

TOWARDS A MODEL OF ICT ADOPTION FOR THE ICT CLUSTER IN THE WEST MIDLANDS

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Signed

Pat Costello

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Abstract

This thesis is concerned with the exploration of a framework for ICT adoption by ICT micro-sized companies in the West Midlands. The thesis evolved out of the author's sense of dissatisfaction with several cardinal aspects of traditional approaches to facilitating adoption of the latest technologies in small companies to enhance business performance. Four main weaknesses were identified: first, there is often a lack of a theoretical foundation for the approach taken with regard to interventions. Second, there is ample evidence to suggest that the environment of small companies is complex and volatile and fundamental to the economy and yet hitherto success of the support in this area is patchy. Third, the role of those working to support small companies is largely unsupported in terms of their understanding of the problems. Fourth, small companies themselves are often uninformed of the issues and unaware that simple changes will aid their approach to ICT adoption.

Inspiration from three sources helped the author to develop the work behind this thesis and attempt to remedy weaknesses: first, the work of many researchers in ICT Evaluation methods and frameworks provided insights into the value placed on ICT within organisations and the subsequent impact of the perception of value. Second, developments in the study of SMEs provided new insights into the unique environment that exists within small companies and the issues that these organisations face on a daily basis. Third, research around the new field of EDI and eBusiness adoption provided the basis for the exploration of frameworks and models that were applicable to the SME environment and could be developed to work with any technology adoption.

This thesis is therefore the exploration of a new model for micro-companies, supported by a thorough grounding in these three areas, which was achieved by taking an exploratory research approach. The model will indicate to a small company the weaknesses in their environment regarding ICT adoption and what they need to do to increase the success rate of any proposed ICT adoption. The framework has been developed to incorporate the issues regarding the personal factors of the owner-manager, the firm, organisational readiness, external pressures, strategy and perceived value. The author describes the methodology behind the development of the framework and makes recommendations for improved ICT adoption initiatives. Application of the general methodology through exploratory research has resulted in new opportunities to embed the ethos and culture surrounding the issues in the framework into new projects developed as a result of Government intervention. .

The thesis proposes three main themes: first that an understanding of the issues inherent in small companies is necessary in order to work effectively in supporting them to make ICT adoption more successful in the future. Second, that a greater knowledge of these issues and the impact that adoption of technology has in small companies can assist those involved in intervention projects. Third, that by drawing together existing models this new framework can guide these companies in their own ability to adopt successfully and raise awareness regarding the need to address these factors. Taken together, these areas represent a new approach to ICT adoption.

The thesis demonstrates originality in four key areas:

1. It extends and develops an understanding of the micro-company environment and the issues inherent when faced with the adoption of new technology.
2. It introduces a new model for use by micro-companies constructed from acknowledged academically grounded models, to develop and highlight their ability to adopt new technology successfully.
3. The exploration of the issues within the ICT sector gives unique insight to a vertical business sector.
4. Investigation of the sector within a UK sub-region gives new insights for that region giving an opportunity for intervention to be augmented by the findings.

Verbatim

“In the temple of science are many mansions, and various indeed are they that dwell therein and the motives that have led them hither.

Many take to science out of a joyful sense of superior intellectual power; science is their own special sport to which they look for vivid experience and the satisfaction of ambition; many others are to be found in the temple who have offered the products of their brains on this altar for purely utilitarian purposes.

Were an angel of the Lord to come and drive all the people belonging to these two categories out of the temple, the assemblage would be seriously depleted, but there would still be some men, of both present and past times, left inside”

Albert Einstein - 1879-1955

List of Papers and Reports Published in association with this Thesis

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Chapter 1 Introduction and Rationale

1.1 Problem Statement

This thesis is concerned with the development of a framework for ICT adoption by Small Medium Enterprises (SMEs) and specifically for micro-sized companies of less than 10 employees. The thesis evolved out of the author's sense of dissatisfaction with several cardinal aspects of traditional approaches to facilitating adoption of the latest technologies in SMEs to enhance business performance. Four main weaknesses were identified: First, there is often a lack of a theoretical foundation for the approach taken with regard to adoption interventions. Second, there is ample evidence to suggest that the SME environment is complex and volatile and fundamental to the economy and yet hitherto success of the support in this area is patchy. Third, the role of those working to support SMEs is undefined and largely unsupported in terms of their understanding of the problems. Fourth, SMEs themselves are often unaware of the issues highlighted and unaware that simple changes to their approach to adoption can aid the success of the ICT adoption.

To address some of these concerns this study will attempt to lay the foundation of a model of adoption which will highlight to both micro-companies and those involved in their support, the issues that are predominant in the adoption situation and the main concerns around these issues. This will help to identify what may need to be addressed to enhance the likelihood of success leading to business improvement from technology adoption. The work that has been identified in this area is varied as the identification of issues by researchers has led to a breadth of knowledge which is now becoming mature and the time is right for work that will encompass that already done and drive it forward.

There is a real need to progress research in this area as although there are a relatively small but significant number of researchers working in the field of ICT adoption (Van Akkeren and Cavaye, 1999b; Harindaranth, 2007), much work remains to be done to assist companies in

this area. This research examines the concerns surrounding ICT Adoption in micro-companies specifically in the West Midlands (WM) region of the United Kingdom (UK) with particular emphasis on the ICT Sector. As research in this area is limited the study takes an exploratory approach to the development of a model proposition.

Many small companies are the potential beneficiaries of adoption initiatives by government which has recognised that technology adoption can help businesses to become more effective and more efficient. However, these initiatives are not always successful as companies are often left with new technology in place that is not used effectively or worse, not used at all. The reasons behind this are as varied as the issues that are pertinent to the situation. A model of adoption would at least identify what issues should be of concern to companies when they contemplate either new technology adoption or their own involvement in technology adoption programmes. In spite of work already done, the need to pursue this area remains, the problem is vast and of national concern particularly as the majority of companies in the UK and indeed in the world are SMEs (OECD, 2000 in Martin and Halstead, 2004). ICT adoption models to date have also predominately focused on the inhibitors and drivers of adoption but none have been models for action or involved the factor of return on investment (ROI) which is of paramount concern to small business owner-managers. Neither do they consider the pre-adoption concerns of perceived value or the post-adoption measures of that adoption success as a driver for future adoptions.

This chapter consists of an initial introduction to the problem area, it then continues with an explanation of the research background, how the work was initiated and its rationale. The context for the research will then be discussed looking at the broader arena for the study and is followed an explanation of the context for the survey which is a subset of the research context. The aims and objectives will be established as will the scope and limitations of the research. This will be followed by an examination of the gaps in current knowledge.

1.2 Research Background

For many small companies innovation is not about 'blue-sky' research and leading edge technology but about the adoption of technology that will allow new processes to be employed by the company that are innovative for them (Mehrtens et. al., 2001). The WM ICT Cluster has recognised this and much of its successful work has centred around adding value and aiding companies to increase the value from technology adoption. This research will help that process by highlighting the factors that need to be present for successful adoption. The decision to adopt technology brings into play a myriad of issues that can be overwhelming for a micro-company. Many models have examined EDI adoption and the transferability of these models from EDI to Internet (Mehrtens et. al., 2001; Jackson and Sloane, 2007) but the testing of the models adoption into all technologies has been less well examined. This research explores the proposition "Can e-business adoption models help with adoption of all technologies? Are the factors the same?" Thus through identifying these issues and exploring the proposition, a model will be developed to guide small companies in that it may highlight weaknesses that when addressed may help improve the success rate of a particular ICT adoption.

For many years most Information Systems (IS) research concerned large organisations although in recent years SMEs have become a focus (Ballantine et. al., 1998). Many large organisations looking to reduce costs have exploited their ability to influence and 'persuade' their suppliers to implement ICT in the supply chain; an example of this is Electronic Data Interchange (EDI). Many SMEs are at least considering using and many have utilised the Internet as a means of communication between themselves and customers (Levy et.al., 1999). The decision to use electronic means of interaction is often seen as imperative to ensure future work.

The Autolean Project (Costello et. al., 1999a, 1999b), which took place in the WM during 1998 - 2000, demonstrated that implementing Internet technology in a company as a communications tool was merely the start of the process of implementation of eCommerce. The real benefits could be achieved by extending the implementation of the infrastructure internally to facilitate desk to desk email, and externally in the form of more advanced technical options e.g. integration of databases with those of customers (Costello et. al., 1999a), and also the adoption of new internal processes (Husein et. al., 1999). The extension of infrastructure often perplexed the participants in the project, who felt the initial project itself should provide a complete 'solution'. This example demonstrates the need for SMEs to adopt and adapt continuously using ICT. Merely supporting the initial adoption did not lead to subsequent ability to use or extend the technology infrastructure to bring about business process improvement.

This research began several years ago by exploring the issues surrounding the technology that SMEs may be investing in and the concern that many may not be realising value from their investments and would then be subsequently reinvesting in an ad hoc manner. This was supported by knowledge from work with companies and initial literature searches which revealed that SMEs do not adopt in a formal sense as larger organisations do (Dans, 2001). This then would surely lead to further purchases that merely reinforced the original concerns of the SME that ICT was simply a cost that was unavoidable and not a strategic investment

The initial literature searches began with a need to understand the SME environment within which ICT investments in infrastructure are made. This then led to a search for the value given to ICT within SMEs and subsequently many ICT evaluation frameworks were examined for their appropriateness to the environment within which SMEs operated. At this point the area of information economics became relevant to the research, particularly as previous

research had shown that value to SMEs was not measured as it was in larger organisations and was often the perception of the value to the owner–manager (Costello et.al., 2006). There is a need for value to be recognised from ICT infrastructure within SMEs as the investment is often viewed by many organisations as a cost not matter what their size (Levy et. al., 2001). For SMEs this is relative and ICT investments are often very high risk and high value whatever size the company is (Remenyi et.al., 1991). It is clear that without measurement to determine the subsequent increase in business performance and/or productivity there is no direction for future investment.

This initial research led to the area of ICT adoption and the concerns surrounding the field and the realisation that very few researchers were active in this field. This research therefore began to concentrate on this area, fuelled by the secondment of the author to the West Midlands Regional Development Agency (RDA) Advantage West Midlands (AWM), where involvement with local SMEs increased motivation to pursue the subject area. SMEs are often the target of Government intervention campaigns to encourage them to adopt the latest technologies without necessarily embedding the skills to enable that adoption to take place unsupported subsequently thereafter. This has an impact on the business support infrastructure in the UK and subsequent funding regimes.

ICT adoption in SMEs is strongly linked to the value that they place on their investments (Levy et.al., 2001). The focus of this work therefore, began a natural progression towards examining other models and subsequent work on developing a new model that would incorporate previous research from the area of EDI and eBusiness adoption. Very little work has been done in the area of adoption of ICT infrastructure in SMEs and yet SMEs form a very important part of the supply chain in the UK especially micro-companies with ≤ 10 employees. A number of white papers and reports have been produced by various organisations focusing on the UK and the West Midlands (Adriot, 2007; eSkills, 2005a and

2005b; Microsoft, 2007; Harindranath et.al., 2008) but the area continues to be neglected as a focus of academic research which might endeavour to develop a model that will guide SMEs in this field.

This research does not attempt to solve the problem of ICT Adoption in SMEs or offer solutions to the current impasse of an ICT sector in the WM which may not necessarily be 'fit for purpose' to support other sectors in their technology adoption strategies. Instead this research examines the factors that may be involved in the adoption of infrastructure using a number of current models combined into a new model that may offer a way forward and identifies which of these issues may need addressing first. This is encapsulated in a model which is offered for further research and as a step towards identification of these issues by micro-companies.

1.3 The Research Context

Within this study the research context has been sub divided into the research field, which is broader than the context in which the survey is carried out, as the research field involves the overarching subject area in the realm of SMEs and adoption ICT by SMEs and micro-companies within the UK and indeed could be extrapolated to suit most European (EU) countries. Whereas the survey context is taken from a specific sector within a UK sub-region, that is the ICT sector in the West Midlands. This could of course be replicated into other regions across the EU and into other sectors. It is however, important to emphasise that the research in the literature review represents the broader context in which the survey exploring the issues is set.

1.3.1 The Research Field

The term SME may describe a wide range of organisation definitions and criteria which can vary across countries. Some of the commonly used classifications are: number of employees, total net assets, sales and investment level. However, of these the most commonly cited categorisation is the number of employees of which there is also variation in defining an upper and lower size limit, with some countries using a maximum staffing level of 300, and some, not differentiating between small and medium classifications. Despite this variance, a large number of sources define an SME as an organisation, as having a cut-off range of between 1 and 250 employees. The term SME was first adopted by the European Union (EU) in 1996, in an attempt to provide equality between SME organisations within the EU, and allow the EU to improve the reliability and usefulness of its interactions with the SMEs. (Commission Recommendation 96/280/EC of 3 April 1996 Official Journal L 107, p. 4-9, of 30 April 1996.)

However, there were an estimated 4.5 million active businesses in the UK at the start of 2006¹ 99.3% of these were small businesses with less than 49 employees. Only 0.6% (less than 27,000) were medium sized enterprises (50 - 249 employees) and only 0.1% (6,000) were large (250 or more employees). These small businesses accounted for 45% of non-government employment and (excluding the financial sector) 38% of turnover. In contrast the 7,000 largest businesses accounted for 45% of non-government employment and 49% of turnover. In the UK, large scale companies are down sizing and increasingly relying on networks of SMEs. Daly (2002) also suggests that a 'technologically strong SME system will be necessary to develop, attract and work with large enterprises'. However, the average size of 98% of all firms across the European Union are identified as having seven employees and are termed 'micro-enterprises' since they employ less than 10 people and in the UK, an average company is around six to eight employees. (OECD, 2000 in Martin and Halstead,

¹ <http://stats.berr.gov.uk/ed/sme/smestats2006.xls> (date accessed December 2007)

2004). This incorporation of micro-businesses into the morass of small companies with less than 49 employees leaves micro-companies exposed as their peculiarities are in stark contrast to the larger 20+ size small companies (see section 2.2.1), although these larger companies do suffer the same resource poverty as the former.

Dans (2001) showed that small companies pose a particularly difficult field of research, as the world in which they operate is very volatile. They are created and 'die' in large quantities every year and although the numbers quoted above may grow, the individual organisations change rapidly. There is also evidence to suggest that increasingly small companies are faced with more and more complex IT/IS investment decisions (Hillam and Edwards, 2001). This environment has been relatively neglected in terms of ICT adoption research. However, work in the area of large organisations has developed various eBusiness adoption ladders, steps, frameworks and models which have been offered as a panacea to direct both interventions and private sector activity in this area. These mainly consist of linear approaches to the problem and do not necessarily identify the specific issues that would need to be addressed or approach them in a multi-faceted manner necessary to at least start to help companies to help themselves. In spite of all this small companies pose a particularly interesting field of research and involvement with them often creates a passion within those tasked with helping them and in researchers working with them.

Overarching questions within this research context focus on the exploration of the micro-company environment in the adoption situation. These question areas are predominately:

1. What drives micro-companies to adopt ICT in the manner they do?
2. Why do micro-companies invest in ICT in the ad hoc manner that so many researchers report on?
3. Is there anything that can be done to help change this approach?
4. Can the adoption process itself be the cause of this lack of increase in performance?

These overarching questions will drive the approach and focus for this research with specific research questions being highlighted in section 3.2.

1.3.2 The Survey Context

It is important to state at this point three case studies were carried out with small companies was carried out at the start of this research to further explore elements and to help design the survey instrument. This was followed by a sample survey of eight companies as the model was developed to further refine both the issues in the model and also the survey instrument. The companies involved in this initial work were from different sectors as that was the initial focus of the research. However, during the course of the research an opportunity arose, driven by the author's secondment, to concentrate on a sample of approximately 200 companies within the ICT sector and the work then moved to concentrate on this sector. All company names in the case studies, pilot survey and main survey are anonymous in compliance with the Data Protection Act 1998.² Both pilot survey and initial case studies are discussed in detail in section 3.6.1 and 3.6.2. The ICT sector is critical to the delivery of ICT services and products within the WM and the sectors' ability to adopt ICT effectively within its own organisations may have implications for their capability to support the ICT adoption strategy in other sectors in the region.

Sheppard and Hooton's³ (2007) report commissioned by eSkills UK and published in July 2007 provided forecasts of the economic impact of ICT on the UK's regional economies. They claim that the potential economic impact, if ICT is optimised, would be significant for all UK regions. They estimate potential achievement of between three to four percent in productivity savings; which could equal between £1b and £5b per region. They further expect the scale of

² The main survey data is the property of AWM.

³ Regional Economic Impact of ICTs and the Role of RDAs/DAs. A White Paper: Informing the Policy Debate by Adroit Economics Ltd. July 2007. Although not an academic source this report has had major repercussions within the region for its inference to potential GVA uplift from successful ICT adoption.

impact could be even greater as new technologies and capacities open up unforeseen opportunities. The report further establishes that the WM region demonstrated a gap in GVA⁴ of £10b when compared with other UK regions. It also highlighted that a 10% increase in productivity affected by successful and efficient adoption and use of ICT could reduce that gap by £3b. This issue is replicated across the UK when latest statistics produced for the government by London School of Economics (2005) shows that productivity gains are identifiably associated with widespread use of computers by employees within firms.

This makes the successful adoption of ICT imperative to the success of the region and as the ICT sector could be fundamental to this; an examination of this sector could aid this work. They also suggested actions that RDAs could implement and cautions that though the potential benefits are great, there are barriers and inhibitors likely to impact successful adoption of ICT in the WM. They also stress that if these are not addressed, the full potential increase in GVA (see below) may not be realised.

The Office of National Statistics (ONS, 2005) states that GVA is an important measure in the estimation of Gross Domestic Product (GDP). There are three theoretical approaches used to estimate GDP; and these are 'production', 'income' and 'expenditure', when either 'production' or 'income' approaches are used the contribution to the economy of each industry or sector can be measured using GVA.

These economic measurements, are described by the ONS (2002) as follows: The 'production' approach estimates the value of an output (goods or services), less the value of inputs used in that output's production process. The 'income' approach measures the income

⁴ Gross value added is the difference between output and intermediate consumption for any given sector/industry. That is the difference between the value of goods and services produced and the cost of raw materials and other inputs which are used up in production.
http://www.statistics.gov.uk/about/glossary/economic_terms.asp

earned by individuals (e.g. wages) and corporations (e.g. profits) in the production of outputs (goods or services). The third GDP estimation theory, the 'expenditure' approach measures total expenditure on finished or final goods and services produced in the domestic economy. The link between GDP and GVA is described as an equation:

$$\text{"GVA + taxes on products - subsidies on products = GDP"}$$

ONS (www.statistics.gov.uk)

As well as impacting on this important economic measurement, efficient ICT adoption will also produce cost savings in production or operational expenses, which in turn increases the output's value. Sheppard and Hooton (2007) believe that GVA primarily derives from businesses and if we do not have enough businesses benefiting from ICT this will affect contributions towards the region's GVA. If RDAs are able to implement changes to the current status of adoption, the impact will be considerable.

This research examined the ICT Sector in the WM as this is of particular interest to the author who has worked on secondment for the last four and a half years as an executive member of the ICT Cluster Opportunity Group. This strategy board was set up by Advantage West Midlands (AWM) to determine the strategy and approve funding for strategic opportunities to regenerate the ICT sector in the WM. An assumption may have been made that the ICT sector, as specialists in this area, would be adopting and implementing technology infrastructure for their own businesses in an efficient manner and would therefore be equipped to deliver infrastructure and services to other sectors in the region. If the ICT sector was discovered to have issues regarding the successful adoption of ICT then there are implications for the region and other sectors could be severely impeded in their progress and the increase in GVA previously cited may not be achieved.

The latest intelligence from the WM ICT Cluster⁵ shows that there are over 3,000 businesses currently identified as specifically ICT as well as many thousands more businesses whose intellectual property is predominantly ICT in origin (Rowe, 2007). A significant proportion of these companies are small in size, with the majority employing less than ten staff and 72% employing less than four. This directly mirrors the situation across the UK and as such the results of the survey may be applicable to other regions.

Advantage West Midlands (AWM) is one of nine RDAs responsible for delivering economic advantage to the UK's regions. AWM's Agenda for Action (2001) defined three distinct delivery vehicles for addressing the economic challenges faced by the Region: High Technology Corridors, Regeneration Zones and business clusters. The High technology Corridors and Regeneration zones in the WM are determined by geographical areas. Therefore the only mechanism concentrating on industry sectors is the business cluster concept.

The development of clusters (or cluster strategy) was first described by Porter (1990) in which he described a cluster as a group of "Interconnected companies specialised suppliers, service providers and associated institutions". Some well known clusters are Silicon Valley (ICT), Bangalore (Software Outsourcers) or even Hollywood (film industry). Porter (1990) proposed a 'Diamond of National Advantage' (Figure 1.1) in which he claims that Nations can create circumstances for increased competitive advantage using infrastructure which includes skilled labour, a strong technology and knowledge base, government support and culture. This concept is not discussed in depth here but is used to illustrate the fact that the role of Government is to act as "a catalyst and a challenger" and that this strategy could have

⁵ The ICT Cluster refers to the government initiated project implemented through the Regional Development Agency of the West Midlands region, Advantage West Midlands (AWM). More information and references are provided in Chapter 3 of this thesis.

significant benefit. This has led to many RDAs adopting the technique and interpreting it to their own regions' infrastructure.

Porter's (1990) four attributes of national advantage are:

- a. Factor conditions (i.e. the nation's position in factors of production, such as skilled labour and infrastructure),
- b. Demand conditions (i.e. sophisticated customers in home market),
- c. Related and supporting industries
- d. Firm strategy, structure and rivalry (i.e. conditions for organization of companies, and the nature of domestic rivalry).

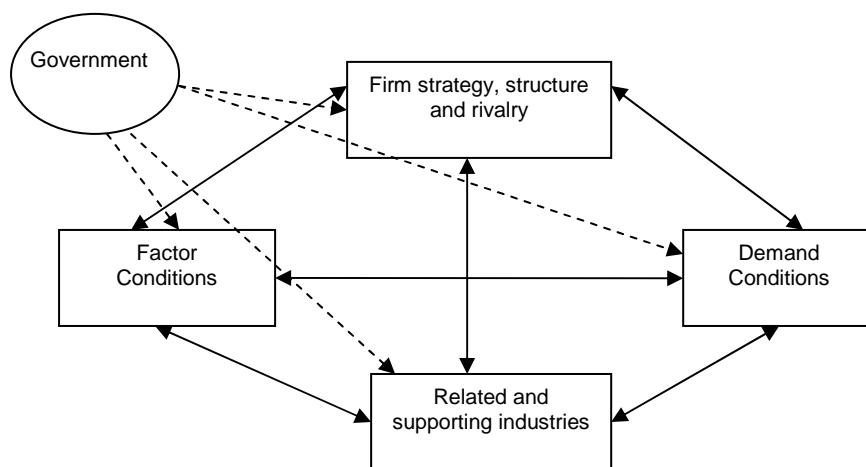


Figure 1.1: The Diamond - Competitive Advantage of Nations (Porter 1990)

Clusters are groups of companies which are linked through their activity; it is usual for these companies to be located in the same area. The connection between companies in a cluster can be both vertical via the supply chain and horizontal through complementary products or services. Most will also involve social network that can produce benefits for the companies involved. Clusters may consist of companies, suppliers, service providers, related industries,

and associated institutions (for example universities, agencies, and trade associations) in a particular field that may compete but also co-operate with each other. (Porter, 1998)

There is also a cultural difference between sector and cluster. A sector may be perceived as a group of competing businesses whilst a cluster can be perceived as individually competing businesses that are also willing to collaborate with each other for mutual benefit. ICT Adoption is critical to the development of clusters, but in particular coordination technologies such as LAN, WAN, databases, collaborative systems, information flow models, EDI, groupware, Internet, etc (Carbonara, 2003). Efforts to date in the WM have included the development of a formal cluster strategy and action plan, the appointment of cluster managers at AWM and representatives from key partner organisations, the formation of an industry-led Cluster Opportunity Groups (COG) charged with the cluster's development and a number of projects to address identified business needs.

The WM has a specific challenge in terms of ICT adoption as data provided by Point Topic (2007) demonstrates:

- 66% of West Midlands businesses have internet access, compared with a national average of 86% - the region is at the bottom of the league
- 30% of West Midland's businesses utilise eCommerce, compared with a national average of 39% - the region is 4th from the bottom of the league

The challenge is clear and there is a specific need to target ICT companies who would be expected to be ready to help meet that challenge. The WM are not the only region facing these challenges with southwest London and Thames Valley areas being some of the most productive regions of the UK yet reporting similar concerns (Harindranarth et. al., 2007)

If the ICT Cluster in the WM were to develop an identification of the factors involved in successful adoption and implementation of technology, it would be a significant aid in the development of the cluster. Firstly, by identifying whether companies who have ICT as their core business have the same factors affecting adoption as other businesses and secondly by identifying the factors important to their market it provides valuable market analysis. Levy and Powell (2005) state that industrial sector has no bearing at all on the Internet adoption process. Clusters provide another view of sectors as they are not so delineated and this research will examine this factor also. Information about the drivers for ICT adoption amongst SMEs would prove invaluable to the ICT cluster.

1.4 Aims and Objectives

The research aims to focus on the belief that real change can be afforded by supporting very small companies in their quest to adopt ICT that will help drive their business. The research began initially by focusing on the areas of ICT Infrastructure in small companies, ICT Infrastructure Investment and its link to Business Performance in SMEs and Pre-Investment Decision-Making in SMEs. As the research developed it moved into the field of ICT adoption and from this the current research developed. The original areas provided a sound background and allowed for a broad start which could be ultimately focused in the area of technology infrastructure adoption. During the course of this study and subsequent writing, the field of ICT adoption has grown from being a field of study of interest only to academics to being the subject of several eBusiness adoption initiatives by government, and now being the source of major concern at regional development to both the ICT Cluster (Rowe, 2007) and the ICT policy group within AWM and in several other RDAs across the UK and the EU.

This research does not attempt to develop theory from investigation but instead utilises existing models to develop a new model which has been explored in a particular situation within one sector in a specific geographic area. The needs of a specific industry have been

thoroughly investigated and the findings could be of importance to industrialists, educationalists and policy makers.

The objectives of the research were developed early in the project and the area was thoroughly investigated and the gaps identified from that research and from practitioner experience in the field by the author in consultation with colleagues. These are:

1. To review and analyse current research in ICT adoption.
2. To review and analyse ICT adoption models and use these models to develop a new model which is more encompassing and aimed at micro-companies.
3. To investigate ICT infrastructure purchases in the research as most adoption models to date examine specific technologies, e.g. EDI, eBusiness and Internet. This would not differentiate technologies reflecting the approach by micro-companies.
4. To explore the issues within the models by extending the research into the broader research area and exploring the categories and elements within the model
5. To provide a new model of ICT adoption for micro-companies within the ICT Cluster.

1.5 Scope and Limitations

To validate the research claims the investigative part of the project focuses on micro-companies within the ICT sector within a single UK region, the West Midlands (WM). The respondents within those companies were predominately the owner-managers and were interviewed over a 6 month period in the latter half of 2007. It had been assumed that they would have excellent knowledge of this area but this was not always the case although it is assumed for this research that they have more knowledge of adoption than owner-managers in other sectors. The scope of the questions was intended to address four major areas within

the survey: the background details (name, location, etc.) what ICT was currently employed by the company, the purchasing decisions made and the subsequent impact of the adoption on business performance. It was also assumed that small companies would not want to take place in the survey but this was not the case. What did interest the companies was what would be done with the results by both the researcher and the funder (AWM) and how it might help them. This is explored further in section 3.6.5.2.

The initial case studies and pilot study were focused on small companies in a number of different sectors. However, the opportunity to conduct a survey amongst ICT companies was sponsored by the ICT Cluster at AWM and the survey then concentrates on these. The impact of this was that the researcher had to ensure that the work presented to AWM did not impact on the research for this study. This was achieved by presenting a report to AWM focusing on actions to address the findings by interventionists. During the course of the survey it was realised that the majority of respondents were from micro-companies. This then served to influence the rest of the work as an investigation of the literature revealed very little work on micro-companies and still less on adoption. Micro-companies have peculiarities that mean they need specific help in this area and this is investigated in section 2.2.1.

There are a number of limitations inherent in any research and particularly in the social sciences fields, represented here by information systems. The limitations inherent in this research are:

- This research did not use a control group of non-adopters as in previous research using adoption models. There was no single technology investigated and instead all ICT purchases by companies were investigated using as a framework the models cited in chapter 2.

- The research concentrates on micro-companies and as such may not be applicable to larger organisations, the reason for this was that of the 203 respondents 167 were from micro-companies with less than 10 employees.
- The majority of respondents were owner managers of ICT companies who, as the survey output indicated, found it difficult to admit that they may have problems with adoption of technology; bias may be inherent in this.
- The survey used within this research, collected both quantitative and qualitative data. This was analysed and categorised rigorously. However, this can sometimes be perceived as being less rigorous than a scientific experiment (Oates, 2006).
- The questionnaire itself had a number of open ended questions that were subject to interpretation by the owner manager; this was a deliberate strategy that could be seen as a limitation within this research (Galliers, 1992).
- The underlying paradigm of interpretivism, which is discussed in chapter 3, indicates that this research will have some bias within it (Kelliher, 2005).
- The sampling was done in an opportunistic fashion and the respondents were selected from owner-managers who attended ICT orientated events within the West Midlands region. It could be anticipated that certain types of owner-managers attend these events, and that in itself means that the data collected may be biased in favour of those 'types'.
- There is always the inevitable bias in the researcher, in this case, colleagues of the researcher also helped to inform the research and would bring another potential degree of bias (Oates, 2006).
- Qualitative research lends itself to categorisation and the very act of categorisation can lead to bias in interpretation, and the opportunity for data to be missed (Tsoukas, 1994; Cornford and Smithson, 2006).
- The quality of the research needs to be considered and monitored by the researcher when developing objectives and choosing methods. This choice can impact in two ways: the validity of the method chosen can impact on the findings as the relationship between

what the method is intended to examine what is actually examined. The reliability of the method or how robust the method is where the researcher's bias and influence impacts within the qualitative methods (Anderson, 1998).

1.6 Gaps in Knowledge

SMEs and micro-companies represent a significant contribution to the UK economy (see section 1.3 and 2.1) and therefore are often the subject of both research and Government intervention, although less frequently the subject of IS research. There have been many calls for further research at the micro level in SMEs (Martin and Matley, 2001; Levy et. al., 2001b; Dans, 2001; Farbey et. al., 1993; Brynjolfsson and Hitt, 1998; Ryan, 1997; Bannister and Remenyi and Lubbe, 1999; Costello et.al., 2007; Kai-Uwe Brock, 2000; Lee, 2001; Lefebvre & Lefebvre, 1996). There are many reasons for this but the most significant of these for this research is to increase SMEs ability to add to the economic development of the UK as they represent a very diverse and interesting group of subjects. There have also been questions raised about the value of ICT to small companies (Lefebvre & Lefebvre, 1996; Martin & Matley, 2001). However, the understanding of the relationship between efficient ICT use and increased productivity is now more fully understood (Department for Trade and Industry (DTI), 2006) and therefore the effective use of ICT in SMEs, given the size of this market, could produce major benefits. More recently, Harindranath et. al. (2007) stated that the use of ICT by SMEs within the UK had been limited to a few studies that were now out-dated. They stated that as these previous studies had found a correlation between ICT use and other factors, implying that SMEs were at a disadvantage in terms of ICT use, that it was now time to revisit the issue.

There is some research available with regard to the application of ICT in SMEs (Ballantine, 1998; Dans, 2001; Duhan et.al., 2001; Kingswell, 1999; Levy et. al., 1998; Levy and Powell, 2005) but very little that examines the adoption of the technology infrastructure that supports

the business. It is well documented that business needs should drive the technology (Galliers, 1991) but little is understood about the ICT technology infrastructure that supports this within SMEs. Typically in this study the underlying technology to run the ICT business was often the same technology which was used for product and/or service provision for customers. Hence, this is not differentiated here either. Indeed recent research even suggests that ICT is not essential to an SMEs success at all (Martin & Matley, 2001). The emphasis of this project looks at ICT infrastructure (see definition section 1.7) and the problems surrounding the area of adoption of that infrastructure that SMEs have when implementing or extending the technology base.

A plethora of frameworks, models and methods have been developed in an attempt to understand both ICT Investment and ICT Adoption. In the very particular situation within micro-companies these issues frequently equate to the same subject as even when an ICT adoption is 'free' i.e. part of a Government initiative, it still represents an investment for a small company as their contribution in time and resource is seen by them as a major investment. In spite of some twenty-five years of research in this area there is still no framework which contributes to the need for a strategy of successful adoption for SMEs. This is coupled with the fact that no model to date includes any measure of Return on Investment (ROI) either econometric or value related as called for by Van Akkeren and Cavaye (1999b) either pre or post-adoption.

Recently there have been criticisms of the amount and type of intervention by Government in the ICT adoption field and interest in this area has come to the fore (Harindranath et.al., 2006). However, the UK online initiative⁶ and more recently Technology Means Business⁷

⁶ [http://archive.cabinetoffice.gov.uk/e-envoy/briefings-top/\\$file/onlinecampaign.htm](http://archive.cabinetoffice.gov.uk/e-envoy/briefings-top/$file/onlinecampaign.htm) (date accessed September 2007)

⁷ <http://www.technologymeansbusiness.org.uk/>(date accessed September 2007)

project have each made some progress with the problem. This research is intended to contribute in informing some of that intervention.

This research will contribute in a number of ways:

1. Provide a more encompassing ICT adoption model developed from previous models in EDI, eBusiness and internet adoption underpinned by a significant literature review and personal knowledge from work in the area.
2. Draw together the areas of ICT in SMEs research, ICT adoption models and Value of ICT to inform the debate and to ensure full coverage of the subject.
3. Include ROI in the model.
4. Inform the debate regarding Government intervention.

It is expected that the research will add to the body of knowledge by adding new qualitative evidence to the IS research area, provide a model to enable micro-companies to determine if their firm is in a favourable position for ICT adoption to be successful and explore models previously developed. It will also add a limited set of statistical data from the survey to this knowledge to support any further research. Other outcomes will help those involved in ICT adoption interventions to identify issues in the companies that they work with.

1.7 Definitions and Glossary of terms

A number of definitions were used in the compilation of this thesis; the underpinning theory for the use of those definitions is detailed here:

Decision-making:

Decision-making within SMEs would be expected to be relatively non-complex to reflect the simplified structure in many small companies:

Decision-making refers to the practise of considering information set, and resolving competing criteria so as to arrive at a conclusion for action. It can be isolated (single decision event) or sequential (multiple events) and focused on an individual or group of

individuals. A decision making process comprises a series of formal or informal activities designed to support and inform a decision event. Jeffrey (1992).

This gives us the simple approach that the decision is as a consequence of considering information that is available to the person(s) making the decision and assumes that that person(s) has the information and or knowledge in order to make that decision. This discussion is pursued further in the literature review (section 3.2.2.1).

Decision making is the cognitive process leading to the selection of a course of action among variations. Every decision making process produces a final choice. It can be an action or an opinion. It begins when we need to do something but we do not know what. Therefore, decision making is a reasoning process which can be rational or irrational, and can be based on explicit assumptions or tacit assumptions. Wikipedia (2007)

The definition offered by Wikipedia the new free encyclopaedia on line may not provide a rigorous academic underpinning but much more closely reflects the concerns within SMEs that the decision is not necessarily well informed, can quite often appear irrational and can be based on either explicit or tacit assumptions. This more closely reflects the terms scattered across IS literature in this area which describe the process in SMEs with regard to ICT investment decisions as: "instinct" Bannister and Remenyi (2001), "acts of faith" Farbey et al (1993), "blind faith" Weill (1990), "gut instinct" Powell (1992).

Value:

Value can be described in a number of ways; for the purpose of this research *perceived* value (Mehrtens et. al., 2001) was seen as the necessary measure as actual value is so rarely measured by SMEs. Classical economics shows us that there are two types of value: value in

exchange and value in use. Traditional accounting is based on *value in exchange* where the amount of money exchanged for a product equals its value. *Value in use* is more complex to understand and is very difficult to quantify.

"The problem which arises in IS evaluation is that value in exchange is not of much help in assessing the success on an investment where there is no exchange. We are therefore forced to come to terms with the quantification of value in use concept and this is where the problems really start."

Bannister & Remenyi (2001)

Throughout this research the following is used as a measure if we then couple this with the term *perceived* then there is truly concerns about the effectiveness of any measurement. In IS methodologies the true meaning of value will always be a concern and no doubt many researchers will wrestle with this subject for some time to come.

"IT Value is the ability of ICT to enhance the business performance of the enterprise"

Parker and Benson (1987)

Lech (2006) added to this by stating that ICT value was the ability of ICT to support the organisations business goals. As these goals will vary between organisations then the value will also vary. This will also be the situation within this research since the term 'perceived value' adds another subtle dimension in that the perception of the interviewee will also colour that value definition.

ICT Infrastructure:

ICT Infrastructure is generally defined as including hardware, software, development environments, shared databases, common applications, and human skills and expertise. Rai et. al. (1997) broke down the ICT budget investigated for their research in SMEs into key

areas: hardware, software, telecommunications and IS/IT staff. Here the latter definition is used and referred to. Lillrank et. al (2001) defined the terrain of ICT infrastructure as in Figure 1.2 this visually demonstrates the area under examination in this research. The infrastructure supporting business processes and ICT applications is the area of concern for this research.

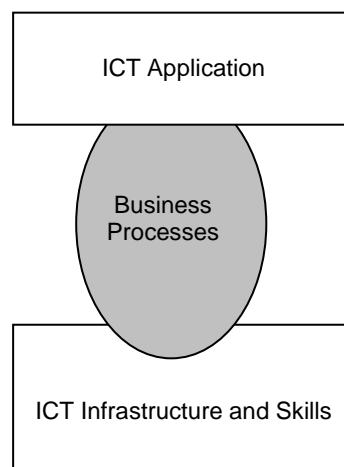


Figure 1.2: Based on "Rough Features of the terrain" Lillrank et al (2001)

Micro-companies in the ICT sector often use the same software infrastructure to develop products and services for customers as they use to run their own business. This study therefore allows the respondents to determine the use within their business.

SME:

On 6 May 2003 the European Commission adopted a new Recommendation 2003/361/EC regarding the SME definition which replaced Recommendation 96/280/EC.

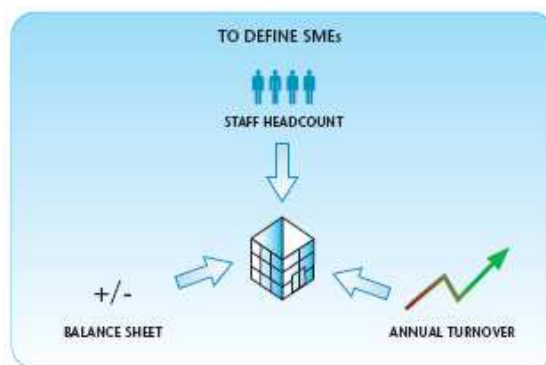


Figure 1.3: European Definition of SMEs

Figure 1.3 illustrates the elements that determine whether a company is an SME. (The new SME definition: user guide and model declaration, 2005). The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet total not exceeding 43 million euro. (Extract of Article 2 of the Recommendation 2003/361/EC)

Within this definition there are then sub category's into which the enterprises can be broken down. Table 1.1 demonstrates the boundaries that apply when categorising a company into any of the three sections.

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

Table 1.1: Boundary Classifications (European Commission, 2005)

1.8 Structure of Thesis

The structure of this thesis is as follows:

Chapter 1 Introduction:

This chapter initially introduced the problem area and the work that has/has not been done by other researchers. It explains why there is still a need to continue the work and why there is still a problem. There has been some highlighting of how previous models are restricted and do not consider ROI in their thinking nor do they look at the pre-adoption perceived value or the measure of that adoption success as a driver for future adoptions. There has been an explanation of what the research area is and what the thesis is about and what it is the study is attempting to achieve. There has also been a brief introduction to the survey context which is a subset within the research field. It has explained the strategy and approach employed to complete the work and the contribution the work will make to the field. It has introduced the SME arena and the need to explore the issues in micro-companies. There has been a brief look at the overarching research questions there are in this area and what questions the thesis will attempt to address. The aims, objectives, scope and limitations have been discussed and the assumptions that have been made as part of the research. An explanation of the gaps in knowledge and how this work will attempt to address those has been discussed.

Chapter 2 Literature Review:

This chapter first explains how and why it is organised and why is it necessary to approach the subject in this way. The main literature in this field is then reviewed and analysed to explain what the ICT environment is like for SME and especially for micro-companies when it comes to adoption. It then explores what specific problems micro-companies have and what it is that makes their situation different from larger companies. This is then followed by an examination of what the government has done to date, what the history of support is and why

it is or is not working. There is then an analysis of the models in current debate, what is happening with those models and what this work will be doing to develop and add to those models and to the debate. The issues and categories raised in the models are the subjected to further analysis from the literature on SMES and especially micro-companies. Missing from many models is the return on investment (ROI) and this is also explored through the field of Information Economics. The final section focuses on how a new model is constructed, why it contains the issues and categories that it does and how those categories were selected, including the academic grounding for them. The chapter concludes with a new model to be explored through the survey.

Chapter 3 Research Methodology:

This chapter introduces the exploratory nature of this research within an interpretivist paradigm and how, within this, more formal methods were used including case studies and a survey. It introduces the methods used and why they were chosen. It sets out how the survey was designed and what approach was taken acknowledging AWM as a driver of the outcome. The development cycle is explained and how the work changed over time. It also explains how the case studies and pilot survey shaped the final survey and the impact of having a third person collecting the data. The selection of the sample is explained and the impact of the researcher's role within AWM is explored. The academic grounding for the questions is explained. This is then followed by an explanation of how the data was collected and subsequently analysed and manipulated.

Chapter 4 Survey and Analysis:

In this chapter the results from the survey carried out with 167 companies via telephone and face to face interviews through a semi-structured survey which collated some statistical and some qualitative data are analysed and interpreted. The chapter is organised to follow the categories and issues that have been highlighted in the model proposed in chapter 2 and

subsequently explored during the survey amongst ICT micro-companies in the WM. Each element is examined for its applicability to remain in the model, its presence within that particular category and its usefulness to the companies. New issues that came to light during the survey are also discussed. Each area will have some statistical data and some rich data taken from the statements made by the respondents to add to the rich picture that this research represents. This is followed by some cross referencing of factors to determine how the factors may or may not be linked and how they impact on each other. A new model emerges from this and is offered as a model of adoption specifically for micro-companies in the ICT sector in the WM. The model was finally evaluated with a focus group of SMEs represented by the ICT Cluster Opportunity Group (COG)⁸ and those involved in delivery of intervention projects.

Chapter 5 Research Outcome and Conclusion:

Finally this chapter draws on the original literature review for its format and discusses the results of the survey in the light of the literature and explores if any new phenomena or insights have been discovered. The chapter draws together the findings and implications for researchers, policy makers and businesses in this area and draws upon the previous chapters to demonstrate contribution to knowledge and possible extensions to research. It concludes by highlighting ways in which further research might be developed from this study and a discussion of the contribution to knowledge.

⁸ A sample of major decision makers from SMEs and Corporates who represent the Industrial community of the West Midlands (WM)

Chapter 2 Literature Review

2.1 Introduction

"the actual root cause of failure (of SMEs) may be seen to lie with the apparently non-rational behaviour and decision-making of the entrepreneur and/or owner-manager who does not obey the 'rules' of classical management theory"

(Jennings and Beaver, 1997)

This chapter examines the literature surrounding ICT Adoption within SMEs with a particular emphasis on micro-companies. There is a paucity of literature regarding SMEs in this area and research on micro-companies is even rarer and therefore this chapter will draw upon academic sources and also include government reports and white papers when necessary whilst concentrating on these very small firms. The chapter begins by examining the environment within which micro-companies operate, including a discussion on UK Government Intervention to date and how work in that area has impacted the rates of adoption in the UK. In this it will examine both the macro and micro environment within which small companies operate and make decisions regarding ICT adoption. Culkin and Smith (2000) claim that too often only the macro environment is examined which leads to a 'blunt instrument' being used for intervention. This will be followed by an analysis of current models for EDI, Internet and eBusiness adoption that are considered academically rigorous and poses the question are these models adequate in an adoption situation, can they be improved and what elements require greater emphasis? There has been criticism of ICT adoption techniques offered by researchers to date which are in the main either directed at large companies (Levy et. al., 2001a) or they attempt to treat all small companies in a similar manner (Martin and Matlay, 2001). The ICT infrastructure within micro-companies as it is determined for this study and in the context of the much-simplified infrastructure of micro-companies is extolled as of major concern and the main issues from this are selected from the literature. The discussion also includes a history of the development of adoption models and where this research is heading. Individual categories and elements within the models,

and those explored in the literature which may be absent from current models, are then expanded and investigated in greater detail. Academic literature from the wider field surrounding SMEs and adoption is reviewed to establish the justification for inclusion in a model to support both micro-companies and those who facilitate in this arena. There then follows a section which uses the current models and critiques of them in the literature reviewed to build a new model. The chapter terminates with a proposal for a new model to be explored within this study.

2.2 The SME Environment and Adoption Concerns

In 1970 the UK government formed the Bolton Committee to scrutinize the role of small companies in the economy. This committee was set up in spite of the opposition to it which stated that small companies were of little consequence in the world economy (Culkin and Smith, 2000). The outcome from this committee raised more questions about the role of small companies than it solved. At that point it was established the rate of market share for small companies in the UK was in faster decline than in any other developed economy (Bolton, 1971). Since this the small firm has been the subject of interest to political parties and researchers. There have been many discussions over the importance of this sector to the economy although there is evidence to suggest that small firms do play a major role in the world economy (Hill and McGowan, 1999; Timmons, 1994) and that they constitute the bulk of enterprises in all world economies (Storey, 1994).

Much IS research in the past has concerned large organisations although more recently SMEs use of ICT have become a focus of attention (Ballantine, 1998; Dans, 2001; Duhan et.al., 2001; Kingswell, 1999; Levy et. al., 1998). SME research is crucial as they form a very important part of UK business⁹ and have the ability to impact in a major way on customers and suppliers. Large organisations that have turned to electronic means of

⁹ 99.3% of UK small businesses have less than 49 employees
<http://stats.berr.gov.uk/ed/sme/smestats2006.xls>

communication, for example, will often find that the 'bottleneck' in the supply chain will be an SME which is an immature technology user (Costello et.al., 2006). This study focuses on the ICT infrastructure in micro-companies and their ability to adopt new technology to augment or replace this infrastructure. ICT infrastructure as defined by Rai et. al. (1997) is used in this work and was chosen for its applicability reflecting the minimal structure inherent in most micro-companies. Micro-companies also use the term IT more frequently than either ICT or IS, whereas researchers generally use the term IS although ICT is fast becoming another commonly used term. Rai et. al. (1997) broke down the ICT budget investigated for their research in SMEs into four key areas: hardware, software, telecommunications and IS/IT staff. The research for this thesis refers to all these areas as encapsulating "ICT infrastructure" and is not concerned with splitting this infrastructure into its component parts. The underlying infrastructure that is purchased by micro-companies lies at the heart of this and they are free to determine the term they wish to use in this context.

