office

Has there been a trend towards any of the following in your organisation as

result of having broadband:

- Hot desking

- Hotelling / use of docking stations

- Operating as a virtual office

- Home working

- Video conferencing

Question 13
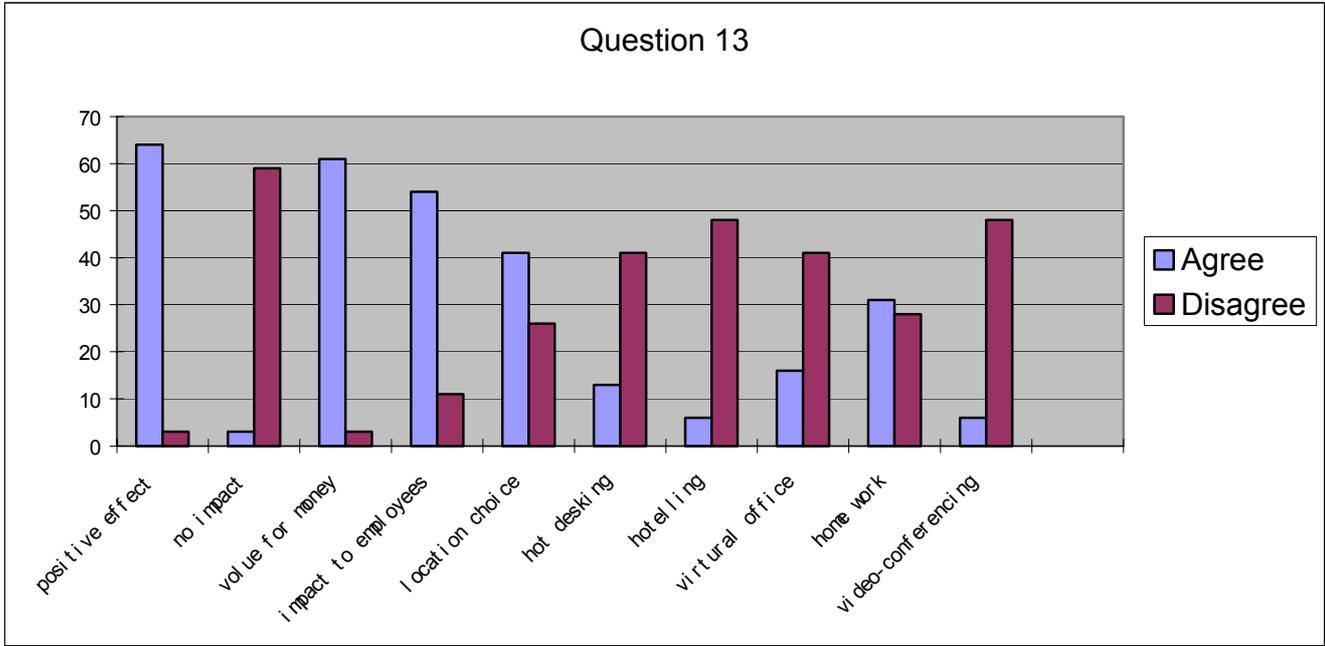
One aim of this research project was to establish whether the way office workers undertake their work has changed since the introduction and use of broadband technology. The respondent with broadband clearly confirmed that the use of broadband had had a positive effect on business efficiency and they considered that it was good value for money, having a big impact upon the business practices of employees.

The adoption of broadband has had a positive approach on the location of their offices, with 62 % confirming that they would not relocate to an office location which did not have access to broadband.

The respondents confirmed a number of interesting in-sights into changing working practices which have resulted due to the use of broadband, with the use of home working being the most frequently adopted new working practice to result from the use of broadband.

In order to obtain a crude assessment as to whether there is any correlation between the use of broadband technology and the amount of office accommodation occupied by an office user, the final question was asked.

Q14- Has the use of broadband had an impact upon the floorspace requirements of your organisation?
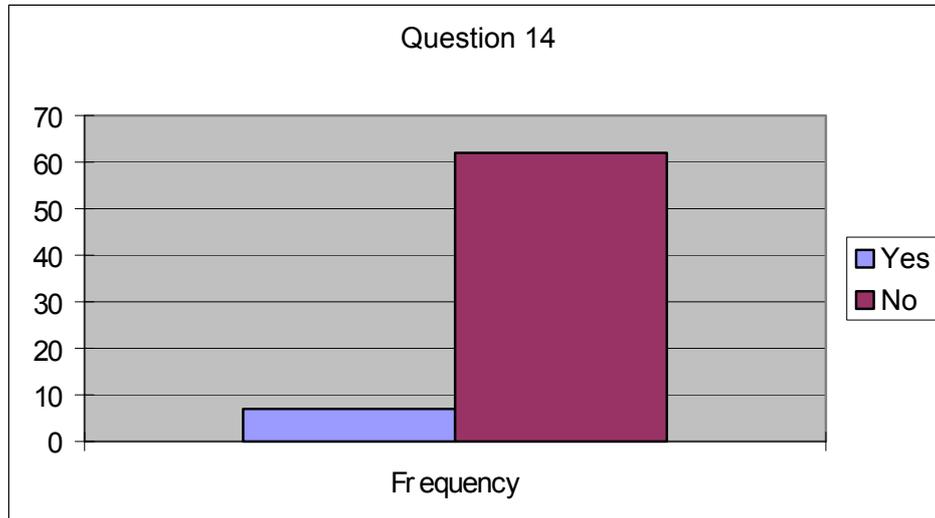
The result shows that the majority of the respondents (88%) do not consider that there is any correlation between specifically the use of broadband and their floorspace requirements.

Three relevant comments generally sum up the tone of the responses received:

> *"....it is difficult to say whether the number of staff members has risen or decreased just because of the introduction of broadband- there are a lot of other factors to take into account"*

> *".....whilst a number of our staff now work remotely more often, we still need accommodation for them here"*

> *"......as our business has expanded greatly due to the expansion of our net based services, we have needed more staff to work here".*

Conclusions

The business world has been transformed by e-commerce and connectivity. Government policy is aimed at promoting ICT for SMEs and there are many successful initiatives currently being undertaken to reach businesses which are not yet able to access affordable broadband. The concept that ICT will continue to play an important role in transforming business practices is proven. All of the SMEs canvassed for this project had an Internet connection and 85% had broadband access. Given the improvements proposed by the government and the telecom suppliers, it is expected that the vast majority of SMEs will have access to affordable broadband within the next two to three years. However there has been little research to consider the impact of ICT, and in particular broadband, on SMEs (Dixon et al., 2002a).

Further research is required to establish the impact of broadband technology upon the office market for SME enterprises. This survey was limited to a small geographical area, it is considered that further research should be aimed at a wider area, in order to establish the perception and needs of office occupiers in relation to the location and size of their office accommodation and

changing working practices and to draw conclusions upon the effects of broadband upon the office market.

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