The main concern in this study is that SMEs are not homogeneous and differ within sectors and between sectors and according to size (Martin and Matlay, 2001). Academics and governments have previously attempted to address the issue of increasing efficient adoption of ICT and this issue is gathering pace in the WM fuelled by the work of Sheppard and Hooton (2007), which determined a strong causal link between efficient and effective technology adoption and increases in GVA¹⁰. In spite of many years of work in the field of ICT adoption by scholars, progress is slow, as complexities inherent in this area make it a difficult research topic. Investment by Government also continues in an attempt to increase the adoption of ICT by SMEs as this has been shown to be a very effective way of increasing GVA. However, much of the work supported by Government involves a single technology and does not address the concerns surrounding the environment within which SMEs operate

¹⁰ Gross Value Added (GVA) measures contribution to the economy of each individual producer, industry or sector in the United Kingdom. $GVA + \text{taxes on products} - \text{subsidies on products} = \text{GDP}$
<http://www.statistics.gov.uk/cci/nugget.asp?ID=254> accessed 11/10/2007

which may have an adverse effect on the success of adoption and also limits future take up. There is a need to embed the culture and skills within SMEs and raise awareness regarding ICT's potential this would aid any future adoption of technology.

There is major support for the findings of Van Akkeren and Cavaye (1999a) in Australia that the main inhibitors to adoption of Internet technologies are lack of time, perceived lack of business benefits and mistrust of the ICT industry and advisors from it. In 1993 Kirby and Turner reported that lack of knowledge of benefits and the computer literacy of the small business owner were implicit in the adoption of technology. Zinatelli (1997) found that lack of internal computer training and expertise and financial constraints were the main inhibitors. Ryan and Harrison (2000) highlighted the people element in ICT adoption and the subsequent impact that has they have on the value measured for any new ICT adoption.

Many micro-companies look to ICT to aid their growth in terms of increased capacity, increased profit and/or market differentiation. Locke (2004) states that increased profitability as a proxy for growth, is most strongly correlated with ICT usage. Although focused on the link between adoption and economic growth, their results were not conclusive of a strong correlation between ICT Usage and sales performance or market share. However, work carried out by the Department for Trade and Industry (DTI) in June 2007¹¹ states that the problem lies in the poor management, investment in and use of ICT and that a general awareness raising and education was needed amongst all small companies. Bloom et.al. (2005) expands on this further by demonstrating that productivity through the use of ICT is significantly higher in US based firms than UK business, expressing the conviction that the differential in total productivity could be solely attributed to IT. This differential is particularly strong in sectors that use a significant amount of IT as may be the case for the ICT sector (Sheppard and Hooton 2007).

¹¹ Raising UK Productivity – Unlocking the Potential of Information and Communication Technology (ICT), DTI, June 2007. A report produced by the Information Age Partnership.

Locke (2004) posed the following conundrums:

1. There are no significant differences in ICT investment with firm size and type.
2. There are no significant differences between organisations in their approaches to either evaluation or justifying their ICT investment.
3. There are no significant differences between organisations motivation for ICT adoption.
4. There are no significant differences in the benefits and costs incurred by organisations.

However, Locke concluded that there were difficulties in these generalisations owing to an inconsistent definition of SME between studies and concerns over the small sample size of most ICT adoption studies. This PhD study has a significant sample size and also examines one industrial sector and is therefore thorough in that aspect and will be replicable to other sectors. However, this study does not examine investment as a percentage of turnover, believing that in the micro-companies that form part of the survey this would be irrelevant. ICT micro-companies' products can have a very high profit margin and the percentage turnover per individual employee can be significant. This study instead uses academically established qualitative aspects to gather information on this issue.

Many organisations appear to spend vast amounts of money on ICT and yet reap very few benefits (Brynjolfsson and Hitt, 1998) and often organisational re-engineering is highlighted as the catalyst for ICT adoption pay off (Husein et. al., 1999). Locke (2004) also found that organisations from different industry sectors significantly differ in the amount they invest in ICT but that firm size (in terms of turnover and number of employees) does not influence ICT investment levels. However, poor investment can have a critical impact on SMEs and the

knock on costs to realise benefits from ICT investment can be significant (Costello et.al.,1999b).

2.2.1 Peculiarities of Micro-companies.

There is very little research that is solely focused on micro-companies and much research here is dependant upon the SME research in this field. The concept of an SME and therefore a micro-company has been determined in section 1.7 using the EU definition. However, the average size of 98% of all firms across the European Union are identified as having seven employees and are termed 'micro-enterprises' since they employ less than 10 people and in the UK, an average micro-company is around six and eight employees. (OECD, 2000 in Martin and Halstead, 2004). It should not be assumed, however, that these companies can be categorised together as a homogeneous group (Martin & Matlay, 2001). It has been suggested that those with less than four employees are different from other firms, since these are generally newly formed companies or established companies with a wish to remain as 'life-style' companies.

Defining this complex morass of companies could, in itself, be the subject of a major study. One of the best descriptions of a small business is that used by Bolton (1971) who states that a small firm is an independent business, managed by its owner or part owner and having a small market share. However, the discrepancy in the term SME adds complication to this as a small business can be very different in terms of this description, not all being totally independent and not all having a small market share, the same can be said of micro-sized companies too. As the EU definition classifies an SME as up to 250 employees; the 'M' in SME can be a very different type of organisation to the organisation with less than 10 employees which are the subject of interest here.

Dans (2001) showed that SMEs companies pose a particularly difficult field of research, as the world in which they operate is very volatile. SMEs are created and 'die' in vast quantities every year and although numbers may grow the individual organisations change rapidly. However, they form a distinctive part of the industrial landscape of the UK, with most having quite distinct characteristics. On the positive side they are able to adapt quickly in the way they work, decisions can be acted upon quickly; they have proximity to their markets and significant customer loyalty (Reece and Costello, 2005). This is believed to be due to them operating within niche markets and having good relationships with their clients (Julien et.al.,1988). Bergeron and Raymond (1992) stated that these same characteristics affect the adoption of ICT in SMEs. In particular, lack of resources and the dependency on a few key individuals were cited as key issues, mainly due to lack of significant numbers of skilled staff. Companies often support the supposition that the potential to adopt ICT can be found throughout the whole of a small company's operations (Reece and Costello, 2005). Dupont (1986) sees their involvement in very specific markets as increasing their vulnerability, and implies that SMEs therefore have a limited number of products or services. In addition Bergeron and Raymond (1992) believe SMEs suffer from a lack of resources in terms of finance, information and people to develop a thorough understanding and analysis of their environment.

Many micro-companies emphasise operational efficiency in their adoption strategy and this is relatively simple to implement in comparison with the focus on strategic issues that are the sign of more mature ICT users (Galliers 1991). This strategic focus, however, has been indicated as a locus that can lead to a gap in the organisations capability at decision-making level (Farbey et.al., 1999). However, operational efficiency is simply a response to increasing market and customer demands. It is expected that companies will follow an ascent through adoption over a period of time. However, most micro-companies are attempting to take the leap to a higher point straight from their first implementation of ICT, particularly those buying

applications that have the capability of combining back office transaction processing with the front office desk top and reporting capabilities of quite complex Management Information Systems (Laudon, & Laudon, 2004).

In many companies there will often be a person or persons who champion the cause of ICT as an investment with potential implications for improving business performance (Farbey et. al., 1999). However, often the person who takes this stance within an organisation has an in-built commitment to the investment (Farbey et. al., 1999) and will promote the benefits and minimise the drawbacks. They may 'bend the rules' of the real value to extol the virtues of the new purchases which will demean the evaluation process. There may also of course be a counter champion who does not have the same commitment and will draw attention to the possible problems (Yeates and Cadle, 1996). Dans (2001) reflects that SMEs seldom have an ICT plan regarding investment and often make a decision driven by personal attitudes or perceptions.

At the individual level, top managers especially those of smaller sized firms are believed to be very influential (Damanpour and Schneider, 2006). These companies are often orchestrated by a dominant owner with centralised authority (Schein, 1983; Poza et. al., 1997; Sharma, 2004). They usually establish a paternalistic culture and challenges to this authority are virtually unheard of (Sharma, 2004). The personal characteristics of this owner-manager will to a great extent influence the organisational culture (Damanpour and Schneider, 2006; West and Anderson, 1996). Adoption will often be perceived as a strategic choice or a behaviour which is an outcome of business characteristics (Thornhill, 2006), such as business structure, business resources, and organisational culture, etc (Barney, 1991; Chandler et al., 2000), or even due to external environmental stimuli or pressure (Tornatzky and Fleischer, 1990).

The peculiarities of micro-companies in relation to adoption can be summarised as the dependence on the social capital (discussed in section 2.5.1.2), the owner-manager education, knowledge and personality (sections 2.5.1.1, 2.5.1.3, 2.5.1.4) and the sheer lack of internal resource but in particular management capacity and specialist skills (section 2.5.2.3).

2.3 Approaches to Adoption Issues by Government

Mitev and Marsh (1998) lists factors that can de-motivate adoption for SMEs: including perceived lack of expertise in the planning process and in the technology. There is a strong need for impartial advice independent from vendors. Many need practical help in the form of trusted ICT Consultancy (Harindranath et. al., 2007) as well as grants or loans. In October 2002 the government's Small Business Service had grants ranging from £2,500 to £450,000 to help SMEs make better use of technology (Simons, 2002). However, direct subsidies are hard to find and although it is reported by the DTI that, in 2006, 1.9m SMEs were online, this omits the fact that at least one third of SMES are not even at the most basic level of owning a computer.

Intervention by Central Government has the ability to interrupt and change the 'normal' economic cycle in the adoption situation. It interrupts the normal cycle of 'Information Economics' by trying to encourage adoption of ICT and although the initiatives are normally funded, either fully or in part, they still require heavy investment by a company in respect of time and resource. In spite of several years of intervention packages by Government in the UK the small business sector still has problems with technology adoption and in fact is often left suspicious of those that work to help them such as Business Link and Chambers of Commerce (Bennett and Robson, 1998). There is now a plethora of support services available for small companies and this in itself can be confusing for owner-managers. However, support to adopt new technology is often superficial, aimed at end users and of limited use to companies whose core business is ICT. Policy makers need to address the

benefits for SMEs, rather than the need to hit government targets (Culkin and Smith, 2000) and indeed be concerned with the SMEs needs and not with personal career development (Mercer, 1996). It has been suggested that many intervention projects have addressed the needs of the policy makers' career rather than the intervention itself (Culkin and Smith, 2000). Although, it can be argued, that is an understandable concern given the often transient nature of job roles in projects and initiatives funded by various government agencies.

Many of the government initiatives in recent years have attempted to assist SMEs with the take up of technology. Infrastructure provided by Government is important to help both economic growth and technological progress. However, the targets that are set and the way they are defined point towards a 'generalist' view of SMEs (Martin & Matlay, 2001). In work done by MacGregor and Vrazalic (2005) eBusiness was recognised as a major source of competitive advantage. The work states that Governments worldwide have recognised this and are creating funding schemes and initiatives to facilitate ecommerce adoption in small businesses. There have also been many endeavours by authors to familiarise and group barriers and enablers in this major area of concern. The DTI has published the 'adoption ladder' (Figure 2.1) for its UK online initiative. This model underpins much of the understanding around the area of ICT adoption in SMEs that government display (Sergeant, 2000).

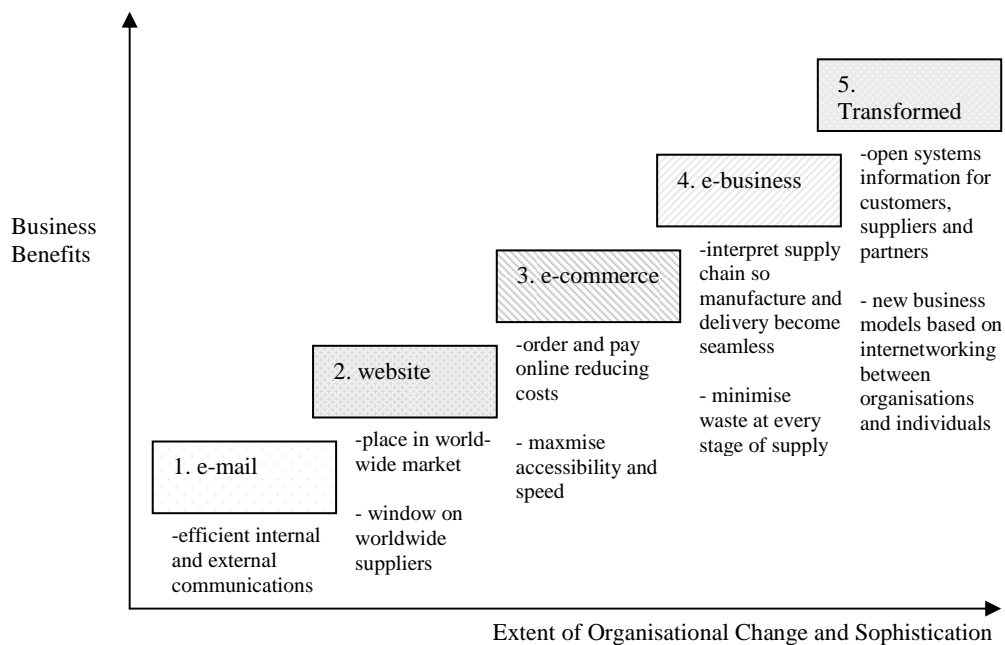


Figure 2.1: DTI Adoption Ladder UK Online. Source: Adapted from Cisco-led Information Age Partnership Study on e-commerce by Small Business

This model was used in a benchmarking study that reviewed the progress of SMEs on the Internet by the DTI in 2000. The only flexibility built into the model is to imply that not all businesses will start at stage one. However there is no flexibility for significant differences in size, sector, ethnicity, gender, human resources, financial resources, level of internationalisation. Neither is there a place for the entrepreneurial or innovative skills of owner-managers in this model. Martin & Matlay (2001) claim there is a lack of 'empirically rigorous data and focused research' on the topic of ICT adoption by small companies. They argue that the DTI literature claims that the adoption of new technologies is essential to survival and growth is based up on sweeping generalisations.

There is much evidence to suggest that linear models of development and adoption are inappropriate for SMEs and tend to oversimplify complex issues (Kai-Uwe Brock, 2000).

There are often intricate processes taking place at the micro level that are not accounted for in models of this type. Kai-Uwe Brock (2000) refers to a paucity of academic research in this area and claims that further research is necessary in order to develop 'real understanding' of ICT adoption by SMEs, with an approach that includes size of firm, age of firm, state of adoption and dependent variables. These findings are an echo of earlier research work by Lauder and Westhall (1997), Iacovou et. al. (1995) and Blackburn and Athayde (2000).

It is a concern that a blanket approach to investment of this kind informs government in this area as it may be inappropriate given that small companies are created and 'die' in vast quantities every year. Many organisations involved in projects, which attract Government funding to help establish their ICT are not necessarily still 'established' a few years later. This creates the impression that the money has not been of any long term help. Without statistics to show how many SMEs who take part in a particular project are still in business a number of years later no assumptions can be made. Equally, neither can it be established if the ICT project itself was a contributor to this failure.

There is also an abundance of opportunities via funding from the EU but this is often difficult to attain for an SME and can require them to be in particular geographic locations deemed to be in more need. The myriad of research grants available via schemes such as Framework 7 (FP7) are applicable only to the minority. Most companies would be eligible for structural funds like European Regional Development Funds (ERDF) and European Social funds (ESF) which are usually disseminated via a third party public sector organisation for example a Regional Development Agency (RDA) or the Learning and Skills Council (LSC). However, involvement in many incentives can be problematic for SMEs and any delays in payment can have very unfavourable results and this is generally seen as a disincentive to participation for SMEs, especially start ups (Imbert, 1996).

Many SMEs involved in EU funded projects are unaware of the strategic reasoning behind the policies that result in their involvement (Costello et. al., 1999b). For many it is the lure of help and advice that is free that initially attracts them to be involved. SMEs are generally expected to contribute little in the way of money and are more likely to be asked to contribute time to their share of the contract. This in itself can be a big disincentive to resource-constrained companies who are working with stretched resources. Many companies particularly micro-sized ones work excessively long hours just to keep the organisation running. However, those companies who take the time to participate in these projects realise much greater rewards than they initially anticipate (Costello and Thompson, 2004). An example of this is a project that took place during 1998 – 2002 in the WM (Autolean I, II and III) and was funded via the Accelerate programme which was administered by the Birmingham and Solihull Training and Enterprise Council and managed by the School of Computing and IT at the University of Wolverhampton. The project's aims were to implement internet and email access for SMEs in order for them to communicate with customers and suppliers. The project gave the companies a high specification PC at a very low cost, free training, free internet access for 12 months, a basic web site designed and hosted free for 12 months and the opportunity for business processes to be mapped to tailor them to take advantage of the new technologies (Szczygiel, 2000). The inexpensive equipment and free training enticed many companies initially. However, many SMEs taking part in the project were pleasantly surprised at the benefits that could be appreciated. This was tempered by the realisation that an enormous amount of time, effort and money needed to be invested.

The project achieved its initial aims but for many companies it left them with a dilemma. In order to use the new technology effectively there needed to be not only changes in processes, but investment in more ICT equipment and further training for everyone in the company including any ICT staff (Costello, 1999a). For example, for many SMEs the central repository for incoming communication was often the reception desk. In order for

communication to be used effectively it needs to enter the company and be distributed to the correct recipient. With fax, phone and letter this was simply achieved via manual processes. However, to achieve this with email it was soon realised that desk-to-desk email needed to be installed, adding to increased need for security on their network. Therefore, whilst helping with the initial equipment, the project also led to a greatly increased need for ICT infrastructure changes and further investment for most of the companies.

Projects of this nature are no doubt of enormous benefit to many SMEs, but those SMEs often need further guidance support and money to fully achieve any success with new technologies (Costello and Chibelushi 2009). Most SMEs involved in this particular project felt that one of the greatest benefits achieved was the education of employees in the capabilities of the new technologies and advice about its use. Since the demise of UK Online, e-skills UK is the only entity playing a national role in the ICT policy arena, although their work is supported by the British Computer Society (BCS) and the National Computer Centre (NCC) and Intellect which are all member-ship based organisations. eSkills aim is to work with businesses to improve competitiveness and productivity by bringing together employers, educators and government, uniting them for a common, employer-led agenda for action on skills. There is currently no national level strategy to increase adoption of ICT by SMEs.

2.4 Analysis of Current Adoption Models

The most effective model of support to aid SMEs in their adoption of new technology is yet to be determined. Poon and Huang (in Ai-Qirim, 2004) describes the need for a more integrated approach to eCommerce adoption research stating that a continuation of the single approach in studies leaves the field with yet more disparate conclusions. The inherent problem with the multi-faceted approach called for by Poon and Huang is the depth of the study which if broad in approach can be shallow in content. However, they then call for the need for triangulation in

'method, theory, measures or observers' which this study attempts to address. The approach recommended by Poon is integrated into this research (see section 3.4)

This section first looks at the history of ICT adoption model development and then discusses several models that have been developed through work with SMEs regarding both ICT adoption and issues in growth which often have a strong correlation. This section ends with a summary of adoption issues found in popular models. The models discussed here have been chosen not just because of their frequency of reference in the literature but also because of their identification of issues replicated throughout SME literature. The evidence from these models, and the further sections in this chapter, form the basis for the development of the new model of adoption this study proposes. These models are thoroughly grounded and demonstrate good academic underpinning for this work.

2.4.1 Current Adoption Models

The work of Rogers (1965 in Rogers 2003) in his book Diffusion of Innovation sets the scene and provides much of the basis upon which work regarding technology acceptance is grounded. The work categorised adopters of new innovations or ideas as innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%) and laggards (16%) based on a bell-shaped curve. This study attempted to explain that innovations stretch through society in an S curve and was able to demonstrate through plotting variables how an adoption grew exponentially. It also demonstrated that change can be promoted and will create a domino effect within a specified population. The study discussed the conviction that an innovation decision was based on a cost-benefit analysis and that people would adopt if they believed that the innovation could produce some relative advantage to the idea it replaced. Diffusion theory also states that 'opinion leaders' and their attitudes directly affect the subsequent adoption. Critics have remarked that it attempts to explain a very complex reality in too simplified a fashion. Nonetheless, this theory has remained as a starting point upon

which much IS research in this area is based. Since this early work, research has consistently found that relative advantage (perceived need) is an important issue in the adoption decision (Bradford and Florin, 2003).

Fishbein and Ajzen's (1975) theory of reasoned action gave insight into the reasoning behind the behaviour of individuals and posited that a person's attitude towards behaviour (attitudes) and how they think others will view that behaviour (subjective norm) forms the basis upon which they intend to behave (behavioural intention). Their model has worked very well in the field of consumer behaviour and has been tested in a number of other areas too. It was this work that formed the basis for the Technology Acceptance Model (TAM) which was developed by Davis et.al. (1989) and Bagozzi et. al. (1992). Their work replaced the two attitude measures with two technology acceptance measures; *ease of use* and *usefulness*. Both models assume that an individual is free to act as they wish once they form the intent to act. In the real world this is not always the case as there are often a myriad of constraints. Work on the diffusion of innovation theory has also taken into account *perceived ease of use*. Tornatzky and Klein (1982) looked at the relationship between compatibility, relative advantage and complexity and found that these had the most significant link to adoption. Much work has centred on testing these models over the last few decades including looking at the validity of research instruments used in the original work. Venkatesh and Davis (2000) developed the work to include perceived usefulness and usage intentions; this model was referred to as TAM2. However, critics of TAM conclude that a limitation of the model is that it excludes influences on personal behaviour and economic factors and outside influences and are not specifically addressed (Van Akkeren and Cavaye 1999b) TAM was subsequently further developed into the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et.al, 2003, Fig 2.2).

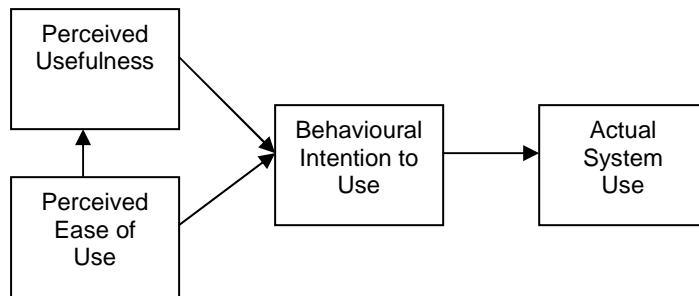


Figure 2.2: Unified Theory of Acceptance and Use of Technology (UTAUT) Davis et. al (1989), Venkatesh et. Al. (2003)

Many ICT adoption models previously have been tested in large companies only (Chwelos et. al., 2001; Jackson and Sloane, 2007; Levy and Powell, 2005; Lefebvre and Lefebvre, 1996) and many revolve around adoption of EDI. The advent of the Internet era has allowed small companies to employ communication on a par with EDI for a fraction of the cost hence many models have been developed for the adoption of Internet/ebusiness. There is still a need for further work to be done in the area of ICT adoption per se for micro-companies. Sarosa and Zowghi (2003) states that research to date has concentrated on identifying drivers and barriers to adoption of ICT and there is still a lack of strategy, frameworks or models that actually guide SMEs in the adoption process. The most frequently asked question by any SME is *how* to adopt successfully.

Grandon and Pearson (2004) analysed ten ICT adoption models to determine the main ICT adoption factors and found that many of the same issues recurred throughout the literature. They summarised these factors into organisational readiness, external pressure, perceived ease of use and perceived usefulness for their study. They determined a causal link between perceived strategic value of ebusiness and ebusiness adoption. This supported the work of Levy et.al (2001a) who identified strategic intent as a factor. Grandon and Pearsons' work collated factors from research done by nine other authors representing the output from more than 1,700 small companies. The factors were amalgamated into a model which was tested

with a survey on a further 100 companies. The survey uncovered that a positive change in attitude towards adoption of the technology based on the 'impression' of its strategic value to the firm was necessary to successful adoption, which could be interpreted as perceived value. Grandon and Pearson (2004) conducted research by electronic survey amongst top managers of SMEs that brought together a number of Electronic Commerce (Internet) adoption models. Their current study summarises adoption factors into four areas: Organisational Readiness, External pressures, Perceived Ease of use and Perceived usefulness. Although carried out in the US, this research has produced a similar pattern to other research discussed here.

Van Akkaren and Cavaye (1999a) identified lack of business benefits, mistrust of the ICT industry and lack of time as the main inhibitors to Internet adoption. In further work Van Akkaren and Cavaye. (1999b) supports the conviction that in SMEs issues around adoption can be divided into factors regarding the owner-manager characteristics, factors to do with firm characteristics and other factors. Other factors include the need for an owner-manager to realise a return on investment which is under researched in the adoption field. This study will explore what that return on investment might be in terms of perceived value and if any return on investment is subsequently measured.

Figure 2.3 below shows the factors identified by their study as affecting adoption in small businesses. The study also claims that there are probably more factors than this as yet to be uncovered by future research.

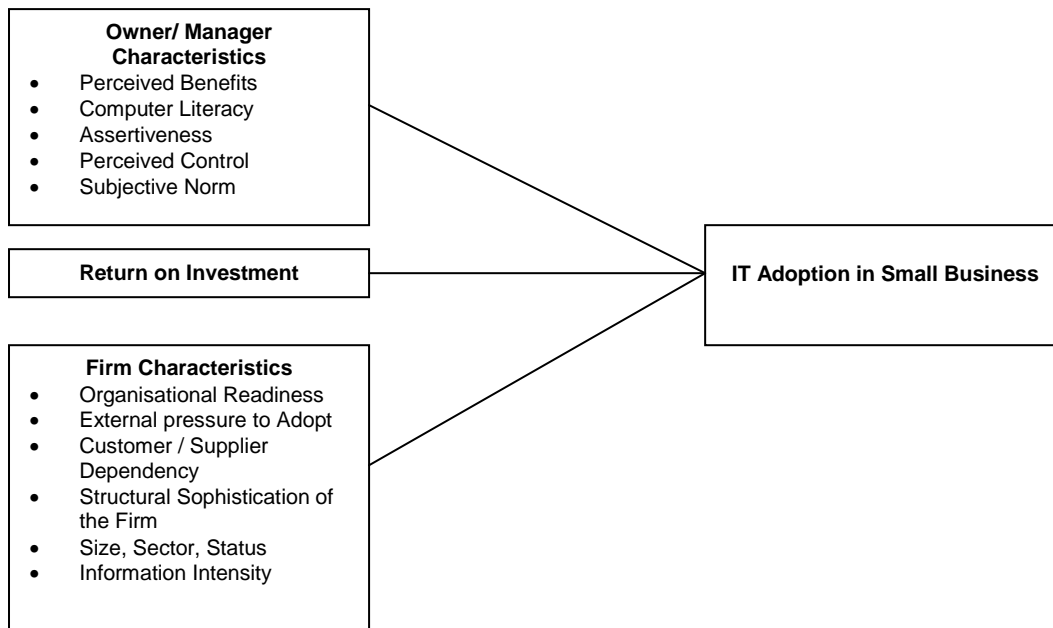


Figure 2.3: Factors affecting ICT adoption in small businesses (Van Akkeren and Cavaye 1999a)

Research carried out by Jackson and Sloane (2007) has shown that more subtle issues such as organisational culture and human resources have a major impact on the adoption of new systems and are therefore included in their model for electronic commerce.

It has been established that the adoption of technology is often fraught with concerns and fears for many small companies due to lack of knowledge and resources. An abundance of issues surround studies into the adoption of ICT by SMEs, however, there is often an underlying assumption by SMEs that simply adopting new technology will automatically produce benefits for the company (Costello, 1999a). In particular, SMEs tend to believe that the technology itself will improve business processes and do not always address the process improvements, trying instead to automate existing ones (Husein et. al., 1999).

In the work of Mehtens et. al. (2001) an attempt was made to use as a model the idea that the CEO has a significant role in ICT adoption in SMEs, especially if the CEO is innovative

and knowledgeable about IT. This model was again developed from existing studies and had as its grounding the work of Lefebvre and Lefebvre (1996) and Thong and Yap (1995). Mehtens et. al. belief was previously identified in the work of Van Akkeren and Cavaye (1999b) above. Mehtens et. al. research uncovered 3 issues that are prevalent in EDI adoption research: perceived benefits, organisational readiness and external pressures these elements were then used to test ICT adoption issues. It was also revealed in this study that there is a need to have the skills in house as this supports the users during implementation. There were 3 factors within the perceived benefits identified which were derived from the categories that developed through the research: relative advantage over traditional methods, communication and business tool. Mehtens et. al. felt that most owners were champions of the technology and that there was an expectation rather than a pressure to adopt. However, lack of expertise did not appear to affect the decision to adopt as management were usually aware of the potential benefits. The contribution of this work is defined here as the transferable nature of the EDI adoption model to Internet adoption as the model had not been used before to explain other technologies. Mehtens et. al. claims that further research could determine if it was further transferable to other technologies.

Supported by the DTI and financed by the Economic and Social Research Council (ESRC) over a three-year period between 1989 and 1992 Storey (1994) completed work that helped form the basis of many of today's models. This work spanned 10,000 SMEs in the UK and resulted in the production of four books and was also a significant influence on much of the previous decades policy making. The model developed which is of interest to this study included factors influencing growth in small firms (Storey, 1994, pp 124). In this model the three factors of the entrepreneur, the firm and the strategy are defined by a number of issues. "The entrepreneur" is sub-divided into 15 issues and although a number of these have shown a correlation between firm growth and the entrepreneur the most significant of these was the education of the entrepreneur. This may indicate the ability to evaluate the business impact of

potential ICT purchases and deal with the many factors inherent in the management of a small company. Analysing factors from eighteen studies of which seventeen examined educational attainment, eight showed a positive correlation between education and firm growth. The other key factor showing significance was the motivation of the entrepreneur, although Storey admits that motivation is a particularly difficult factor to measure. It would seem pertinent, given the substantial basis his work was based on, to include the education of the owner-manager as a factor in the new model constructed here.

In Storey's research "The firm" has 6 elements which appear to demonstrate little effect upon firm growth. The age of the firm did appear to show the fact that the younger the firm the more significant the growth, it has also been identified that the younger the firm the more likely they are to adopt technology rapidly as they grow (Levy and Powell, 2005) so that element would appear imperative in any new model development. The size of firm was also shown to have an impact on the success of an adoption and may also affect the rate of adoption, therefore size should be considered within any new model although this research explores only micro-companies. "The strategy" section of Storey's model has 14 elements and of those the most significant for this study appear to be Technological sophistication, which was shown to have an impact in high technology sectors. It would seem that in any new model development it should be considered as their ability to adopt and implement with fewer issues would be impacted by technological sophistication which would include, specialist skills, former adoption success, and established infrastructure. Information and advice was shown to be more often sought by rapidly growing firms whether that advice was from bankers, solicitors or government funded initiatives. The devolving of decisions to non-owning managers is often key in changing the approach that companies take to ICT adoption (Levy and Powell, 2005) so it would also seem important to explore the issue of who makes decisions within a micro-company as that may indicate their maturity and strategy development. In this research the

ICT knowledge of the decision making professional will also be explored in relation to this factor.

Levy and Powell (2005) support the work of Storey and determine the need to examine the two drivers of business growth and business value in the successful adoption of e- business. Levy and Powell (2005, p.25, fig. 2.1) model was adapted from Storey's (1994) and a development of this model was applied to WM SMEs. Their work on Internet adoption determined that business growth is a key driver in Internet adoption and therefore is a sound basis on which to develop a model. They also describe the SME market as investing in IS at start up and then no further development until the business outgrows its first purchase. Business Value is seen as the second driver for adoption. In this study this could be assumed to relate to the issue of perceived value as previously identified, especially as in a micro-company the value to the business is often that derived from the owner-managers perception. Their model was applied specifically to companies in the WM and is therefore considered very pertinent to this study. Levy and Powell (2005) discovered that SMEs do not necessarily appreciate the value of adopting the Internet and that this is not necessarily because they are 'Luddites' but rather because their knowledge and ability of the use of the internet/technology can be limited. Levy et. al (2005) collated information from a survey of 354 SMEs in the UK and developed from the literature a set of eBusiness Inhibitors (table 2.1) and eBusiness drivers (table 2.2).

Inhibitor		Source
Cost	Implementation Costs	Santarelli and D'Altri (2003); Kendall et al (2001) Grandon and Pearson (2004); Van Akkeren and Cavaye (2000); Lawson et al (2003)
	Limited financial resources	Sharma et al (2004); Chapman et al (2000); Riemenschneider et al (2003)
	Need for immediate return on investment	Van Akkeren and Cavaye (1999+)

Security	Concerns about confidentiality	Santarelli and D'Altri (2003); Kendall et al (2001); Lawson et al (2003)
	Fear of fraud	Van Akkeren and Cavaye (2000)
Management	Insufficient time spent on planning	Bianchi and Bivona (2002); Grandon and Pearson (2004)
	Insufficient knowledge or experience of IS	Klein and Quelch (1997), Premkumar and Roberts (1999); Zhu et al (2003); Sharma et al (2004); Kowtha and Choon (2001)
	Inexperienced owner	Van Akkeren and Cavaye (2000); Klein and Quelch (1997), Premkumar and Roberts (1999)
Technology	Complexity requiring new skills	Kowtha and Choon (2001); Van Akkeren and Cavaye (2000); Riemenschneider et al (2003)
	Existing IS limiting future development	Van Akkeren and Cavaye (2000); Zhu et al (2003)
	Lack of trust in external IS suppliers	Chapman et al (2000)
	Limited in-house IS skills	Santarelli and D'Altri (2003); Kendall et al (2001); Poon and Swatman (1999); Sharma et al (2004); Chapman et al (2000); Lawson et al (2003); Riemenschneider et al (2003)

Table 2.1: Inhibitors for Internet adoption in SMEs (Levy et. al. 2005)

Driver	Source
Reduced operating costs	Standing et al (2003); Quayle and Christiansen (2004); Quayle (2002); Kendall et al (2001); Riemenschneider et al (2003)
Sales and purchasing cost reduction	Quayle and Christiansen (2004); Jeffcoate et al (2004); Tse and Soufani (2003); Riemenschneider et al (2003)
Improved range and quality of services to customers	Quayle and Christiansen (2004); Jeffcoate et al (2004); Tse and Soufani (2003); Mehrrens et al (2001); Teo and Pian (2003); Sadowski et al (2002); Santarelli and D'Altri (2003); Quayle (2002); Daniel and Grimshaw (2002); Riemenschneider et al (2003)
Increased speed in dispatch of goods	Tse and Soufani (2003)
Finding suppliers	Dandridge and Levenburg(2000); Teo and Pian (2003); Santarelli and D'Altri (2003)

Avoiding loss of market share	Santarelli and D'Altri (2003); Kendall et al (2001); Riemenschneider et al (2003)
Increase market share	Standing et al (2003); Quayle and Christiansen (2004); Daniel and Grimshaw (2002); Kendall et al (2001)
Market intelligence	Quayle and Christiansen (2004); Jeffcoate et al (2004); Mehrtens et al (2001)
Improved trading relationships	Quayle and Christiansen (2004); Mehrtens et al (2001)

Table 2.2: Drivers for Internet adoption in SMEs (Levy et. al. 2005)

Levy et. al. (2005) claim that many of the drivers can be described as perceived benefits and many of the inhibitors are recognized as being due to management limitations. A review of these factors reveals very few that are applicable only to eBusiness and could be seen as being drivers/inhibitors of any technology. These issues appear so often in the literature as to be considered very significant and exploring these overarching phenomena will form part of this research too. For example perceived benefits appear in so many adoption models and research studies that it would have a natural place in any new model.

The model proposed by Rashid and Al-Qirim (2001) considers the specific difficulties of SMEs and produced a considerably simplified model for that building on previous work by Thong and Yap (1995) and Premkumar and Roberts (1999). The research was based on work with companies in New Zealand and highlighted factors which influenced and led to the adoption of eBusiness technology. They concluded that issues such as the individual characteristics of the owner manager are critical in successful adoption of eCommerce in SMEs and that competition (external influences) also significantly influenced adoption. Their findings also highlighted that often it is lack of knowledge of the technology that is the main barrier to adoption and the acknowledgement of the strategic importance of the technology usually came from the larger companies in the sample. This is supported by Levy et.al. (2001a) in work related to the Four Competitive Scenarios model which showed only one SME

positioned in the Innovation quadrant of the model. Most SMEs in Rashid and Al-Qirim's (2001) study expressed an interest in help with strategic direction and technology solutions. Their framework divides the issues into four areas: Technological factors, Organisational factors, environmental factors and individual factors. These map directly onto issues considered imperative by other researchers

On a practical note, in a survey of 60 companies conducted by the National B2B Centre at Warwick University in 2005 the determinate factors in adopters and non-adopters of Open Source Software (OSS) were examined. The model developed was based on the work of Rashid and Al-Qirim (2001) but added in other factors that had been evident during the course of the further work with SMEs. The model suggested by their work included Environmental Factors, Economic Factors, Personal Factors and Relevant Solution. Their model also took into account Support (Government and Local) and Social Capital (having friends or collaborators using it) although these factors were shown to not be as relevant as first indicated and were considered to not be a significant influence on SMEs adoption of OSS. Social capital in terms of influence is not considered in other models mainly because of the difficulties in investigating this issue, with very few SMEs admitting to that as a determining influence. The main reasons given by the companies in the NB2B survey for adopting were Economic Factors both the cost and the resources, which underpins the research by Locke (2004) who found that hardware was considered to be the most significant cost and consideration by SMEs. Relevant solution was described as meeting the business needs, easy to use and easy to implement, which could also be interpreted as perceived value. The main reasons for non adoption given in their survey were Economic Factors and Personal factors including technical knowledge. It seems then that economic factors are a major consideration for SMEs although previous research (King-Turner and Bonnett, 2005) found that often the adoption situation encountered economic considerations that were upheld via pre-adoption evaluation which was frequently related to the perception of the purchaser.

2.4.2 Summary of Common Issues

The ICT adoption models discussed in this section provide an insight to some of the most recently developed models and examine the issues that arise from the work conducted by others in the field. A summary of the issues from these models is provided at table 2.3. The elements in this table will be explored through the following sections and subsequently used to underpin and develop (along with other factors from the literature review) a new model for the adoption of technology infrastructure. The adoption models have mainly used academic sources in their development with very few conducting significant surveys. No large studies have been conducted in a single industry sector previously, so this study will provide a unique insight in this field.

Source	Model Development	Factors
Storey (1994)	Longitudinal survey on SME issues	The entrepreneur, The Firm, The Strategy.
Van Akkeren and Cavaye (1999b)	6 Literature sources – no survey	Owner manager characteristics, Firm Characteristics.
Mehrtens et. al (2001)	7 SMEs Case Studies (Australia)	Organisational Readiness, External Pressures, Strategy, Perceived Benefits.
Rashid and Al-Qirim (2001)	3 Literature sources – no survey (New Zealand)	Individual factors, Organisational factors, Environmental factors, Technological factors.
Grandon and Pearson (2004)	9 Literature sources, 100 email surveys	Organisational Readiness, External Pressure, Perceived Usefulness + Perceived Ease of Use
Levy and Powell (2005)	Underpinned by Storey and surveys with WM SMEs	Entrepreneur, Firm, Strategy.
National B2B (2005)	Underpinned by Rashid and Al-Qirim and survey of 60 WM SMEs.	Personal factors, Economic Factors (cost and resource), Environmental factors, Relevant solution.

Table 2.3: Summary of Adoption Factors

Lefebvre & Lefebvre (1996) conducted extensive research and called for much more to be done in the area of SMEs and ICT adoption. They also highlighted many other issues that researchers may be interested in investigating, again the emphasis is on research around IS rather than the underpinning infrastructure. They give a rare insight into the adoption of ICT applications by SMEs but as it is mainly based on statistics it captures the 'what' and 'when'

but fails to encapsulate the 'how' and 'why' that qualitative research allows. The research was carried out between 1993 and 1996 but does give many ideas as to what is needed for further research. Two questions were raised by their work:

1. Do SMEs sacrifice short-term financial benefits by investing massively in ICT for the long-term benefits they provide?
2. Is it simply a prerequisite for continuing to operate in an increasingly competitive context?

SMEs appear to often be more concerned with selection and investment in the technology and equipment, than they are in the supported software and/or business processes.

Currently there are a number of ICT adoption models being offered to the research world but still there is no framework offered to help with the strategic intent of SMEs in their adoption situation. It has been some twenty five years since the Diffusion of Innovation theory was developed and yet the problem still exists. The fact that many factors are similar in so many models may indicate that the technology to be adopted is irrelevant. Levy et. al.(2001b) also indicated that sector is irrelevant but as this research looks at one specific sector the baseline will be similar across the study.

Table 2.4 shows a summary of the issues from each of the models discussed above. These have been categorised into Personal Factors, The Firm, Organisational Readiness, External Pressures, Perceived Value and Strategy. This will form the basis of the model development throughout the rest of this chapter.

Category:	National B2B (2005)	Rashid and Al-Qirim (2001)	Levy and Powell (2005)	Mehrtens et. al (2001)	Storey (1994)	Grandon and Pearson (2004)	Van Akkeren and Cavaye (1999b)
Personal Factors	Personal factors	Individual factors	Entrepreneur		Starting resources of the entrepreneur		Owner manager characteristics
The Firm			Firm		The Firm		Firm Characteristics
Organisational readiness	Economic Factors (cost and resource)	Organisational factors		Organisational Readiness		Organisational Readiness	Firm Characteristics
External Pressures	Environmental factors	Environmental factors		External Pressures		External Pressure	Firm Characteristics
Perceived Value		Technological (innovation) factors		Perceived Benefits		Perceived Usefulness + Perceived Ease of Use	Owner Manager Characteristics
Strategy	Relevant solution		Strategy		The Strategy		Firm Characteristics

Table 2.4: Summary of Factors from existing ICT adoption models for SMEs

2.5 Exploration of Adoption Issues

Table 2.3 and 2.4 give an overview of the academic grounding from previously discussed models leading to the development of a new model of adoption that may indicate to a small company what may be at play in the adoption situation. This may give them insight into possible improvements or investment needs. These issues are explored further in the following sections of this chapter using research from the wider field of information systems and business literature to firmly establish these areas and to provide further justification for their inclusion in a new model. There are three areas for discussion; first a number of issues relating to owner-manager, followed by a discussion of the firm issues and finally an analysis of the strategy and perceived value concerns. This split follows the style of the Van Akkeren and Cavaye (1999b) model which divided elements into these three overarching categories and highlighted that the third area of return on investment (here termed measures of success) had not been explored previously in adoption model research.

2.5.1 Owner Manager Issues

Within this section will be an exploration of the owner-manager education, the social capital that they have to draw upon, the management capacity that they have and the decision making arena within micro-companies and how these impact upon the technology adoption situation.

2.5.1.1 Education of the Owner Manager

In Storey's (1994) longitudinal study education was found to be the most important factor as a proxy for growth amongst the 15 owner issues that he uncovered. Storey speculates that this may be as the higher level of education gives the owner more confidence when dealing with all business issues. If this is the case then all aspects of business would be affected and not just business growth. This supposition is further supported through work in other fields regarding small and micro-companies including research into adoption

(Levy and Powell, 2005; Van Akkeren and Cavaye, 1999a; Cooper et.al., 1994). In fact, Cooper et.al. (1992, 1994) claims to have found a positive relationship between education and firm performance. Research by De Clercq and Arenius (2003) demonstrated that education impacts positively on the likelihood of starting a new business and felt that this was mainly as it gave their respondents confidence in their entrepreneurial ability. However, holding a post graduate degree did not have the same effect as having an undergraduate degree. There is very little work regarding the impact of formal versus informal education within the adoption literature and as such this work draws on the business community research into growth and innovation. It could be assumed from this that that all business activities have the potential to be impacted by the education of the owner-manager, especially in an environment with less than 10 employees.

In work carried out by Reece and Costello (2005) it was found that only one company aligned their IT to their business strategy. They argued that this was due to the IT educational background of the MD, which gave him the focus to ensure ICT had a significant role within the business strategy. Thus, demonstrating once more that the knowledge and education of the owner-manager is a major influence in the adoption scenario. It is often an owner manager's attitude and experience which is affected by their educational background that can influence significantly the role that ICT takes within the company (Duhan et.al., 2001). Thompson et al (2004) carried out technology transfer over the course of three years and established in that work that although projects of that nature were of enormous benefit to many small companies, most owner-managers needed further guidance, support and money to fully achieve any success with new technologies. Most companies involved in their work felt that one of the greatest benefits achieved was the education in the capabilities of the new technologies and advice about its use.

Can this educationally induced confidence support companies as they attempt to keep abreast of technology trends through strategic adoption which often proves to be a difficult challenge for larger organisations? In the ICT sector this problem is exacerbated as new technologies and trends hit the market at an alarming rate and they are often seen as the trend setters. Keeping abreast of technologies to keep their own product and service range relevant is difficult but using the technologies to give themselves a competitive advantage is an area thus far unexplored and an area that this research will include.

Chesher and Skok (2000) attempted to develop a roadmap for business to adopt technology and also found in their work that SMEs see IT as a success if it enables them to 'stand out from the crowd'. They also found that amongst the main factors influencing the adoption of IT were the educational level and age of the business owner.

The literature clearly establishes that the owner-managers educational attainment would need to be a factor in any work regarding adoption and both the owner managers education and their knowledge of ICT would be an important consideration in adoption success. It would seem pertinent, therefore, to place this issue in a new model development.

2.5.1.2 Social Capital

Social capital has been described as taking a sociological view and perceives individuals shaped by societal factors. Social capital is particularly important for micro-companies as having less than ten employees means there are difficulties in manipulating and absorbing enough information to allow decision alternatives to be gauged and they often rely heavily on networks to obtain the information to aid these decisions (De Clercq and Arenius, 2003).

Micro-companies are very dependant upon their extended support networks in terms of both business and personal contacts. Lacking the specialist functional departments can be a barrier to adoption and growth. However, many turn to collaboration with other small companies or to the networks of personal family and friends who can help them to overcome the barriers, without the cost burden of consultative services (Cooke, 2007). In fact Cooke (2007) postulates that without social networks most firms could not function and that high performance firms are the most demanding in terms of social capital usage.

Culkin and Smith (2000), claim that often a range of individuals will be involved in the purchasing decision. These can range from 'key influencers' to 'purchasing specialists' even in small companies though it is more often down to the owner-manager themselves. They conclude that support and information mainly comes from a network of individuals which may include: Professionals such as accountants, solicitors, etc. other small businesses operating in the same area, suppliers, staff, customers and occasionally competitors. This list also includes contacts from their personal life such as family and friends. This is because with many micro businesses their business and personal life overlap (see Figure 2.4) especially in those who could be described as 'lifestyle' companies who have chosen to run a business as a lifestyle choice and do not intend to grow merely wanting to earn enough money to maintain their 'lifestyle'. This is reflected in previous research (Culkin and Smith, 2000; Bennett and Robson, 1998; Costello and Sloane, 2003) which also concluded that friends and 'friendly' consultants and sales advisors were often the preferred choice for advice.

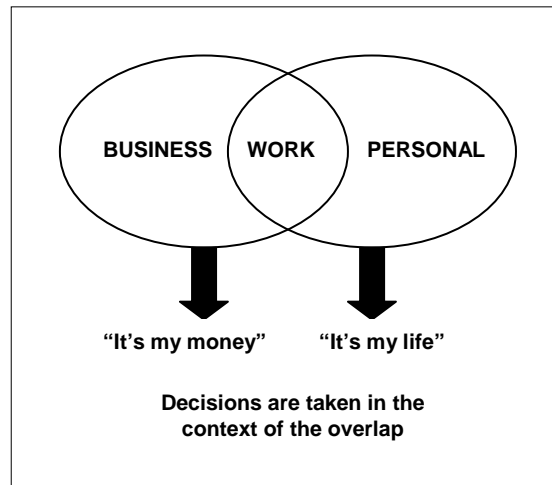


Figure 2.4: Culkin and Smith 2000. *The Business Personal Overlap*

Martin (2004) demonstrated through six UK case studies that successful adoption of the internet is possible and managers often recognised that business value was possible before they understood what could be attained from it.

De Clercq and Arenius (2003) discuss the possibility of future research examining a link between human capital (that is the individual owner-managers ability and knowledge) and social capital. They argue that there may be a recursive positive relationship between the two areas. It would therefore be applicable to examine the influence both external and internal on the purchasing decision including who helped in that decision and where sought from. This will be explored in the new model for this reason as influences on the purchase from social capital could lead to further problems including implementation concerns through misalignment with the business model

2.5.1.3 Management Capacity

Levy and Powell (2005) identified different management styles within SMEs as they grow. When an SME is first created it is likely to be unstructured with all staff reporting to the owner, who has the focus of management decision-making. As an SME grows it is likely to create a small management team and hence move towards a more formal structure, although there will still be the tendency to bypass this and go direct to the owner who is dominant in the hierarchy. This leads to autocratic management styles with the decision style being reactive due to a lack of relevant information (Bianchi, 2002). The style of management and how the manager is perceived by users can have a significant impact on how ICT is used and accepted within an organisation. Management is key to shaping the attitudes towards the use of technology, where there is poor management there is often pressure on users or lack of commitment to projects, which can impact on the perceptions and acceptance of new technology (Kendall, 1997). It has been found that where the management of ICT is weak the users are not ready to accept systems and that this can act as a barrier to new technology adoption.

There has been much discussion in the literature of the fact that SMEs and in particular owner-managers do not place any emphasis on 'managing' their company. Matlay (1999) found that management capacity was limited in micro-companies as in a study of 5,383 owner-managers not one was prepared to delegate overall responsibility. They also found that the majority preferred an informal management style. Those who work with SMEs experience difficulty when attempting to relieve owner-managers of actually 'doing' the work, when real benefit could be achieved by owner-managers just standing back and managing the company (Costello et.al., 1999b). Yet the performance and growth of SMEs is highly dependent on the competence and capabilities of its managers (Kingswell, 1999). Management issues are very important in micro-companies for this reason, although often there is a need to 'educate' them regarding this. The mindset of the owner manager often adds significantly to the motivation or inhibitors of ICT adoption

(Reece and Costello 2005). However, there are many claims that there are barriers to obtaining sufficient objective data from small companies (Poon, 2002).

The complexity emerging from this problem is often confounded in that SMEs are often adopting ICT for the first time and are attempting to reach the highest level of the evolutionary ladder in the shortest possible time. There were many examples of this during the .dot com era. To achieve this effectively SMEs require quite sophisticated knowledge and skills, which are often in short supply. Many decision-makers both individuals and group when asked to describe their final reasons for the decision regarding ICT are often quoted as stating 'instinct' (Bannister and Remenyi, 2001). Glazer (1993 *in* Bannister, and Remenyi, 2001) points out that "managers themselves are the best judges of the variables with which they work". With micro-companies the owner manager's attitude and experience can impact heavily on the role that ICT subsequently takes within the company (Duhan et. al. 2001).

Remenyi et.al. (1991) attempted to answer the question "are ICT investment decisions fundamentally different to other investment decisions?" The conclusion was that there are no real fundamental differences, the real problems occur because of lack of understanding and credibility. Remenyi et.al.(1991) also states that this is often confounded by the fact that ICT investments are often both high cost and high risk. Bad decisions can have repercussions on costs, productivity and customer service that most SMEs can ill-afford. Problems may occur if there is a lack of management guidelines, companies may either refuse to implement an ICT infrastructure that could aid the SMEs long term profitability or invest in ICT as an act of faith or even use creative accounting as a means of bypassing the justification process (Love and Irani, 2004).

Micro-companies have limited support both internally or externally to keep systems up to date. A further feature of these companies is the variation in the amount they are willing to invest in ICT. Palvia et. al. (1994) point out the financial constraints of small companies

can tightly limit the budget allocated to ICT. Often there is also an assumption that the new technology must be better than the old technology it is replacing. Micro-companies in particular tend to believe that the technology itself will improve matters and do not always address the process improvements, trying instead to automate existing ones. Remenyi et.al. (1991) states that as organisations reach higher levels of maturity in their use of ICT that managing benefits from adoption becomes increasingly more important to senior managers. This is not necessarily applicable to micro-companies where few have or will reach that level of maturity. Most micro-companies are looking for short-term improvements to operational performance. They lack "the ability to strike a balance between long-term development and short-term operational pressures" (Anderson, 2001).

Rai et. al.'s (1997) research confirms that of Strassmann (1988) that ICT adoption benefits were only felt if there was a corresponding simplification of management tasks, reduction of administrative overhead and redesign of associated business process. The claim is made that computers may not help as they may just automate dysfunctional management procedures. They call for separate models for measuring the effects of ICT on management effectiveness and strategic business performance as opposed to firm output performance and labour productivity.

Reece and Thompson (2005) found that many SMEs believe they need a solution but do not know why. When buying and developing a new system a business needs to consider if it will make the operations more efficient, provide operational, meaningful information and provide management information. Most managers are often surprised that ICT systems can assist in strategic decisions and business planning. This general lack of awareness is a weakness in the management of a micro-company. Gramignoli et.al. (1999) identified two different ways of implementing IS management in SMEs. The first method is to use external consultants, who could use their knowledge and expertise to support the company from both a technical and strategic perspective and the second way is to have a role encompassing significant management experience with the ability to

understand and develop the strategic aspect of IT. This may lead to systems that support the company in developing a competitive advantage (Mata et.al., 1995).

2.5.1.4 Decision Making

It has been cited that the reason for the success or failure of an ICT project is the poor quality of an organisation's decision-making process (Farbey et.al., 1993). If proper evaluation is not carried out then the result can be less effective decision making, as the results of the evaluation should inform the decisions. Often organisations will blame everything else except the actual decision that was made

Bannister and Remenyi (2001) argue that although objective matters such as returns, income, etc. can influence us we are also open to bias from cultural, political, personal and other more subtle factors when making decisions. They found that often decision-makers say that they rely on 'instinct' to make decisions and that this is more likely the more complex the decision is. This is supported by earlier work which used similar subjective terms to describe this process such as: Farbey et al (1993) who described it as an "acts of faith", Weill (1990) who used the term "blind faith" and Powell's (1992) use of the term "gut instinct".

Bannister and Remenyi (2001) also claim that although we should be able to distinguish between the value of an investment to the organisation and the value to the decision maker in practise this is often confounded in the minds of the decision makers. As decision-making is complex and involves so many factors a model of decision making was proposed (Figure 2.5). This model attempts to show the various influences on the decision-makers and the world in which they operate. No attempt is made to 'weight' the factors although it is implied that the factors do carry different weights in the mind of different decision-makers. The external filters in the model refer to subordinates, consultants, journalists, salespeople, etc. The interior filter is made up of the personal

experience and psychological make up of the decision-maker. A major part of this will be their perception of the value of the investment. Their conclusion is that instinct and a degree of rationality is required to make the correct decision.

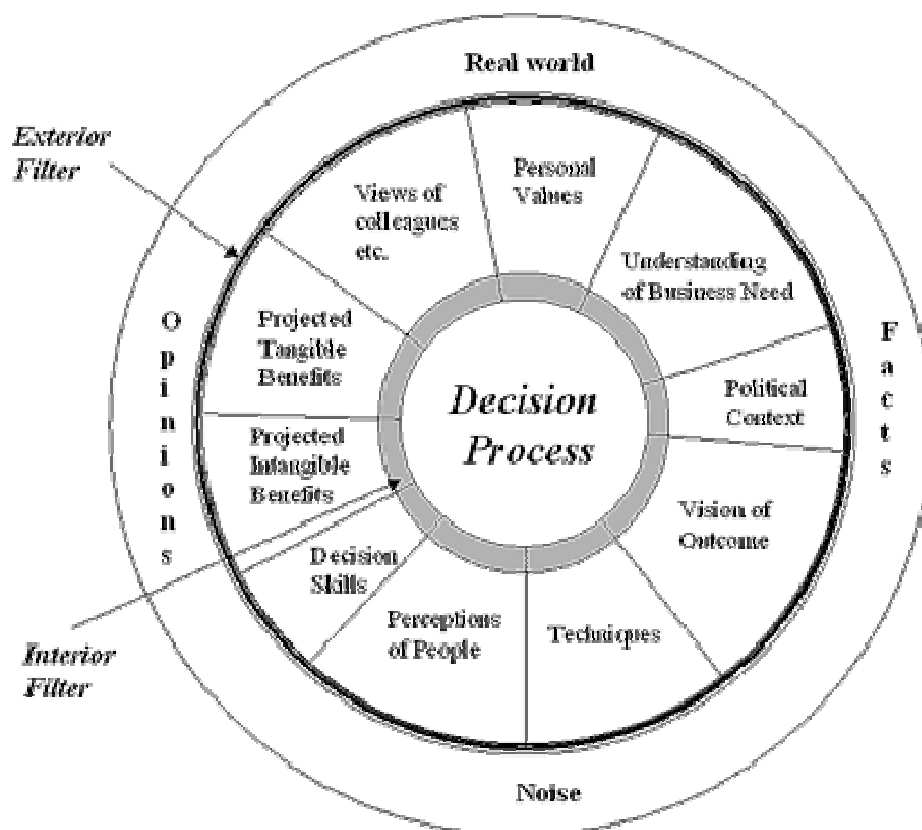


Figure 2.5: Decision Process Model by Bannister and Remenyi (2001)

In large companies decisions are usually made in a relatively structured manner, so although it may be a more complex decision it is often reached by a more rational approach than decisions in smaller companies. Micro-companies have a relatively simple structure but they frequently also have much more intricate behaviours and attitudes which are often personality driven in the way that large organisations are not. In a micro-company the owner-manager often has to make decisions about everything from hiring personnel to buying a radio for the office (Costello et.al., 2007). This relatively simple structure can help in terms of decision-making and the SME can be treated as a neat economic unit (Swartz and Boaden, 1997). However, if this was the case then

researchers and interventionists should have a straightforward approach and be equally successful in their approach. However, this is not the case as although large companies often have multifaceted structures the decisions they make are often made in a much more rational manner than those within small companies where personalities can often get involved in a way that they cannot in larger organisations (Culkin and Smith, 2000). This complexity is heightened the smaller a company is as the decision to adopt technology by the organisation is interwoven with the personal perceptions and attitudes towards a particular technology by the owner-manager (Van Akkeren and Cavaye, 1999b).

There is evidence to suggest that increasingly SMEs are faced with more and more complex ICT investment decisions (Hillam and Edwards, 2001) and any help that they can be given to think more strategically about their investment decisions will assist. Owner-managers of SMEs may have different measurements of success and different criteria in their decisions to those of larger organisations (Reece and Thompson, 2005). Bannister and Remenyi (2001) state that often confusion can occur in SMEs as the investor, decision-maker, manager and owner are frequently the same person.

Galliers (1991) recognised that IS strategy is often reactive to business strategy rather than an integral part of it. Micro-company owner-managers may have other factors influencing their decision-making which make this process a reaction to elements other than business strategy. For example Ballantine (1998) found in small companies that when selecting ICT pressure from major customers was an important consideration, it was often also accompanied by the need to improve efficiency. However, Dans (2001) reflects that SMEs seldom have an ICT plan regarding investment and often make a decision driven by personal attitudes or perceptions. When computers first entered the business arena and large organisations adopted them they were used mainly to automate mundane business processes. This use has now spread to include the strategic use of computers as many authors have stated in the evolutionary models of ICT adoption that

have been specified e.g. Anthony's model (1965), Nolan's Growth Stages Model (1973 and 1979), Earl's Model for Information Systems Planning (1983), Bhabuta's Model (1988), Hirschheim et.al.'s Model (1988) and Galliers and Sutherland's Model (1991). This has made the decisions in adopting various ICT more complicated for large organisations that have used computers for many years. The decision for micro-companies is often equally as difficult.

This research will also explore who makes the decision to adopt, whilst the level within the organisation of that decision-maker will be included in the new model as it may indicate a companies maturity in terms of functional structure and strategy.

2.5.2 Firm Issues

This section will include a discussion on the firm issues including the pressures that exist external to the company, influences that are exerted from within the company, the impact of the human resource (or lack of it) and the skills that they bring to the adoption process and finally the difficulties that the implementation phase of adoption can exert.

2.5.2.1 External Pressures

Lefebvre and Lefebvre (1996) see the main external influences on investment by SMEs as being: customers and contractors, direct competitors, trade associations, hardware and software vendors, consultants and governments. Barber et. al. (2000) concur that main sources of influence on SMEs with regard to technology and technology adoption are Suppliers, Customers, Knowledge Pools (Trade Fairs, Associations, Exhibitions, etc.) Consultancy Firms, Business Links, Higher and Further Education Institutes. The main findings of their research concluded that the largest source of technological information in manufacturing - based firms was the supply chain. It also concluded that those firms in all sectors who were progressive but not leading edge are vital to the supply chain. SMEs often adopt ICT due to pressure from major customers (Hill and McGowan, 1994), in

some sectors in particular large contractors will force suppliers into using particular types of applications. Competitors also will be a major force in the decision process and significantly influence adoption (Rashid and Al-Qirim 2001). Large organisations looking to reduce costs have always had the power and influence to 'persuade' their suppliers to implement electronic methods of working; an example of this is Electronic Data Interchange (EDI). Some smaller companies may have been deselected as suppliers if they were unable or unwilling to finance the installation of this very expensive tool (Husein et.al., 1996). However, more recently the cheaper alternative of using the Internet as a means of communication has been the chosen method (Levy and Powell, 1999) as often a direct result of a larger customer's request (Costello et. al., 1999b). This difficulty is augmented by the fact that most SMEs do not have the resource to employ dedicated staff in ICT (Costello and Reece, 2005).

Consultants and hardware/software vendors can also have a significant influence on micro-companies, mainly because of the lack of internal expertise. Employing external vendors or consultants can add significant value to the success with which ICT is adopted; especially as lack of knowledge and skills is seen as a prime inhibitor of adoption (Proudlock et. al., 1999). However, the costs of employing external advisors can be very prohibitive for small companies. External pressures, such as eCommerce or BPR, are often one of the determining factors in Internet adoption (Nathalie et.al., 1998; Merhten et.al., 2001; Levy and Powell, 2005) which may indicate that this is a factor in adoption of any technology. For example, technologies such as eCommerce will require the network of SMEs supporting larger customers to develop in order for it to progress. However, small companies often receive conflicting messages in this area, whilst the government insists that support for this is available to them, headlines in the press often relay a plethora of conflicting messages. Stories in the press such as those that discuss the problems that micro-companies have in accessing or paying for their broadband access proliferate. Many providers will often exploit a small company's needs by charging significantly for 'business packages' that many micro-companies can ill afford. The

confusion created for micro-companies is incalculable and can result in 'hasty' decision-making when speculating on quick returns as is often the scenario for this size company.

Frequently changing markets can add to the need for micro-companies to keep up to date with technology as they are often required to diversify quickly in order to survive. Adjustments that companies often need to make in order to survive were reported by Smallbone et. al. (in Storey, 1994) as:

- Product and market adjustments.
- Production process adjustments.
- Employment and labour process adjustments.
- Ownership and organisational adjustments.
- Locational adjustments.

Companies who were the most active in making adjustments were usually the most successful in terms of survival. Many of these adjustments require changes to technology and ICT infrastructure. The same research states that the younger a firm the less chance of survival than an older more established company. As companies are more likely to be adopting technology at a fast past in the early years (Levy et. al., 2005) resource poverty in this situation would have a significant impact.

2.5.2.2 Internal Pressures

There are a number of internal influences that affect the adoption of ICT amongst micro-companies including the employees themselves and their ability to cope with the technology. In particular a lack of skills will affect the company's ability to source and implement new technology. The recruitment of new employees can influence the balance within an organisation and bring new attitudes and capabilities. There is often an internally driven need for increased capacity and capability or a marketing strategy that requires technology to be implemented. Cragg and King (1992) suggested that SMEs

with very sophisticated systems tend to perform worse than those with more basic types. This is because SMEs tend in general to have much more limited ICT knowledge and skills than larger organisations. The strategic information may be available but micro-companies are not always able to take advantage of it. Furthermore very few micro-companies actually plan their use of ICT and most planning that is done is for done for transaction processing systems (Hagmann and McCahon, 1993).

Proudlock et. al (1999) claim that organisations who planned the adoption as part of their planning process perceive ICT as significantly more important especially in their decision making. This may not necessarily be that ICT aids the process but that the decision-making is generally better if formal processes are applied. Chesher and Sklok (2000) assert that small companies see ICT as a success if it enables them to differentiate', although often the factors influencing the use of ICT in small companies may be the business sector in which they operate, the nature of the products and services, which are also closely allied to business sector, the educational level and age of the business owner and the extent to which it is tied in with its suppliers. Levy et.al. (1998) argues that the business sector has no bearing on the success of an adoption but this does not outline 'what' ICT is prevalent in the different sectors.

The fact that many small companies are in a state of resource poverty has been recognised and reported on for many years by researchers (Van Akkaren and Cavaye, 1999a; Levy and Powell, 2005; Storey, 1994) It is somewhat surprising then to discover that an issue recognised and invoking prolific research in other fields is the confidence and competence of staff in their use of IT, for example much has been written about the competence of teachers in the classroom delivering lessons using IT. Given that there is a longer history in the use of ICT in business, there has been substantially less research conducted into the competence and confidence of those who use and invest in ICT in the workplace. Even less research has concentrated on companies whose core business is ICT. This leaves the staff vulnerable when new systems are implemented and their lack

of ability can be a major influence on adoption success. Many micro sized companies already work excessively long hours just to keep the organisation running (Thompson and Costello, 2004) staff are highly unlikely to give over extra time to training.

Pressure from employees can be a major influence on adoption within a company. For example, Thompson and Costello (2004) found that company employees enrolled on to Masters level courses in Strategic IT Management began the course for a variety of reasons. The employees came from varied backgrounds but all were either in a management position or aspiring to be. Amongst the participants were an IT Director, a systems developer, a systems/business analyst, an accountant, a web editor, a key skills project consultant, an infrastructure analyst, several entrepreneurial owner-managers, and many technical experts who felt the need to develop in a managerial capacity to support their technical ability. Participants were evaluated at mid term and it was found that the original intention of the majority of the students was purely to gain IT skills, but full-term results revealed that there was increasingly less need to develop purely technical skills. Participants became less focused on their own future and more involved with the application of skills in their place of work, this led to increased pressure to adopt new technology and associated processes for many of the micro-companies involved. One participant from a micro-company commented:

"I now have a greater understanding of the contribution IT makes to my company. A clearer picture of the approach to IT projects within the company and an increased understanding of the different aspects of IT, how they interact and their overall contribution to our company's strategy."

(Thompson and Costello, 2004)

The motivation of the workforce to use ICT and make it a success is therefore another major influence on the adoption process. Szczygiel (2000) found in a similar project that

adoption was more successful *after* business processes had been mapped and employees educated. Bannister and Remenyi (2001) argue that although objective matters such as returns, income, etc. can influence us, we are also open to bias from cultural, political, personal and other more subtle factors that may also influence us in decisions we make regarding IT. It is therefore prudent for any company to ensure that employees have the right attitude too influence the adoption of ICT. The internal pressure on companies to adopt technology will be explored through the new model.

2.5.2.3 Human Resources

It has been highlighted that there can be no value in ICT investment without changes taking place in any associated business processes (Husein et. al., 1996) and subsequently in the human resource that supports them. This means that adoption decisions must also consider these systems and correspondingly invest in them. It may also make the assumption that radical improvements require radical changes. This will often dissuade SMEs who often do not have the resources to implement major changes. Although it has been established that the education of the owner-manager may be paramount for successful adoption and growth in micro-companies, the lack of education of the owner-manager can have the opposite effect. This is seen in work by Martin and Halstead (1994) who report that the early educational experiences of an owner-manager may impact on his attitude to training for his employees too.

People issues are often at the forefront of the 'softer' benefits and dis-benefits discovered by many researchers in the area of ICT evaluation and subsequent value realisation. People are arguably the most important and the most expensive resource whatever the size of the organisation (Levy and Powell, 2005) and this has a particular impact on SMEs. Recognition of the particularly difficult area of human resources is paramount in this study as most micro-companies not only do not have sufficient resource but often that resource is lacking in the specialist skills needed to either implement or evaluate technology (Cragg and King, 1993; Reynolds et.al., 1994).

The joint eSkills and Gartner Consulting report on the UK situation (2004) states that over the next ten years, technology trends such as mobility, escalation in data volumes, high bandwidth wireless access and the coverage of multiple technologies will open up new business markets and change the way employers conduct business. These technology trends will require constant upgrade of skills, if UK businesses are to successfully exploit their potential. Unfortunately the report also showed that the UK is currently lacking the ICT skills required and needed by businesses today, identifying that over one third (34%) of businesses with job vacancies for ICT professional staff, are finding these vacancies hard to fill. 42% of the companies in this situation report this as having a major effect on their operations. 76% had to delay the development of new products and services, and 42% had suffered an increase in their operating costs whilst 39% experienced problems meeting customer service objectives. Over one-fifth (22%) had lost business orders to competitors. This will lead to a negative impact on a company's competitive edge.

Often in large organisations applications are implemented with limited training conducted on a small number of components (Hassall, 1999; Reece and Thompson, 2005). It takes much longer for many users to develop to the stage of using the technology available more effectively and some users never reach this stage. (Hassall, 1999). Micro-companies often learn the use of ICT by experimentation that can result in limited use of functionality. The competence and confidence of ICT users in micro-companies is vital if they are to make effective use of technology and therefore realise benefits from their investment.

"IT budget allocation to staff can indicate an organisations commitment to attracting, retaining and developing high quality IS resource".

(Rai et.al, 1997)

When ICT staff are employed they usually represent the largest expenditure from the budget in a small company and they cannot be ignored, however, they often represent an

unacceptable overhead to micro-companies. However, investment in this element must surely yield results in the performance of the business? Human resource issues are usually at the forefront of the 'softer' benefits and dis-benefits discovered by many researchers in the area of ICT adoption (Farbey et.al., 1993). Remenyi and Lubbe (1999) postulates that the amount of money spent on equipment is not important in realising benefits but there is a definite correlation between the amount of money spent on staff training and production. These findings are from research conducted with large organisations and the framework developed from the research aimed at managers in large organisations. As micro-companies spend relatively less on training and staff it can be seen why their influence could be a major inhibitor towards successful adoption.

What has been identified by Joshi et.al. (1986) is the need to have users involved in the ICT decisions, as this will ensure users accept the new procedures and will feel they have been treated fairly and equitably. In a survey of fifty ICT decision-makers it was shown that often the impact of the social system is either minimised, excluded or put-off until after implementation (Schneider, 2001). The social sub-system may have a much greater impact than is recognised at present and indeed may impact upon decisions made both now and for future projects.

For most SMEs ICT has to be seen as an advantage over the more traditional methods they are currently employing for them to even consider adoption. Mehrtens et.al. (2001) found that this was one of the important factors in adoption as many SMEs cannot afford the resource to invest in new learning or new methods without perceiving a correlation between adoption and subsequent productivity increases or an increase in competitive advantage.

Micro-companies often discover new technologies and practises through their network of friends, family, suppliers, customers and even salesmen who provide the necessary insights to what is available and what they should be doing in their particular field (Daly,

2002). Having gained new infrastructure the next problem is how to gain understanding and knowledge and then use it effectively. One of the major stumbling blocks to the building of a supportive ICT infrastructure for a micro-company is the availability of the necessary skills. There is an increased need to invest in staff training when new ICT is introduced in an already resource-starved environment. Therefore, evaluation of ICT equipment needs to include an investigation of the ease of implementation and/or use (Costello et. al. 2009). Many small companies cannot afford to employ professional ICT people and often rely on external sources or on self-taught ability (Lefebvre and Lefebvre, 1996). In an effort to overcome this some turn to external companies or 'outsourcers' but this also carries a price tag. A new option for companies is 'Managed Service Providers' or 'Application Service Providers' and can include the outside company taking care of all the needs of a small company from hardware and software to security and data. This may, however, lead to many problems that larger companies have already discovered. The main difficulty focuses on that of trust, relationships and effective contracts. Often the terms and conditions in the small print of packages offered to SMEs can be overly restrictive (Scargill, 2001). This can be actively discouraging and cause SMEs to have serious concerns about the conflicting messages they are receiving from the press, government and the suppliers of the services they need to build their ICT infrastructure.

Reece and Thompson (2005) advise us that often SME do not discover the full functionality of their purchases until they experiment with them after they have invested, this is supported in work by Hassall (1999). Reece and Costello (2005) also discuss the poor planning of specifications for infrastructure, the lack of skills and training. SMEs aim to save costs but rarely plan to do so as so often they are seeking to support an operational failure. They are very focused on what their product is and often the internal culture is unstructured in terms of lines of duty with the ICT systems often worked around and any inadequacies overcome by changes in working practices. Lack of qualified personnel is of acute concern for micro-companies whilst larger organisations do not see

it as such a problem and ranked it eighth in their top ten barriers to adoption (Schneider, 2001). The lack of knowledge regarding ICT can often result in a micro-company not adopting as they are not sure of any benefit that ICT may bring. This is mainly when there is a lack of qualified personnel and knowledge of the subject often relies on external vendors who may find larger organisations more attractive.

The role of the ICT champion can be paramount within micro-companies and many investments will be justified simply because the organisation has a champion of the technology, which in micro-companies can be the owner-manager themselves. Lubbe and Remenyi (1999) state that very little learning takes place during the investment process and mistakes are often repeated. Micro-companies are lacking in all resources including human resource and yet skills are imperative to the success of adoption (Rai et. al 1997). This issue will also be explored in the new model examining what specialist skills are available to the company.

2.5.2.4 Implementation

The greater use of ICT and e-business is already having an effect on the nature of business transactions and the location of businesses. Rashbrooke (2004) highlighted this in a report by e-skills UK with Gartner Consulting, as he stated that over the next ten years, technology trends such as mobility, escalation in data volumes, high bandwidth wireless access and the coverage of multiple technologies will open up new business markets and change the way employers conduct business. These technology trends will require constant upgrade of skills, if the UK is to successfully exploit their potential. If we take this with the fact that the 2003 national employers skills survey on behalf of the Learning and Skills Council, found that the West Midlands (WM) was the worst out of nine separate regions analysed. 6,933 interviews were carried out with employers in the WM, which identified some 30,343 job vacancies that were 'hard to fill'. 16,906 posts of these cannot be filled due to skills shortages. A total of 348,534 employees (15% of WM workforce) were identified by employers as lacking the ICT skills needed to do their jobs

effectively. This may well indicate that the SMEs in the WM are struggling to fill skills gaps and therefore do not have the knowledge of the possibilities that ICT could bring to them.

Many SMEs are in danger of being deselected as suppliers if they are unable to utilise technology effectively to save money, compile results, get orders and deliver products faster and more accurately than competitors (Husein et.al., 1999). However, the vision to select the appropriate technology and utilise it effectively eludes larger companies with greater resources. Fordham (2001) claims that in order to predict technology with any degree of accuracy ICT needs to take lessons from economists and other such forecasters in that they need to identify trends, track new developments and make predictions. With the proliferation of new technologies it seems an impossible task to ask any small company to achieve all of these. Even if we establish that it might be possible to do this, we have to assume that SMEs have both the skill to do so and the time to invest in it, both of which have been identified as in short supply in this group of companies (Hassall, 1999).

There are many models which track the development of IS / ICT evolution in organisations e.g. Anthony (1965 in Ward and Peppard, 2002), Nolan (1979), Earl (1989) and Galliers and Sutherlands (1991). Galliers (1991) states that for an organisation to successfully use ICT in a strategic manner they need to be mature users of IT. Nolan (1979) however assumed that organisations learn over time and progressively become mature users and that by doing so they increase the possibility of successfully using IT. Many SMEs are not successful at using ICT and many learn by experimentation after purchase (Hassall, 1999) and therefore may not learn due to resource constraints; Nolan (1979) simply assumes that all organisations do. The adoption of ICT by organisations has and continues to be facilitated by the development of hardware/software. This research concentrates mainly on the infrastructure that underpins the business processes, therefore, although the business needs should drive the ICT investment,

without the basic infrastructure in place and the ability to use it effectively, most organisations cannot begin to compete in their particular sector.

In an International Data Group (IDC) white paper sponsored by Novell (Robinson, 2000) the idea is explored of an organisations business processes developing along an Electronic Business Continuum (Figure 2.6). The basic concept is that the processes develop in concert with technology advances and electronic business and can be plotted historically through the ICT era of Batch / Online, Client / Server, Network Computing, the Information Society and on into the Net-economy. In spite of the 'dot-com' boom and bust press coverage, eBusiness goes much further than selling products on-line and is more about integrating technology to enhance processes throughout the whole business. In order to examine how an organisation might develop its technology profile it is perhaps necessary to look at how technology trends have developed and how an SME of today can use this to predict their next move.

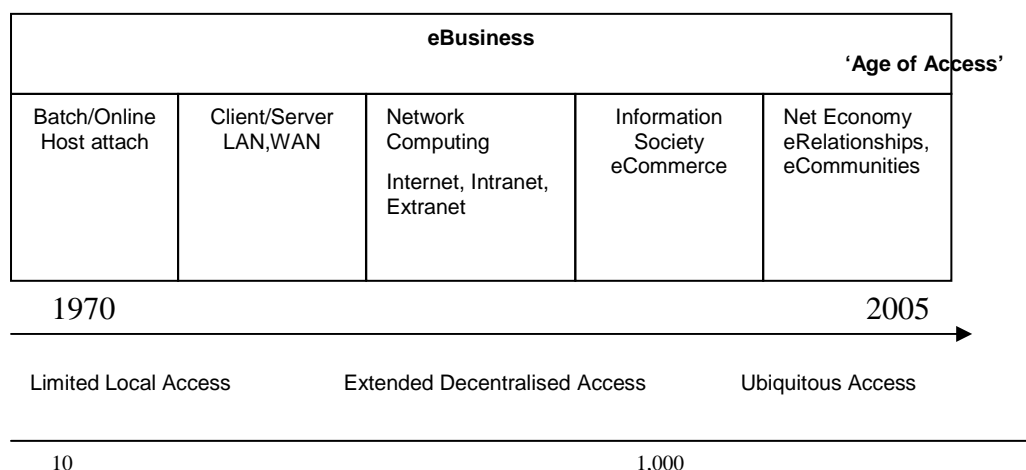


Figure 2.6: Adapted from the Electronic Business Continuum (Robinson, 2000)

As many micro-companies use the same technology to support their business the differentiators are often their ability to use the technology strategically and adapt it to develop new business models. The breadth of issues related to the evolution of ICT infrastructure is immense, ranging from the actual fitting of the wires in a building to the

backing up of data day to day and the people structures involved in this. Caldeira and Ward (2002) report that for many companies, but especially for micro-companies with less resource available the main issue with adoption will arise during the implementation process itself which often leaves companies with very expensive systems which are not fully used. The main concern they have is that often even when external consultants are used in the implementation process problems can occur as those involved do not understand the business needs. This can lead to extra costs, delays and operational problems, which are unacceptable to micro-companies. It has been claimed that most of the cost of an IT adoption is incurred during implementation (Love et.al., 2004).

SMEs are more likely to prioritise the implementation of the technology itself, including the cost and the problems of implementing the technology itself and the immediate associated problems which are likely to be very high on the micro-company list of priorities (Costello et.al., 2006). It is often only with hindsight that an attempt is made to make the technology 'fit' the organisational requirements (Costello et.al., 1999a). They rarely have the expertise to cope with implementation alone and although very dependent on outside consultants for help with their choice of technology, they are often too expensive and small companies lack confidence in the ability of computer vendors to provide ongoing service and support (Lefebvre and Lefebvre, 1996).

Therefore the ability to cope with the technological and business related issues surrounding implementation whilst balancing the strategic intent of the adoption would appear to allude more mature technology adopters. Implementation issues will also be part of the new model developed here as this may indicate a companies organisational readiness in both a technological and strategic manner.

2.5.3 The Role of Strategy and Value in Adoption

Many organisations feel they must introduce computers into their business and succumb to the latest trends without careful thought as to the usefulness for the business or indeed the value to their business (Levy et. al., 2005). This often means that that purchase is not successful and the perception of ICT being a 'cost' is perpetuated. Of major concern for micro-companies is the lack of proven business models specifically for smaller companies, which may demonstrate the usefulness of a particular technology.

In this section we examine a small part of the field of Information Economics as defined by Parker and Benson (1987) examining how the value of technology adoption can be measured in a meaningful way for a micro-company. Many micro-companies do not embrace technology with figures as high as 42% of micro-companies in some sub regions of the West Midlands not even owning a computer¹² however, the ICT sector is relatively unique in its need to do so. An exploration of perceived value is appropriate in a new adoption model and therefore, reasons for investment (pre-evaluation), measures of success (post evaluation) and perceived value as a concept are explored as part of this. This has not been articulated in previous research although other researchers have extolled the need to pursue this (Van Akkeren and Cavaye, 1999a).

Information Economics is a term coined by Parker and Benson (1987) and refers to the need to measure the value of information systems that enhance revenue or add value in some way. The information economics scorecard was a precursor of the balanced scorecard (BSC) developed by Kaplan and Norton (1992, 1993 and 1996). Although neither of these methods is an exact science they do involve open discussion and the consideration of both business and technology in assessing the value of the variables in the process.

Throughout this study the term 'value' is used to indicate the returns from ICT adoption and as this can be very subjective, success of implementation can be difficult to define or

¹² Black Country Adoption Survey 2007

quantify, particularly as only 'perceived value' as a concept is used. Lee (2001) evaluated a causal relationship between ICT implementation and business value and demonstrated that although there is a relationship this is complex and not direct; e.g. use of ICT and cost and time, however, there may be a complex and indirect link between ICT and profit.

Cragg et.al., (2002) identified a stronger than expected link between the ICT planning process and the business strategy in small businesses. They did not undertake a detailed study as to the cause of this, but they hypothesised that it was due to the less formal aspects of operation of SMEs, which they describe as possibly being caused by the myriad of responsibilities taken on by managers within these small companies. This might mean that as they are involved in strategy development it makes it easier to share thoughts and ideas across the business and IT. More importantly what they found was this strategic alliance was influenced by non ICT managers, as Cragg et.al., (2002) stated most small firms do not have a dedicated ICT manager or ICT department.

Schneider (2001) found that the bigger the organisation the more likely they are to involve users in all aspects of ICT and in particular strategy. In organisations with less than 50 employees it was much more likely that an individual would monitor technology and its use and much less likely that there would be any formal procedures in place. This would assume that the 'measurement' of the impact of any implementation would also be left to an individual in a micro-company. In micro-companies there is often a need to raise awareness with owner-managers as to the link between ICT, strategy and benefits as most see ICT as a cost based exercise (Levy et.al.,2005).

IS theorists believe that ICT adoption and investment should be made in the context of IS/ICT strategy and should support business strategy (Earl, 1989; Galliers and Land, 1987). Other research (Lyles et.al., 1993; Jennings and Beaver, 1997; Anderson, 2000) has shown that there is a clear link between businesses performance and the strategic planning process. However micro-companies generally lack strategic planning as a

management tool (Anderson, 2001) and this alone will have a major impact on their decisions. Levy and Powell (1999) in their research found that only one SME demonstrated that ICT can add value in the same way as in larger organisations. At one end of the scale very little use is made of strategic information from ICT in SMEs, whilst some recent start up companies are totally dependent on ICT for their existence. Levy et. al., (2005) claim that ICT investment in the latter can be very high initially but then declines, as the lack of resources prevalent in all SMEs become apparent.

2.5.3.1 Reasons for Investment

Remenyi et.al., (1991) stated that the search for the 'IT effectiveness metric is the modern day equivalent of the Holy Grail', Ryan (2000) and Dans (2001) echo this. Remenyi et.al. (1991) also states that as organisations reach higher levels of maturity in their use of ICT that evaluation and measurement of the value that ICT becomes increasingly more important to senior managers. This is not necessarily applicable to a micro-company as many have yet to reach a level of maturity that is equal to this. The majority of micro-companies are looking for short-term improvements to operational performance. Anderson (2001) states, that SMEs lack the ability to balance their long-term development with the short-term operational pressures which they face on a daily basis. From the literature it can be assumed that most SMEs and therefore micro-companies do not have strategies and are driven by short term gains which often mean that perceived value is the most important reason for investment (Levy and Powell, 2005).

Farbey et.al. (1993) claimed that evaluating ICT investments is about setting targets and predicting outcomes but there are many stumbling blocks to the successful outcome of the process. Farbey et. al. (1993) also claims that many organisations are simply unaware of the actual costs, benefits and dis-benefits that may be incurred. The search for the value and benefits from ICT investments over time has moved from simple measurements to much more complex organisation-wide searches for 'value'. It is probably necessary for

micro-companies to take a view of their ICT investment in a much wider sense than may originally have been predicted. Lefebvre and Lefebvre (1996) conclude that SMEs see financial feasibility as much more important than any organisational or technological considerations. Quick returns are very important to micro-companies also who often operate within very limited financial guidelines. Research in the public sector sphere claims mammoth returns from investment in ICT adoption amongst SMEs (Sheppard and Hooton, 2007).

Levy et. al. (2001) conducted research with twenty-six companies using the 'Focus Dominance Model' model which showed that only one SME fell into the innovation quadrant. Further analysis revealed that SMEs usually invest in ICT to carry out activities that already exist but in a more efficient manner. Rarely is there seen a need for or the resources available to invest in the strategic use of ICT. Their work is insightful in this context as it represents the fact that very few SMEs involved in their work were at the higher evolutionary levels in their use of ICT and it demonstrates the type of ICT SMEs are investing in. Most SMEs are looking to reduce costs but some are beginning to investigate adding value, their framework is useful to an SME in highlighting their motivation and raising awareness.

There is very little pre-evaluation carried out in small companies and those involved in ICT justification will often make subjective judgments. The views expressed in studies are usually those of an individual and the small company environment is more complex. Often those replying to surveys may be more likely to carry out evaluation and be satisfied with their processes. The variety of definitions used to classify SMEs can also make comparisons difficult. Locke (2004) concludes that investment levels are not influenced by size and that organisations in different sectors vary significantly in level of investment. The study also claims that hardware costs are the highest ranked direct costs in all sectors; this is likely to be so in this study too as the sample is ICT companies. Exploring

their reason for investment as part of the new model development would be seen as pertinent in any analysis if this area.

2.5.3.2 Measures of Success

Should SMEs measure the effect of ICT at all? There are those who believe that there is little point as many of the benefits are so intangible as to be incalculable. Research by Brynjolfsson and Hitt (1995) and Rai et.al., (1997) has shown that the effect of ICT on competitive strategy and industry structure explains why there is a lack of relationship between ICT investment and traditional measures of performance.

ICT investment projects still fail to deliver benefit to companies (Ward and Daniel, 2006), one possible assumption could be the failure to conduct post implementation evaluation (Frisk, 2007). Measures of ICT success have two main dimensions in the literature: Firstly econometric measures which search for relationships between input and output data, for example cash flow type methods e.g. Cost Benefit Analysis, Return on Investment (ROI), Net Present Value (NPV), Internal Rate of Return (IRR), Payback Time (PTB) This formed the basis of extensive research by Loveman (1991), Brynjolfsson and Hitt (1994, 1995) and Brynjolfsson and Yang (1996) which revealed what has been termed the 'Productivity Paradox', which demonstrated that an increase in ICT investment did not automatically result in an increase in productivity. Secondly, there has been the search for ICT value researched by Mooney et al (1995) who developed a process view of ICT value, based on similar metrics but being much more complex and subtle. It views value creation as a process, which allows for much more discriminating views of value conception. This is a view which has been extolled by many others e.g. Rai et.al. (1997), Ryan (1997), Levy and Powell (1999) and Ryan and Harrison (2000). Suggested intangible benefits can be: Improvements in resources, functions, management, quality of product or service, customer services, spotting future opportunities in markets, products and operations, adaptability and flexibility (Lillrank et.al., 2001). More recently research by

Sheppard and Hooton (2007) has found a direct correlation between computer *use* and profitability in organisations.

A review of ICT value articles (Chan, 2000) provides strong evidence of a schism between the use of quantitative and qualitative measures in IT-value research. Rarely is an ICT investment audited post implementation (Farbey et.al., 1993; Levy and Powell, 1999), largely because organisations do not demand that it is (Remenyi et.al., 1991). When investments are revisited future predictions of growth or possible strategic benefits may not be taken into account. Berghout et.al. (2005) criticises rational evaluation methods as they neglect qualitative aspects of investments, favouring short-term views on investments and therefore disfavouring long term infrastructure investments.

Devaraj and Kohli (2000) have highlighted the lag effects of ICT investment in their longitudinal research. Whilst, Kennerley and Neely (1998) hypothesised that this time lag is something that SMEs are not prepared to tolerate, as lack of resources requires instant payback. However, Rai et.al. (1997) claims that the lag effects of ICT investment may be significantly reduced in comparison with other investments because of the accelerated rate of obsolescence that ICT has. Many researchers have begun to realise that there is no simple link between ICT and business performance. It has been identified that most benefits are distilled through operational process indicators (Lillrank et.al., 2001) and therefore it is advantageous to measure ICT in its operational terms and to identify the link between operational and financial benefits. SMEs will frequently not evaluate their investment at all, assuming that if it is working then it represents value for money. This is a reflection of their lack of strategic focus (Cragg, 2002) and their view that ICT is merely a cost. However, in micro-companies the lack of any form of measurement either pre or post implementation of ICT implies that decisions are made which are not based on actual data and may therefore be based on assumptions (ONS 2005).

Much of the literature available in the field of ICT evaluation shows step wise approaches on how to evaluate your ICT investment whilst ignoring the subtle nuances involved. Berghout et.al. (2005) postulates that many evaluation methods often omit the establishment and discussion of risk factors in investment rationale and are frequently disposed to manipulation, and inappropriate scientific use and historical ways of working, rather than dealing with and responding to the social view of evaluation. The technology itself is often of major concern to micro-companies that do not always have the skills in house to deal with issues surrounding this area. For example, user satisfaction, as defined in the Delone and McLean (1992) model, is ideal as a general-purpose *perceptual* measure of IS success but micro-companies margins are very small and they cannot afford the 'luxury' of using a measure as ethereal as this and that *User Satisfaction* does not come into the equation, as users must just 'learn to like it' (Hassall 1999).

There is a need to develop a simple holistic approach to ICT evaluation with a particular emphasis on small companies who lack the knowledge and resource to commit large amounts of time to this aspect of ICT adoption (Costello et.al., 2006). It seems that currently most micro-companies lack any measurement on which to base future decisions (Lubbe and Remenyi and Lubbe, 1999). This lack of measurement would be an indicator of lack of historical data to inform future purchases and therefore measures of success will also be an element in the new model.

2.5.3.3 Perceived Value

Thornton (1997) tells us that when it comes to measuring the value of ICT that the commercial world is split into three points of view. Companies' either view under-performing ICT investments as a problem or as a defining condition of the complex world we live in or they are in denial that ICT moneys are not being wisely spent. However Seddon (1997) described the success of ICT as a value judgment made by an individual but from the point of view of the stakeholder. When the stakeholder is also the investor,

owner and user (as is often the case with very small companies) the complexities grow exponentially. With SMEs the owner manager's attitude and experience can impact heavily on the role that ICT takes within the company (Duhan et.al., 2001) this attitude can have a major influence on the perceived value of any potential adoption and many researchers have already looked at the individual variables that influence owner-managers (see section 2.5.1.1 and 2.5.1.2).

Berghout et.al. (2005) suggests that the plethora of literature showing step wise how to access your ICT evaluation ignores the subtle nuances involved in this process, the definition of 'perceived value' being the main motivator for owner-managers of small companies. Perceived value is seen as a major issue in the development of a model of adoption as this is often the main influence on the decision made to adopt by the owner-manager. Bannister and Remenyi (2001) have also called for research into the *value* (both perceived and actual) of ICT investment to the organisation arguing that this is a different concept that can have no true measure. There is a real need to raise awareness regarding the value of ICT within SMEs and the subsequent need to measure that value in order that future investments are informed and mistakes are not compounded.

Mehrtens et. al. (2001) uncovered perceived benefits in the development of a model for internet adoption as they are much more intangible than cost related benefits and yet these have been shown to have a major impact on the purchasing of technology. A more thorough exploration of perceived value will inform the debate once more. Harindranath et.al. (2007) also discovered that by far the largest influence on perceived benefits was either customers or competitors. In particular, stating that the companies saw the adoption as more than a resource saver but as an enhancement to products or services.

The new model to be developed here would need to include 'perceived value' for the owner-manager which in the micro-company environment could be seen as the single

most important factor and is often absent from other models (Van Akkeren and Cavaye, 1999a), especially as micro-company owner-managers have significant influence on adoption success rates. It is this owner-manager's 'perception' of the value to the company that is often either the inhibitor or the driver for the adoption. It can be assumed that the perceived value of technology in a very small business will be greatly influenced by the owner-manager and particularly so if the owner-manager is strong-minded (Poon et.al., 1996).

A lack of specialist personnel may also be reflected in the narrow education and experience that is often inherent in micro-companies and this may also hinder any adoption by the non-recognition of the value of ICT. Parker (1997) has also stated that the intrusion of family interest will also influence the final decision as very small companies are frequently family owned and run. Many researchers (Premkumar and Roberts, 1999; Cragg and King, 1993; MacGregor et.al., 1998) have recognised that the main motivation for small companies to adopt ICT is the anticipated (perceived) benefits that it will bring to the company. Therefore adoption is less likely to take place if the micro-company does not anticipate value from its use. Poon et al. (1996) also stated that hype is often a reason for a micro business to commence using such technologies as the Internet, suggesting that these firms might believe that they will gain the benefits promised by the hype.

The value to a micro-company is also often based on short term anticipation of value and their use of ICT is usually influenced significantly by their perception of tangible, short-term measures of performance, cost and benefits. This suggests that very small businesses may be more likely to be motivated to use ICT if short-term profitability can be demonstrated (McGregor et.al., 1998). Previous models have looked at 'perceived usefulness' and 'perceived ease of use' of a specific IS investment (Venkatesh and Davis, 2000; Grandon and Pearson, 2004). 'Perceived benefits' has been used more recently in

surveys (Harindranath et.al., 2007) and in this context this research attempts to broaden this concept to 'perceived value' to give a broader perspective and attempt to capture more than just the one aspect from the company.

2.6 Constructing a New Model from the Literature

The previous sections in this chapter have outlined the theory surrounding both this study and the adoption issues prevalent in the literature. It has demonstrated that there is a case for further work in this area and that the case for a model for SMEs and in particular micro-companies is well grounded in both theory and practise. The issues from previous adoption models and from the literature will now be refined and amalgamated into a model which will be explored through a survey of ICT Cluster companies in the WM and may be transferable to other sectors. There is also the potential subsequently to conduct further work to examine the applicability and the potential differences between companies whose core business is ICT and those for whom it is not.

The models discussed in section 2.4 were all developed through work with SMEs. They have been rigorously tested and provide a firm basis for this study. Levy and Powell's (2005) model uses as its base the model developed by Storey (1994), their model was tested in the West Midlands. Levy and Powell (2005) based their work on Storey's who's own work (1994) was across the UK the quantity of data collected (10,000 SMEs) over a period of time allowed for factors to be validated. Both of these models concentrate on growth within SMEs and not on adoption, however, the issues within the models are significant as many companies experiencing growth adopt at a fast rate and as such these factors will be incorporated. Many of the issues that Storey uncovered in his work impact on this; for example the education of the owner-manager was found to be the most significant of 15 related factors. More evidence is provided through Mehrtens et al. model (2001) where research was conducted in seven small firms and provided confirmation for factors which were further developed through case studies with the companies. Whilst Grandson and Pearson (2004) and Van Akkeren et. al. (1999b)

through a thorough analysis of the literature on ICT adoption models show the academic grounding for supporting the approach taken and factors used which are common throughout literature in the area.

Grounding a new model in this way not only makes the model robust but makes the task of model building relatively straightforward. Particularly, as the models are well respected in the IS community as academically rigorous. Each of the models chosen to be employed reflects the myriad of issues apparent in research in this area and have been chosen for their relevance in this situation to SMEs and therefore transferable to micro-companies. The issues from these models have also been explored through the broader literature in the areas of SMEs, micro-companies, adoption, strategy and evaluation. No adoption model has previously been offered for micro-companies and thus the model developed is also appropriate for SMEs but the survey will be conducted mainly with micro-companies reflecting the profile of the ICT sector in the West Midlands. The categories from the combined adoption models are incorporated into the new model with a selection of the elements which have been grounded in the academic literature. The rationale for the choice of elements is:

1. The element appears in the literature as of concern to both micro-companies and SMEs.
2. The element appears in adoption and/or growth models as of concern to micro-companies or SMEs.
3. The element is proven by previous research to be of significance in the adoption situation
4. The element is proven by previous research to be of significance to micro-companies/SMEs.

The model will be explored through a survey and that survey needs to be manageable for the micro-company and reflect the simplified formation and decision making pathways in their structure. The model was also influenced by the author's knowledge and experience of working for and with SMEs over some 14 years in the area of ICT adoption.

Many adoption models overlap and/or compliment each other (Van Akkeren and Cavaye, 1999b) and most involve at least some factors that are directly comparable. This research will further explore these factors by examining recent technology purchases by SMEs exploring the last significant purchase the company made, the significance being defined by the owner-manager. Lefebvre and Lefebvre (1996) conducted extensive research, which examined the impact of ICT adoption in small companies. This gave some insight as to successful adoption and the environment required to facilitate this. From their work two further elements are considered as important here. Firstly who makes the decision to adopt ICT and their attitude towards technology can affect the success of adoption (Lefebvre and Lefebvre, 1996) that element does not appear in the models used and is incorporated into this new model, this has been interpreted as who made the decision and is part of Strategy category. This choice is based on the assumption that if the decision is made by a significant member of staff for the right reasons this can indicate the maturity of the firm as far as ICT strategy is concerned. Secondly government has created initiatives to aid adoption of ICT, this intervention is challenged as support afforded by ICT Cluster projects and available business support may not be addressing these issues. These projects form part of the social capital available to micro-companies but will in particular highlight if local access to government intervention is being taken up.

2.6.1 Category Selection

In the work of Van Akkeren and Cavaye (1999b) factors were categorised from the literature into owner manager characteristics and firm characteristics, whilst they also

added in return on investment which it was claimed was usually missing from models. This study supports and develops that work by adding in a number of adoption models developed since that date. This study has also looked at ICT adoption strategy and value in micro-companies in order to determine how companies might define the value of ICT and thus considers return on investment in terms of perceived value since it has been verified that the perception of that value, which is frequently unmeasured, is often a determinant in the decision to adopt. The perceived value to the owner manager in a micro-company can be directly interpreted as perceived benefits defined in other studies, where 'value' and benefits might be used interchangeably. Value, however, when interpreted by micro-companies can mean significantly more than benefits. The term return on investment (ROI) to owner managers often does not mean any econometric measure but the return in perceived benefits for effort invested which can include money, personnel, time, etc.

Although this split of owner-manager characteristics and firm characteristics is divided in the work of many researchers it is often not as easy to define lines between these areas. For example the small company sophistication may be due to the owner-manager or the level of technology within the firm already. There could also be an assumption that the organisational readiness could be as much linked to strategy or lack of strategy in the company as to the owner-manager's attitude to adoption. The balance of ensuring a thorough study whilst capturing all of the pertinent elements has been completed in a number of ways:

1. Evidence from existing models both in practice and in academic literature.
2. Evidence from SME literature surrounding the subject.
3. Evidence from initial exploratory interviews and pilot study discussed below.
4. Knowledge and experience of the author.

2.6.1.1 Personal Factors

The owner-manager characteristics can include perceived benefits, computer literacy, assertiveness, perceived control and subjective norm (Grandon and Pearson, 2004; Levy and Powell, 2005; Van Akkeren and Cavaye, 1999a; Thong and Yap, 1995; Iacovou et.al., 1995; Rashid and Al-Qirim, 2001; Mehrtens et. al., 2001; Storey, 1994). These are seen in perceived value and personal factors within the model developed here. Computer literacy will be noted via the survey through the presence of skilled ICT professional within the company and the owner-manager themselves as a technology champion within an ICT company. It is also considered within the implementation issues explored since skills levels may account for adoption problems experienced post-adoption. Assertiveness, perceived control and subjective norm are not explored in any detail for this study as the subject area is very broad. These aspects would require some considerable understanding of the sociological and psychological aspects of the owner-manager environment; therefore this is left for further research to examine.

The knowledge, skills, experiences and perceptions of the owner-manager are paramount in any purchasing decisions within a small company. Not least as they are often responsible for the purchasing of everything from the coffee to the latest CRM package (Costello et.al., 2007). This study then needed to include elements of the personal factors relating to the owner-manager. It was therefore decided to include the two elements that could be most quickly measured and which have been proven to have a major impact on the adoption process and indeed of the success of a business per se. These are educational experience and knowledge of IT.

Educational experience: The educational experience of the owner-manager has been shown in numerous surveys and longitudinal research studies to be paramount in the growth of companies. Storey (1994) identified from eighteen studies, fifteen characteristics of the entrepreneur, of these seven of the studies had identified education

as an important factor in growth of small companies, thus identifying education as the single biggest influence. There was a dichotomy as to whether the greater knowledge facilitated the development of greater knowledge or simply more confidence in dealing with customers and suppliers. Since growing companies often need to adopt technology at a faster rate both to cope with a growing infrastructure and a growing market (Levy and Powell, 2005); the educational attainment of the owner-manager is seen as being imperative in this study in order that relationships between this element and other issues such as turnover can be examined.

Knowledge of IT: Having already discussed the need for specialist skills within the SME it is then important to establish the ICT knowledge of the owner-manager. Mehrtens et. al. (2001) stated that if the CEO is innovative and knowledgeable about IT then adoption was more likely to be successful this was previously discovered by Van Akkeren and Cavaye (1999b). As often the perceived benefits to the company are perceived by the most influential individual in the company, the owner-manager, then it is paramount that they have enough knowledge of ICT to either, make the decision themselves or recognize their lack of knowledge and seek appropriate advice.

2.6.1.2 Organisational Readiness

There are a number of interpretations of organisational readiness in the literature for example Mehrtens et.al. (2001) refers to the level of technological sophistication the company has already reached. Specifically the level of technology and systems already incorporated into the business and business processes. If companies have very little technology or if that technology is out dated then it is expected that they will not adopt new technologies readily. However, the readiness of an organisation to adopt technology can often refer to wider issues than the fact that they have not done so in the past as there is a need to consider *why* they have not done so for example are they simply immature users (Costello, 1999b), is it lack of training or the resource to train (Zinatelli,

1997) is it managerial limitations as in lack of expertise in the planning of adoption (Nathalie et.al., 1998). The new model would need to incorporate a number of elements identified as imperative in an adoption situation. These elements include advice sought, internal pressure to adopt, specialist skills in the company and implementation issues reflecting these concerns.

Advice sought: If companies had to seek advice outside of their own organisation then it will be assumed for the purpose of this research that advice or the necessary knowledge to make the decision was not available in house. Exploring this issue is necessary as it has been identified by numerous researchers as being an important issue within the adoption situation. Particularly as micro-companies are so dependant on the social capital that they have access to (Cooke, 2007). In fact, often very small companies will ask a range of individuals for advice and the majority of this advice will be informal (Culkin and Smith, 2000). The advice given to the owner-manager may identify the breadth of social capital available to small companies. Exploring this element may also give valuable insight into the technological sophistication of the company; as may the decision makers choice of advisor. For example seeking advice from a PC shop would not be a good strategic move as that advisor would not know of the company's business strategy or have the expertise to apply the advice specifically to that business.

Internal pressure: The literature has also identified that internal pressures may be an influence on the success or not of an adoption and in fact if that adoption takes place at all. As Thompson and Costellos' (2004) research showed that the more knowledgeable the employees were about the use of ICT the more pressure they felt to improve systems within the company. If employees are knowledgeable about ICT then they are likely to be aware of the availability of, and the need for systems that can increase capacity, capability or aid a marketing strategy. In fact any internal pressure may indicate a higher level of knowledge of the employees. There are also influences that may or may not be

positive such as the cultural, political and personal biases (Bannister and Remenyi, 2001). An exploration of the internal pressures could identify the level of knowledge and sophistication of the resource available to the micro-company and therefore a very important element within an adoption model.

Specialist skills in the company: The fact that not having the right technological skills in a company can severely impact an adoption is well documented. There are however, technology skills and knowledge needed to make the decision to adopt in the first place. If the skills to align technology with the business are not available then the decision to adopt will be flawed in a number of ways. For example it could be that the technology is based on the knowledge of the decision maker with no technical knowledge, it could be based on the business model and made by someone with no knowledge of technology or it could just be flawed by the limited knowledge of those tasked with making the decision. In any of these scenarios the decision is made in less than ideal circumstances and subsequently the problems are often compounded during implementation.

There are a number of angles in this element that will impact in an adoption situation. Specialist skills within a micro-company can refer to either the owner-manager or the employees. This element would be an important element to explore as the discussion in section 2.5.2.3 demonstrated. The literature postulates on this as a multi faceted influence:

- Martin and Halstead (1994) educational experiences of an owner-manager impacts on his attitude to training for employees
- SMEs lacking in resource (Levy and Powell, 2005).
- Even when they have sufficient resource that resource is often lacking in the specialist skills needed to either implement or evaluate technology (Cragg and King, 1993; Reynolds et.al., 1994).

- eSkills and Gartner Consulting report on the UK lack of skills in all areas of ICT situation (2004).
- There is no point in spending money on ICT without spending money on staff training (Remenyi et.al., 1991).
- Knowledge about new technologies often comes from their network of friends, family (Reece and Thompson, 2004)
- Lack of skills and training leads to poor specifications (Reece and Costello.2005).
- Very little learning takes place during the investment process and mistakes are often repeated (Remenyi and Lubbe, 1999).

Implementation issues: It has been established that micro-companies predominately concentrate on the implementation and the cost of the technology (Costello et.al., 2006). This can be assumed through the fact that very few micro-companies focus on strategy (Levy and Powell, 2005). As technology trends escalate and data volumes increase this issue will be exacerbated (Rashbrooke, 2004; Fordham, 2001). As most small companies do not invest in training and employees learn through experimentation implementation problems are likely to be at the centre of adoption issues within micro-companies (Hassall, 1999; Caldeira and Ward, 2002). Bringing in outside help may also exacerbate the situation as they do not understand the business.

Therefore many of the implementation problems are linked to skills as not having the right skills can impact on the problems surrounding the post-adoption period. Having staff that are unable to spend time getting to know the new technology, or adapting the technology to suit already entrenched business processes can both lead to problems. Often implementation issues go beyond the skills available to a micro-company and will leach into technical areas of data migration, incompatibility, etc. Most new adoptions have these problems to a degree but the company's ability to deal with them or even to be prepared

for the risk they may present may indicate their readiness for adoption and their technological sophistication.

2.6.1.3 The Firm

Firm Characteristics can include, organisational readiness, external pressure to adopt, customer/supplier dependency, structural sophistication of the firm, sector and status (Grandon and Pearson, 2004; Levy and Powell, 2005; Van Akkeren and Cavaye, 1999; Thong and Yap, 1995; Rashid and Al-Qirim, 2001; Mehrtens et. al., 2001; Storey, 1994). The sector in this study is not considered as the survey is completed in one sector; although there are indications from Sheppard and Hooton (2007) that the ICT sector is important and that some sectors embrace ICT more readily than others. The ICT sector could be assumed as a sector to be in the enviable position of adopting technology at speed and with less issues than other sectors, however, this study looks at whether the ICT sector is embracing technology to use within the business in a sophisticated way or if they do not 'practice what they preach'. The structural sophistication of the firm is not measured instead the evidence from the literature review shows that companies become more structurally complex as they grow and that the larger the organisation the more likely they are to consider strategy this element is therefore captured via strategy.

External pressures are examined and the pressure of customer and/or supplier noted within this element. Organisational readiness uses other elements and does not just examine the technology already in place within an organisation; although this is also part of the overall picture of what technologies are being adopted and why. For this model other more subtle factors from both models and the literature are examined as the organisation as a whole needs to be ready and able to adopt. All of these factors then which represent the firm characteristics are encapsulated into Strategy, organisational readiness, the firm and external pressures.

Factors relating to the firm itself have been shown to impact on adoption as SMEs who are growing rapidly or those who are very new have been shown to adopt technology more readily and with greater speed. When this work began it was intended to be cross-sector and therefore sector was included as data to be collected. However, since the remaining survey was eventually aimed at the ICT sector this question became irrelevant. It is considered that this element would however, need investigating in a cross sector analysis as companies in some sectors would need to adopt more frequently due to new legislation, etc. A small survey was conducted during the pilot study which was cross sector and although the sample size is not large enough to show any positive correlations some interesting phenomenon were observed from these and are discussed in section 3.5.2.

Age: There are a number of reasons for incorporating this element; including the fact that it has been shown that many SMEs experience rapid growth upon start up and in order to cope with this growth they adopt technology at a faster pace than at any other time during their lifecycle (Storey, 1994; Levy and Powell, 2005). It would be anticipated that those who have been established for a number of years would adopt technology in a different pattern to those at start up, i.e. technology infrastructure would be less established and would perhaps have more problems regarding implementation. Many researchers use age of company as a control and within this study it will provide a 'constant' that can be used in some statistical analysis. In Storey's (1994) analysis of fourteen previous studies it was found that there was a negative relationship between growth and age of the firm since many firms grow quickly initially and then slow down. This is an anticipated result with adoption too particularly as it seems that fast growing young companies adopt more quickly than older, more slow growing companies (Locke, 2004).

Size: Both size of company and age can be a major indicator of success, both elements present can be a compelling argument. Since small companies are born and die with increasing frequency having been established for a number of years with a number of

employees can be an indicator of future success too. However, it must be considered that many companies are sole traders and intend to stay that way choosing to run the business for 'life-style' purposes. Although they also have adoption needs. Recent research¹³ has shown that in the period 2001 – 2005 UK firms with no employees grew from 2.6 million to approximately 3.2 million whilst those that sit in the medium size definition actually fell in number from 19,355 to 18,910.

Locke (2004) stated that in their research there were no significant differences in ICT investment relating to firm size in terms of turnover and number of employees. However, a number of researchers have called for further work that includes size and age of firm (Kai-Uwe Brock, 2000; Lauder and Westhall, 1997; Iacovou et. al, 1995; Blackburn and Athayde, 2000). The survey for this work will concentrate on micro-companies predominately but it is anticipated that some larger companies may take part and thus give some comparisons in some areas.

2.6.1.4 Strategy

For the purposes of this research strategy has been interpreted as the elements that are most likely to influence the owner-manager in their decision-making when considering adoption of new technology, this reflects the work of Levy et.al. (2001a) in the area of strategic intent. Although other elements including technological sophistication may be important in this, the information regarding the technological sophistication will be gathered via the infrastructure and has been indicated within organisational readiness above. However, rolling programs of technology updates and frequent use of the latest technologies to improve the business would be considered to be strategic decisions. Although companies should be considering their customers in their decisions if they are not planning these changes and just acting in a reactive manner to customer demand then that would be considered a lack of strategy. Companies should be frequently

¹³ SBS Data 2006 available at <http://www.dti.gov.uk/bbf/small-business/research-and-statistics/statistics/page38563.html>

reviewing new product introductions, their market positioning and market niche; especially companies within fast moving markets like IT. The maturity of a company and the strategic stance it adopts can often be indicated by their decision to devolve decision making to management rather than all decisions being made by the owner manager. This category is designed to explore the strategic decision making in this area.

The level of decision making undertaken: It has been shown through the literature that the simplified structure in micro-companies does not necessarily lead to less complexity in decision making as personal beliefs and knowledge can have a major impact. that decision making can be very complex within small companies. Having shown that small companies adopt different management styles as they grow (Levy and Powell, 2005) who makes the decision to adopt can be an indication of their strategic maturity. Firstly it may show that a company is starting to grow and adopt a more formal management style with some delegation of decision making or lack of delegation will demonstrate the autocratic style that much of the research to date has uncovered in micro-companies (Bianchi, 2002). However, as Matlay (1999) established that management capacity is limited in micro-company it is anticipated that many of the companies surveyed will have an owner-manager who makes the decision themselves. Remenyi et.al. (1991) had already established that decisions regarding ICT are not fundamentally different to other decisions and thus are prone to the same lack of understanding as other areas.

Reason for purchase:

This element is included within strategy to help define the objectives that a company may have within an adoption situation., Throughout the literature the reasons that micro-companies invest in ICT have been many and varied and can range from a deliberate strategic investment to a decision to adopt brought about by peer pressure (Storey, 1994,

Levy et. al., 1998, Costello and Sloane, 2003). Even the hype itself surrounding the technology can drive small companies to adopt (Poon et.al., 1996).

The reason for the purchase will be explored with each company as this may help illuminate the thinking within the company. From the literature it could be anticipated that the reasons already outlined may be at play or much simpler approaches including the drive to grow the business, customer pressure to have a particular type of technology or at a more strategic level alignment of infrastructure to the business model. Any of these reasons would demonstrate a very different approach to the investment in ICT from a very reactive approach to the more proactive approach to business development. Many SMEs are not aware of strategy, and do not implement strategy using a formal method. Including the reason for the purchase in the model as an element in the model will provide evidence of strategic intent as described by Levy et.al., (1998)

Significance of purchase:

The significance of the purchase has been defined for exploration from the literature regarding strategy. This area provides insights into the attitudes towards the purchase that the company or the owner-manager may have towards technology. The 'significance' for a particular company may vary from being a financially significant purchase which may indicate that they have an eye on short term, cost reducing, profit driven strategies, or merely that they regard ICT as a yet another infrastructure cost. A company may decide that an adoption is of technological significance thus suggesting that technological competence could be an issue. Rashid and Al-Qirim (2001) identified technological factors in their model and these were supported by NB2B (2006). Exploring this issue will provide insights in a number of areas. The literature explored identified that there are a myriad assumptions by small companies when adopting technology. Exploring the significance of the purchase as defined by the owner-manager within a micro-company will give useful insights to the adoption situation and the strategy that they have adopted (Levy & Powell, 2005; Merhten et.al., 1999; Van Akkeren and Cavaye, 1999a). Levy

et.al. (2005b) identified drivers and inhibitors of internet adoption could relate to issues as diverse as an inexperienced owner, complexity requiring new skills to security concerns. This element will highlight the emphasis that the owner-manager and/or decision maker places on their investments. Significance could also indicate the the perception of that purchase to the company as a major impact on business processes could be a positive outcome as that company may be growing strategically and recognising that changes to business processes are necessary to gain maximum benefit (Husein et.al., 1996).

The significance of the purchase differs from the reason of the purchase in that the reason of the purchase may be shown to be due to pressure from external as well as internal sources. However, the significance of the purchase may indicate attitudes, bias and culture towards the adoption.

2.6.1.5. External Pressures

It has been shown by many previous researchers that SMEs are under increasing pressure from customers and suppliers to incorporate technology into the way they run their business (Grandon and Pearson, 2004; Merhten et. al., 2001; Van Akkeren and Cavaye, 1999; Nathalie et.al., 1998). It is therefore imperative to include external pressures within any new model. SMEs are often dependent upon their customers, and many of their customers are adopting new technology at a rate that makes it very difficult for SMEs to keep pace. It is often difficult for the SME to be able to see that external issues may be exerting pressure on them to adopt. Particularly as they may have adapted a strategy of responding to their customers needs in this particular way, they may not necessarily view this as a strategic method or indeed recognise that this is a driver. This is of particular significance to companies in the supply chain of larger organisations as they may themselves have suppliers who are under pressure to respond by adopting technology. This category has 2 elements in it as identification of external pressures in the decision making process is seen as important for micro-companies, there is a need to explore if there are external pressures which align with those already identified and if

those pressures are recognised. Whereas influences on the purchase takes that element a step further by examining the influences in the larger sphere of influence including any social capital they have access too.

Identification of external pressures in the decision making process: It was established in section 2.5.2.1 that external pressures on the decision can be varied and previous researchers have identified the main external pressures as being customers, competitors, trade associations, hardware and software vendors, consultants and governments (Lefebvre and Lefebvre, 1996; Barber et. al., 2000; Rashid and Al-Qirim, 2001). Supply Chain pressures can also be added to the list of pressures (Husein et.al., 1996; Jackson and Sloane, 2007)

The external pressure experienced by a micro-company when attempting to purchase technology can often be the sales advice from vendors that does not align with their business model, this can then impact on the implementation process too and cause further concerns. External pressure was considered of significance in many of the models cited in this chapter (section 2.4). This pressure may not be direct and indeed it may have taken place at any point in the decision-making process. This element would be expected not just to identify what the external pressures are but whether or not the micro-company owner-manager recognises that external influence as a pressure in their investment decisions.

Influences on the purchase: This element may provide other significant insights into the social and economic circles that SMEs move in and are influenced by including the social capital that they have access too (ref. section 2.5.1.2). It has been identified that these circles include; friends, family, suppliers, customers, salesmen, advisors, etc. Although many SMEs would consider these influences to be friendly advice, within this research it would still be considered as an influence within the decision making process. Other

influences that may affect a micro-company are those related to the work of Rogers (2003 5th ed.) where owner managers may act in a manner which is indicative of the subjective norm. Often the influence on the purchase may be an indicator of organisational readiness; for example if the influence on the purchase is a customer then the company may not necessarily have the skills to deal with the adoption and may not be approaching new adoptions with anything other than a reactive approach to customer demand. Indeed, Husein et. al. (1996) indicated that some smaller companies may have been deselected as suppliers for this reason. Frequently changing markets can also be an influence on the purchase and companies in fast moving technology areas or those with recurrently changing legislation would need to keep pace with this (Smallbone et. al, in Storey 1994)

2.6.1.6 Perceived Value

Advantage over traditional methods: This element has been identified in adoption research since Rogers (1965 in Rogers 2003) work included the issue as the identification of perceived benefits over the method a new innovation was replacing. This has been further explored in section 2.5.3 and supported by numerous researchers including Bradford and Florin 2003, Tornatzky and Klein 1982, and Mehrtens et. al. 2001. It is often cited as the perceived benefit of a new technology adoption by SMEs and stated in numerous adoption surveys. SMEs adopt technology because they perceive the advantage it represents over and above traditional methods previously employed by the company. These advantages are often seen as increased capacity, higher productivity, shorter lead times, etc. The reality is often not as simple as this. The evidence demonstrates that adoption of new technology can lead to improvements but there is not always a direct correlation straight forward as would be identified by those involved in adoption initiatives. This element is included in the category perceived value building on the work of all of the above research.

Measures of success / Evaluation: A wealth of research has been investigated in pursuit of this element (section 2.5.3.2) as it was seen as imperative that a measure of success was explored in order to establish the return on investment cited by Van Akkeren and Cavaye (1999b) that is missing from most adoption models proposed to date. It has been identified that the effect of ICT on competitive strategy and industry structure explains why there is a lack of relationship between ICT investment and traditional measures of investment (Brynjolfsson and Hitt, 1996; Rai et al, 1997). However, Sheppard and Hooton (2007) identified a direct correlation between investment and productivity. ICT projects still fail to realise benefits and this could be through lack of measurement of either tangible or intangible benefits (Ward and Daniel, 2006; Frisk, 2007; Lillrank et.al., 2001). For example, a company seen to be measuring the success of an implementation either post or pre-adoption would be seen to have sufficient management experience to understand the need for careful evaluation of the options available pre-adoption and/or an understanding of the need to review post-adoption in order to inform future adoption. This is therefore considered as a prime element of perceived value as it may provide the antithesis of *perceived* value if an SME is measuring the success then the decision is not purely about perception but is a measured decision which would make this part of the firms strategy.

Perception of success: The perception of success is explored in this model as a much more ethereal method of measurement than that discussed in the previous element (see section 2.5.3.3). The perception of success of an adoption to others both within and external to the company can have a marked impact on the success of the adoption. If it is perceived as having value within the company then staff are more likely to be happy to work with the new technology and adoption is more likely to be perceived as a success. Likewise if the adoption is perceived by customers as being a success then the SME is more likely to value the new technology and it will be seen as adding value. Changing perceptions and making future adoptions more likely. Much of this can still depend on the owner-manager and their view of the success particularly in micro sized companies.

Numerous researchers have identified perceived benefits as a major influencer in the adoption process (Seddon, 1997; Duhan et.al., 2001) There have been many calls to open this debate further by identifying ‘perceived value’ as a much broader concept (Berghout et.al., 2005; Bannister and Remenyi, 2001; Poon et.al., 1996; Premkumar and Roberts, 1999; Cragg and King, 1993; MacGregor et.al., 1998). Within this area Poon et. al. (1996) also identified hype surrounding a technology as an influencer on the identification of perceived value. The perceived value to the owner-manager and the company are seen as particular significance in this study and in this context success can be evaluated both pre and post-adoption. In this model it was considered vital to explore this element as the lack of measurement within SMEs often relates to their lack of strategy also. This means that often no planning is done prior to adoption and no evaluation is done post-adoption which may mean that micro-companies are operating in handcuffs and blindfolded. Not having the advantage of planning associated with the business plans and related to changing markets and not having the historical data to learn from mistakes.

2.7 Conclusion

The categories used in this model were drawn from the literature reviewed and three pilot interviews which took place right at the start of the research to gain an understanding of the factors important to small companies when adopting ICT. This evidence was translated into the following model (Table 2.5) which will form the basis of the survey to explore this models’ applicability to technologies other than EDI , eCommerce and Internet.

Category	Models the issue appears in	Elements
Personal Factors	Rashid and Al-Qirim (2001) Levy and Powell (2005) Storey (1994) Grandon and Pearson (2004) Van Akkeren and Cavaye (1999b) National B2B (2005)	Educational experience, knowledge of IT

Organisational readiness	Rashid and Al-Qirim (2001) Mehrtens et. al (2001) Grandon and Pearson (2004) Van Akkeren and Cavaye (1999b) National B2B (2005)	Advice sought, Internal pressures, Specialist skills in company, implementation issues (often linked to skills).
The Firm	Levy and Powell (2005) Storey (1994) Van Akkeren and Cavaye (1999b)	Age, size, sector.
Strategy	Levy and Powell (2005) Storey (1994) Van Akkeren and Cavaye (1999b) National B2B (2005)	The level of decision making undertaken, reason for purchase, significance of purchase.
External Pressures	Rashid and Al-Qirim (2001) Mehrtens et. al (2001) Grandon and Pearson (2004) Van Akkeren and Cavaye (1999b) National B2B (2005)	Identification of external pressures in the decision making process, influences on the purchase.
Perceived Value	Rashid and Al-Qirim (2001) Mehrtens et. al (2001) Grandon and Pearson (2004) Van Akkeren and Cavaye (1999b)	Advantage over traditional methods, Measures of success, evaluation, perception of success.

Table 2.5: Individual elements in the new model development.

The main problem identified from the literature is defining the factors that impact on successful adoption of IT as they so varied and are frequently intangible. The factors included should therefore provide a wealth and breadth of data to add to the field. Many researchers have worked in the area of EDI adoption and Internet/ebusiness adoption and many have found that these models are transferable within the realm of these communication technologies. There are, however, difficulties with transferring the models from large companies to SMEs and micro-companies as decision-making structures are incomparable. Neither have these models been tested and applied to successful adoption of *all* ICT infrastructures rather than just a specific technology. There are numerous calls throughout the literature reviewed for more research on SMEs per se and specifically around ICT adoption (Martin & Matlay, 2001). Martin (2004) extolled that the adoption of technology remains patchy in spite of recent progress this was compared to the firms discussed by Storey (1994) who believed that many small companies are buffeted by

shocks that they do not have the managerial experience to deal with. This research should highlight further issues in this very specific area.

This chapter has explored the areas defined by ICT adoption models in SMEs and micro-companies to provide some of the context within which the work with micro-companies is based. This review began with an analysis of the SME environment within which adoption takes place and in particular the peculiarities of micro-companies with their dependence upon the owner-manager personal and social capital and their lack of resource and skilled personnel. This was followed by a review of current approaches by government to ICT adoption which is woefully inadequate and misguided (Martin and Matlay 2001). Then an analysis of some of the most well known adoption models from the SME research to date was conducted and a tentative model constructed from this. The plethora of issues identified within this were then further researched to gain perspective and in depth knowledge of the areas of concern. A final model was constructed from the literature which will be explored through the survey.

The justification for constructing a model is in the usefulness of the model in testing previous models for transferability to all technologies and in exploring the established research surrounding the factors to ensure completeness of the final model proposition. The resulting model will aid companies by demonstrating factors that may need to be present to help with adoption of technologies. This rest of this work will aim not to provide a complete solution to companies but will help by working towards a model that may indicate factors that need to be improved to increase the likely success of a particular adoption. By highlighting the key elements involved in adoption the model will indicate to companies where they may need to align skills and strategy to enable successful adoption. This will be also be important in future funding of technology adoption initiatives by government as simply helping companies to adopt a new technology without

embedding the ethos and skills to adopt in the future will lead to a requirement for more help and funding each time a new technology is adopted.

This chapter has shown how the model to be explored was constructed through building on the work of previous researchers. The adoption model was developed by using other adoption models discovered through an extensive literature review these were augmented by factors found in the wider research area, which were then further augmented by pilot studies and the knowledge and work of the author.

The model described in this chapter will be explored through a survey conducted amongst ICT companies in the West Midlands. Having established the need for research and the building of a model to explore the next chapter will describe the research methods and strategies employed in this research and describe the research process.

Chapter 3 Research Methodology

3.1 Introduction

“Research is the creation of new knowledge, using appropriate process, to the satisfaction of the users of the research”. Oates, 2006

This indicates that appropriate process and new knowledge alone may not be a sufficient aim and that the users of the research whether practitioners or other researchers are part of the equation too. Having established in chapters' one and two the need for the research it would be appropriate here to establish the methods chosen as being applicable to the type of research undertaken and the outcome to be achieved. Hence, a discussion of the some of the approaches available together with an explanation for the chosen methods is presented in this chapter.

The chapter begins with restatement of the research questions adopted in chapter one, this is followed by discussion of research approaches and methods considered acceptable in the field of Information Systems (IS) and those selected for this research. There is a description of the underlying paradigm and method used in the study; the approach and the strategy employed, the process and the research framework that was originally established and a discussion of the purpose of the research. A detailed description of the research instruments used in the study is augmented by a discussion of how and why the data was collected in the manner it was and how it was encoded and validated. The chapter concludes with a discussion of the impact of having a third party collect the data and how the role of the researcher as an agent of AWM impacted on the research. Finally the plans made for the analysis of the data are discussed.

3.2 Research Questions

There appears from the literature review to be much evidence to support the premise that the adoption of ICT by an organisation can help reduce cost and increase productivity throughout its supply chain. Many benefits which are both tangible and intangible have been observed and described by previous researchers (King-Turner and Bonnett, 2005; Rashid and Al-Qirim, 2001; Levy and Powell, 2005; Mehrtens et. al., 2001; Van Akkeren and Cavaye, 1999b). However, in very small companies the perception of new technology can vary immensely. Many micros merely view technology as a replacement for current processes, and very few see it as an integral part of current working practices. Can this very perception influence the adoption process? Having thoroughly analysed the literature and taken into account the overarching questions which originally drove the research and outlined in chapter one, the research questions have been refined to the following:

1. Is it possible to develop an overarching model of ICT adoption which can be applied whatever the technology?
2. Can a model be proposed which will help to guide a micro-company in the adoption process?
3. Is it possible to change the process of adoption to help micro-companies realise greater benefits from the adoption?
4. Why do micro-companies appear to invest in an ad hoc manner for their IT infrastructure?
5. Can changes to government intervention help ICT companies with technology adoption?

These questions will be returned to in the conclusion to examine if it has been possible to determine or indicate a possible solution to the conundrum.

3.3 Research Methods

This section is concerned with the Information systems paradigms, strategies and methods used for this research and why they were selected. Cornford and Smithson (2006) state that IS approaches to research need to be well understood as they are not drawn from models in either business management or computer science. IS as an academic subject is a relatively new area of approximately thirty years. IS is often used to refer to information, data handling activities and people within organisations but this needs to be tempered by the need to address the technology issues also. There a number of views about the way technology is addressed within IS studies, within this research the computer is viewed as an instrument for progress this is referred to as *technism* (Mowshowitz, 1981 in Cornford and Smithson, 2006).

Much of the IS research field advocates the use of multiple methods resulting in 'convergent methodology' or 'triangulation'. When a multi-faceted approach is taken it increases the validity of the results through a process of cross-validation. This can give an explanation of differences as well as similarities (Gable, 1994; Remenyi and Williams, 1996). This research has been carried out by a process of triangulation: Method triangulation as data was collected via survey, case studies and collaboration with some of the actors and strategy triangulation through exploratory research and survey.

3.3.1 Research Paradigms

A paradigm is:

“a set of shared assumptions or ways of thinking about some aspect of this world”

(Oates, 2006)

There are three major philosophical paradigms associated with IS research and of these the most widely used is the positivist approach. Different paradigms will result in different views of the world and as these paradigms are often shared with a particular research field; the paradigm therefore reflects different strategies being chosen for a research area.

The positivist approach is often referred to as the scientific method since this reflects the underlying assumptions within it. It is the oldest approach and the one that has its grounding within the physical sciences world, this approach has taken centuries to develop.

The second paradigm, and one that is growing in acceptance in the field of IS, is that of interpretivism. This approach allows researchers to be concerned with the social context of systems and how the system is influenced and can influence the setting (Galliers, 1991; Klein and Myers, 1999; Oates, 2006). Interpretivist research recognises multiple subjective realities and can therefore make the quality of research more difficult to ascertain.

The third paradigm is that of critical research which is less well accepted than interpretivism. This philosophy accepts social reality, as interpretivism does, but claims that social reality has objective properties that can dominate the way we perceive the world (Orlikowski and Baroudi, 1991; Myers, 1997; Oates, 2006).

Myers (1997) demonstrates that qualitative research is not necessarily interpretative; but it can be positivist, interpretative or critical. Philosophical paradigms are often associated with particular strategies. In table 3.1 the most usual paradigm for the strategy is listed first but, as can be seen from this, it is possible to have a strategy that can still be interpreted via multiple paradigms.

Philosophical Paradigm	Research Strategy
Positivism	Experiments
Positivism Interpretive	Surveys
Interpretive Critical Research	Ethnography
Interpretive Critical Research	Case Studies
Interpretive Positivism Critical Research	Action Research
Positivism Interpretive Critical Research	Design and Creation

Table 3.1: The Relationship between paradigms and strategies (Lincoln and Guba 1985 in Oates 2006)

Interpretivism has connotations that may impact on the quality of the research which is nonetheless valid for taking that approach. Table 3.2 indicates the relationship to positivism and the interpretation of quality within the paradigm. Multiple methods and triangulation in approaches can also help ensure the validity of the results.

Positivism	Interpretivism
Validity	Trustworthiness
Objectivity	Confirmability
Reliability	Dependability
Internal Validity	Credibility
External Validity	Transferability

Table 3.2: Quality in positivist and Interpretivist research (Lincoln and Guba 1985 in Oates 2006)

This research subscribes primarily to the interpretive paradigm, however, it can also be described as having elements of positivism. The research attempts to understand and

interpret the social context within which people work whilst also using both qualitative and quantitative results to extract patterns. Positivists believe that knowledge is obtained by observing all experiencing phenomena objectively in the “real world” (Cornford and Smithson 2006) which this research seeks to do. However, interpretivism is seen to address both the context within which this research is conducted and the researcher’s impact upon the findings.

3.3.2 Research Strategies and Methods

Galliers (1992) states that survey, descriptive, interpretative and action research appear to be the most widely used methods in IS research. Conversely, Cassell and Symon (2004) argue that action Rresearch is a relatively new approach to IS studies. This research uses an approach of an overarching method which is exploratory in nature. This exploratory approach was suggested by the fact that very little research has been attempted in this area. Within this approach formal methods were used: case studies, survey, etc. but all methods employed were introduced in order to explore concepts and previous models which may indicate tentative and suggested results. In this section we explore the chosen methods

There are 3 main reasons for conducting research (Yin, 1993):

1. Descriptive: describes in detail a set of circumstances or a situation.
2. Explanatory: attempts to explain a social phenomenon and tries to solve the problem.
3. Exploratory: Aims to give a new view on a situation and in so doing find out what is happening or inform the asking of new questions.

Although this research is exploratory it focuses on a proposition in order to help frame the research initially and does not formulate a hypothesis as the study explores and develops the issues in order to more fully understand them. However, the fact that there may be a relationship between ICT adoption and business performance is difficult to observe and

often subjective, as such this research is expected to add to the body of knowledge but may neither prove nor disprove particular correlations. This is not unusual when undertaking research that is exploratory in nature.

The purpose is therefore both explanatory and exploratory since very little research has been conducted with micro-companies. The research is exploratory and hence seeks new insights to explain the 'forces' at work in the research field. It is also explanatory since there is a real need to attempt to provide a solution for these companies and those who attempt to help them.

Exploratory research is often conducted when the problem area has not been defined and little work has been done in the field. It can often help determine the best research design, data collection method and selection of subjects. The main aim in this situation is to find out what is happening regarding particular social phenomena (Schutt, 2006). This research has therefore followed an exploratory strategy, with the researcher actively involved in the context of the investigation, which allowed personal development to also form a part of the work. In more objective scientific methods the researcher is intended to be more impartial. Within the overarching exploratory research strategy, more formal methods were selected including case study and survey which were incorporated to aid data collection and validation. In action research the researcher works collaboratively with other actors within the environment (McKay and Marshall, 1999). However, in this case the immersion in the AWM ICT Cluster allowed for sharing of results and influencing of policy (see section 3.5.5.2) with a limited number of actors and respondents.

Within IS research, action research is viewed as being a powerful tool with which to discover the linkages between people, technology, information and social subsystems (Baskerville et. al., 1992). However, there are those who believe that action research is little more than consultancy (Avison, 1993). Within that context, parts of this research

could be viewed more as 'research action' as described by Heller (2004 in Cassell and Symon, 2004) than 'action research' where the action follows the research and the research was undertaken initially out of the interests of the researcher. However, this research only involved the recipients of the data in the action and not the respondents; therefore it would not be considered to be 'true' action research.

Case studies are the most common qualitative method used in IS research (Burns, 2000, Cassell and Symon, 2004; Orlikowski and Baroudi, 1991; Yin, 1993) because the case study approach can help answer the 'who', 'why' and 'how' questions. However this should be augmented by semi-structured interviews as a research instrument that helps discover the 'what'. This research follows a structured interview technique and case studies to follow that pattern and to ensure that the approach is thorough. Mintzberg (1979) extols the use of 'detective work' initially to enable us to search for recurring patterns and themes followed by the 'creative leap' as the theory is abstracted from the data collected and generalisations are attempted which reach beyond that particular organisation.

"A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" Yin (1993, p13)

Galliers and Land's taxonomy (1987) also demonstrates that case studies can be a positive means of research. Therefore a combination of survey and case study may be required. For example collating and defining the environment where appropriate but drawing upon the multiple techniques for case studies of interview, surveys, etc. where necessary. Case studies were used early in this research alongside the literature review to ensure that the subjects covered were appropriate to the research project. This

seemed the most appropriate method for collecting a large quantity of rich textual and anecdotal data in a relatively short time.

Case studies allow for an in-depth study of a group of people (Yin, 1993) and as this research has an organisational focus it is ideally suited to this method. As this research suffers the same constraints as many other research projects of both time and money, the case study approach allowed for a great deal of qualitative data to be collected very early in the process to aid the development of the research instrument. It also meant that the research was informed from both the literature search and a practitioner perspective. As interviews can be used within a case study all the positive and negative aspects of interviews are also involved.

Yin (1993) states that a case study is a preferred method of 'examining contemporary events' as it prevents the relevant behaviours from being manipulated. He also states that it allows for investigation of phenomenon within its 'real life' context especially where the boundaries between phenomenon and context are not clearly visible. Critics of the case study approach feel that it lacks rigour and does not allow for scientific generalisation. Yin (1993) therefore tells us that four tests can be used to establish the quality and validity of the research:

1. Construct Validity – this identifies multiple sources of evidence, selects changes and demonstrates the measurements to be used. This would involve a review of the pilot study and previous reports to enable the researcher to determine they are asking the right questions.
2. Internal Validity – ensures that the methods are addressing the questions.
3. External Validity – establishes the domain in which the results can be generalised to a theory and asks if the case study is representative.
4. Reliability - Establishes if the case could be repeated using the same method and ensures that records are reliable and comprehensive.

The case studies are discussed at length in section 3.5.1.

Surveys are seen as being very strongly positivist as they seek patterns trying to explain phenomenon. Researchers using this method assume that there are patterns that exist. However, surveys cannot confirm cause and effect in the same way as a scientific experiment. However, they do give an opportunity to see if an association exists between variables.

Surveys are useful in obtaining consistent data from large amounts of people consistently; patterns are then searched for in the data (Avison, 1993). Surveys do not always use questionnaires and can use interviews, observation, documents, etc. for example a literature survey. Surveys are intended to obtain the same kind of data from large groups in a systematic and standardised way (Burns, 2000). Survey strategies are most often associated with the positivist paradigm (Oates, 2006). This research has been conducted via a questionnaire as this provided the ability to gather the information in the quantities required in order to see trends and discover patterns that may be embedded within the information. However, the questionnaire was not given to the respondents, but delivered in face-to-face and telephone interviews. This enabled any questions to be answered immediately (a description of the process is included in section 3.6.5). In this instance it has been used within both a positivist and interpretivist paradigm as it is strongly associated within the exploratory research strategy (Oates, 2006).

Questionnaires are the choice of instrument used in this research to elicit both quantitative and qualitative data that would add rigour to the results not possible with less formal methods. Questionnaires are often used by market research organisations to discover such information as the political persuasion of a population. Both closed and

open questions can and will be used and in this way will add to both the qualitative and the quantitative data gathered.

However, what also allows predetermined, standardised, identical questions for every interviewee. Questionnaires delivered via a structured interview approach were used in both the pilot study and the survey. This method means that although there is some interaction between the respondent and the researcher, and it allows the respondent to ask for clarification; there is no real engagement, other than to explore the survey questions. (Oates, 2006) The method allows for both quantitative and qualitative methods of data collection. There is some difficulty in the method depending upon how the interviewee perceives the interviewer or even on the relationship between them. If the researcher can remain impartial this can be partly overcome but is rarely the case. Responses to highly structured questions may be affected by any inferences drawn surrounding this relationship (Easterby et.al., 1991). However, the collection of qualitative data is enhanced by this method as the researcher may adjust questions asked according to responses given. This allows for insights into reactions and feeling that other methods do not.

Surveys are also considered to be weaker than experiments in that they can only confirm an association and therefore cause and effect can rarely be defined (Oates, 2006). Thus surveys can be considered to be within the interpretivist paradigm. This research aims to begin the process of building a model for micro-companies intending to adopt technology; it is therefore exploratory in nature and is not expected to confirm cause-and-effect

Quantitative and Qualitative Research

Mintzberg (1979) suggested using 'hard' information to uncover relationships (quantitative research) and 'soft' information to explain such relationships (qualitative research).

Qualitative research allows for a wide range of explanatory procedures to be undertaken. Qualitative research does not depend on the researcher knowing all the characteristics and categories of a subject ahead of time but allows for concepts to be developed and refined as the research develops (Forker, 1995). Qualitative research allows for the investigation of 'flesh and blood processes' (Mintzberg, 1979). The investigator defines a small area of time in which he/she will work, this allows the researcher to move as closely as possible to the subject of interest and bring in personal experience. As researchers delve closer into organisational processes the more complex the phenomenon become, qualitative methods allow us to capture a little more of this complexity than quantitative methods.

Lee (2001) explains the difference between interpretivist and positivist research as that between qualitative and quantitative research. However it has been shown by Myers (1997) and Oates (2006) that qualitative can be synonymous with positivist, interpretative or critical research paradigms. Remenyi and William (1996) state that information systems researchers should be able to draw on both types. This study has relied on both quantitative and qualitative methods of research to discover facts. Quantitative methods rely on the collection of numbers in order to do statistical analysis and other numerical techniques. Whilst this method has been employed for some of the data gathered there is also a very large amount of qualitative information that has been collected and analysed.

3.4 Research Design

No standard frameworks have been developed for IS research to date in spite of extensive work by eminent researchers in the field (Gorry & Scott Moreton, 1971; Nolan & Wetherbe, 1980; Galliers and Land, 1987). The framework within which this research proceeds is illustrated in figure 3.1. This framework was derived by the researcher and is designed specifically to include the author's area of expertise. It also allows for the

findings to be fed back indirectly to the micro-companies, in a number of ways, predominantly through the AWM ICT Cluster initiative in the WM, but also through the authors teaching and project supervision, with students who will form the workforce for many SMEs in the future. The framework depicts the application of the knowledge acquired through the research.

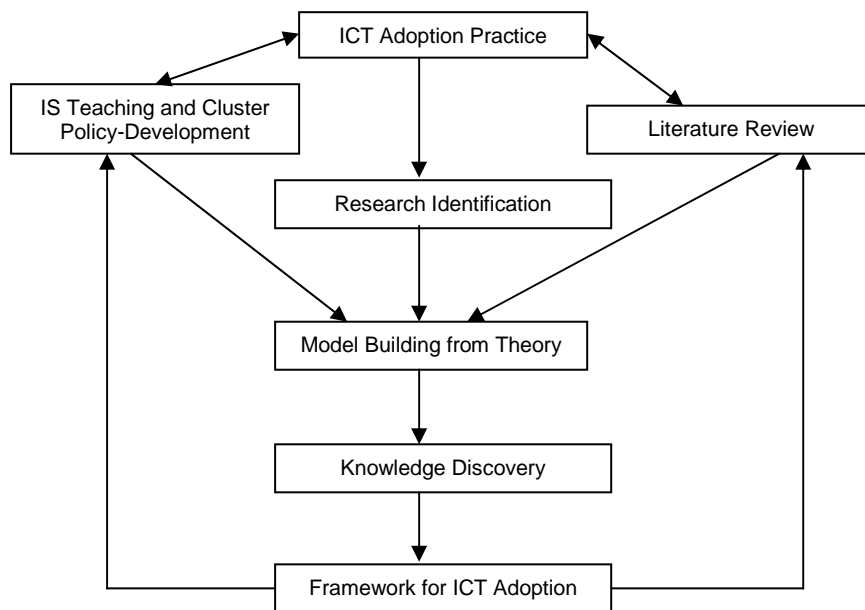


Figure 3.1: Research Framework

However a further framework suggested by Poon et. al. (2002) became applicable during the study and this was also applied. Poon developed a research framework specifically for use in research in the area of eCommerce adoption (figure 3.2). This research has also followed this approach quite closely as he suggests using both qualitative and quantitative methods leading to a greater understanding of the SME situation.

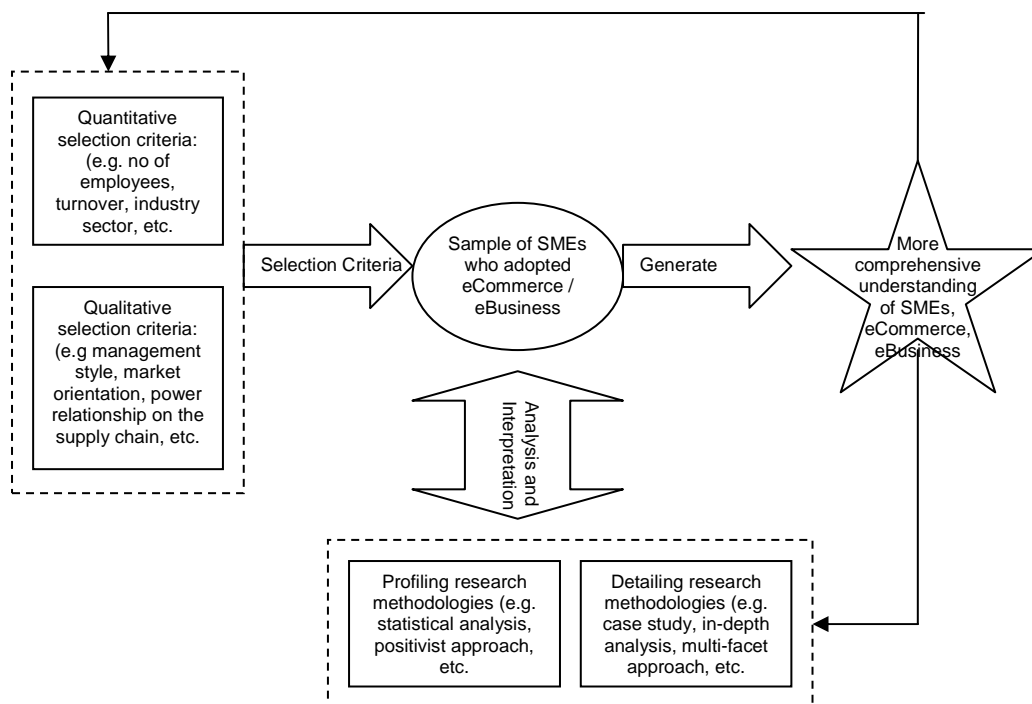


Figure 3.2: Research Framework in Poon et.al. 2002

The process of this research was often determined by the needs of the community for which it is intended and by the researcher's motivation to explain the situation to peers. This process began with an investigation as to "why SMEs invest in the types of ICT they do?" and "what was the effect these investments had on business performance?" This led to literature reviews in three separate areas, ICT adoption, Information Economics and the ICT environment in SMEs in general.

The proposition was not set at the outset but emerged during the course of the research to be: "Can eBusiness, Internet and EDI Adoption models be transferred to the adoption of any information technology?" This approach was adopted as a result of the exploratory research approach whilst educating colleagues about the evidence gathered from the original case studies and the pilot survey. It became apparent that a framework of adoption would significantly guide the interventions that were being proposed by colleagues. In practise, this research only begins the process of exploring a broader adoption model that will subsequently need to be refined and modified by further work.

This research does not attempt to determine the most important factors within the model nor attempt to compare with a sample of non-adopters. The research seeks to explain and explore the issues from academically rigorous models brought together into a broader framework.

When quantitative methods are used it is usual to take a positivist stance towards the research as the elements involved are often reduced to their atomic elements (Popper, 1959 in Cassell and Symon, 2004). With this approach the proposition is often regarded as theory and facts are collated and referenced to substantiate it. Qualitative methods allow an interpretation of a socially constructed world that employs a degree of subjectivity. The positivist approach would be to ensure that the observer is always objective, whereas from an intuitive perspective the observer may be part of what is observed and therefore a part of the research. As qualitative research is often conducted in a longitudinal manner, or in a great deal of depth on a small number of subjects, it is often much more difficult to generalise conclusions (Oates, 2006).

As this research could be described as falling into the Social Science realm a positivist approach is unsuitable as the conditions are often outside the control of the researcher and there also needs to be allowances for the nuances of human nature. If a quantitative method were employed in this situation there would be no scope to discuss variables that may affect the subject for example, owner-manager education, perceived value assumptions, etc. It would not allow for reactions or feelings to be a part of the research. In combining both qualitative and quantitative methods the researcher allows for closely scrutinised formal results and an element of scientific rigour whilst still allowing for the connotation of meaning required in this research.

3.5 Research Process

The process for this research has developed during the course of the study and adapting an exploratory strategy allowed for this process to grow and mature over the course of time. The stages in the research process are illustrated at fig. 3.3 and discussed below:

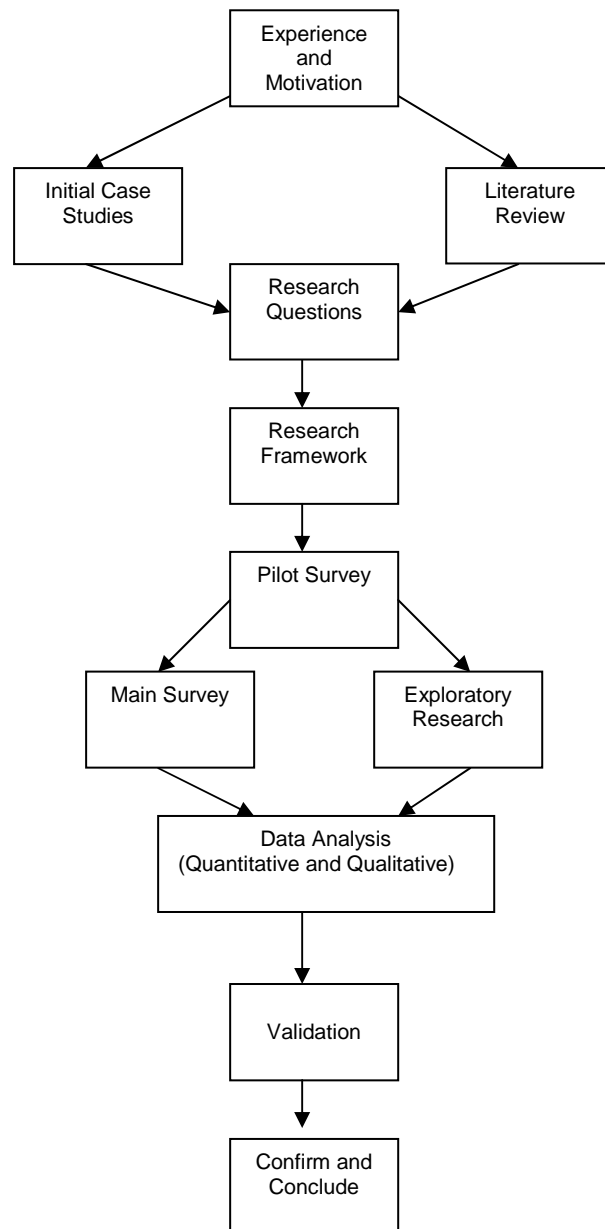


Figure 3.3: The Research Process

Experience and Motivation: the experience that this researcher brings to this project comes from a number of years working in an SME and being responsible for the purchase of new technology before entering the world of academia as a lecturer. The lecturing has been augmented by work on several projects which involve SMEs in the adoption of new technology, including technology transfer from higher education. Four and half years experience working for the ICT Cluster at AWM has allowed the development of both experience and motivation. It was observed that a number of difficulties were inherent in the delivery of projects which were intended to help SMEs to adopt new technology. SMEs were increasingly being left in a position where they needed to seek further help, often through another project whenever they needed to adopt new technology. It was therefore seen that there was a need for some investigation into the reasons why technology adoption was so difficult for SMEs. This may then allow these issues to be addressed during the development of future government supported projects

Literature Review: a literature review was conducted, covering the areas already stated. The literature review was deliberately broad in order to look at all of the aspects that may impact upon a very small company, and their adoption of technology. Very little research has been published in this particular area, and therefore it was necessary to expand the research into that relating to large companies and IS as a broader subject area. A literature review was refined over the course of time to include micro-companies and a number of ICT adoption models were used in order to develop a new model and to guide both micro-companies and policymakers in future adoption interventions.

Initial Case Studies: three initial case studies were conducted alongside the literature review to ascertain if the experiences of the researcher in working for SMEs were comparable to that in other companies. These case studies augmented the researcher's experience and helped to formulate the research questions.

Research Questions: The research questions were formulated as described in chapter one but were later refined as described in section 3.2 above and these together with a literature review determined the development of the survey questions. The research questions are deliberately overarching and broad in nature to encapsulate a broad range of issues. They are also derived to be pertinent to the proposition.

Research Framework: a conceptual framework was developed to add structure to the research. This helps provide an appropriate starting point for the research and enables the research to have structure as it progressed. It also enables the researcher to conceptualise how practitioner experience and the theory-building augment and inform the research.

Pilot Survey: a questionnaire was developed, based on the literature review and information from the initial case studies. This questionnaire was tested in a pilot study involving eight companies, and subsequently reviewed with minor amendments for the main survey.

Main Survey: the main survey was carried out following a discussion with colleagues at AWM, who were interested to discover if the issues uncovered during the pilot study and research to date were applicable to ICT companies. This was also driven by a white paper into the adoption of ICTs in the different UK regions commissioned by eSkills and produced by Adroit (Sheppard and Hooton, 2007). 73 companies were initially surveyed and findings were discussed with colleagues at AWM. Although the findings at that point were showing some trends; it was felt that a larger sample size was needed in order to be representative of the 3000 plus companies, who comprise the ICT cluster. A further tranche of companies were interviewed, bringing the total to 203.

Exploratory Research: as the main survey was developed it became evident that the research was taking shape as an exploratory research project. It had not been identified

as such at the outset when an action research approach had been the method of choice. However as so little has been done in this area lessons learnt as part of this research will to help shape future research.

Data Analysis: The original survey was carefully filed following data entry into an MS Access database and MS Excel spreadsheets. Some data was extrapolated into graphs, other data was entered into SPSS for analysis, and the survey responses were also carefully read and categorised to produce further results. Further information on the data analysis is contained in section 3.6.

Validation: it was felt that as this was exploratory research it was necessary to validate the findings with stakeholders from the ICT cluster. The findings were therefore discussed with the Cluster Opportunity Group (COG) members who are a group of ICT industrialists representing the 3,000 plus ICT companies and leading the ICT Cluster strategy development. The findings were presented, discussed and incorporated into the ICT Cluster Strategy 2008 -2011.

Confirm and Conclude: the validation that led to confirmation of the results of the research was concluded. Further work will be continued to refine the model within work with the ICT cluster. For a discussion of further work potential from this research see section 5.8

3.5.1 Case Studies

During the initial enquiry case studies were carried out with three diverse SMEs in order to determine the direction that this research might take. These interviews were divided into four subcategories, the first of these discussed ICT infrastructure with the SME in order to see what type of technology they were using on a daily basis. The second category explored the current infrastructure within the company. The third area asked

about ICT investment that enabled discussion of the level of investment undertaken and also the type of investment undertaken coupled with any future direction that they may have been investigating. The final category was that of subsequent business performance in order to determine how they view the impact of technology on their business.

The questions used in these interviews were semi structured, as the definitive survey instrument had not yet been developed. The interviews were undertaken to help the development of that instrument and to ensure that there were no other factors that needed to be included within this research. This provided some initial testing of the approach and method chosen and draw out any errors in the research areas. This was deemed necessary in order to determine the need for the research project and also to help recognise any further research questions. The companies chosen were as follows:

Company 1 : Solicitors (medium sized)

Company 2: Irrigation Specialists (micro sized)

Company 3: Replacement Window Company (small sized)

As is clear from the choice of companies at this point in the research there was no indication that the direction that would be taken would be to look at the single sector of ICT. At that stage it was decided to use three very diverse types of companies in order to be as all-encompassing as possible in the research areas. It had already been decided at this point that a questionnaire would be developed, and this was subsequently tested in a further pilot study, which would take the shape of a survey.

It was originally intended that the companies chosen for the initial case studies would be revisited to validate the final survey. However, as is often the case with small companies one of the companies from this period in the research is no longer trading. The companies were deliberately chosen to provide a contrast between the various types of

companies including both sector and size. There is therefore a micro-sized company, a small-sized company and a medium-sized company. Each example could be deemed as delivering a service, as even the replacement window company did not produce the products but sourced and fitted them. All three are described as direct suppliers to consumers, rather than operating in particular tier of a supply chain. This provided the basis for the research which was originally anticipated to be cross sector as so many other studies had chosen. However, as the research developed the opportunity to investigate a single industry sector was presented through the researchers role at AWM and this added a degree of uniqueness to this study.

These companies gave permission for their case studies to be used within this research anonymously, and therefore full details are presented in Appendix 2, 3 and 4. However, a brief overview of each is included here. The selection of companies was opportunistic as there are major difficulties in engaging small companies in research as discussed previously. It was therefore decided that when the opportunity arose it would be pursued. The interviews took place in 2003 over the course of the summer months mainly as and when meetings could be arranged.

Company 1, the solicitors, employ some 76 people in total excluding the 9 partners and is still growing. This company adheres to the European definition of a medium-sized company. The service it delivers is obvious as it sells the time of its experts to the general public in both the private and commercial sector. The use of ICT is now an integral part of delivering those services and many of their processes and communications are conducted through that medium. The adoption of ICT has been a very recent development due to the implementation of several ICT projects. This company is technologically innovative in comparison with many small companies and also in comparison with many in its sector.

Company 2, the irrigation specialists, in total contrast has only 8 employees, plus 2 company directors (the owner and his wife), which makes it a micro-company. The service it delivers is the expertise and time of people again but in a much more physical way. The service itself cannot be delivered through an electronic medium! The technicians from the company operate out in the field and therefore the company would gain many benefits from being more technically 'savvy' yet this is not happening. They have a workshop for storing equipment and offices, yet the majority of administration for the company is still run from 'the kitchen table' in their own home.

Company 3, the replacement windows specialists, provides in individually styled windows for the private sector. It has 17 employees and 1 part-time accountant and fits the European definition of a small company. The company is run by the two directors who are owner-managers and are not related. The service they provide is again specialist. Most customers are gained through personal recommendation and they feel there is very little need to communicate electronically with them. The company is not technically innovative and is the one company who has not had contact with any ICT professionals except a salesman who advises them. They like to deliver a personal service and feel that this cannot include technology.

Semi-structured interviews were conducted with the companies in areas which were outlined prior to the interviews so that the researcher did not omit important areas. Questions were deliberately open to allow the researcher freedom to control the interview whilst still allowing the interviewee to speak freely. The questions outline can be seen in Appendix 1. The questions were partly derived from the literature and partly from the expertise of the researcher who has worked for some 15 years with and for SMEs in the WM region. The case studies were developed alongside the literature review and therefore the process was iterative in terms of outcomes. The results from the case studies drove the literature search and not visa versa.

As can be seen from the case studies in the appendix even from this small study SMEs are aware of identifying potential benefits prior to the implementation of an ICT project which fits with the discovery by Levy et. al. (2001) of strategic intent and that of Mehrtens et.al. (1999). However, the companies remain totally unaware of any need to evaluate those projects subsequently, or their effect on business performance except in a highly ambivalent way (Farbey, et. al., 1993; Bannister and Remenyi, 2001; Lefebvre and Lefebvre, 1996). There were some quite unexpected results in that two of the companies had discovered much more functionality than they perceived the original project to be and both had had the insight to incorporate this into the business, which aligns with the findings of Hassall (1999). Much of the drive to purchase had been 'needs' driven although company 1 felt the need because of the competition, both examples quoted by the interviewee had as their motive the volume of work. Company 2's need was also the sheer volume of work it needed to cope with, without increasing resources, confirming the findings of Culkin and Smith (2000). Company 3 had the same motivation but was happy to accept the equipment's ability to do the job they had originally purchased it for. This idea could be equated to an example of one company being happy that a new telephone could be used for telephone calls only but others may want to explore the potential of 'ring back', answering services, etc. (Hassall 1999)

None of the companies had known that their projects would be successful and had implemented more on 'gut instinct' than anything else which had been reported by previous researchers (Farbey et. al., 1993; Weill, 1990; Powell, 1992; Bannister and Remenyi, 2001). What was more surprising was the amount of money spent on the projects (relative to the size of company) without really knowing if there would be a 'payback' and then not subsequently measuring the performance. This led to more investigations around ICT evaluation. In both cases the companies had no perception of their infrastructure needs and relied on the advice of friends, being self-taught and in one case a salesman who was paid on an ad-hoc basis for repairs. The inference of companies investing in this manner and then later exploring their purchase in order to

justify the value through added functionality is not explored in detail in this research, but is an opportunity discovered which could be used for further research.

Several themes emerged from the initial case studies that could have been developed further and might be of interest to subsequent researchers but are not covered in this study

1. The SME community is vast and if government is to spend money wisely in this area then the more knowledge we have the better. A possible area of research could be centered on the question is Government investing in a supportive manner in our SME infrastructure in this country.
2. The concept of the discovery of additional functionality was an unexpected result and needs further exploration as added functionality would have a major impact on the perception of a projects success. The effective use of packages such as email, Internet, groupware and desktop publishing would have a major impact on the way the business communicates and this in turn upon its perceived usefulness. For example it might be useful to know if there is an increase in profitability / productivity that informs the next purchasing decision or is it the increased functionality and therefore increased use that permeates the company culture and gives the perception of being more of a success.
3. Do small companies have less project failure than large companies because they are less ambitious and more cautious initially? Or does project failure equate to company failure in SMEs?

4. The internal and external influences on purchasing with regard to equipment are very important. Companies should always examine the business need that drives the software purchase that then instigates the hardware purchase necessary to run it. However, as many network managers will relate, that is rarely the case even with large companies as compromises are often necessary. With a small company the influence to buy is often much more basic, as can be seen from the pilot study. Internal and external influences are a whole area of study on their own.

5. The competence and confidence of the users can also have a major effect on a purchasing decision. Selection of equipment will be strongly influenced by the owner-managers perception of ease of use. Training adds a significant and often unacceptable overhead.

3.5.2 Pilot Survey

A questionnaire was developed as a result of the case study interviews and the literature reviewed until that point in time and this was trialled amongst the SME community in the WM. At this point the companies were still in different sectors. The pilot survey followed the same four categories of the case studies. The evaluation of the questionnaire design is described in section 3.5.3 as the questionnaire had minimal changes between the pilot study and the full survey of ICT companies. This section describes the results of the pilot study only.

15 companies were surveyed and eight replied, these were predominately micro-companies with 6 of the 8 companies having less than ten employees (see table 3.3).

Position in company of person responding	6 Directors 2 Technical managers
Industry Sector	4 ICT 2 Retail 1 Manufacturing 1 Training / Education
No of employees	1 = >100 – <250 1 = >10 – <24 6 = <10

Table 3.3: Profile of Companies responding to the pilot survey.

The information gained regarding the ICT used regularly in the company was surprising at this point, especially as there were four ICT companies in the pilot study, it was expected that the technology used would be very advanced but this was not the case (see table 3.4 and 3.5. None of the companies used EDI but two did allow customers and/or suppliers limited access via an extranet. On further analysis, as expected, this was shown to be the larger organisations in this limited study. ICT companies may be expected to have more sophisticated systems and infrastructure and to be less concerned about problems as they would be expected to have the appropriate skills. However. This proved not to be the case.

What ICT do you use regularly in your business?	
a) None	0
b) Stand Alone PC(s)	6
c) Networked PC's (one site only - LAN)	3
d) Inter-networked PC's (inter-site - WAN)	2
e) Wireless LAN	2
f) VOIP	1
g) Hand held devices (Mobile working e.g. Ipaq)	2

Table 3.4: ICT infrastructure currently used inside the company.

What ICT do you have that reaches outside of your business?	
a) Access to the Internet	8
b) Company Web Site	6
c) Email	8
d) Application Service Provider (ASP)	1
e) EDI	0
f) Extranet	2

Table 3.5: ICT infrastructure currently used outside the company.

The companies were asked what their last three purchases were to ascertain if there were buying trends taking place. These last three purchases made amounted to very small purchases in an ICT economic landscape but significant purchases for the very small companies involved. With three companies purchasing a server in the last two years, two companies purchased a printer/scanner dual purpose technology, three purchasing a PC and only one purchasing a laptop. It seems that mobile computing was not on the agenda of these sample companies. As time progresses this was expected to increase for the main survey to be conducted as mobile communications grow in use.

Five of the eight respondents were also the purchaser of the equipment; this has led to the supposition for the main survey that often the education and ICT expertise of the respondent is very important in influencing the investment decisions. Four companies had sought advice from outside the company but only one of these admitted to asking a family member with more ICT knowledge. One sought advice from an ICT cluster funded project. This question was added to the main survey to elicit information for the ICT cluster.

Four of the companies had purchased the product in order to update their existing ICT infrastructure, with two purchasing due to recruitment of new staff, and two purchasing in order to improve business performance. This may indicate that those who responded that it was to update existing infrastructure did not recognise that a simple upgrade could

represent a significant move towards improving business performance, e.g. reliability, lead time, marketing, etc.

When asked to choose one purchase with the most significant impact and then state what that impact was, all eight stated that 'business impact' was the main reason for choosing that purchase as the most significant; with only two stating that it was cost *and* business impact that made the purchase significant. Business impact appears to be the main issue influencing the investment decision and beyond that companies list everything from customer pressure to good magazine reviews as the reason for the choice made.

Implementation problems opened a whole plethora of concerns with five companies stating at least one problem and one company ticking all the boxes indicating significant problems. The main issue here was lack of knowledge/skills to implement the technology, revealing that skills are still a major issue for small companies.

Six companies did not change any of their business processes during implementation which either indicates that they were not aware of the need to review these and are still continuing to implement without any changes or simply that these implementations were simple upgrades and there really was no change needed. Of the two that did make changes the stated changes were to email / account / back office systems to enable new ways of working and changes to enable mobile working.

Only one company found more functionality after they had purchased but that may be because the others had not experimented. The company that had found a significant advantage from the functionality discovered that being able to upload data from anywhere enabled seamless remote working. For example using MSWord DLL program they could access documents from anywhere as if they were on the office network. Previously they had had to make and synchronise copies of files rather than use the original files, which led to problems of version control. Now they could actually see which documents had

been worked on since leaving the office. Time for experimentation or training in the new technology is an important part of implementation and could have demonstrated significant gains for the business but time for this was a concern.

Only three businesses felt that their purchase had been successful or very successful. The measure for these companies was an instinctive judgement based on whether it was doing the job it was purchased for or not. This suggests that small companies are realistic in what they hope to achieve from implementing new technology to the point where their attitude could be detrimental and they may not experiment to achieve the extra gains. One company claimed that it was very successful and that was the same one who had found the extra functionality detailed above. Most companies said they measured the success of the implementation by the "results it produced" or said the results "were evident", the assumption being that you could tell through usage and there was no formal method of measurement of success and therefore no formal evaluation.

When asked about perception of success and therefore some of the realised reflected value to the business, six reported there had been none. Only two responded positively; with one stating that clients could now access the implemented web site and contact them via that method and the other (an ICT company) saying that now that they could take control of the clients systems from a distance the client used the on line help facility less often and contacted them more. This was not seen as a success as it meant more work!

When asked if there was a timescale allocated to the success, in other words a pay back period, six said no and two said they expected immediate results indicating the short-term results ethos detailed in much of the research around small companies is still apparently endemic.

The pilot results gave an indication that the survey had been designed in the manner for which it was intended with only minor adjustments. As the intention was to deliver face to face and via the phone, the interviewer could control the situation within this. The emergence of the opportunity to interview the ICT companies in a very large survey came after a significant amount of time attempting to interview enough SMEs to make the sample size for the survey relevant. In section 3.5.5.1 a discussion of the researcher's role on this situation explains the impact this had on the subsequent work.

3.5.3 Questionnaire design

This section outlines the design concept for the questionnaire and examines why the questions were focused in the way that they were. The design was in four parts which have already been detailed. As this research is exploratory in nature the questionnaire was deliberately wide ranging to capture as much information as possible in a rich format.

The case studies were conducted in an informal manner in order to explore issues as widely as possible, this then allowed for a preliminary design for the pilot study. When the larger study began the questionnaire was still evolving. The survey instrument developed to collect the data was constructed and organised to effectively flow for the interviewer and interviewee whilst remaining straightforward for the SME. The intention was to collect data which explored the concepts elicited in previous limited studies as described previously.

Each question was related to an element from the research previously discussed and had as its grounding elements from the ICT adoption models and surrounding research. A copy of the pilot questionnaire is at Appendix 5 and a copy of the full survey questionnaire is at Appendix 7. The full survey differed in only a few elements, the main element removed was that regarding any additional functionality discovered since the purchase. This element had been an 'interesting' part of the case studies and was explored in the pilot but thought to be superfluous to the main purpose of the research which was to

explore a new model for evaluation. The model at that point did not include experimentation by SMEs leading to further functionality and so this element was removed. Other changes were minimal and this will be discussed through the following sections. Each of the following sections describes the four areas and the underpinning theory for the questions.

i. Company Background:

Many of the models underpinning this research contain elements about the firm including age, size, sector, legal form, location and ownership (Storey, 1994). Although there is evidence to suggest that legal form, size and location are the most significant of these (Levy and Powell, 2005). As this study progressed some of the elements were removed as they were found to be superfluous. Since the main survey is focused on the ICT Cluster there is only one sector, the legal form was included in the questionnaire but removed from the analysis when it was found to be almost exclusively limited liability which removed the opportunity to analyse the impact of this element. It has been shown that limited liability is the best legal form for small companies aimed at growth as there is more likely to be an opportunity to borrow money than as a sole trader (Levy and Powell, 2005; Storey, 1994). The location was fixed as all companies were located in the West Midlands for this study and the ownership is explored through the perceptions of the owner/manager. None the less it was still felt relevant to explore the age and size of the company. Turnover was also included in this section as the turnover to company size ratio can be deceptive in the ICT sector as very small companies can produce very high value goods.

The level of education of the owner-manager was found by Storey (1994) to be the most significant influence on a company's growth and this was also found to impact on adoption (Levy et. al., 2005). This was also the influence behind the question 'Are you an IT professional or does the company employ an IT Professional?' which was intended to elicit if these very small companies had specialist skills in house. The absence of these

skills impacts on adoption and is an element in the organisational readiness category (Merhten, 2001; Levy & Powell, 2005; Rashid and Al-Qirim, 2001; Storey, 1994).

ii. IT Infrastructure:

This section of the questionnaire was designed to document what the company actually has in terms of ICT infrastructure. In the pilot study there were 2 sections which asked the respondents to tick boxes against the types of ICT and asked 'What IT do you have that you use regularly in your business?' and a second section asking 'What IT do you have that reaches outside of the business?'

This proved to be an inefficient way of collecting the data and the final survey included 'What IT do you have already that you **use** regularly in your business?' and included a table which companies could tick if the item was used daily, weekly, monthly, but also included an option for 'don't know' or 'don't understand'. This not only gave an indication of technology use in very small companies but also added to the discussion with regard to any lack of knowledge within the company (Zinatelli, 1997; Costello and Reece, 2005; Levy et. al., 2005). It also helped to determine both level of use of ICT in the companies and the level of knowledge of the respondent which again equates to organisational readiness in terms of specialist skills in the company from Merhten (2001) and Rashid and Al-Qirim (2001). The survey also provided an opportunity to identify similarities of purchases across companies; which provides valuable information for the ICT sector who are the suppliers of goods and services.

iii. IT Investment:

The original questionnaire had several questions relating to this section which required the interviewee to go back and forth between questions depending on their answer (see Appendix 5). It was decided that this was too cumbersome and did not add to the information collected. For example there were 3 questions relating to advice sought which

were simplified into one. Therefore, in order to explore the investment and adoption decisions made by the companies the respondent was asked to 'Please detail below the last 3 **significant** IT purchases you made' the use of the term 'significant' was important in this context as it was intended to elicit what the respondent felt was significant and allow them to explore this themselves, thus raising their awareness too. The question was framed in a table which allowed the following to be asked about each purchase.

- Product Description.
- When did you buy it?
- Who bought it? (position)
- Who advised them?
- Reason for purchase?

This allowed a summary of the decision-making process prior to the purchase to be collected quickly. From this it was expected that it might be possible to identify purchasing trends and also identify the level of decision making undertaken which was determined by Levy et.al. (2001b) as being an important turning point in SME growth. Delegation of this decision may even signify growth and maturity. The reason for the purchase was expected to elicit any strategy and/or objectives the company may have (Storey, 1994; Levy et. al., 2005). The reason for the purchase could also help to identify external pressures in that process (Merhten, 2001; Rashid and Al-Qirim, 2001; Grandon and Pearson, 2004).

Each respondent was then asked to select the most significant purchase from the previous three and answer all the following questions in the survey in relation to that one purchase. The first question was 'In your view **why** is that purchase the most significant?' This could well indicate the perception of the respondent who was also the owner-manager and the purchaser in micro-companies. For example it may indicate that the respondent had a particular emphasis such as financial if it was a cost impact, a process

impact if they were not necessarily able to adapt internal processes, a technological impact if they lacked specific skills. Again these elements would help to define the strategy category of the model (Levy et.al., 2005; Merhten et. al., 2001; Van Akkeren and Cavaye, 1999b).

The next question was: 'If you had to seek advice prior to the purchase can you please explain why that advice was necessary?' This question was included as a number of researchers had identified that advice sought prior to purchase could significantly influence the purchase and that often that advice is from unqualified mentors and friends within their social or business sphere (Culkin and Smith, 2000; Bennett and Robson, 1998; Costello and Sloane, 2004). This could indicate if the respondent and/or purchaser had appropriate knowledge. The choice of advisor may have indicated an informed decision or it may simply be friendly advice. Again this element relates to the organisational readiness element by specifying the organisations ability both in terms of decision making and technical skills.

The next question was 'What were the main influences in this purchase? (why did you buy?)' This was designed to begin the insight into the perceived value of the purchase. It was thought that this might start to reveal any external pressures of wither a technical and/or business nature (Merhten et. al. 2001) or the level of knowledge of the respondent depending on the way the question was approached by the respondent. (Levy et.al. 2001b, Merhten et. al., 2001; Smallbone et.al., in Storey 1994).

The next question was: 'Was there any internal pressure to buy and if so who or what?' designed to help inform the organisational readiness element of the model. Cragg and King (1992) had indicated that more sophisticated systems meant a more skilled workforce who could put pressure on management to adopt. Szczygiel (2000) had determined that adoption was better after employees had been educated but this could mean more pressure internally. The limited suggestions for respondents were e.g.

business growth, new employee. Simply making the decision as part of the internal planning process would indicate also the maturity of a micro-company (Proudlock et. al., 1999)

Following on from this the next question was: 'Was there any external pressure to buy and if so who or what?' External pressure could be of a technical nature or a business nature and suggestions to help the respondent were e.g. technological advances or pressure from a customer. External pressures were identified by many of the researchers previously (Grandon and Pearson, 2004; Merhten et. al., 2001; Van Akkeren and Cavaye, 1999b; Nathalie et.al., 1998). A number of possible influencers in this area had been identified previously (Lefebvre and Lefebvre, 1996; Barber et. al., 2000; Rashid and Al Qirim, 2001; Husein et.al., 1996; Jackson and Sloane, 2007) and these were discussed in chapter 2 (section 2.6.1.5) and this would confirm once more those findings amongst the ICT companies in the WM.

'What implementation problems did you have?' was included as an additional question which was double-edged. It was intended to elicit from the companies if any problems had been paramount as it could help to highlight their specific (lack of) knowledge or skill. It would also identify for the ICT Cluster where specific support may be needed. This was followed by 'What are you planning to buy next?' which it was hoped would indicate buying trends which were also important for the ICT Cluster. Question 2 had provided historic data regarding previous purchases whereas this gave some glimpse to the future investment plans indicating once more organisational readiness.

iv. Business Performance:

This section of the questionnaire was designed to allow for the element of perceived value (ROI) which it was felt had been missing in previous models (Van Akkeren and Cavaye, 1999). The first question in this section was therefore designed to be a simple Likert scale to measure perceived success and was thus 'indicate how successful **you**

feel the purchase has been.’ Respondents were given options ranging from ‘very successful’ to ‘complete disaster’.

The next question originally asked ‘How do you know it was successful?’ but in the pilot study most respondents said ‘because it works’ this was therefore replaced with a more open question ‘What are the benefits of the purchase?’ This would enable the perceived benefits to be directly collated and this element has been cited in the majority of models discussed in this research (Van Akkeren and Cavaye, 1999b ; Mehrtens et. al., 2001; Rashid and Al-Qirim, 2001; Grandon and Pearson, 2004; National B2B, 2005; Levy et. al., 2005b; Seddon, 1997; Duhan et. al., 2001). Supported by the calls to open the debate further (Berghout et.al., 2005; Bannister and Remenyi, 2001; Poon et. al., 1996; Premkumar and Roberts, 1999; Cragg and King, 1993; MacGregor, et. al., 1998) these questions will explore this element in a number of ways. The questions in this section were all designed to examine the measurement of success that may or may not be present within the adoption situation. Given that Brynjolfsson and Hitt (1996) and Rai et al (1997) declared a lack of relationship between adoption and benefits whereas Sheppard and Hooton (2007) claimed that there was a correlation between computer use and increase in performance

The question ‘What measure of success has there been?’ then relates to perceived value and is intended to bring in an exploration of the ‘instinct’ (Powell, 1992) that previous researchers have alluded to in the adoption process. Even an indication of a simple measure may indicate that a company is more mature in its investment decisions. This will be used with the following question: ‘If you did not measure the success can you explain why not?’ to explore if they even considered any form of evaluation in order that future purchases may be more informed.

The original questionnaire contained two further questions relating to perceived value (success/benefits) ‘What perception of its success has there been from people within the

business?’ and ‘What perception of its success has there been from people outside the business?’ This was simplified into ‘Have others commented on the success either within the company or from outside?’. This will determine if it is only the owner-managers perception of success that is considered in these micro-companies.

The final question is related to raising awareness of the need to measure the success and simply asks, ‘Did you allocate a timescale to the success? E.g. Was there a Payback period? How long was this?’. It was expected that most respondents would not have done or would expect an immediate payback (Kennerley and Neely, 1998; Van Akkeren and Cavaye, 1999b). However, exploring this element adds the ROI element which other models lack.

3.5.4 Data Sample Selection

The sampling frame was decided by the application of this research to the ICT Cluster following the opportunity for AWM to fund the survey. It was then necessary to decide on the sampling technique. Oates (2006) lists probability sampling techniques of probabilistic and non probabilistic types (Table 3.3). Two techniques are involved in sampling the target population; one could be described as probabilistic in that it applies to cluster sampling as companies attending ICT events throughout the West Midlands region were approached during the events and asked to take part in the research. This then led to non-probabilistic, snowball sampling as having gained the trust of the owner-manager of one company; they would often give details of associates, partners or collaborators who would also be willing to participate.

Probabilistic	Non-probabilistic
Random	Purposive
Systematic	Snowball
Stratified	Self-selection
Cluster	Convenience

Table 3.6: Sampling techniques (Oates 2006)

Response rates were excellent using this technique as potential respondents were often approached face to face or by associates who had already responded. The survey results was to be presented to AWM in a separate report and many small companies are aware of the work that is done in this region by the RDA and were keen to know how the results might be used to help them. Very few owner-managers who were approached declined to take part but the majority of those who were approached were very helpful.

203 companies were surveyed and from these only 6% were unusable as the companies decided not to finish the interview for a variety of reasons predominately running out of time to do so. The 200 completed surveys consisted of 167 micro-companies with less than 10 employees reflecting the composition of the cluster. In fact there is a slightly higher percentage of micro-companies in the UK as compared to the sample for this research with Department for Business, Enterprise and Regulatory Reform (DBERR)¹⁴ 2006 figures showing that in a total of just over 4.55 million companies approximately 95% were micro-companies with less than 10 employees¹⁵. This research therefore concentrates on the micro-companies within the survey to examine the emerging model. The results from the small and medium sized companies are not statistically viable and therefore results from the small and medium companies surveyed will only be presented where comparison might be useful. The profile of companies also reflects the make up of the ICT Cluster in the West Midlands which is also predominately micro-companies (Rowe, 2007), with showing 74% of companies with less than 10 employees.

3.5.5 Data Collection

This section discusses the approach taken by the research to the collection of the data. This survey collected both quantitative and qualitative data in order to capture some statistics to identify trends whilst also investigating the rich environment in which the ICT Cluster companies operate. This particular topic requires appropriate methods to be used

¹⁴DBERR formerly known as Department for Trade and Industry (DTI).

<http://www.berr.gov.uk/files/file38984.pdf>

¹⁵ <http://stats.berr.gov.uk/ed/sme/smestats2006.xls>

as research instruments as the collection of qualitative data is to be augmented by the limited use of quantitative data as extolled by Ragin and Griffin (1994). This research deals with the same number of subjects for both types of data collection. The method was chosen initially as it was intended to use a small number of respondents. However, the approach by AWM to survey 200 companies from the ICT Cluster circumvented the problem of collection of large amounts of data as it allowed for the researchers to use an assistant to collect the data. However, this in itself led to issues which are discussed below in 3.5.5.1 in that it introduced a third party into the research who did not have an in depth knowledge of the subject area.

Also, as face to face and telephone interview were used, this proved to be much more time consuming reflecting the numbers involved. Respondents were keen to participate as the research was now an initiative financed by AWM. It also led to many questions regarding the use of the data and any future plans and/or initiatives to help micro-companies on this area.

The majority of companies who participated were more than happy to meet face to face and only a few decided that they would prefer to complete the survey over the telephone.

Company contacts were obtained through the following channels:

- A database of small companies in the WM was provided by University of Warwick Science Park (UWSP) ICT Cluster Directory Project.
- Attendance at business meetings and workshops.
- Attendance at business exhibitions.
- Visiting to various Technology parks in the region.
- Personal referrals.

The study was conducted through face-to-face (83%) and telephone interview (17%). The interviewee was provided with information on the importance of the study and their involvement in the study. Face-to-face interviews seem to be richer in detail and company representatives tended to answer questions in a more relaxed manner than in a telephone interview. Consequently, richer and more detailed information was collected in face-to-face interviews. The telephone interviews tended to be less relaxed and most respondents preferred the discussion to be as short as possible and as a result, less information was provided.

3.5.5.1 The Role of the Research Fellow

Exploratory research rarely uses large numbers in a survey as it designed to elicit ideas and concepts (Yin, 1994). However, the opportunity to be financed by AWM enabled a large amount of data to be used in this context. The employment of a research fellow by the researcher's organisation gave an opportunity for both the research and the individuals to benefit.

The research fellow had a background in computer science but had done very little work in the area of ICT Adoption or SMEs. Nonetheless as a new employee with a portfolio which included a title 'Research Fellow - IT Strategy Small and Medium Enterprises' the research offered was mutually beneficial.

- The research fellow had the chance to take part in a survey and report on SMEs for AWM (see Appendix 9 shows a summary of this) and all of the subsequent opportunities that this raised. Also being 'coached' in the subject area by the researcher for this study who had many years experience in the area.
- The researcher could direct the data collection, co-write the AWM report and collect a large amount of data for this work and have support to load the large quantity of data into MS Excel.

This seemed an ideal opportunity but did give rise to a number of concerns and drawbacks. The collection began in a very slow manner as the research fellow was very unsure of the subject area. This proved to be an enormous learning curve for her as she worked to understand both the subject area and the context. This took many hours of extra work for the author who at times questioned the approach in spite of the benefit which would eventually occur. It also, however, led to other opportunities for insights as the research fellow decided to ask an extra question to close the interview; this was not on the original survey but was regarding what support the company felt they needed from any future projects. This added extra data for the analysis but was also useful information for the AWM report.

The survey had been designed to encompass data in a rich format and was *very* free form. This meant that in order to respond to the interviewees initially there was a need to field many questions back to the researcher. This proved to be very frustrating and often led to the researcher questioning concepts and pre-conceived theories. It also led to searching self-questioning regarding the depth, breadth and context of the survey. Nevertheless, a relationship was formed which led to a report for AWM and further joint publications on sub-sets of the data.

The rich data captured was often brief as the involvement of the research fellow meant that both researcher and interviewer tried to work towards keeping the interaction between the respondents and the interviewer as unbiased as possible although this is not always achievable as described by Oates (2006). The impressions of the research fellow were often used to describe the experience that she had had when interviewing respondents and this led to some frustration for both as each struggled to come to terms with this relationship. It was decided eventually to talk through a random selection of responses to enable the researcher to get some feeling for the 'mood' of the respondents. It also led to the research fellow questioning the role of the researcher in her capacity as

an AWM secondee and how that role might eventually help the respondents who obviously needed support.

3.5.5.2 The Role of the researcher as an AWM Agent

The researcher was seconded to AWM in June 2004 on a 50% role as the ICT Cluster Innovation Manager with a portfolio which included as an example: acting as Higher Education (HE) advisor, acting as a conduit to the nine Universities with a large ICT effort within the WM, understanding the needs of the ICT Cluster in the WM, acting as the bridge between academia and industry, etc. This has proved to be a demanding role and coupled with 50% employment for University of Wolverhampton including teaching, research, project development, etc and the PhD research, the progress on the research has been very slow. The role has, however, given rise to many opportunities in terms of collaboration and access to data and information for research and publications.

Acting in the role of ICT Innovation Manager has also led to a change in direction for the research from its initial intention of investigating ICT investment and evaluation and using a grounded theory approach on a small number of companies; to the research in its current form. There has also been ample opportunity to share the work with colleagues and influence policy development and investment in initiatives. This included being able to discuss the work with both large and small companies who form part of the Cluster Opportunity Group (COG), the 'Board of Directors' for the ICT Cluster strategic plan. This opportunity led to the inclusion of ICT adoption as a primary market focus in the ICT Cluster 2008-2011 plan (Appendix 10). The work was further discussed with colleagues working with the AWM ICT Steering Group who are responsible for strategy with regard to the end user community. This work then helped to support the set up of the IT Advisory Service (ITAS) which has operated as a pilot project in 2008 and is currently being developed as a £10m Business Link Initiative.

The impact of the role on the respondents of the survey proved to be interesting as in a few cases. The role enabled a referral to be made to one of the AWM ICT Cluster projects for access to finance which then enabled the company to get some support. It also meant that plans had to be made to disseminate the results to respondents who wished to see the results and a feedback loop to be set up whereby the impact on the ICT Cluster plans were subsequently fed back to the companies.

The role will continue until at least 2011 and allow for the results of this study to have a major impact on the work subsequently undertaken.

3.6 Survey Analysis Methods

Qualitative researchers normally follow a process of analysing the data in an observational way and build their theory during and after collecting the data. Their findings are usually developed 'bottom-up' from all the collected evidence and observations. Sometimes theory developed in this way is called grounded theory (Glaser and Strauss, 1967). Qualitative researchers develop theory based on what they have been studying and only after the data has been collected and they have spent time with the subjects do their theories emerge. This research has been exploratory and although using some elements of qualitative research, some of the data collected is quantitative which has been determined by the roles described above.

However, the plans for the analysis were in part supported by the roles discussed above as the research fellow helped to input the data into a spreadsheet under the close direction of the author. This division of roles meant that the researcher spent less time with the subjects and more time discussing the outcomes with the research fellow who had that close relationship with the respondents. This of course had a major impact on the observations possible during the data collection. The survey instrument was thus designed to be semi-structured and although some qualitative data was collected, this

was more limited than had been anticipated. This proved to be useful when it came to the analysis of such a large amount of information, although the emergent themes were the author's interpretation.

The original survey results were carefully entered into an MS Excel spreadsheet, this was in order that separate tables could be constructed to deal with data analysis and textual fields could easily be manipulated. Some data was extrapolated into graphs, a very small amount of data was entered into SPSS for analysis, and the survey responses (textual fields) were also carefully read and categorised and encoded to produce further results.

There are various methods to establish validity of data during this process including: member check, saturation, interviewer corroboration, peer debriefing, prolonged engagement, auditability and balance (Lincoln and Guba, 1985). However, an interpretivist paradigm included the suggestion that results do not necessarily have to be reproducible as there may be several realities (Lincoln and Guba, 1985). This research does not lend itself to the extreme of interpretivist thinking and believes that the research results need to be, at the very least, interpreted as 'trustworthy' and replicable. The validity achieved here through the interpretivist paradigm would therefore ask as Oates (2006), 'how much trust can we put in the results' rather than 'are they valid'.

The respondents may have been biased in their responses, particularly as there could be an element of recounting to AWM 'what they want to hear'. However, within this paradigm some validity is achieved through the volume of data which is rare in this type of research. Validity is also achieved through the triangulation of method with the organic development through case studies and pilot study (Myers, 1997). This context is a unique opportunity and there may not be an opportunity to validate the results via other sectors, regions or countries but in the exploratory nature of this work that *may* not matter. However, an audit trail could be followed for this research which means that should the opportunity arise then the work is replicable. The collection of data was validated with the

respondents themselves as their answers were fed back to them for verification after the survey was completed.

The thematic analysis process used to analyse the data, particularly the textual data, was open coding (King in Caswell and Symon, 2004). The data was read through several times to establish the general trend of the replies and to help focus the mind of the researcher. The methods open to qualitative researchers often means that the coding of the data involves a certain amount of interpretation based on the researcher's conceptual model which often means simplifying reality (Cornford and Smithson, 2006). The problems normally encountered by qualitative researchers were also inherent in this, but by reducing the amount of textual data collected this was minimised using the semi-structured interview method. The data was then sorted on the spreadsheet by the size of company and the companies larger than 10 employees were extracted to another spreadsheet to act as comparative data when (if) required. Data that was quantifiable was extracted to graphs and a small amount to SPSS. The remaining textual data was encoded manually using letter representations in the spreadsheet. The letters were then used to produce a graph and this was replicated throughout all of the textual data. Cross correlation of factors was achieved by using these codes.

3.7 Conclusion

Morse (1994) states that all qualitative analysis, regardless of the specific approach, involves:

- *comprehending* the phenomenon under study
- *synthesising* a portrait of the phenomenon that accounts for relations and linkages within its aspects
- *theorising* about how and why these relations appear as they do, and

- *recontextualising*, or putting the new knowledge about phenomena and relations back into the context of how others have articulated the evolving knowledge.

These steps describe well the process inherent within this research although the variant can be caused by the exceptional role of a third party within the qualitative process and also the driver of having a funding organisation for the survey.

This chapter has examined in detail the research questions which were outlined in Chapter 1. The methods chosen within the interpretivist paradigm are exploratory in nature and will therefore attempt to uncover new applications and new insights into this situation. There has been an exploration of the approach taken and the process involved which has been organic in nature and has involved the researcher's role and changes to personal circumstances. The case studies which set the scene initially have been examined and the pilot survey results presented. The semi-structured interview design has been discussed in detail and supported academically. The sampling technique has been examined and in particular an explanation of the impact of the role of the research fellow has been highlighted. Finally, the plans for encoding and analysis have been described.

There can be no denying that most researchers would expect their findings to be generalisable, and this would be the main aim for this research too. However, there is little doubt that the researchers experience and motives will impact on the results of this work and the role of the research fellow has added an element which has left both the researcher and the research study richer for that encounter. This may leave a question of subjectivity in the minds of the reader. This is circumvented in this work by the collection of the data from the respondent in a semi-structured questionnaire and by the validation of the data at the point of collection with the respondent.

The next chapter will present the findings from the study and an analysis of these findings through the exploration of the model developed from the literature review.

Chapter 4 Analysis and Findings

4.1 Introduction

Chapter 2 presented the literature reviewed that underpins the research and demonstrated how previously defined elements from published models could be amalgamated to produce a refined model. The elements used in the proposed model have also been shown to be the principal issues surrounding the problems of ICT adoption in small companies. Chapter 3 described the research methodology and reflected on the approach taken and instruments used for the survey. In this chapter the findings from the survey are presented along with analysis and reflections on the data collected. The issues are explored in the order that they appear in the proposed model from the literature review. Facts and statistics are augmented and supported by comments from the respondents where applicable. In the final section cross referencing is applied to explore the impact of one factor against another.

There were a total of 203 companies which responded to the survey. They were approached personally at ICT events across the West Midlands or from referrals from other respondents. There were no refusals using this method of selection. The break down of respondents by size is displayed in Figure 4.1 which shows the statistical representation of SMEs involved in this study. This research concentrates on micro-companies and thus uses the 167 responses from this category to explore the model developed from the literature. Occasional reference is made to the small and medium categories where this may enhance understanding or adds to the discussion.

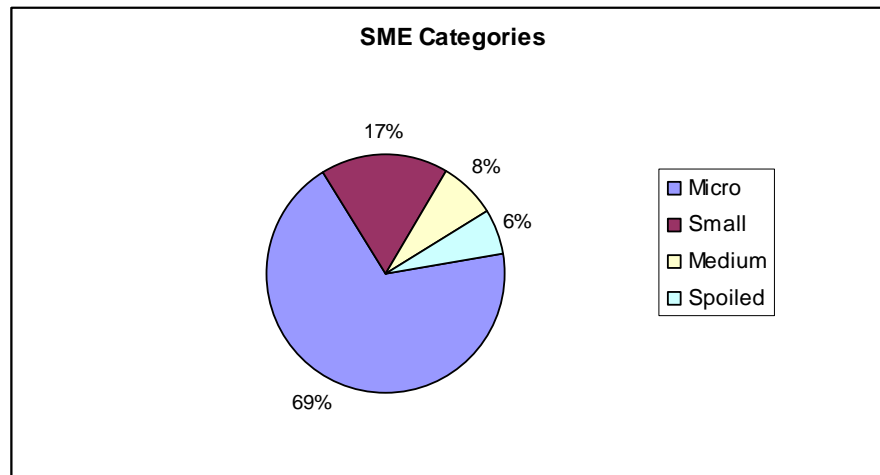


Figure 4.1: SME categories involved in the study

The latest information from the ICT Directory Project (Rowe, 2007) which maps the ICT companies in the WM shows 72% of companies as having less than 10 employees. This study is therefore directly comparable with that profile.

Respondents were asked about the current ICT infrastructure employed in their business and the frequency of use of the equipment to establish if any of them were still working with low end technologies. The results of this are at table 4.1.

IT Infrastructure	Frequency of use (%)						
	Daily	Weekly	Monthly	Don't know	Do not understand	Not used	Not disclosed
Stand alone PCs	87		1				
Networked PCs (LAN)	69		1				18
Inter-networked PCs (WAN)	73						14
Wireless LAN	62	1	1				22
VOIP	35	2	2				
Hand held devices	52	2	1				17
Internet connection	88						9
Company website	83		1				3
ASP	31	1		1	1	1	21
EDI	18	3	1	2	2	1	29
Extranet	13	1		1	1	1	20

Table 4.1: Technology in current use at micro ICT companies in the WM.

The survey had been originally designed to be cross-sector but when it became apparent that it would only include ICT companies this question was re-evaluated and a decision to leave it in was made. This question intended to establish the organisational readiness and baseline technology already implemented within the company; which may indicate their experience of technology use described by Merhten et. al. (2001). It was also hoped to establish what was currently in use as a prelude to establishing the types of infrastructure companies were investing in. However, some of the ICT companies were unhappy answering this question stating that 'as we are an ICT company we would be expected to have the majority of these', of course, no such assumption can or was made. In fact during the course of subsequent discussions it became clear that this was not the case. The questions later in the interview regarding their support needs and implementation issues revealed this as did the low-technology nature of their current investments. This, however, accounts for the high level of non-disclosures listed in table 4.1. When these companies were first approached many were surprised that the survey might be examining the adoption of ICT by ICT companies as the attitude that many displayed was that as they advised others, they would not expect to have any problems.

Therefore, the 'don't knows' were slightly disconcerting for ICT based companies as were the 'not used' and the 'do not understand'. These replies were the first indication that ICT micro-companies may not be as knowledgeable as they 'perceived' themselves to be.

From table 4.1 it can be seen that companies use the whole spectrum of technologies from stand alone PCs (87%) to EDI (18%). This diversity is expected to add to the richness of the qualitative replies as different respondents will have different emphasis depending upon their personal knowledge and experience.

From this point forward the outcome from the survey is presented in the sequence of the proposed model from the literature review. Each element is reported from the findings and evaluated. The chapter concludes with a discussion of the correlating elements emerging and which are of reference to a new model of ICT adoption.

The factors in the new model were identified in Chapter 2 and are presented below in relation to the survey outcomes. The personal factors explored are presented first followed by the factors relating to the firm.

4.2 Personal factors

Personal factors in this survey were deliberately kept to a minimum as this was not intended to be a study which evaluated issues around the ability of the owner-manager to make investment decisions and associated psychology and/or management studies; particularly since previous research has already emphasized the importance of the owner-managers' perception, education and beliefs in the ICT adoption process (Rashid and Al-Qirim, 2001; Levy and Powell, 2005; Storey, 1994; Van Akkeren and Cavaye, 1999b). It was therefore a deliberate decision to base the personal factors on the two most significant issues taken from the previous models explored and discussed in chapter 2, and these were 'educational experience' and 'knowledge of IT'. The knowledge of ICT was explored via the knowledge acquired through formal and informal educational routes

and is also re-visited in the organisational readiness section below as the presence of specialist skills in the organisation is paramount in their ability to adopt efficiently or effectively.

4.2.1 Educational experience

This section examines the level of education of the micro-company representatives involved in the study. The majority (approximately 96%) of respondents were the owner-manager of their company. 71% of micro-company owner-managers are educated to at least first degree level in this sector. In fact:

- 50% of the owner-managers are first degree holders
- 20% hold postgraduate qualifications
- 27% have 'A levels', secondary school education or have attended a course in the college
- 1% of the owner/managers hold a PhD

This means that the ICT sector as a whole appears to be well educated (see Figure 4.2).

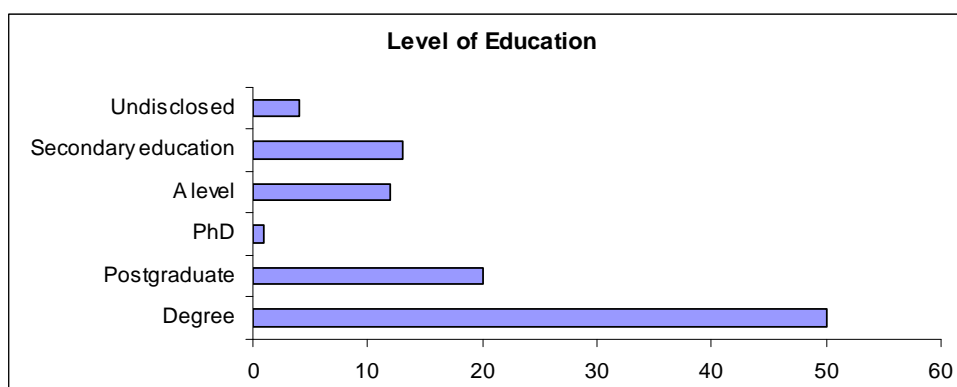


Figure 4.2: Level of education of owner-managers in micro-companies.

The findings show that, among the postgraduate degree holders involved in the *entire* study (including the small and medium sized businesses), 81% were from micro-companies. This may indicate that in this sector, in order to start a company, a high level

of education is a supporting factor. It may be speculated that a possibility is that the higher level of education helps with knowledge and skills to support a company (Storey, 1994; Cooper et.al., 1992, 1994; De Clercq and Arenius, 2003), particularly in this sector, and to spot opportunities with technology (Duhan et.al., 2001).

Of those who acquired their knowledge and skills through experience rather than formally, their educational background was from areas including: Business Administration, Business studies, financial management, Chartered accountancy, Mechanical engineering, Automotive engineering, Quality engineering, Neural science, Genetics, Physics and applied physics, politics, education etc. Overall, owner-managers the ICT Sector appear to be educated in other specialist fields. The impact that education has on other factors in the adoption model is examined in section 4.8.2.

4.2.2 Knowledge of ICT

Most owner-managers in this survey who claimed to be an ICT professional had acquired their ICT knowledge through experience, and not through formal educational routes. That is, 68% of owner-managers involved in the study claimed to be ICT professionals. 23% of those who claimed to be ICT professionals had acquired their knowledge through formal education, while 53% had obtained their knowledge through experience. Of those micro-company owners-managers who acquired their knowledge and skills through formal education, their degree specialism was either in computer science (68%) or from electrical and electronic engineering (32%). None of those formally educated claimed to have received that education through a combined degree such as Business and ICT, which one would have expected would help with the running of a small business and alignment of ICT to business strategy.

It was established in chapter 2 that the knowledge of ICT of the owner-manager is paramount in the success of adoption in the same way as the success of the company as a whole (i.e. increased turnover) is related to the formal education of the owner-manager

(Duhan et.al., 2001; Thompson et.al., 2004). This led to the need to examine the relationship between the success of the company in terms of turnover against the education of the owner-manager and whether or not that education was an ICT related degree (section 4.8.2). The knowledge of ICT being present in the company is not just through the owner-manager although their influence is often the most pertinent. This aspect of knowledge of ICT is explored further in section 4.4.3.

4.3 The Firm

Four factors were explored in this category to present each company background: the number of employees, the approximate turnover, number of years of operation, and registration types. Since 91% of all micro-companies are registered as limited companies, company registration type was dismissed as a factor in the analysis as there is little variation to allow comparison. Size of company has been discussed above and this work concentrates on those with less than 10 employees. Here we examine the years of operation and the range of turnover of the individual companies. The relationship and impact of these elements on each other are discussed further in section 4.4.3.

4.3.1 Age

Some of the companies involved in the survey have been in existence for over 20 years, having established themselves in a specific technology area. Start-up companies account for far less with this sample including only 7%. The majority of respondents appear to have been established for over 15 years, this is a worrying aspect as the number of start ups is limiting.

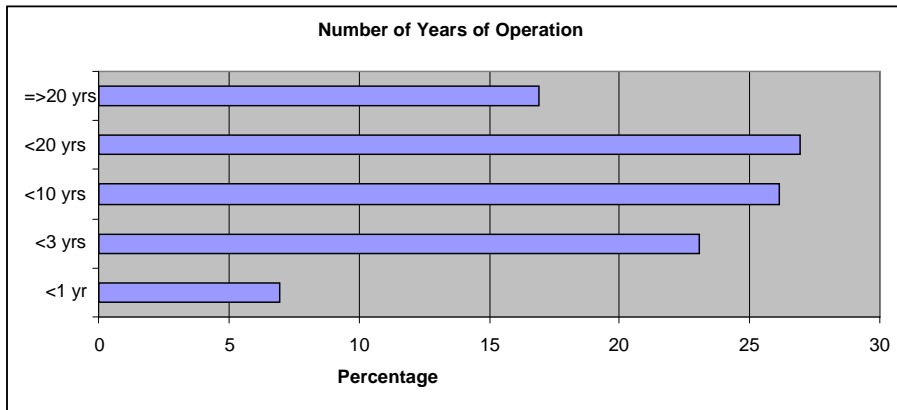


Figure 4.3: Number of years of operation of micro-companies.

An assumption could be made that companies who have been established for a long time may have systems in place to ensure survival at the very least (see section 4.10). Also companies that have been established for some time would be expected to spend less money on technology (Storey, 1994) and those that are newer would be expected to be investing more (Levy and Powell, 2005).

4.3.2 Number of Employees

The size of the micro-companies, measured by number of employees, involved in the survey reflects very closely the size of companies in the ICT Sector in the WM (Rowe, 2007).

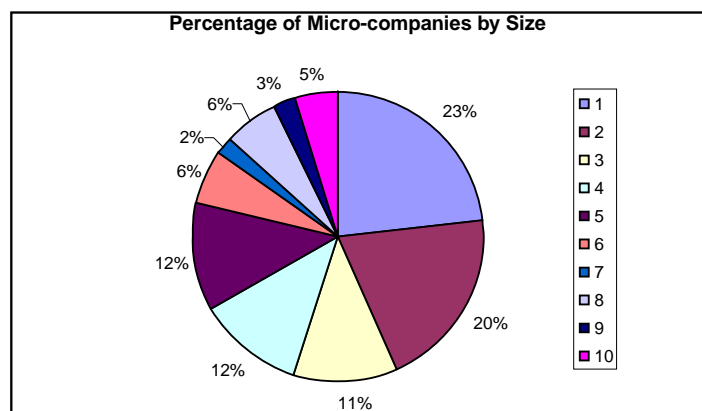


Figure 4.4: Size of micro-companies involved in the survey.

23% of companies in the survey are sole traders, and only 5% have 10 employees. The ICT Cluster Data Directory Survey 2008 (Rowe, 2007) reports 64% of the ICT Cluster as having less than 4 employees. The mix of respondents in this survey echoes that profile and gives confidence that this survey is representative of that sector. Overall, 74% of ICT businesses employ fewer than 10 staff. In fact the survey reported that those engaged in ICT consultancy employed typically 1-4 employees whilst many who employ more than 5 employees are software product and solution design and development services businesses.

4.3.3 Turnover

Of the 167 micro-companies only 129 (78%) revealed their approximate turnover. Of these 33% had a turnover of between £50,000 and £100,000, 29% a turnover of between £200,000 and £500,000. 18% had a turnover under £50,000, 17% a turnover between £150,000 and £200,000 and 15% a turnover of between £500,000 and £1,000,000.

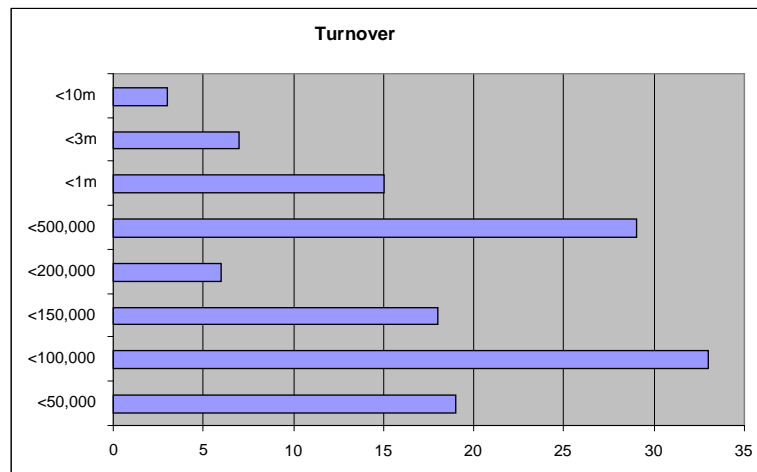


Figure 4.5: Turnover of micro-companies.

The ICT Cluster group of companies have many software developers who deal in high value products. In fact, the general productivity per employee in the ICT industry is higher

than that in most other sectors in the UK (Sheppard and Hooton, 2007). However, it has been suggested by Locke (2004) that there is little differences in ICT investment relating to firm size in terms of turnover and number of employees (see section 4.10)

4.4 Organisational Readiness

Organisational readiness is often interpreted in different ways by researchers. In this study the organisational readiness category demonstrates a company's ability and the competencies available to them, in the adoption process and is dependent upon the forces at work in their environment. The elements used for this research provided an opportunity to gather both qualitative and quantitative data. Companies were asked to comment on the advice that they may have sought prior to the adoption, as this may indicate if they felt they had the skills in house, or if they believed they did not then who did they believe had the skill to advise them? They were also asked to discuss the internal pressures that may have been present from staff or the business needs to adopt. Specialist skills available in-house were also explored in this category as were any post-adoption implementation problems which could also demonstrate organisational readiness of which the company was unaware (Merhtens et.al., 2001).

4.4.1 Advice sought

Influences on the purchase: This element may provide other significant insights into the social and economic circles that SMEs move in and are influenced by including the social capital that they have access too (ref. section 2.5.1.2). It has been identified that these circles include; friends, family, suppliers, customers, salesmen, advisors, etc. Although many SMEs would consider these influences to be friendly advice, within this research it would still be considered as an influence within the decision making process. Companies were asked specifically what advice they sought for each of their last three purchases and where that advice came from. In the survey this question required a free text answer and those answers were categorised into areas demonstrated in figure 4.6. Often, the

decision to invest in a particular type of ICT depends on the advice given directly to the owner-manager and of course this is then influenced by their trust in that person, their own knowledge and education and previous experience with adoption of technology. A large number of the micro-companies at the start of the survey stated that as they are ICT companies and ICT is their core business they would not require any advice on what to purchase. However, making recommendations to customers and selecting ICT for your own business infrastructure which aligned to the business model require very different skills.

It seems that micro-companies seek advice from many different sources; answers were categorised into six sources: internet research, supplier, external advisor, friends and family, a company employee or a PC magazine.

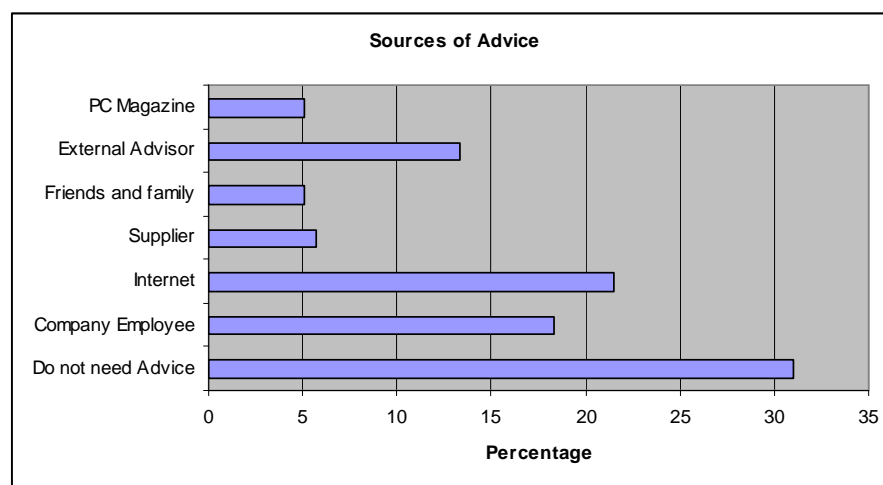


Figure 4.6: Source of advice for micro SMEs

Over 30% of micro-companies claimed not to need any advice and although this illustrates that most micro-companies believe they have their own internal expertise to advise on the purchase of the equipment, such purchases were not indicated as being specialised software or hardware tools for the business, but were frequently items such as laptops, printers or PCs. This type of equipment often has less complex descriptions

on its performance, and most ICT company employees may be expected to be able to make a decision or give some advice on the purchase.

As a comparison 48% of the small companies interviewed relied more on their own employees, whilst 42% of medium companies seek advice externally (see Appendix 11). This may imply that micro-companies have neither the skills in house nor the resource to afford an external advisor or a professional consultant and as a result rely predominately on internet research.

The comments also indicated that when a micro-company purchased ICT tools that they considered to be specific (or core) to their business they were more likely to seek advice from an external advisor. Examples of specific tools include: a server, video camera (used by a film and video production micro-company), e-commerce software (used by web solutions micro-company). External advisors, however, included a friend who was either working in the area or had used the tool before, an ICT store representative or another company which was trading on that service. As these tools are relatively expensive, micro-companies do tend to seek advice to minimise the risks of financial pitfalls, although that advice is still often not professional in nature and therefore is often 'risky'.

The findings in figure 4.6 illustrate that the external advisors used by most micro-companies were not necessarily 'expert' in providing advice but were regarded as trustworthy individuals. The study shows that the Internet is used by micro-companies who already know what technology they need, and is used as a means to compare the price and performance of a particular technology.

Micro-companies that use computer magazines for advice varied from those who buy core tools and non-core tools. There was no evidence from the study about the motivation of some micro-companies to seek advice from a PC magazine, when similar advice can

be obtained from the Internet. It is worth considering that this choice may be that the Internet is perceived as a less trustworthy source of information. However, the majority of the companies who claim to use an external advisor, when questioned further, often admitted that these were friends, relatives, a trusted individual from another SME, a supplier, or a store advisor.

No micro-companies claimed to have employed a professional consultant. When asked if they were reluctant to seek external advice because of the cost many of the replies demonstrated dismay at past experiences that showed a degree of mistrust in those who had intended to help them.

"I have been running this business for 18 years now; I have hired a few consultants who claim to be professional. However, I have never found a really proficient consultant; most come to see me and waste my time and take my money. Since I decided not to hire one, I have been working longer hours to understand the needs of my business and plan accordingly by myself. I think it has helped the company to grow".

"I hired a few in the early years but I never saw the benefit. There was a time the government offered us some help by sending a so called professional consultant to advice us on different aspects of our business. He did not tell me anything new, he wasted my day, and I regretted accepting that support. I just don't trust that most consultants have enough knowledge to give any advice to an experienced business person. I stopped hiring an external advisor. It is better to sort it out by ourselves".

Overall, 22% of micro-companies, in fact the largest proportion, seem to rely on Internet research to make decisions on ICT investments. 18% rely on a company employee to

give advice. This indicates that micro-companies may be merely looking for technology and assessing technological options rather than business solutions.

There is a possibility that implementation problems may be caused by the type of advice given to these micro-companies prior to their decision to invest in new technologies (section 4.10). The literature review explored the possibility that often micro-companies may invest in ICT solutions which are not aligned well to their business model and therefore do not support their business well. This is exacerbated by their implementation problems outlined below once the purchase has been made. This leaves the micro-company exposed whilst they wrestle with the technology problems rather than running their business. Such problems may inhibit a micro-company from growing as they are unable to effectively adopt and implement technology which supports and is aligned within their business.

4.4.2 Internal pressures

It has already been shown that this sample of micro-companies do not necessarily use sophisticated systems, which is positive in this situation as Cragg and King (1992) had implied that those who do tend to perform worse than those with more basic types. Proudlock et. al (1999) also demonstrated that organisations who plan adoption as part of their planning process perceive ICT as significantly more important. These issues have been reflected in the survey questions regarding internal pressure. Micro-companies have many other pressures which can often lead them to invest in new technologies including other company directors, new ideas, etc. The respondents were therefore given a very open question and the answers were recorded as free text: Was there any internal pressure to buy?

The responses were categorised in the following areas:

- Business growth - through innovation or new markets
- Enhanced performance – improved efficiency, increased productivity, etc.

- New customers - the need to attract customers as opposed to external pressure from an existing customer.
- Other
- No pressure

Many micro-companies had problems in answering this question as they did not believe that pressure could be generated internally unless it was to fulfil the needs of a new employee and often this had to be explained to them.

Figure 4.7 outlines the responses from all micro-companies. 39% of micro-companies did not think that they had had any particular internal pressure to invest in new technology. 30% explained it as simply 'a need to enhance performance', this included enhancing the efficiency, productivity and the quality of the service they provide to their customers but driven from within the company. 18% of the micro-companies see future business growth as the main internal pressure to invest in technology. They feel they need to keep up to date with the technology so that they can attract more customers.

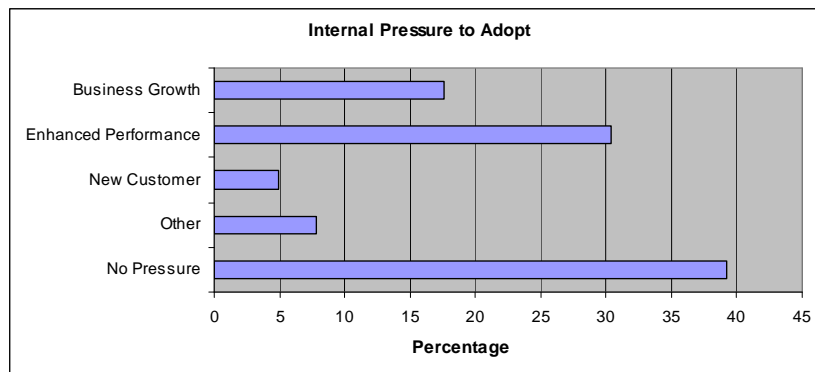


Figure 4.7: Internal pressure to invest for Micro-companies

Some typical examples of comments from the companies in each of these areas:

Enhanced Performance:

“A desire to continuously improve in providing good service to

customers“

“This was a recent release that we saw as essential to enhance what we do“

“Technical requirement“

“Internal pressure for more reliability“

“We needed to spend less time to reading and deleting spam’s. “

“To make sure that our data was safe and also the upgrading our service“

“To be able to interact more easily with customers“

“The engineer was not able to do the job properly the computers were slow and had not enough space“

“To decrease recovery time and protect data“

“Within the company, we needed to make the system faster and more reliable“

Business Growth:

“Business growth and to establish myself as a consultant“

“Business growth, more customers who enabled me to continue operating in the same sector

“Essential for our business growth“

“Business Growth I need to move my business forward“

“To grow the business“

“Business growth, do more jobs in less time.“

“Development of our new solution and building the businesses we work with too“

“New business - to make sure we can log in to the customers sites and provide them with proper services“

“Business Growth we need to drive the demand“

New Customers:

“I had to do it to get more customers“

“This one was customer led“

“For a new project“

“We need to know how to run it before we supply to our customers“

“Efficiency and decent quality of services to customer“

Examples of the ‘Other’ reasons given:

“Pressure from the supplier and colleagues“

“Essential, without it there is no business“
“We needed one as the previous one blew up“
“It was a needed to keep up to date“
“Extra employees“
“Needed for research and development“
“Employees constantly complained about the number of computer crashes“
“We needed it to keep up with technology changes“
“The system we were using became too old“

Overall, 39% of micro-companies believe that there is no internal pressure to invest in new technology. This is not a good state of affairs as it suggests that these companies have no inherent desire to improve their services or to develop or grow their business. It may also indicate a very reactive approach to planning of technology investments. There were indications in interview that micro-companies who stated that there is no internal pressure were mainly focused on one set of customers and tended to use the same methods to both provide for customers' and their own business' needs. Such businesses may have a desire to grow their businesses but might not have the confidence or awareness of the factors necessary for their business development and certainly have not considered effective strategic use of ICT.

4.4.3 Specialist skills in company

The fact that not having the right technological skills in a company can severely impact an adoption is well documented and discussed previously in this study (Levy et. al., 2005; Costello and Reece, 2005; Proudlock et. al., 1999; Cragg and King, 1993; Reynolds et. al., 1994). There are however, technology skills and knowledge needed to make the decision to adopt in the first place. If the skills to align technology with the business are not available then the decision to adopt will be flawed in a number of ways. For example it could be that the business purchase is based on technical knowledge of a decision maker with little understanding of the business model, or it could be aligned with the business model but made by someone with no knowledge of technology or it could just be flawed

by the knowledge and skills of those tasked with making the decision. In any of these scenarios the decision is made in less than ideal circumstances and subsequently the problems are often compounded during implementation.

As 71% of companies in the study had an owner-manager who was educated to degree level or above, the respondent were also asked about the presence of ICT Professionals within the company. This question referred to the presence of those who had been formally educated in ICT and had achieved that through the completion of an ICT related degree. It also involved those who had achieved their knowledge of ICT through experience. The latter may show that there is an enthusiasm for ICT and therefore the presence of an ICT champion but may not necessarily indicate the correct skills for making ICT investment decisions. In 97% of the cases the decision-maker was the owner-manager and this may influence the adoption significantly. 24% of the respondents had an ICT related degree and overall 70% considered themselves to be an ICT Professional either by formal or informal education. This could lead to the conclusion that the ICT sector in the WM is very aware of the issues with adoption and well prepared to face them. Unfortunately, from other discussions and results reported here that does not appear to be the case. There is a distinct possibility that the ICT sector believes that their technology skills are sufficient but this study demonstrates that they are not. Also there are many who consider themselves to be ICT professionals who are self taught but where formal education is in other areas; this could indicate that businesses are launched in niche areas and when technology advances these very small companies are unprepared for diversification as they are not being able to plan for a new technology market.

4.4.4 Implementation issues

Respondents were asked if they had any implementation issues following the adoption. This question could indicate the level of in house knowledge and expertise and also give some indication of the organisational readiness. This is particularly pertinent given the

self taught nature of many micro-companies in ICT (Lefebvre and Lefebvre, 1996). Few choose external consultants to help but those that do often find that problems can occur as those involved do not understand the business. Love et. al. (2004) asserts that the majority of an adoption cost happens during implementation.

46% of micro-companies in the survey claimed to have no problems with implementation. However, discussion with the respondents regarding support needs (see below) often demonstrated that this was not the case. Figure 4.8 shows 53% of ICT micro-companies admit they have implementation problems of one type or another. A certain number of problems are often to be expected but as these companies are ICT companies they may have less than other sectors. It is however, of concern that problems are often due to lack of appropriate skills, which may be directly related to the fact that often their ICT skills and knowledge are gained through experience alone. Even within this sector issues were described as lack of technological know-how, data transfer issues, third-party support or system compatibility problems. Some of these would be problems for most companies but it was expected that ICT companies would not find technological know-how or third-party support to be too much of a problem since their ability should be inflated in comparison to other sectors.

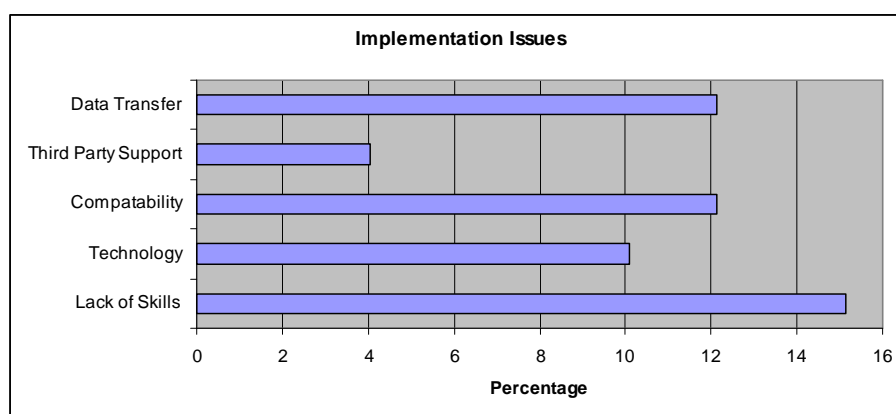


Figure 4.8: ICT Implementation Issues

Many companies in the survey went on to explain both the ICT implementation problems encountered and their support needs. This may suggest that their advisors (often the owner-manager themselves) do not update their knowledge regularly, or do not fully analyse business needs. Typical comments were:

“I advise people and solve their problems”

“We supply specialist mother boards; we would not expect to have problems we could not deal with!”

“I have a strong computing background and have worked on this type of work before so it’s not a problem.”

There were also some very honest answers:

“We had lack of skills and compatibility issues. Training is the biggest problem. Business is about inspiration and we want to find the easier ways to do things so it takes a lot of time and financial strain”

“Mainly lack of skills, there was a poor software delivery scope and the manuals were not very comprehensive”

“Lack of skills and lack of information I ended up having to ask other people who have come across these problems”

“Technology issues and transfer of data and when the machine was installed the trainer came in but was not very clear”

Results indicate that a large percentage of these companies suffer from data transfer limitations. These are mainly companies whose business involves a large amount of data, for example those which are involved in the media, graphics, and ICT training fields. Similarly, the study revealed that this is not only a problem which is common to less experienced micro-companies, but also a setback to micro-companies that have been operating for 20+ years. There is further contradiction as, when questioned, none of these companies had invested in acquiring knowledge to avoid such limitations, opting instead to invest in items such as laptops, hand held devices and servers to extend their operations rather than improve efficiency or effectiveness.

However, in this sample more of the small-sized companies acknowledged they had problems (73%) than micros and this may be of major concern to the ICT Cluster and would require further investigation as small companies often demonstrate the greatest potential for growth, having demonstrated that they are not 'life-style' companies. Almost 80% of the medium companies stated that they did not have any implementation issues. This may be as they have the resource to solve issues (see Appendix 11).

Although many of the micro-companies interviewed claimed that they had no implementation problems with their latest investment, when the same micro-companies were asked as a closing question for the AWM report to provide information regarding the areas in which their companies may need support, they provided detailed information which may contradict this and demonstrates that they may have significant issues. Although support needs often vary with the nature of business, this study classified 6 major areas. These are shown in Table 4.2.

Type of the required support	Description
Business Facilities	Loaning equipment for short term projects, access to a server, Hand held devices
Training	Training on specialised software such as E-commerce, CRM, PHP, MySQL
Human resources	Need students for short term contracts, to develop company websites, or other online systems
Consultancy	Advice on networking, business performance measurement, wireless, Innovation
Marketing	ICT for marketing purposes, ICT business marketing strategies
Funding	Help in financing business areas to allow growth

Table 4.2: Description of the support needed by SMEs

Only 22% of companies stated that they had no support needs at present. The remaining 78% of companies requiring support in the areas illustrated in Figure 4.9. The results confirm concerns that many ICT micro-companies need support in adopting and utilising new technologies for their business.

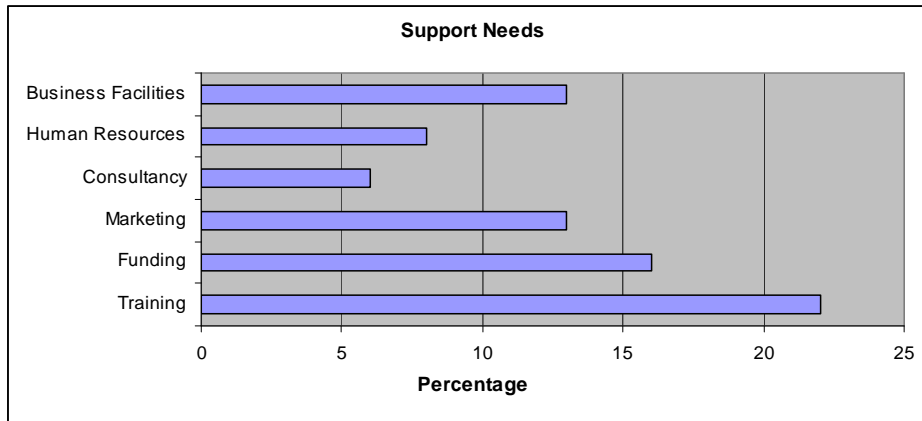


Figure 4.9: Type of support required by micro-companies

Of those who claimed to need support these results indicate that the areas that are of greatest concern to the ICT Cluster is training, especially in specific technology on an ad-hoc basis alongside trusted consultants for help and advise. The few small and medium companies interviewed had a very similar response although micro-companies seemed to have less need for consultants than the larger companies and none of the small or medium companies mentioned funding in this context (see Appendix 11).

Some of the comments regarding support which closed the interview:

Business Facilities

“If we can loan software or laptops or equipment when it is needed and when we have extra work to cope with”

“Contacts and facilities for business”

“We need IT equipment and especially storage systems”

“I would ask for help to be introduced to small business forums, small consultancy groups, etc.”

“Make us aware on what is happening for example exhibitions, or other business oriented issues.”

Consultancy

“I haven’t spoken to anyone about my IT needs. As a company we depend on the internet I will always be looking to improve my IT and moving with technology although I would need advice on the best equipment for my business.”

“Help to source Specific software e.g. Quick books / SAGE to work with SAMBA.”
Some business coaching. Consultancy and advice in different aspects of business including research and development and innovation.”

“Finding reliable suppliers who can install, configure and tailor”

“Consultancy which can help to move my business forward.”

Funding

“Funds to extend the research and development, on the best way to use the software which we have, and innovation in our business”

“To receive some funding to help us develop some new products.”

“Financial assistance to buy equipment such as a server”

“Identifying clients, self marketing, understanding what are the possible grants available.”

“Grant to travel overseas to seek opportunities and learn on how other people run businesses”

Human Resources

“May be students who can support us in bigger projects”

“We need someone who can when extra work comes in”.

“Marketing people, we are only two people working in the company, we have no time to do marketing”

“An extra pair of hands for special projects”

“We need extra resources - e.g. people to develop software straight away because our customers are unpredictable, they come with different needs, it is difficult to predict what will be needed and what expertise will be required.”

Marketing

“We are rich in IT skills but we need help with our sales and marketing and a large screened laptop for demos”

“We find ourselves targeting the wrong market, we need support on how we can target the correct market so that our business can grow.”

“Means to get very qualified employees who are ready to do marketing planning, forecasting, and tax benefits.”

“Help in marketing and sales”

“Marketing, promotions, rules and regulations take our time.”

Training

“Training in CRM/ERP package with open source. I would want to know how this can help my business, and how easily can it be deployed”

“Training on PRINCE ITIOL- IT project management”

“Training in PHP and MySQL, Additional help in designing PHP and My SQL web solutions, and we need assistance in marketing.”

“Advanced training in different languages for software development.”

“New technologies which need to be taught to save time SOAP for example for web and database applications.”

“We considered using Open Source but in the end we did not use it because the time to learn the skills is longer. Also, we can't pass that liability to customers, it costs more in the long run”

“Help to upgrade the computers to make them faster. We do not have time to do that.”

“Training on Open Source, CMS e-commerce.”

“Advice on how best to communicate between different computers in different offices, Training on LAN and servers.”

“Training on new technology to be aware of in present and future technology.”

“Training in languages such as Java.”

“Training courses related to new technology.”

“A facility which will help us to keep up to date and familiarise by ourselves. For example an online training facility.”

Of those who said 'None' very few commented:

None

“We need nothing; we are IT security specialists.”

“I wouldn't ask for any help, I would rather research for myself and do it the way I think is right.”

4.5 Perceived Value

Levy et. al. (2001a) found a link with e-business between perceived value and adoption as did Van Akkaren and Cavaye (1999b) and others researching in this area. In this study perceived value as opposed to any measurable element of value is used as it had been shown from the academic models discussed in previous chapters that the perception of the owner-manager of the value to the company of the purchase is paramount. This research then deliberately asked what those perceived values may be that influenced the purchases and what 'perceived' measures may be used to evaluate the success, thus demonstrating a potential link between pre and post-adoption perceived value.

4.5.1 Advantage over traditional methods

The first element of 'advantage over traditional methods' evolved from the influences on the purchase question when 'replacement for traditional methods of working' arose as a reply. In the final analysis here it will now be incorporated into the strategy category as it

was often observed as a major influence in pre-adoption decisions. It was, however, only *one* of the drivers in these results; although a major indicator in previous research (see chapter 2) other issues were found to be just as significant in this study. In the analysis for this study 'advantage over traditional methods' or 'replacement for traditional methods of working' is not treated as a separate element but incorporated into the reasons for the purchase (strategy) section (4.7). The rationale for this is that if a company sees the replacement of traditional ways of working as a worthwhile strategy for investment then that is the company's strategy. At the final evaluation stage this research identifies this element as an indicator of the company's view of their strategy for investment in technology.

To most micro-companies involved in this study, replacement for traditional methods of work involved investing in technology that could improve the efficiency and productivity and often also provide larger storage capacity. However, this is a smaller percentage than had been shown in previous ICT adoption models discussed in the literature review.

4.5.2 Perception of success

Perceptions of success link directly to the perceived benefits of the purchase as demonstrated in the work of many others including: Mehrtens et. al. (2001), Lefebvre and Lefebvre (1996), Thong and Yap (1995), Van Akkeren and Cavaye (1999b).

Respondents were asked the question: What did you see as the benefits of the purchase? The perception of the success of the micro-companies' investment was categorised into 6 issues as shown in table 4.2. This aspect of the research was measured qualitatively by offering the owner-managers an open question on their perception of benefits. This question is retrospective as they were asked to define the benefits that they were anticipating pre-purchase but the question was asked after the implementation phase. This then could significantly bias the outcome as it relies predominately on perception. The categories in table 4.3 emerged from the answers.

Benefits of purchases	Description
Efficiency	High productivity, effective business processing, improved working practices, ability to have control on their products
Marketing	Increased sales, good customer service, increased market share
Reliability	Reliable: access to hardware remotely, remote communication system, network system
Financial Considerations	Cost Savings, Increased Profit
Business Development	Technology advances, work professionally, gain more skills
Too early to judge	Has not completed its payback period

Table 4.3: The benefits of purchases

Although this aspect of ICT adoption cannot be measured quantitatively, a non-rigorous quantitative measure was used to understand how micro-companies perceive the success of their purchase. Many micro-companies believed that mobility provided them with an efficient means of doing business (Figure 4.10). These companies mainly invest in laptops, handheld devices, and servers (which can allow them to access information remotely) and other operational technology. 23% consider their purchases as 'essential to their business' (interpreted here as business development) as this may include new employees, training, etc. Marketing was only a consideration for 6% and this included better interface with the customer. Financial considerations were anticipated by 12% with increased turnover, more customers and cost savings were noted frequently within this category. Reliability was another reason stated by 14% which included hardware and software upgrades to increase security, storage, access, etc. 3% of micro-companies felt that they could not comment on this aspect as in their opinion their purchases had not completed the set payback period, which indicated that they may measure benefits. However, when questioned further none of the micro-companies employed any formal measurement techniques, instead their 'perception' of adoption success or 'instinct' was used.

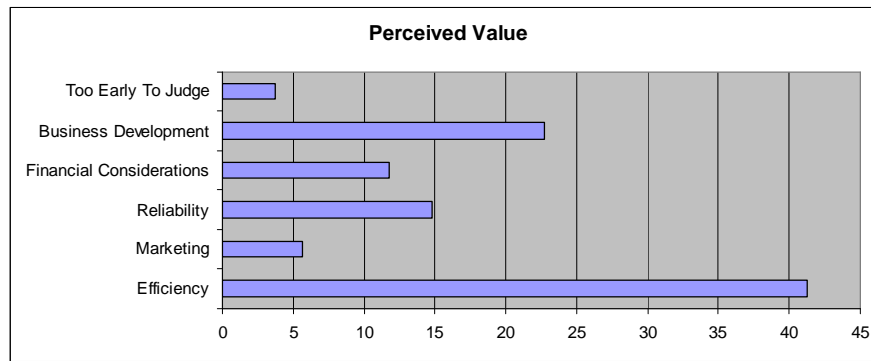


Figure 4.10: Perceived Value of Purchases

Some examples of their replies in each category:

Efficiency

“It’s more convenient for customers to use the internet and for us it is easier to configure their systems”

“Easier back up, Graphics package fireworks runs more quickly on this PC than the laptop, faster updates”

“Improved processing power and efficiency”

“I can work remotely”

“It enables us to work concurrently with different clients and operating systems”

“To keep up to date with the technology and be more efficient”

“Reducing the time taken for diagnosing customer problems”

“Gave us more customers, higher quality printing and improves production”

“It reduces the manual work, efficiency is increased”

“Portability”

“Working from home”

“It’s a very good system and being VOIP means we don’t need as many network outlets in the building as the phones and PCs can run from one”

“Mobility”

Marketing

“Prospective clients are able to clearly see our software“

“Wireless access allows me to show my customers my business online rather than from still screenshots. “

“Collaborations and centralisation“

“Having also purchased software tools our productivity is higher and sales increasing“

“Working from home the customers can call and be transferred to the right person“

Reliability

“Ability to recover during power cuts“

“We managed to have more control of the websites we produce and the software we deploy. “

“Now my business is doing well as my diary is always well organised“

“Stops the viruses, spams and it makes me more efficient“

“Added security, not losing data all the time as I used to“

Financial Considerations

“Saves time and money“

“More money coming in“

“It was a vital purchase for us to save the customers and finish the project“

“The project could be completed without that server. We needed to do this for our customers and to increase our turnover“

“Better customer services and increased profit“

Although few companies specifically mentioned the words ‘business development’ this was typical of the responses from 15% of companies:

Business Development

“We’ve been able to implement processes and develop marketing“

“Allows me to teach about that software, and enhance my skills“

“Better software development, re developments of software to customers“

“Financially it has not returned yet we should increase customers and this should be at the end of this year. In fact with the customers we have already we should be able to return our investment“

“It enabled me to obtain the contract“

“A growing workforce; we needed additional PCs are to ensure improved working processes that in turn will increase the profitability of the business“

“Improved working practices, productivity and technological advances“

“Allowed us to offer hosted services“

In spite of the explanation of the perception of benefits prior to purchase a few respondents still answered this question in a post-adoption sense although this represents less than 4%, although the one company who defined as a 3 year plan was quite an exception:

Too early to judge

“Haven't used them yet“

“It hasn't produced yet“

“Too soon to say if we will see any benefit - it is a 3 year plan“

Others simply stated that they considered the purchases as so ‘essential to their business’ that they remarked that without investing in IT, they would have been unable to run their business. This may be a reference to the infrastructure being seen as an underpinning support for the business and not as a strategic investment for growth. These companies, when questioned further gave replies which centred on: training, new employees and being seen as more professional, these were grouped into the category ‘Business Development’.

It appears that, predominately, the micro-companies in this survey are looking for efficiency gains when purchasing ICT and are rarely focused on any strategic needs which have often been the case in previous research with SMEs. Companies of this size might be expected to be even more focused on this.

4.5.3 Measures of success (post-evaluation)

This issue is included for a number of reasons:

- Van Akkeren and Cavaye (1999b) in their assessment of current models in the literature called for a model which included return on investment (ROI) and stated that small companies needed an immediate return.

- A recent review of the literature for this study revealed that the inclusion of ROI in a model as still not being fulfilled.
- Lefebvre and Lefebvre (1996) concluded that SMEs see financial concerns as much more important than anything else in ROI for small companies.
- Concern from the literature review that with no pre-evaluation and no post-evaluation measure micro-companies will continue to make decisions based on a poor assessment of their last adoption.

97% of micro-companies do not evaluate purchases or measure the success of those purchases in any tangible way. Instead they rely on 'gut instinct' to make a decision as to the implementation success of a purchase. Of the small percentage of micro-companies who did measure the adoption success a single factor was used to measure it, this was not an econometric measure but much more intangible. What measures of success has there been?

The measures used by these micro-companies were categorised as follows:

- *Profitability* – Any profit which the company makes as income out of the services it is providing to their customers is measured as a success
- *High levels of interest (more customers)* – some micro-companies measure their success quantitatively; by statistically counting the level of interest in their service offering, although this is often an estimated increase.
- *Cost Reduction* – If the purchase resulted in a reduction of costs for the same services.
- *Efficiency* – Using less time to provide their services
- *It Works* – Was considered a serious answer, as long as the technology is working then it must be a successful adoption.
- *None* – If there is no complaint from the customers which is related to the service provided by a micro SME, then the micro SME may believe

that that is a measure of its success. Some just said no we do not measure - *“what a stupid question!”*

This may indicate a gap in knowledge of micro-companies regarding some factors that are important in measuring adoption success as well as lack of understanding of business success. All of these factors can be measured but were not, which reduces the micro-companies’ ability to use historic data to inform future investment.

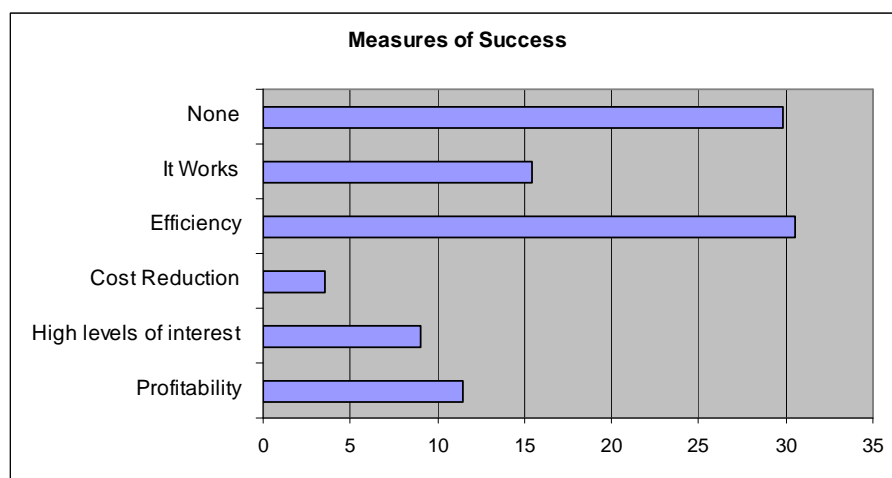


Figure 4.11: Measures of Adoption Success

Figure 4.11 indicates that a large percentage of answers related to the fact that there was either no measurement or simply the fact that ‘it works’ was enough. Efficiency is still high on the agenda in terms of adoption success for many micro-companies. This should be no surprise as companies strive to compete. Although their inability to see the need to measure any success in a quantifiable and repeatable way will stand in the way of improving the success rate of adoption.

Here are some comments from micro-companies in each of these categories:

Profitability

“We know it’s successful by how it helps us to develop new products and achieves sales of new products”

“Only profit is highlighted, there are no sophisticated metrics”

"By how much we sell or the profit we make"

"By how much money we get"

"The number of times, we make a profit"

"We do not have a system in place we just measure profitability"

"Turn over has increased"

"We don't measure; we look at the work which it does and if it's increased turnover"

"We have only just implemented; the only thing I can say is that we have more customers and more profit"

High levels of interest

"We have been able to offer additional services to clients"

"Repeat orders"

"Improved facilities and performance to the customer"

"Everyone who sees our construction software is very impressed"

"The amount of customers which will roll in by December we should be able to measure then"

"the size of market and financial profitability"

"The number of clients I have - The return on the investment"

"Glowing testimonials from customers."

"Employees feedback and customer feedback"

"People will phone more and more to ask if they can be trained on Vista, we will measure through the amount of people"

"Customer satisfaction"

Cost Reduction

"By cost, any cost saving"

"Reduction in communication costs"

"Revenue marketing vs costs"

Efficiency

"Time to deliver and operate has decreased"

"By how much we use it, we look at how efficient the items is working for us"

"Time spent to do the tasks, the speed"

"Its quicker"

"Increased the speed of development and hence the production"

"Productivity, speed which can help us write more programs"

“Subjective but it’s more efficient and much easier”

“Improved working processes; time saving and improved customer care”

“No metric, just that things are done quicker”

“Speed in processing data and downloads are much quicker as well”

“Observation, is it efficient to finish the job, not easy to do”

“Performance, we measure how quickly the item performs as compared to the older equipment it replaced”

“Success is measured by web site availability and database speed”

“Success was measured by ease of management and recoverability”

It Works

“I don’t. It works”

“It hasn’t gone wrong yet”

“It works or it doesn’t you can’t measure work”

“If it’s doing its job we do not measure”

“It does what it’s supposed to do “

“It doesn’t go down. If it does what it is meant to do than it is a success”

None

“It is a bit subjective”

“I doubt but I should”

“I don’t measure”

“It can’t be measured”

“None, just daily use”

“It is very difficult to measure these things”

The survey then asked ‘If you did not measure the success can you explain why not?’.

The majority of respondents simply said “no need to” or “there was no time” or “I don’t have the resources”. Some typical replies were:

“It works for me so I don’t need to measure”

“I am on my own”

“The success was not measured quantitatively because of lack of time and resources”

“I was on a course”

“It serves it’s purpose as is”

This is a major concern as no measurement means there can be no tangible knowledge of success. Respondents were also asked if there had been any other comments from either internal to the business or externally. Some examples of the replies are:

- “Customers love the new service provided as a result of the purchase our software has been recommended to other construction companies”
- “It looks wonderful to customers but the battery lasts 55 minutes, for development work on the train it’s hopeless”
- “Partners are excited and working hard to expand the market”
- “Employees are happy using the latest hardware. Customers happy as the hardware handles the load they want”
- “Employees happy, customers have better reliability I think that is good”
- “Customers like the benefit of seeing my product working during the meeting”
- “Within the company it has been noticed that efficiency has been increased”
- “Yes internally a distinct improvement in communications; also the ability to work remotely”
- “I am happy as I am not wasting money to employ more people”
- “Both employees and customers were unhappy before as jobs were delayed”

Companies were also asked “Did you allocate a timescale to the success” and of the respondents 56% said they had not, mainly as they had anticipated immediate results or there is “no point”. Of the remaining 44% the responses were:

Timescale	Immediate	<1 week	<1 month	<3 months	<1 year	<2 years	> 2 years
% responses	10	16	11	17	24	19	3

Table 4.4: Timescale for Benefits realisation

Table 4.4 indicates that the majority of companies expected either an immediate result or a result within 12 months. However, there is no tangible measurement and nothing is tied into the investment in terms of planning or strategy.

4.6 External Pressures

The literature review highlighted the previous studies which have found external pressure exerted by customers and suppliers at work in the adoption scenario (Grandon and Pearson, 2004; Merhten et. al., 2001; Van Akkeren and Cavaye, 1999; Nathalie et.al., 1998) this was therefore imperative as an issue to explore. The exploration of this element would both verify the previous research and validate the findings in this study. Companies were therefore asked two questions with regard to this element: Was there any external pressure to buy and if so who or what? They were also given examples such as technological advances, pressure from a customer. They were also asked: What were the main influences in this purchase? if they asked for further explanation they were asked Why did you buy? And given examples e.g. customer /supplier? replacement / upgrade for older equipment?, replacement for traditional methods of work, etc?

This question may highlight external pressure as in previous models or even lack of skills which would relate again to organisational; readiness.

4.6.1 Identification of external pressures in the decision making process

46% of micro-companies believe that there is no external pressure to invest in technology (Figure 4.12). This may suggest that these companies are investing in ICT of their own volition and are coping well with technological advances and trends. However, evidence in this study demonstrates that this is not the case and they are often led by customers, technology advances and competitors but do not recognise this as a pressure. Results presented previously also indicate that a large number of companies have no plans to invest in the latest technologies unless compelled to do so by customers. It is unclear what this lack of awareness of external pressures indicates. Many companies are simply reactive to customers needs but do not recognise that this is an external pressure. Section 4.11.2 provided additional findings on this issue, indicating that a large number of micro-companies have implementation problems mainly due to lack of skills,

technological know-how, data transfer issues, third party support and compatibility yet again indicating that they are unprepared for these pressures to invest.

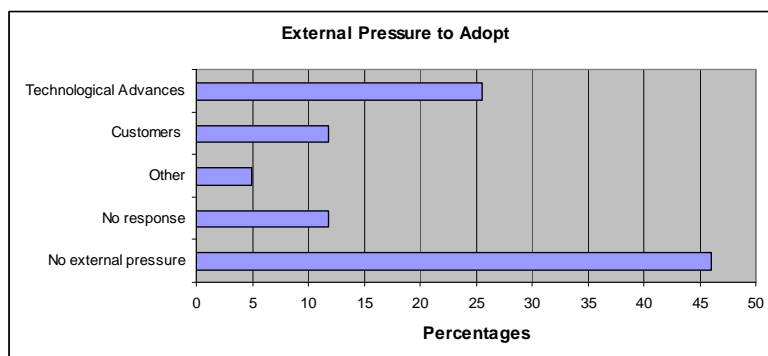


Figure 4.12: External pressures to adopt

12% did not respond to this in any useable way and this could be interpreted as not acknowledging any external pressure, discussing once more the pressures they had responded to in the earlier question regarding internal pressure. Although 26% in this sector appear to be investing to keep abreast of technological advances, the general impression is that these companies are not really focused on external markets but on one set of customers. Many of those investing for technology advances also mentioned that these were in response to customer needs. Here are a few typical responses from the 14% of respondents who felt that customers were the main pressure:

- “Our customers expect us to have experience with the software”
- “Not directly as my customers did not know what to ask for. Indirectly as the solutions chosen are to enable us to meet changing demands”
- “Because clients wanted us to buy the software and we need to keep up”
- “Pressure from the customers I have to do work for the BBC”
- “Fear of losing the business, so we kept moving and getting new technologies so that we can give customer robust solutions”
- “Technological and marketing advances to create a niche”
- “Technological advances and pressure from a customer. You will fall behind if you don't keep up with the technology. It was also to keep our

customers.”

“I need to upgrade because of security reasons.”

“Our customers expect us to have experience with these EGPs.”

If the majority of micro-companies do not recognise external pressures, does this indicate that they have enough customers and are not worried about the competition? It could also indicate that their customers have limited technological needs. With the variety of implementation problems reported it would appear that many adoption issues are related to general problems in SMEs of lack of business acumen which has also been identified in this sector (Sheppard and Hooton, 2007). How do these companies satisfy their customers and at the same time feel that there is no external pressure? The evidence may indicate that responding to customers, new legislation, etc. although a reactive rather than proactive response is simply not recognised as external pressure and merely a part of the ever changing landscape for micro-companies. Education in business awareness as well as the potential of technology to address business issues may be a major contributor in adoption success. Indeed, education could well be the key to these issues.

4.6.2 Influences on the purchase.

This element was chosen to capture those influences that may not have already been discussed with the respondent. Especially as most were the owner-managers and Merhten (2001) states that often they are champions of technology themselves. It will also help to establish where replacement for traditional methods was placed by these companies as this is often cited as present in the adoption decision (Bradford and Florin, 2003). Many influences may be related to the social capital that the owner-manager has access to and the elements identified in internal or external pressure are also impacting here (De Clercq and Arenius, 2003). Other influences such as cultural, political and personal biases may also be exposed (Remenyi and Lubbe, 1999).

Often the main influence of a company decision to invest in infrastructure is an indication of either their attitude towards the business or their attitude towards technology. Upgrading the hardware or software, the price of the equipment and its performance, as a replacement for their previous methods of work which they may or may not have regarding as traditional, the customers, technology advances and the investment being seen as 'essential' were the interpreted categories from this qualitative question (Figure 4.13). When explored further 'essential' was most often an inference to an increase in employees or it was necessary to fulfil a customer request.

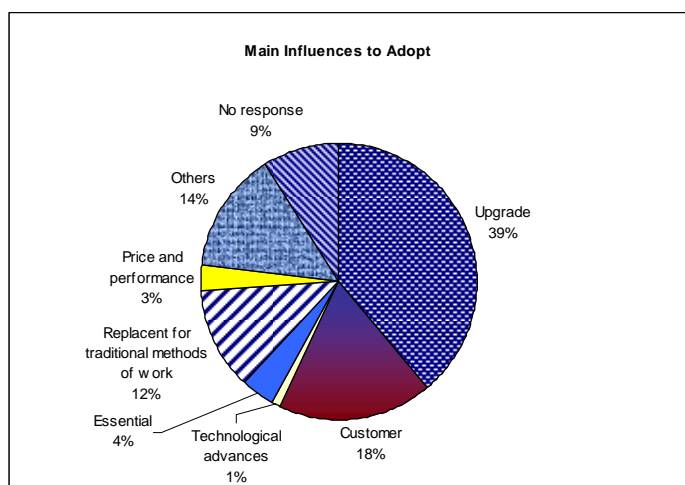


Figure 4.13: Influences on adoption for micro-companies

39% had invested in upgrades and these were seen as necessary as micro-companies are often catching-up with the technologies to stay competitive and may be struggling to stay ahead in the technology stakes. Very few micro-companies recognised the need to progress using new technological advances which could indicate that the markets they operate in are relatively stable (unlikely in this sector) or that they are unaware of technological advances outside their field of expertise. Typical statements from those who believed that they were 'keeping up with technology':

“It is industrial leading software so we need to know how it works”

“We have to keep ahead of technology”

“That is the way the market will grow and we will make money out of it, we had to learn and wait for the opportunity”

“The capability and speed of the processor is much faster and bigger hard drive

“we need to have a latest software”

“We also want to install and support this product with other clients so we wanted first hand experience of using it”

Only 1% invested due to technological advances; those companies that do intend to keep ahead of technology advances do so in order that they are better able to advise and give better services to their customers. This may indicate that most micro-companies invest in ICT only when they are under pressure from a customer. This is particularly relevant as many cited ‘upgrades’ as a main influence, but there is a possibility that some of these were also upgrading systems to satisfy customer requirements.

Customers accounted for 18% of investment decisions for micro-companies. As customers invest in new technologies ICT companies are forced to follow the trend and also invest in the latest technologies. They have to not only invest in their own infrastructure and use it in a way that gives them a competitive edge; but also to understand the technology to provide high quality services and products. Some customers provide the companies with specifications for the business solutions they require. It is then a decision by the micro-company will be made as to which new technologies will enable them to provide these solutions. Examples of remarks about this are:

“Both customer and suppliers because I wanted to work with Local Authorities”

“Needed for our clients and also needed a reliable system”

“We work closely with customers - know what they want, and what they need so we need to provide them with a better solution”

“Customer influence and to improve our response to customers”
“The service, which we give our customer, should be of high reliability”
“Demands of customers added to the necessity”
“The need to produce drawings which are acceptable to customer”
“The NHS tend to buy CISCO”
“We have to do it because the business will suffer if we don't, the industry needs us, customer pressure”
“Customer, to keep them and to get more”

3% of micro-companies decided to invest in technology because the price of that particular technology has reduced significantly making it affordable, whilst the expectation of the performance of the equipment is now much higher.

“Price/Performance and the support being local”
“Price and performance were the main influences”
“It has increased performance”
“Price, reliable supplier”
“Performance by web hosting provider”

The customers who discussed the adoption as a replacement for traditional methods were not as many as in previous studies at only 12%. This was anticipated as those companies who a few years ago were converting from paper based systems to technology have made that transfer and are now upgrading to either accommodate and expanding client base, have more efficient systems or as these companies often use technology that serves their customer base and fulfils their own needs they are merely keeping up to date. Those who mentioned that it was a replacement for traditional methods were normally referring to the fact that this technology meant that procedures were anticipated to change.

“Replacement of our more traditional methods of work”
“Needed desk top with more space and more capability to run graphics”
“Replacement and upgrade of existing server; also an upgrade was

crucial of our software to improve our working processes.”

“Replacement for our traditional methods and higher specification”

It is probably not appropriate to even interpret these responses in the more classically accepted sense of replacement for traditional methods of work. It became apparent that the majority (57%) were investing to merely upgrade or under pressure from customers. However, it was evident from the responses that this was an anticipated benefit pre-adoption. The upgrades were often a direct result of pressure from customers too. Only 1% were investing for the sake of technological advances are these the innovative companies within the sector? Very few differences were demonstrated between small and micro-companies in this area. The major shift seemed to happen with medium companies who spent 66% of their investments on upgrades (see Appendix 11).

4.7 Strategy

Aligning technology with the business strategy is a matter which is increasingly being recognised by academics, industrialists and practitioners around the globe but is not necessarily translating to the SME community. For example a recent study of Canadian SMEs highlighted the need to integrate technology initiatives into business-planning processes (Astle, 2007):

‘when an SME says it aligns its ICT purchases with business strategies, the business strategies are sell, reduce costs and be faster than the competition. They generally don’t have the experience to take their ICT investment to the next level’

The research for this thesis identified elements from the strategy category in other models. Three issues were identified: the level of decision making undertaken for ICT investments (Farbey et.al., 1993; Anderson, 2001; Lefebvre and Lefebvre, 1996; Levy and Powell, 2005), the reason for the purchase was identified as another way of capturing strategic intent as in Levy et.al. (1998) and the significance of the purchase which may

indicate attitudes, bias and culture towards the adoption by the owner-manager or others within the organisation particularly as the questions were left open to their definition.

4.7.1 The level of decision making undertaken

In almost all cases micro-company owner-managers when asked who made the final decision about what to purchase the reply was 'me'. This was anticipated given that the literature review identified that many micro-companies have not yet reached the stage of maturity where decision-making is devolved (Levy and Powell, 2005) and this impacts on the decision that is made and generally on the strategy adopted by the company. There is a dependence on the experience and/or education of that individual as the owner-manager. In this study 98% claimed to have made the decision themselves. The remaining 2% either asked another employee or a university department/consultant. For each item listed the companies were asked both 'Who Bought it?' and 'Who advised them?'. This study therefore validates that of previous researchers in that micro-companies have an over dependence on the owner-manager and his knowledge or lack of knowledge is the defining element in many of the decisions.

4.7.2 Reason for purchase

Most micro-companies interpreted the reason for the purchase in an identical manner to their approach to questions regarding influences on the purchase both internal and external. This research would therefore assume that this element of the proposed model *may* have been unnecessary as reasons can be identified through the pressure exerted on micro-companies to purchase.

This could indicate that the knowledge shown towards business development and strategy in these companies is limited. This would support previous work in this area which was identified in the literature review. There seems ample evidence now given the maturity of the subject area to instigate further investigation into the area of educating

micro-company owner-managers regarding why they purchase and what pressures are at work in their environment. Typical comments from the companies were:

"Easier printing"	"New employees"
"Improve efficiency"	"Growth of the company"
"Efficiency and mobility"	"Communication enhancement"
"Business generation"	"Enhance Service Provision"
"Create awareness of company"	"Hardware underperforming"
"Driven by my customers"	"Moving premises"
"Administration purposes"	"Improve response times"
"Customer driven"	"Upgrade required by software provider"
"Greater Speed"	"Replacements"
"Upgrade was required by our software provider"	"Failure of existing one"

These comments identify that the main reasons once again are either efficiency gains or customers. This may leave an inherent problem when that efficiency is not measured either before or after investment. There appears to be a developing pattern within the study which points this way.

4.7.3 Significance of purchase

For most micro-companies ICT investment is seen as significant and ICT micro-companies are no different as most ICT investment involves relatively large cost and often high risk. Most micro-companies do not have a business strategy or ICT strategy and the answer to the open question regarding the significance of the investment may indicate their attitude towards strategy per se. Often the significance of an investment is interpreted by the owner-manager and can indicate their personal attitude towards technology adoption.

Companies were asked what the last three purchases they had made were and then asked to define which was the most significant of these purchases and why they felt it was the most significant. They were given a limited number of options to choose followed

by an option to select their own. These options were: Technology Impact, Financial Impact, Business Impact, Process Impact or Other (please explain). The reasoning for this was drawn from the literature discussion in chapter 2 and interpreted as

- Financial impact may indicate that the investment is viewed as a cost.
- Process impact may indicate their lack of skill at business process mapping or attempting to adopt technology without underlying changes to processes.
- Technological impact may indicate a major upgrade with compatibility, data transfer implications etc. or simply lack of ICT skills.
- Business Impact may be broken into several areas and those that indicated this were asked to expand their answer and these answers were then categorised

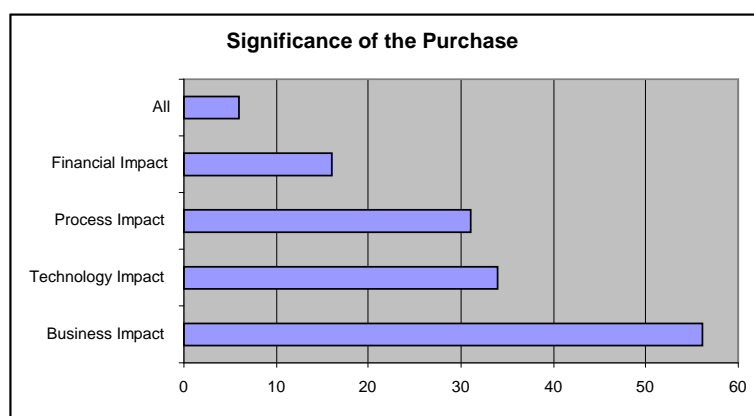


Figure 4.14: Significance of the purchase for micro-companies.

Figure 4:14 illustrates that 53% of micro-companies considered their ICT investment to have a significant business impact. There were a significant number of micro-companies in this category who believed that investing in technology provided them with speed and efficiency in producing their products and other services for customers. Most micro-

companies who answered this stated that the investment would provide their business with:

- better communication and customer demonstration facilities
- enhanced efficiency
- a wider range of services
- speed in producing software and solving customer business problems
- equipment that was viewed as fundamental to running the business or providing services.

Replying with similar statements to those given regarding the benefits of the purchase indicating that there may be a perceived link between the benefits and the significance to a micro-company.

The majority of companies felt that the umbrella term 'business impact' covered why that particular purchase was significant. However, when the answers are analysed it seems that there is some misunderstanding of what would be a process impact and what would be a business impact. Examples of typical answers were:

"Business Impact - To give our business a shopping window via the Internet"

"Business Impact, used for communication/presentations/ research/operations and finance"

"It was essential to implement and to give a large financial profit"

"A 21st Century way of communicating through the WWW with video streaming technologies"

"Technology Impact as we needed the latest PC with the application for doing our jobs"

"Technology Impact, Modern Technology allows remote management"

"Financial and Process Impact, most expensive, had to allow us to support our customers"

“Financial and Process impact, were expensive but we use them a lot to generate business”

“Process Impact, to write software for handheld devices and also speed is required for solving customer problems”

“Process Impact, it takes a third of the time to do things now”

It seems even from these comments that customer influence is a strong driver once more. 32% of micro-companies considered technological impact to be a significant influence on their investment many of these were companies who worked as consultants, software designers and/or developers. These types of companies needed to stay ahead by investing in the latest technology in order to learn and understand it before they could advise their customers. It could also indicate their concerns about technology knowledge and skills.

This rest of this chapter explores the possibility of any linkages between some of the elements within the suggested model. A number of assumptions have been made within this and these will be addressed alongside each of the areas. If any relationship can be found then this would show that a possible correlation may be at work within the model and may identify potential issues that micro-companies could be supported to resolve.

4.8 Cross Correlation of Firm Issues

‘I have been working for 10 years now in this specialised business, I do not have many competitors because it is a very specialised area. I am nearly at the age of retirement, and the main problem with that is that this business does not have anything which I can sell as a company (e.g. assets) apart from my skills in the area, there is nothing else. However, in order for me to continue to earn money for my retirement, I have decided to reduce my customers. I would not want to employ anybody because it is hard dealing with people, and also, I am not used to working with others. I am planning to retire in two years time, and I think I will be able to sell the company, at least in terms of skills by working for a customer part time.’

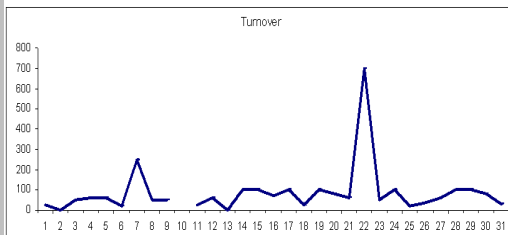
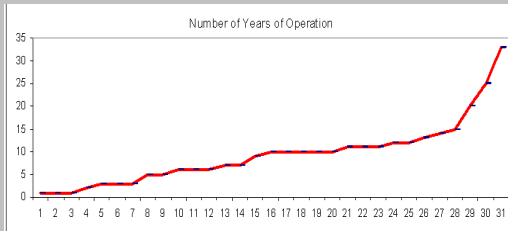
This is a strong message from one of the micro-companies interviewed demonstrating that there is little chance of full retirement enjoying the profits generated over the years. Hence, number of employees, the approximate turnover, and the number of years of

operation were examined together to see if it might reveal any concerns surrounding this sector in terms of growth. Although this is not the key issue for adoption success, research suggests that growth can indicate investment, both in terms of younger companies investing in technology and growing companies expanding infrastructure (Storey, 1994; Levy and Powell, 2005). The three elements of age, turnover and size are examined in relation to each other with some micro-categories reported separately as there may be a link between size of company, turnover and number of employees, etc.

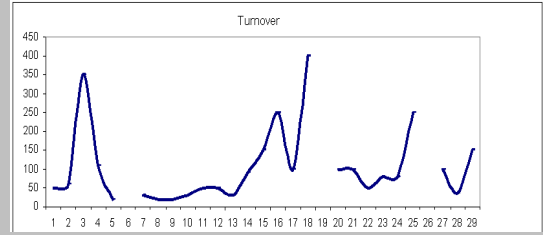
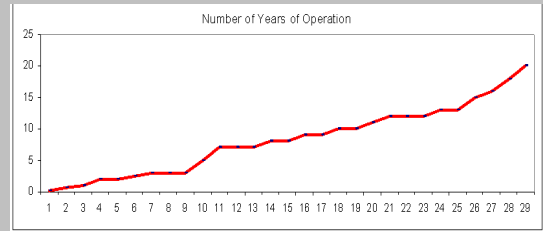
The study covered a variety of micro-companies, in terms of employees (1 to 10), years of operation (0 to many) and varying amount of turnovers. The comparison of the three factors is represented in Figure 4.15 in which companies with 1 to 10 employees are independently examined and graphically represented.

All categories of micro-companies show a random rise and fall of business turnover at different times during their history. This may indicate how competitive the business environment is for ICT companies. This analysis could indicate that greater emphasis needs to be placed on helping companies' understand why turnover does not increase as employees and years of operation do. The adoption of new technology is paramount to business growth and especially in the ICT sector as in order to grow companies need more infrastructure and ICT companies in particular need to stay ahead with technology developments. Further investigation would be recommended regarding the reasons for the rise and fall in turnover of micro-companies in the ICT sector. However, this research does not extend to that discussion. These issues are flagged as the sporadic growth of these companies may be directly related to their ability to successfully adopt technology.

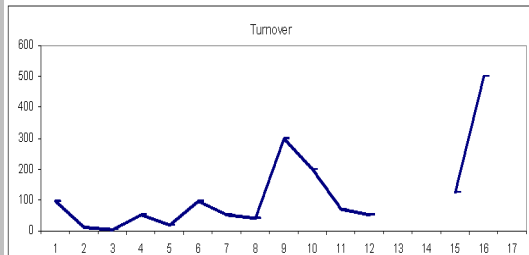
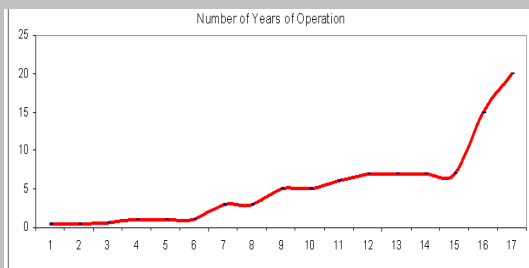
1 Employee



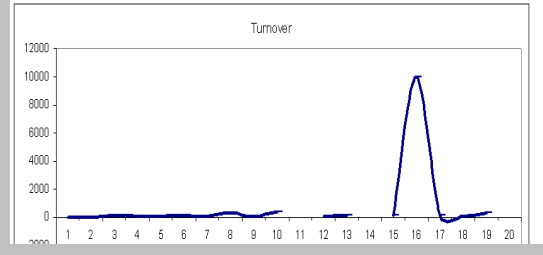
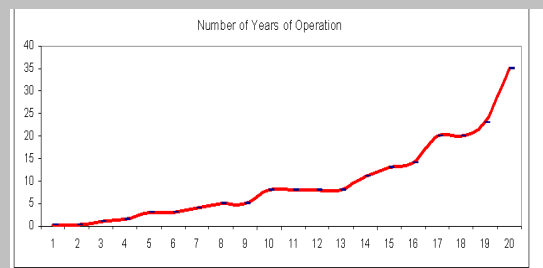
2 Employees



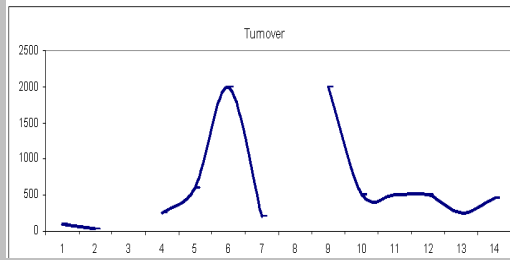
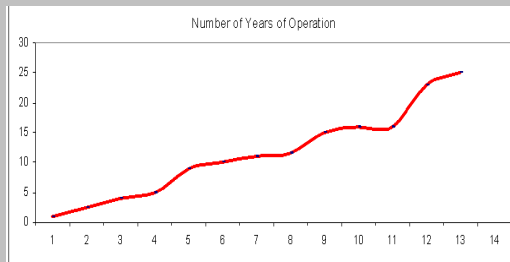
3 Employees



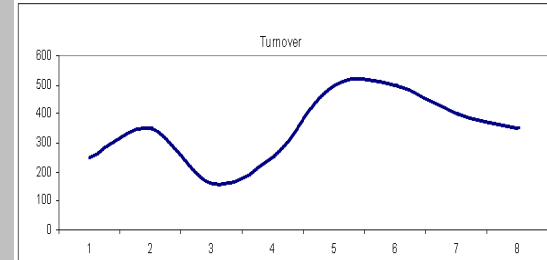
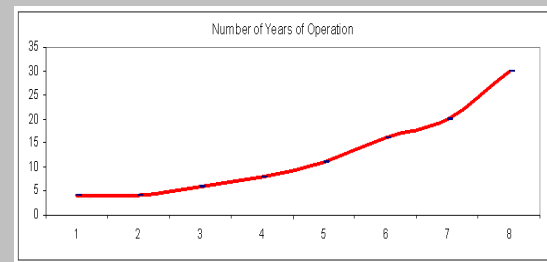
4 Employees



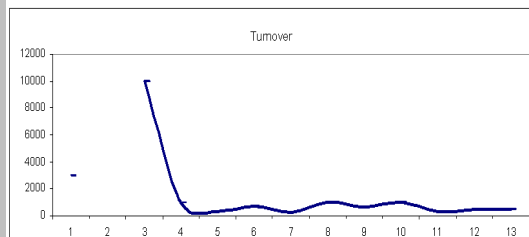
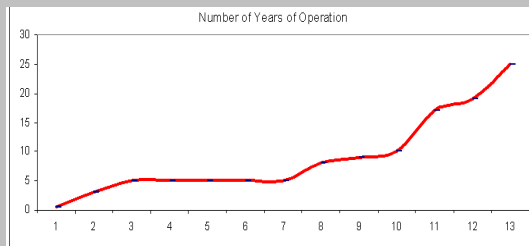
5 Employees



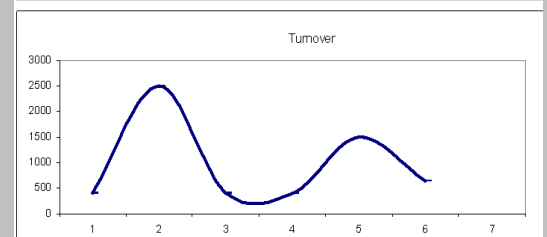
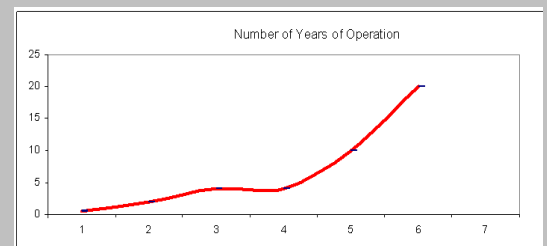
6 Employees



7-8-9 Employees



10 Employees



*Note that the turnover is in thousands of pounds.

Figure 4.15: Relationship between number of employees, turnover and the years of operation for micro-companies.

This sporadic growth could also be related to other factors including the influence of turnover, increased competition, changes in staffing levels and indeed needs further investigation (see section 5.5). The broken line in some graphs is an indication that some companies refused to reveal their turnover. However, in general figure 4.15 shows a

rugged graphical representation of the three factors and although there are exceptional cases in turnovers of micro-companies with different years of their operation, it suggests that as the number of years of operation increases, it does not necessarily guarantee that turnover increases. This is a matter of concern as it would be expected that more experienced micro-companies would understand their markets and their competitors, and use that information to develop and grow. It may also indicate that the market in which they operate is very volatile. In terms of adoption if turnover (and resource) is an issue then companies will only invest reluctantly when it is perhaps instigated by a customer.

4.9 The Effect of Education and Skills

This section examines the effect of education and skills on the adoption situation and therefore the respondents are divided into categories according to their education and/or skills. It was recorded if the respondent had a degree and if so what area that degree was in. They were also asked if they considered themselves to be an ICT professional and if their knowledge and skills was gained mainly through informal methods. As often an ICT champion may be self taught but will have a huge impact on the success of an adoption. In this section education and skills are used as the constant against a number of other issues, including turnover, significance of the purchase, internal pressure, perceived value and measures of success.

4.9.1 Education and Turnover

Analysis was carried out to understand if there was any correlation between the turnovers of the micro-companies who claim to have an ICT professional, those who had at least a first degree, those whose degree was ICT related and those who no specialist knowledge.

Figure 4.16 indicates that there may be a correlation between those with an education in ICT and turnover. However this is not as strong as the correlation between owner-managers who claim to be an ICT Professional either acquired formally or through experience, as compared to those who do not (Figure 4.18). This is particularly pronounced in the category £51k to £250k. Although addressing this factor alone is not enough for the SMEs to become competitive; as companies need other business aspects addressed too, such as using their ICT infrastructure to *support* the business. The graph does, however, support the findings from the literature review that an owner-manager with a formal education enables a more successful business when success equals turnover (Figure 4.17).

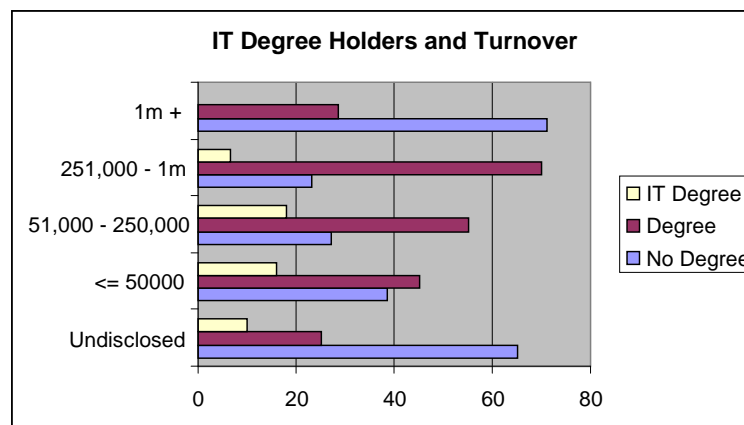


Figure 4.16: The relationship between ICT degree and turnover

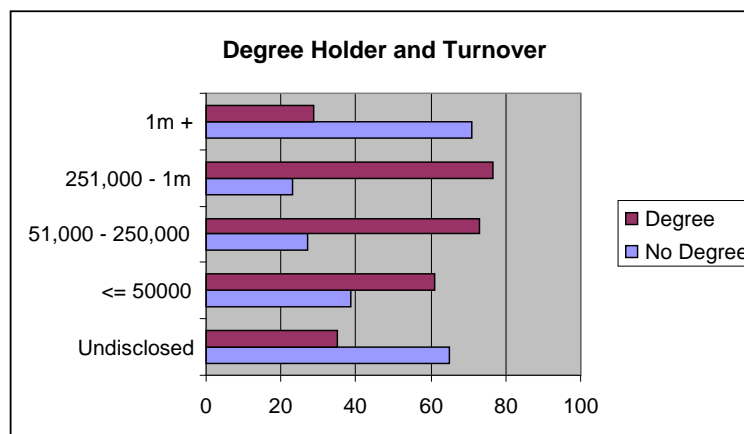


Figure 4.17: The relationship between degree (any type) and turnover

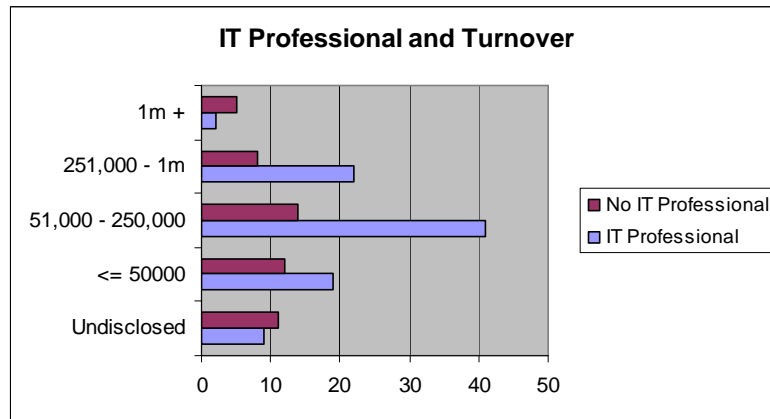


Figure 4.18: The relationship between ICT Professional (formal and informal) and turnover

Another interesting finding is that at the £1m plus turnover having a degree of any type seems to become irrelevant. There is no indication of why that might be and perhaps would be an area worth pursuing beyond this work. In summary, there is some indication that companies who claim to have ICT professional skills in house have a higher turnover than those companies who have no ICT professional. This is not clear cut as there are many other factors too, including the sub-sector that these companies operate in since some ICT companies have very large turnovers in comparison to number of employees for example software developers with very high value products.

4.9.2 Education and significance of the purchase

Once again education was used to examine if a greater significance was placed in certain areas when an owner-manager was educated to degree, or if that degree was in ICT or if they considered themselves to be an ICT professional (figure 4.19, figure 4.20 and figure 4.21). The results indicate that the education of the owner-manager may make them more able to make decisions based on knowledge of their business, the technology or even the environment within which they worked (Storey, 1994).

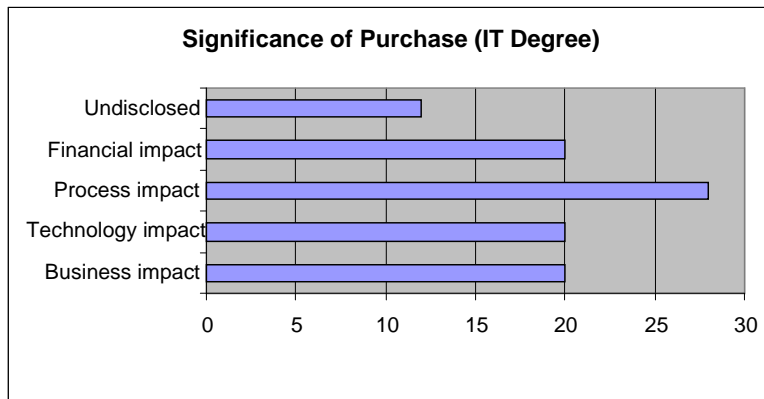


Figure 4.19: Significance of ICT investment (IT Degree)

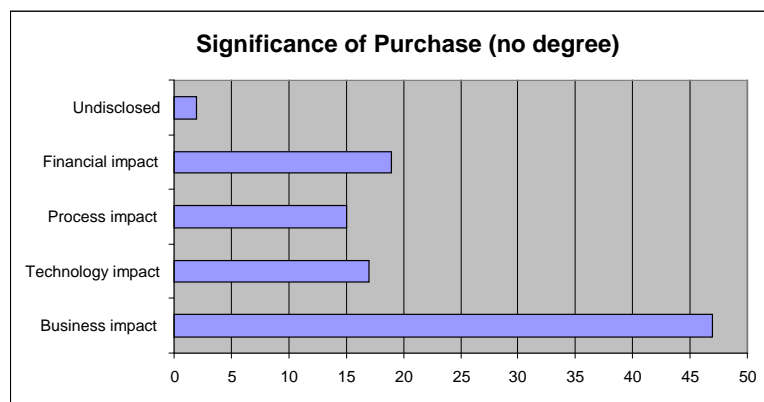


Figure 4.20: Significance of ICT investment (no degree)

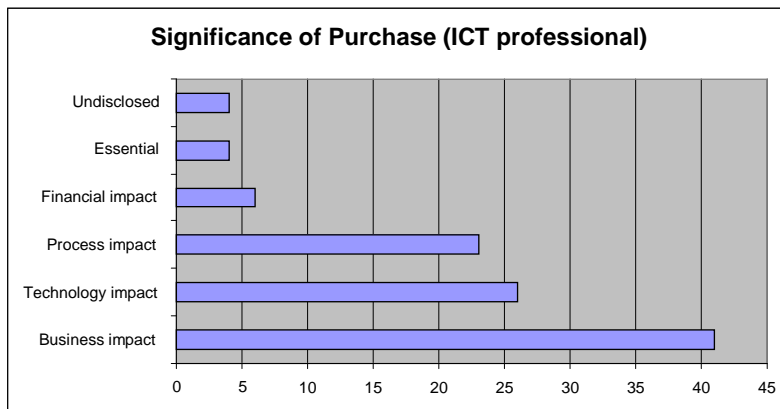


Figure 4.21: Significance of ICT investment (ICT professional)

Examining the outcome determines that the majority of respondents in the full survey indicated that business impact was the most significant influence upon their investment (section 4.7.3). However, when these results are broken down into the 3 areas of interest

here it can be clearly identified that when an owner-manager has a non-IT degree or considered themselves to be an ICT Professional they still place business Impact at the fore. However, when the owner-managers degree is in the field of ICT there is a much more even spread of results and no real emphasis on any particular category. Although there does appear to be a recognition amongst this group of process impact that is not present in the other graphs. This could be interpreted not as the ICT degree holders being educated in the application of ICT but the other categories show a lack of understanding of the other areas of significance for example not being able to define process impact with everything construed as 'essential to the business'.

4.9.3 Education and internal pressure

This section examines the relationship between perceived internal pressures to adopt and education. This was in order to explore several of the softer pressures in the environment were impacted by the owner-manager education.

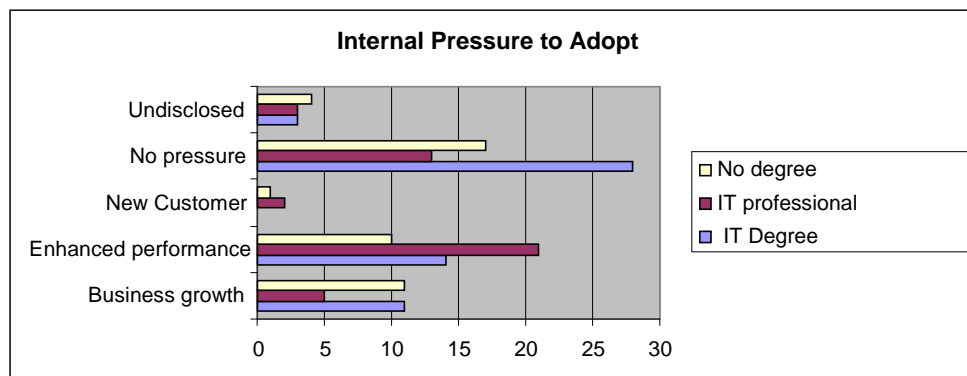


Figure 4.22: Internal pressure to adopt comparative to owner-manager education.

39% of companies in the study did not feel that any pressure was exerted internally and this is discussed above. However, figure 4.22 would appear to indicate that 27% of companies which have an owner-manager who is formally educated in ICT felt no internal pressure to adopt which was significantly higher than those without a degree. None of those with an ICT degree also felt the need to use technology to attract new customers. There was also generally less need to adopt for enhanced performance in comparison

with those companies with no professional input or input from a non-formally educated professional. There could be many variables in this process but it could indicate that having a thorough grounding in ICT education helped with the evaluation of technology and the realisation that ICT could be used for business growth. It could also be construed that many educated in ICT are not necessarily aware of the need to use technology to attract new customers. Those who were considered ICT professionals felt that the main internal pressure was increased efficiency.

The interesting result is that both those with a degree and those with an ICT degree thought that business growth had been an internal pressure whereas the ICT professionals did not feel this. Does this reflect the views of the ICT champion who is focused on technology and not the business?

4.9.4 Education and perceived benefits

This analysis was aimed at evaluating the effect of education upon the owner-managers perception of the value of the adoption to their company. Figure 4.23 demonstrates perceived value measured against the percentage of owner-managers who selected this element as being their perception of the value of adoption. In all cases the respondents felt that improved efficiency was an important element. The details of the meaning of business development are discussed in section 4.5. However, it seems that this was also a significant perceived value for most of the respondents.

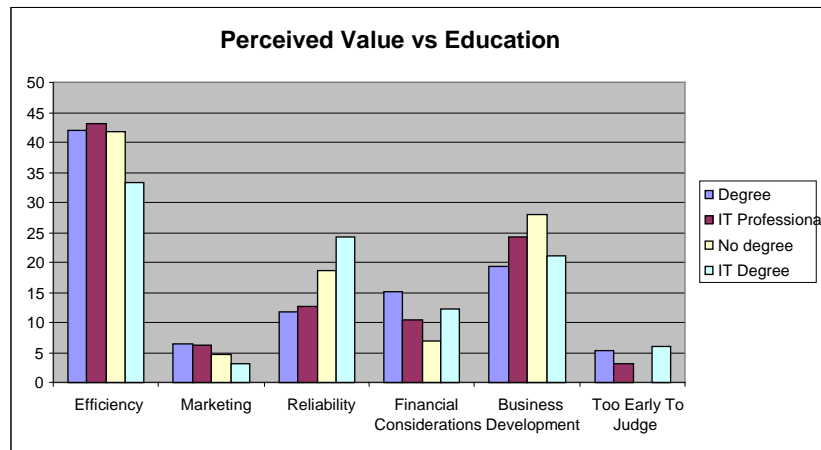


Figure 4.23: Perceived Value of Purchases compared with Education in micro-companies.

There does not however, appear to be any *significant* correlation between owner-managers who classified them selves as ICT Professionals, those who had a formal ICT degree or those who had no degree in terms of their perceived value (Figure 4.23). Although the emphasis on reliability may show that those with an ICT degree concentrate on the technical infrastructure more than the business benefits, this is statistically marginal but may be considered as significant when taken in conjunction with other factors. For example although efficiency was seen as important to all groups, those with an ICT degree seemed to perceive this as of less value. Marketing seemed to be perceived as of little value by those with an ICT degree and financial considerations were important to those with a non-IT degree. Overall, micro-companies appear to understand that there are benefits attached to investment in ICT. However there does appear to be a link between education and the perceived value of an adoption although this effect is marginal.

4.9.5 Education and Measures of Success

If education has a small but significant impact on perceived value does this change when we consider post-adoption measures of success. It might be expected that education would again play a part in the definition and measure of the success of that investment.

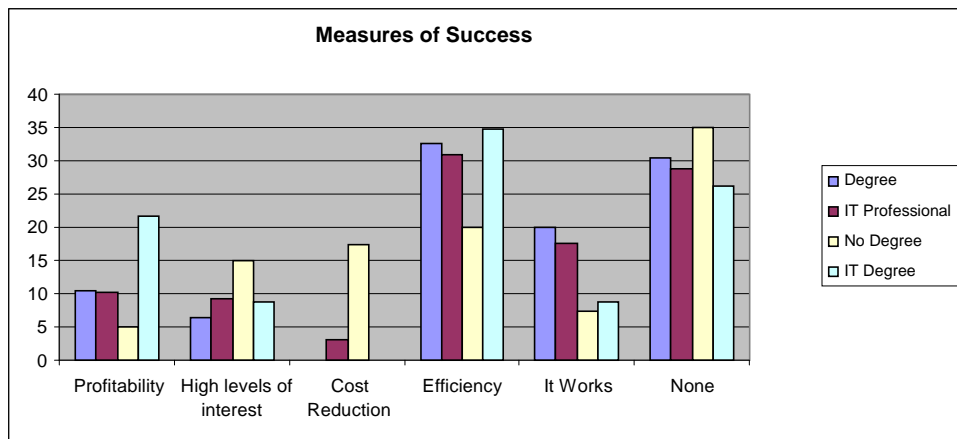


Figure 4.24: Measures of success compared with Education in micro-companies.

Figure 4.24 appears to show that there is a change in emphasis when the education of the owner-manager is taken into account. Although none of the respondents claimed to have any metrics as far as measurement was concerned, all used 'instinct' or 'my experience' to judge the success. Nonetheless, again efficiency was a very large category within this issue. Although many said that they did not measure at all. Those with an ICT degree were more likely in this case to look for either profitability or efficiency as a measure of success. Of those with no degree it can be seen from figure 4.24 that efficiency, cost reduction and high levels of interest from customers etc. (marketing) were the assumed measure of success. Many of those with an ICT degree expected a gain in reliability of systems at the pre-adoption stage, when asked about the post-adoption measures the closest that this study could relate to that was a group who simply felt that if 'it worked' it was a success. Business Development had been important prior to the adoption but following the adoption profitability was a more likely measure.

Overall it seems that education may not have a major impact post-adoption on whether a company actually measures the success. It may be possible that micro businesses have so many issues with implementation that they are spending so much time making sure that the adoption works and 'beds in' with their day to day work, that they do not spend

anytime reflecting on the success. Indeed many had not even thought about this issues until asked as part of this study.

4.9.6 Education, perceived value and measures of success

It would be appropriate for a micro-company which has an expectation of the perceived value of an investment to anticipate that it might estimate the success of that investment post-adoption. The literature shows that this is not the case (Levy and Powell, 2005; Farbey et.al., 1993). It might therefore be fitting to explore whether an anticipated benefit becomes a reality or not, and how that is judged by a micro-company. The categorisation of variables in both the perceived value area and the measures of success were determined by examining in detail the responses to the questions and assessing the most logical format of the responses. This gave the categories in table 4.5:

Perceived Value	Measures of Success
Efficiency	Efficiency
Marketing	High levels of interest (from customers, etc.)
Financial Considerations	Cost Reduction
Business Development	Profitability
Reliability	It Works
Too Early To Judge	None

Table 4.5: Categorisation of Perceived Value and Measures of Success

Producing such categories demonstrates that there is an attempt by micro-companies to link pre and post-adoption evaluation. The limitations of this in this study are that the question on perceived value was asked after the investment, meaning that respondents were asked to look at this retrospectively and the measures of success were also asked in the same survey interview. The questions were separated by several other questions, so that respondents did not relate back to the former question. However, as no measurement was used by any company for either pre or post-evaluation all of the replies

are based on their 'gut instinct' (Powell, 1992). What it demonstrates is that in a few areas it might be possible to attempt to show some correlation between pre and post-evaluation. The areas that might correlate are: efficiency and efficiency, reliability and it works, marketing and high levels of interest (customers, etc), financial considerations and profitability / cost reductions. The following figures examine the link between these areas and the education and skills of the respondent.

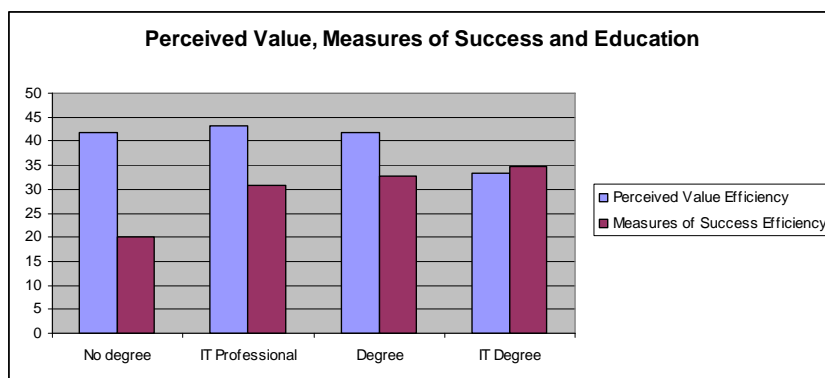


Figure 4.25: Perceived Value, Measures of Success and Education (Efficiency vs Efficiency)

Figure 4.25 demonstrates that owner-managers who were seeking efficiency in general seem to believe that was achieved. However, those with no degree are less likely to believe that they have achieved this. Whereas, those with an ICT degree are more likely to believe that they have achieved their perceived value in their post evaluation period. This would once more appear to show that education is a key component in success in business even within the technology adoption scenario.

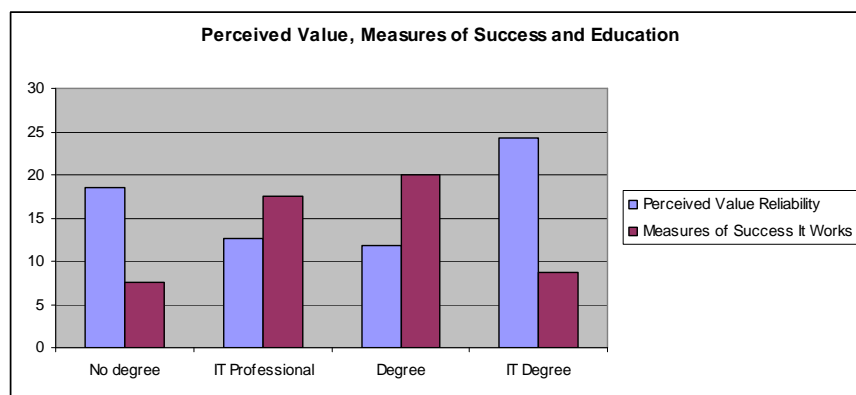


Figure 4.26: Perceived Value, Measures of Success and Education (Reliability vs It Works)

Figure 4.26 examines the tenuous link between those whose perceived value was reliability, which seems a reasonable anticipated benefit when these companies are ICT companies and many of their customers depend on the reliability of their systems, and the measure of success being simply 'it works'. The latter being a very tenuous measure of reliability but nonetheless important in this scenario. This demonstrates a great deal of concern as 24% of those with an ICT degree were anticipating reliability as a perceived value for the adoption but considerably less considered this when asked if they considered the adoption to be a success. This is concerning for ICT companies as reliability would have been expected to be measured at least in terms of downtime, as this would be a measure they would work with regularly with their customers. The other issues of note from this comparison of pre and post-evaluation is that those with a degree on other subjects and those who considered them selves to be ICT professionals anticipated used the term 'it works' more often than the other categories to describe the measures. There are a number of things this may indicate including the fact that reliability was not an important consideration for those categories as a perceived value and that it could show there is no correlation between the pre-evaluation and post-evaluation in this comparison. This may still be an indication that there is a correlation between pre and post-evaluation in these areas but that education is not a constant here. This is examined in section 4.9

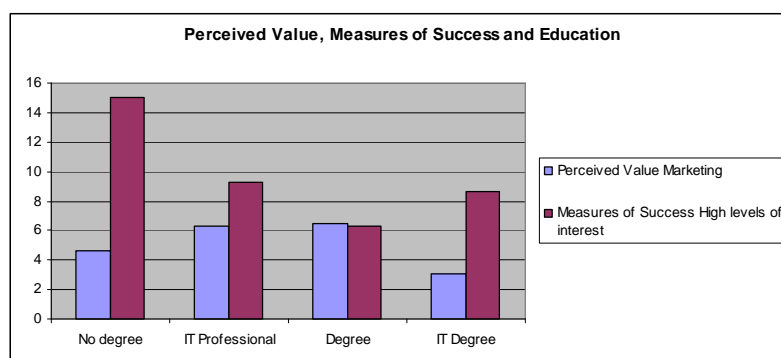


Figure 4.27: *Perceived Value, Measures of Success and Education (Marketing vs High Levels of Interest)*

Figure 4.27 examines a link between pre and post evaluation perceptions in terms of the benefits being marketing. It would have been assumed that if marketing was a perceived

value then it would have been relatively simple to measure the success of this in terms of new customers, new markets, etc. However, this study clearly demonstrates that those with an ICT degree had not adopted with a view to marketing being a benefit but clearly appear to use this as a measure post-adoption, as do those with no degree. Only those with a degree in other areas appeared to be achieving the success they had anticipated in marketing. Considering the results in figure 4.27 this may indicate that those with an ICT degree have considered more in the technology realm prior to the adoption and recognised the technology as achieving more post-adoption, whereas, those with other degrees may anticipate and recognise business benefits.

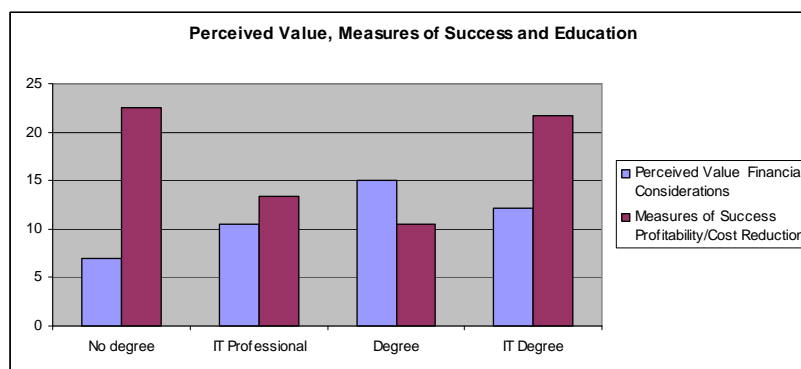


Figure 4.28: Perceived Value, Measures of Success and Education (Financial Considerations vs Profitability / Cost Reductions)

In figure 4.28 the pre-adoption perceived value of financial considerations is considered and the issues of cost reduction and profitability are amalgamated to try to provide a comparison around the area of cost in this adoption benefits discussion. It would seem that although this had not been a major consideration pre-adoption that it was frequently used as a measure in the post-adoption period. Again the biggest discrepancy between pre and post-adoption is shown in those who have an ICT degree and those who have no degree. This is a worrying discovery as it may indicate that the concerns regarding the education of the owner-manager are warranted and that those with an ICT degree are in no better a situation with regard to pre and post-adoption benefits and measures than those with no degree. The exception to this is the efficiency measure and although this

study did not examine this in any greater detail there may be a disparity in the definition of 'efficiency' by those with a degree, an ICT degree or no degree.

Overall, it would seem that education is an important consideration in the adoption process (Costello et. al. 2009). Having a degree, as indicated by the work of Storey (1994) is an important element in the success of a company in terms of turnover and growth. However, there is little indication that having an ICT degree is an advantage in the ICT adoption situation, with those with generic degrees faring better in pre and post-adoption benefits matching, unless those considerations are of a technical nature as in 'efficiency' measures. It has also highlighted the differences in those who have a degree in non-related fields and those who have an ICT degree.

4.10 Adoption explored

The survey explored the types of investments currently being made by the companies to understand what these are, particularly as this study does not consider any one technology. The results of the study initially demonstrated that only 24% of the micro-companies' recent investment was on specialised software specific to their business and in some cases used both in the running of their business and in the development of products and/or services (figure 4.29). Business software also includes development software in this category as the companies had not been divided into sub sectors there could be no analysis of those who used development software as there were also many training companies and consultants amongst the micro-companies. A total of 46% invested in operational tools, these included: laptops, servers, personal computers (PCs) and handheld devices. The remaining 29% of micro-companies' most recent investments had been in peripherals include: equipment such as printers, scanners, external hard drives, VOIP phones and networking devices like routers.

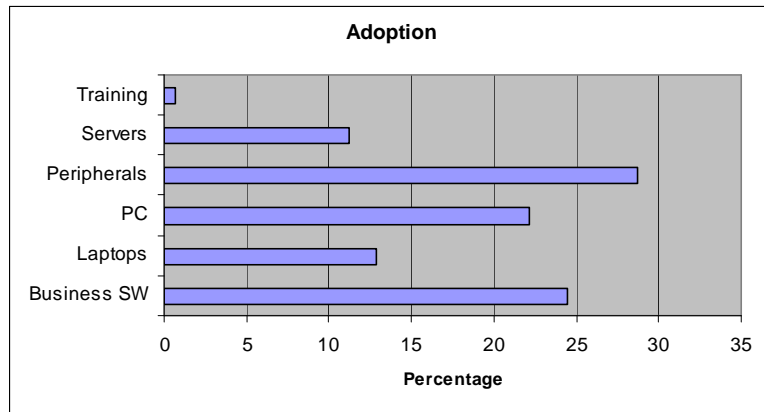


Figure 4.29: Adoption of ICT by micro-companies

4.10.1 Turnover and Adoption

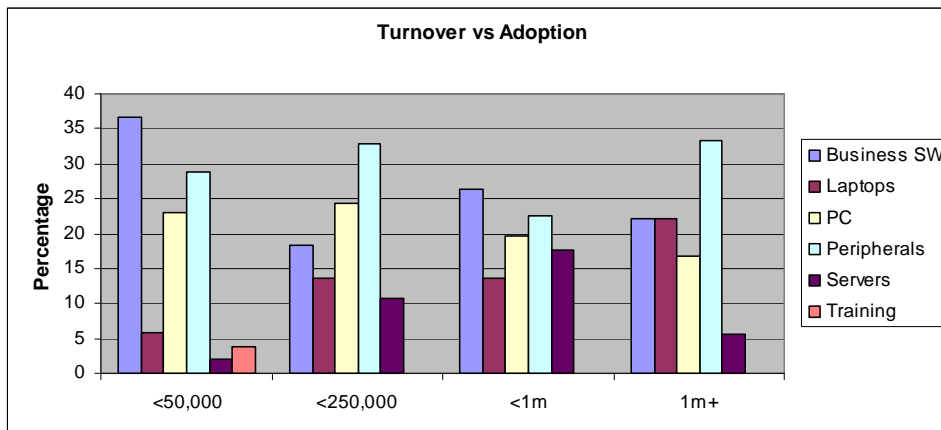


Figure 4.30: Turnover and adoption for micro-companies

The results were then broken down according to turnover of the company to see if this indicated any trends in the purchasing. The intention was to understand if the purchase of laptops, servers, PCs and the software and hardware items were related to the amount of turnover a company had. The results in figure 4.30 suggest that micro-companies do invest predominately in peripherals and in a very sporadic way with no real trends appearing. This may not demonstrate anything of value as it may depend upon the sub sector the company is in. Development software and business software have been combined for this analysis as often in this sector the sub sector may indicate that the company might differentiate these. What these figures do indicate is support for Levy and Powell (2005) who determined that companies often invest more at start up than later

with those with the lowest turnover investing more in business software than those with greater turnover. The lowest turnover group also included the only 2 companies who indicated that training had been there most significant recent investment.

All categories were investing in peripherals and classifying those as a significant investment. There does appear to be a significant number of companies in the larger turnover category investing in laptops.

4.10.2 Years of Operation and Adoption

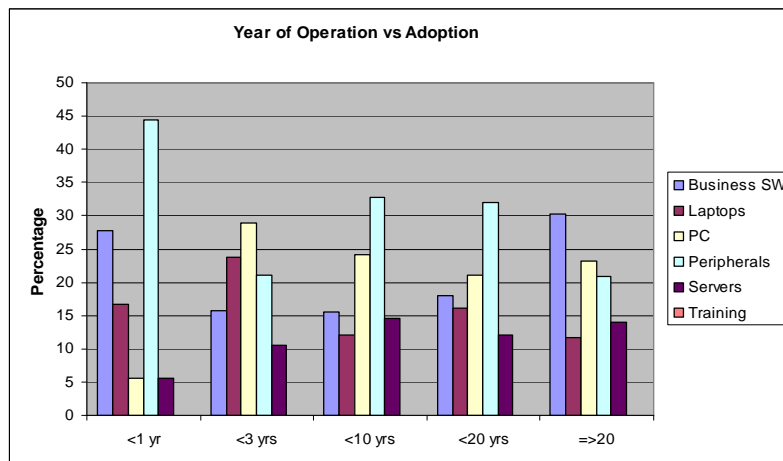


Figure 4.31: Years of operation and adoption by micro-companies

The results were further manipulated to examine the age of the company to determine if the purchase of laptops, servers, PCs and the software and hardware items was connected to the age of the company (Figure 4.31). Turnover vs the age of the company was considered to be an important consideration to determine if companies continue to invest in the random manner over time. What this demonstrates is that in this sample more companies invested in peripherals at start up and that business software was an important investment at less than one year and more than 20 years. Overall this may support the fact that companies invest a great deal at start up in both business software and peripherals.

4.10.3 Number of Employees and Adoption

The results were then broken down according to size of the company to see if this indicated any trends in the purchasing. The intention was to understand if the purchase of laptops, servers, PCs and the software and hardware items were related to the number of employees.

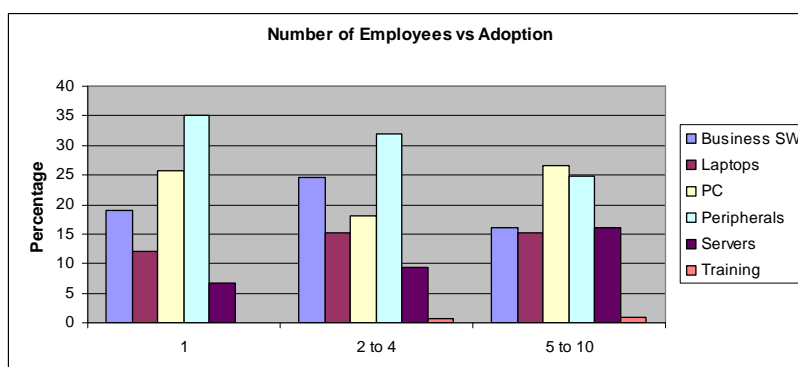


Figure 4.32: Turnover and adoption by micro-companies

Figure 4.32 demonstrates the investment in relation to size. It was encouraging to find that many companies of this size invest in servers, as this may be one of the factors helping them to work efficiently and lower their business costs. The findings from the study show that the purchase of servers has both a business and technological impact for these companies. The owner-managers pointed out that by investing in servers they were able to improve their working practices. This includes faster communication, increased capability to satisfy customers' needs, as well as improved marketing and sales

Overall it seems that very little impacts on what these companies purchase and they continue to buy low value products and invest in low value technology whatever age, size or turnover they have. This should be of major concern and taken together with the impact of education may indicate that education and knowledge of potential entrepreneurs will be an important consideration in this sector.

4.11 Correlation Analysis of other Factors

Having established some links between factors within the model it was pertinent to explore the possibility of links between some of the qualitative answers. This section therefore looks at the possibility of any linkage between perceived value and measures of success which would determine a link which might indicate that companies were obtaining the perceived value (Levy et.al., 2005 'strategic intent') that they had set out to achieve. It also examines any links between internal and external pressures as if companies do not recognise these pressures it is also an area for concern. The implementation issues are examined against the support requested by micro-companies. This would also give an indication of whether the companies are aware of their support needs or if implementation is merely 'tolerated problems' and support is seen as being in other areas. There is also an exploration of where the advice came from during this adoption (sources of advice) and the subsequent implementation issues.

4.11.1 Perceived Value and Measures of Success

In section 4.3.2 there was an examination of the role of education on perceived value and on the subsequent measure of success (ROI) used by the micro-company owner-manager. Here we examine the overall selection of categories for perceived value and how that maps to the selection of measures of success. The categories were analysed in the same way as before using the coding for all other sections. These codes were then analysed together and a table produced (table 4.6) which gives an opportunity to explore any possible correlation between these 2 measures. As this is a qualitative study the limitations are that the researcher has made assumptions within the analysis which have allowed the issues to be 'drawn out' from the text.

Table 4.6 demonstrates the pre and post-adoption measures by percentage of companies, for example 14% of companies chose efficiency as both their pre and post-adoption measure.

Perceived Value	Efficiency	Marketing	Reliability	Financial Considerations	Business Development	Too Early to Judge	
Measures							Totals
Efficiency	14	2	10	3	4	0	33
High Levels of Interest	5	3	0	3	3	0	14
It Works	2	2	1	3	3	0	10
Profitability	6	2	1	5	3	1	17
Cost Reduction	2	0	0	2	0	1	4
None	11	3	3	1	3	0	22
Totals	40	11	14	17	16	2	100

Table 4.6: Perceived Value and measures of Success (%)

It can be seen from the table that the most obvious correlation would appear to be efficiency which was of interest to owner-managers both pre and post-adoption. However, some inconsistencies between pre and post-adoption become apparent. For example: 40% overall were looking for efficiency gains but of those 11% had no measure of that and only 14% used efficiency as a measure. 10% of these looking for reliability claimed to have measured that by efficiency gains, which could be interpreted as a type of reliability but is more likely a separate measure. 17% stated that their perceived value was financial considerations whereas 21% used that as a post-adoption measure, using both profitability and cost reduction. Of more concern are the 16% whose perceived value had been business development but there was no comparative measure within the survey results.

There are also some factors that bear closer comparison for example In total 40% anticipated efficiency gains and 33% used that as a measure. For 11% marketing was their pre-adoption perception of value and this was used as a measure by some 14%. Although of those who claimed to be anticipating marketing as a value from their investment only 3% used that as a measure.

Once more there appears to be some attempt by owner-managers to anticipate the value from their purchase but the correlation with the post-adoption measures is loose and dependant on other factors at work in the environment, possibly education and skills as discussed previously.

4.11.2 Internal Pressure and External Pressure

A comparison between internal and external pressures on companies to adopt technology might be expected to yield either similarities in thought or at least highlight the pressures in the external environment that impact on micro-companies. In this study again the free text answers were encoded and sorted and the results are presented together here. The results are presented in a table as there can be no direct comparison between elements within these categories.

Internal Pressure (%)				
No Pressure	Other	New Customer	Enhanced Performance	Business Growth
39	8	5	30	18
External Pressure (%)				
No external pressure	No response	Other	Customers	Technological Advances
46	12	5	12	25

Table 4.7: Internal and External Pressures (%)

It would seem that 39% of companies believe that there is no internal pressure and 46% perceive no external pressure either. This is concerning and may mean a number of things for example: micro-companies are so intent on running their business they do not have time to consider either the macro or micro environment, there is no recognition of the pressures and education and skills may once more raise a number of questions here, or did they simply had issues with the question itself. The fact that 12% did not respond to the question regarding external pressures may be an indication of the fact that some grew unresponsive as the interview progressed; indicating lack of engagement or simply lack of time, or it may demonstrate that the question was simply not well comprehended.

Some 5% noted new customers as a pressure in the internal environment; this may mean that they work so closely with customers that they seem to be part of the internal environment. Close examination of the responses, the term 'new customers' in this context is the internal desire by the company to actively seek new clients.

When questioned in this area most companies who did not recognise any pressures were often those driven by a single customer in a single market which makes them very vulnerable should the customer move affiliations. Overall there does not appear to be any correlation here and it was not anticipated. The area was examined to determine the main drivers in the environment for these companies, always remembering that it mostly refers to low level technology and the pursuit of similarities to other studies which explored EDI, Internet and eBusiness. The drivers might then be anticipated to show differences.

4.11.3 Implementation and Support

Also examined here are the issues of implementation set against the support that companies felt they needed. The main concern with examining these two areas together is to determine if companies having had implementation issues then recognise that for the long term there is a need to resolve any lack of skills and other concerns that they may have to mitigate future problems.

Implementation Issues (%)						
None	Lack of Skills	Technology	Compatibility	Third Party Support	Data Transfer	
46	15	11	12	4	12	

Support Needed (%)						
None	Training	Funding	Marketing	Consultancy	Human Resources	Business Facilities
22	22	16	13	6	8	13

Table 4.8: Implementation Issues and Support Needs (%)

It is interesting to note the correlation between the 15% who felt lack of skills led to their implementation problems and the 22% who claimed to need support with training. This is in comparison to the fact that only 2 companies from the 167 surveyed stated that one of their recent significant investments had been training.

46% of companies claim to have had no issues with implementation and 22% stated that they had no support needs. 12% of companies had compatibility problems which could often be considered to be the norm in any implementation situation. However, problems with the technology, third party support and data transfer issues could all be construed as lack of available skills but companies rarely stated this as a support need.

The support that they stated was almost always related to business issues which these companies felt they were lacking: marketing, consultancy, funding, business facilities. There is a dichotomy between the implementation skills issues and the business issues which may indicate that companies are not willing to seek support for the adoption of technology and prefer to seek support to drive their business forward. There is a further discussion here which centres on the need to balance business and technical skills for micro-companies in this sector. If this sector cannot achieve this, then other sectors will struggle and the ICT sector will not be able to support these sectors adequately.

4.11.4 Sources of advice and implementation concerns

In this section an exploration of the sources of advice and the subsequent implementation problems are examined to assess if where the advice came from may provide a clue to where these companies are encountering barriers.

Source of Advice								
Implementation Problems	Do not need Advice	Company Employee	Internet	Supplier	Friends and family	External Advisor	PC Magazine	Total %
Lack of skills	8	3	3	5	3	5	5	31
Technology	0	0	0	2	0	5	0	6
Compatibility	5	14	3	0	0	0	0	22
Third Party Support	0	3	8	0	2	6	0	19
Data Transfer	3	3	6	0	2	5	3	22
Total %	16	23	20	6	6	20	8	100

Table 4.9: Source of Advice and Implementation Problems (%)

Table 4.9 again demonstrates the percentage of companies who had implementation problems in relation to where they had previously sought advice from, for example 8% thought their implementation problems were lack of skills but also claimed not to need any advice.

46% of these companies claimed to have no implementation problems; these have been excluded from this analysis. However, 54% admitted to needing advice. Of the total of 25% who said they did not need advice, 16% admitted to having some problems in implementation. This left 9% who claimed not to need advice and indeed had no implementation problems. Of the 54% who did have problems with implementation, the advice sources and areas of concern are represented in table 4.8.

It seems that wherever these companies go for advice they may still have some problems although it may be assumed that they may have less than other sectors. If it is assumed

that advice from a company employee, from a PC Magazine and from the Internet are all self-advised then the total who had implementation problems following this was 51%. If those respondents who 'do not need advice' are placed into the category who may be thought to be advising themselves, a total of 67% of companies have not sought any outside advice but have had implementation issues, this is two thirds of all companies. If we compare this with fact that the same advice categories (company employee, PC magazine, internet and do not need advice) claimed to have only a 19% problem from 'lack of skills' it could mean that many of these companies do not recognise their own limitations. It is interesting to see that there are no implementation issues around compatibility for those companies who sought advice externally. But, only 8% of those who used a PC magazine had implementation issues. This may indicate that these companies are both confident and capable.

Overall it would seem the mismatch of advice that companies access from their social capital leads to a variety of implementation issues. However, these results do indicate that too many of these companies adopt a 'do it yourself' attitude stemming from their self reliance on being 'experts' in ICT which then leads to the myriad problems that are experienced in a similar way to that seen in other sectors.

4.12 Emergence of a new Model

The original intention of this research was the exploration of published models in an attempt to understand how some of these elements might be linked and what influences are at work for the ICT sector in the West Midlands. This would then be used to understand how any intervention could best be developed to achieve the greatest improvement for these companies. However, this has led to the emergence of a new model which is more comprehensive than earlier models as it takes a broader perspective and allows an understanding of a broader range of variables for ICT adoption, whilst linking in pre and post evaluation perspectives of the owner-managers.

The categories in this proposed model have been adjusted to fit with the findings derived above as some of the elements have merged to take account of the environment and interpretation by owner-managers. The educational attainment of the owner-manager still remains the most direct influence on a micro-company who has a major influence on the success of adoption and indeed on most aspects of the business. Levels of decision making became of lesser importance within the model as the majority of owner-managers in the sample had made the decision themselves as had been anticipated. 'Advantage over traditional methods' was cited as an influence on investments along with other issues it is still however seen as a chosen strategy and a perceived benefit to the micro-company and therefore will remain in the latter category in line with previous research. The findings are summarised in table 4.10

Category	Elements	Findings
Personal Factors	Educational experience	This factor was a major influence in all other research areas related to SME growth and successful adoption and is again cited as a major influence within this research. It was examined here to differentiate the presence of an ICT professional through experience (self-taught) or through formal education as being influential in adoption and also impacted on the next element – that of knowledge of ICT.
	Knowledge of IT	Although knowledge of ICT is an important issue for all companies if that knowledge of ICT has been gained through the educational experience of the owner-manager within ICT companies then that has an impact on both the company turnover, perceived value and significance and therefore adoption too. If an owner-manager considered themselves to be an ICT professional this also had an impact. This may be linked to the presence of an ICT champion as cited in the literature review.
The Firm	Age, size, turnover.	These three factors were examined together and it was found that there is no guarantee of increased turnover as a company grows in terms of number of employees or years of operation. Neither was there any link between these factors and adoption. Companies were not more successful as they grew in experience.
	Turnover	Turnover was also examined alone and supports the fact that degree holders have an increased turnover in comparison with non-degree holders.

		The discipline was irrelevant.
Organisational readiness	Advice sought	The advice sought is a major influence on the success of the adoption and in subsequent implementation problems. This study has again confirmed that most micro-companies seek advice from the circle of known contacts.
	Specialist skills in company	The specialist skills examined here were the education of the owner manager and whether that was formal or not and in ICT or not. It appears to have a major influence on adoption success as it impacts on both strategy and perceived value, may be indicating the presence of an ICT 'champion'.
	Implementation issues	The main implementation issues measured here were supplemented by asking what support the companies required. These companies have major implementation issues and concerns regarding support and the availability of consultancy support that can be trusted.
	Internal pressures	Very few companies recognised internal pressures although this has been identified as a barrier / enabler by other researchers. This could indicate that these companies are very reactive and do not attempt to drive forward the adoption agenda in their own company, or simply be that this research concentrated on low level technology.
External Pressures	Influences on the purchase.	Main influences were seen as customers and upgrades and most upgrades were for customers. Demonstrating a very reactionary approach..
	Identification of external pressures in the decision making process	Most do not recognise external influences and when they do it is predominately customers or technology as above.
Strategy	Reason for purchase.	The main reasons for the purchase are those cited as the main influences above. This demonstrates that micro-companies' strategy is as a reaction to either customers or technology and their reasoning often does not extend beyond this.
	Significance of purchase	Most companies recognised the significance as the ability of the technology to have an impact on the way the business was run. This may indicate that whilst they may not 'do' strategy there is willingness there and an understanding of technologies place in their business which may require some awareness raising. Those with an ICT degree placed a different significance on the purchase to others
Perceived Value	Perception of success (pre-adoption)	This was seen predominately as efficiency or productivity gains however as no measures are shown (see above) this is again mainly based on instinct. There was a small but significant link to the post-adoption measures which could be exploited. Replacement for traditional methods appears here too.

	Measures of success (post-adoption)	Most measures of success were qualitative e.g. more profit or more customers. No companies use quantitative measures, however, the link between pre and post-adoption is important here.
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Table 4.10: Summary of findings related to the explored model

The main categories arrived at through this process of analysis based on the survey results and the literature review combined is outlined in table 4.11. Those elements that the companies did not consider to be a major influence have been removed from the model developed in chapter 2 which was based exclusively on the literature.

Category	Elements
Personal Factors	Educational experience, Knowledge of IT.
The Firm	Age, size, turnover
Organisational readiness	Advice sought
	Specialist skills in company
	Implementation issues
	Internal Pressures
External Pressures	Influences on the purchase.
	Identification of external pressures in the decision making process
Strategy	Reason for purchase.
	Significance of purchase
Perceived Value	Perception of success.
	Measures of success

Table 4.11: Proposed model of adoption for micro-companies in the ICT Cluster.

4.12 Conclusion

In conclusion a number of points have been drawn out by this research and are suggested as a starting point for all companies looking to improve adoption success:

The owner-manager's knowledge and education has been indicated as an essential element in successful adoption. The findings here indicate that in order to be successful in this sector a high level of education may be necessary, although there is no direct indicator as to why this is. It is suggested that a high technological competence and understanding of advances in technology may also be necessary. These findings show that companies who have an owner-manager who is formally educated in ICT feel less need to use technology to attract new customers and generally felt less pressure stemming from the need to enhance performance. Although other variables may affect this process a thorough grounding in ICT will help with evaluation of technology to enhance business growth. There is concern, however, that the reactive approach to the planning of technology investments may also lead to problems. Micro-companies were often focused on one set of customers and tried to make technology investments 'fit' their business needs and their customer's needs.

There is also some indication that companies who claim to have ICT professional skills in-house have a higher turnover than those companies who have no ICT professional. The reasons for this are not clear but previous research (Grandon and Pearson, 2004; Levy et. al., 2005; Van Akkeren and Cavaye, 1999; Thong and Yap, 1995; Iacovou et.al., 1995; Rashid and Al Qirim, 2001; Merhten et. al., 2001; Storey, 1994) indicated that the presence of in-house skills is imperative in successful adoption of technology. It would now appear that this also affects the growth in terms of turnover for ICT companies. It is believed that the random rise and fall in turnover in these companies may indicate how competitive the business environment is for ICT companies. As the adoption of new technology is important in business growth, especially in the ICT sector, the sporadic growth of these companies may related to successful adoption of technology although this research did not involve a longitudinal study, this issue would benefit from further investigation (see section 5.5).

The study reported here has confirmed that, as indicated in the literature review, most micro-companies take their advice from a variety of sources including: friends, relatives, ICT store representatives, the Internet. In all cases companies indicated that they use the source they 'felt' was the most reliable, although even these sources were not always viewed as trustworthy and were approached with a degree of scepticism. This often resulted in implementation problems and the adoption not being as successful as they might hope. It is therefore suggested that implementation problems may often be caused by the type of advice given prior to a decision to invest in new technologies that do not align well to the business model. Most micro-companies were left wrestling with technology problems rather than running their business. This may be leading to the inhibited growth indicated by the sporadic turnover.

Implementation problems are of major concern even for ICT companies; a certain number of problems were anticipated. However, it is suggested that this sector may have less concerns than other sectors, and this could be of major concern to other sectors that rely on the ICT sector knowledge and competence. Most problems experienced by the sample companies were due to lack of appropriate skills, which could also be related to the majority gaining ICT skills through experience. In particular the fact that technological know-how and third-party support are a problem is a major anxiety and may indicate the inability of these companies to support other sectors. There is a need to address how these companies can be supported to enhance their ability to support other sectors. The sample companies were not questioned in detail about training but the indication that many implementation problems were due to data transfer limitations (in particular where large amounts of data were involved), third party support, technology, etc demonstrates the lack of ICT knowledge in these companies. However, none of the companies had invested in acquiring that knowledge to avoid such problems, opting instead to invest in basic equipment to extend their operations rather than in improvements in their skills profile.

Also of concern is the issue of ICT companies not recognising their own limitations in this area with many companies claiming they would not require any advice on what to purchase. The same companies later in the survey explained the implementation problems encountered and their support needs. Many do not recognise that recommendations to customers and selecting ICT for your own business infrastructure aligned to the business model often requires a very different skill set.

One of the main support needs indicated was training, although results indicate this is often on specific technologies on an ad hoc basis. However, it was not anticipated that ICT companies would have fears about the lack of trusted consultants for help and advice. This sector would have been deemed to be able to negotiate and seek out knowledgeable consultants.

The questions around influences on the purchase raised the issues of 'advantage over traditional methods' which had been denoted by previous research as being a major factor in adoption. In these results it was seen as only one of the drivers in the adoption process. This study implies that 'replacement of traditional ways of working' can be a valid strategy for adoption too. The new model emerging from this research however, would still incorporate this element into the perceived value category being a pre-adoption decision influence although the issue was raised from the 'influences on the purchase' question, it was seen by respondents as a valid strategy for investment.

As anticipated from the literature search the majority of micro-companies do not evaluate purchases or measure the success of those purchases. Using 'gut instinct' to make a decision as to the success of an adoption. Where a measure was used it was a single factor and this was not an econometric measure. Companies stated such measures as more profit, no complaints from the customers, more customers, efficiency and simply 'It Works'. This may indicate that many micro-companies simply do not understand the importance of measuring adoption success or indeed business success.

Business impact was cited most often as the reason that the adoption had been considered to have a 'significant impact'; this was interpreted as the fact that many found the adoption to have a major impact on how they conducted business. Many used ICT to develop their business and cited changes such as better communication, better customer demonstration facilities, a wider range of services, speedier software production, etc. Much of the detail collected here reflects that regarding the 'benefits of the purchase' indicating a possible link between the benefits and the significance to a micro-company.

This study once more confirms that the owner-manager education is imperative when recognising the significance of an adoption to the business, where significance indicates the subsequent impact of a purchase. With owner-managers formally educated in ICT indicating a much more even spread of results across all categories, where others simply interpreted everything under business impact. This may mean that ICT degree educated individuals also recognise more often other areas such as process impact and technological impact.

Most companies did not acknowledge much in the way of external pressures in their adoption decisions. There could be many reasons for this including non-recognition of the competitive environment as a pressure. With the majority of implementation problems reported seemingly due to general problems of lack of business acumen (also identified by Sheppard and Hooton, 2007), this should be of major concern. As many companies are reactive rather than proactive it could mean that they are simply unaware of the need to be vigilant of the macro environment, merely reacting instead to the need to respond to customers, implement new legislation, etc.

Education in business awareness as well as the potential of technology to address business issues could go some way to address these shortcomings for the ICT sector. In all micro-companies keeping up with technology advances by upgrading the software

or hardware was seen as the main influence on adoption. The reasons for upgrades were cited as being faster operation, improving efficiency, increasing reliability, expanding storage, having better network security, running more sophisticated software environments, adding wireless and broadband technologies.

These upgrades were viewed as 'necessary' as the micro-companies are often catching-up with new technologies. Very few micro-companies recognised the need to progress their business using new technological advances which may mean they are unaware of technological advances outside their field of expertise.

Overall the issues arising would indicate addressing the education and knowledge of the owner-managers to ensure that their ICT adoptions are aligned with their business needs. This issue was particularly prevalent when examining those who had an ICT related degree in comparison to those who did not. However, as most micro-companies see their strategy as being the 'next sale' or the 'next customer' this poses a particular difficulties and specific actions may be required for the ICT sector.

To conclude, this chapter has explored the model developed from the research by examining the responses from 167 micro-companies from the 203 companies surveyed in the ICT Sector in the West Midlands. The following chapter will reflect on the findings from this study as compared to the literature to date, the exploratory, qualitative research approach taken and the further work that is recommended as a follow on. In particular the chapter reflects on recommendations for what may be necessary to support the ICT sector in order that they may support other industrial sectors.

Chapter 5 Research Outcomes and Conclusion

5.1 Introduction

Earlier chapters have examined the literature in pertinent fields to determine the issues in the exploration of an ICT adoption model for the ICT sector in the West Midlands. A model based on the literature was subsequently proposed and explored through a survey of 167 micro-companies in the ICT sector in the West Midlands. This work has addressed both Levy et. al's (2001) concerns that most research to date addresses large companies and Martin and Matlay's (2001) concerns that all small companies are treated in a similar manner. This work has looked at a specific sector and concentrates on micro-companies which are an under researched area even within SME research.

At the start of this chapter a very brief section identifies specific issues for the ICT sector in the WM and how regional government intervention might address these. A discussion follows regarding the findings of the survey in comparison to the literature review. A conceptual model is proposed and discussed in light of the findings and previous adoption models reviewed. The conclusion includes an examination of the research approach taken along with a indication of further work beyond this thesis and the contribution to knowledge the work affords. A reflection on the work carried out and how that work addresses the research questions posed concludes the study.

5.2 Reflection on Approaches to Adoption Issues by Regional Government

As established in section 2.3 both central and regional governments have the ability to interrupt the cycle of adoption by moderating behaviour in the adoption process and thus raising awareness and educating micro-companies in these issues. If policy makers address the issues directly it would be of more relevance than the current approach of addressing government targets and thus de-motivating both intermediaries who might help and micro-companies themselves (Culkin and Smith,2000; MacGregor and Vrazalic,

2005). In this section the specific issues for the WM ICT sector are discussed along with how this research may help to address these concerns.

5.2.1 Adoption concerns specific to the ICT Sector in the WM

There are a number of issues to emerge from this research that are very specific to the ICT sector within the WM in regard to micro-companies and these are discussed in this section. It is appropriate that micro-companies and policy makers might regard these as issues in future adoption projects.

The literature review revealed the contention, which have been upheld by the survey, that micro-companies do not align their technology adoptions with their business plans (Reece and Thompson, 2005; Cragg, 2002; Gramignoli et.al., 1999) and this is where the most help could be given (Harindranath et. al., 2007). It would be necessary to raise awareness and educate owner-managers in this area who exert control over these issues (Cragg, 2002; Storey, 1994). This could be carried out through trusted intermediaries as ICT companies also found it difficult to trust local ICT consultants. It might therefore be appropriate to form a close alliance with the Business and Professional Services sector to explore what may be done in this area. This would need to include the establishment of on-going, trusted partnerships with these intermediaries who can help with both alignment of technology to business plans and the establishment of realistic metrics to help with future decisions. The latter is an area that would help the micro-companies to establish a measure of ICT adoption success to inform future decisions.

Skills are another major issue for the micro-companies in the survey and, in particular, training in specific technologies which they often require on an ad hoc basis. Lobbying of the appropriate funding agencies that can help deliver these requirements and the recognition of the very specific skills requirements of this sector is vitally important. The difficulties demonstrated in adopting new technologies were mainly related to skills,

compatibility, inter-operability and lack of third party support. This indicates a major issue with technical competences and skills.

From the results established here and by previous studies it appears that most micro-companies are customer driven and there is no future planning which might make the adoptions more successful in the long term (Levy and Powell, 2005). A programme which attempts to demonstrate how ICT can drive the business and create competitive advantage would enhance their ability to adopt strategically. The majority of the micro-companies concentrated on the customer needs and not on investment in their own business activities.

There is a lack of ICT degree holders as entrepreneurs in this sector and the role of the entrepreneur in any small company is paramount (De Clercq and Arenius. 2003; Storey 1994). This could be addressed in a number of ways. One way could be to work with University departments responsible for the education of computing students ensure that entrepreneurship, risk-taking and start-ups are in the curriculum of ICT degrees. Another approach could be to identify University departments, in all subject areas, who are producing students who start ICT companies and work directly with these.

The companies in the survey showed very little awareness of the pressure from the wider economic and business environment. If these micro-companies could be made aware of the importance of understanding external pressures, it would help the companies to develop a sound strategic plan within their current markets. This may require education in market analysis techniques.

Customer initiatives are firmly established in this sector as a driver for growth and also for adoption of technology. It may be appropriate to educate ICT micro-companies to understand that although this is laudable a more measured approach needs to be taken in their investment decisions to ensure future sustainability in turbulent markets

The education of policy developers with regard to ICT adoption is a continuous process with the ICT sector being paramount in this process. This study has observed not just a lack of knowledge in this area by the companies themselves but also a lack of knowledge in major government initiatives and support agencies as to how ICT can create competitive advantage and how it can be adopted strategically (Sheppard and Hooton, 2007). Developing a web site and implementing that for a company does not then embed the knowledge required to subsequently achieve more with ICT adoptions in the future or how to maximise potential from that web site. When these companies subsequently need to adopt technology they once again need help and support. A series of workshops to educate the appropriate policy developers may be a worthwhile initiative.

These are the main issues surrounding the ICT sector specifically within the WM, and this would assist in developing, within the ICT sector, the skills to help other sectors to adopt technology which will increase productivity and help gain competitive advantage for the WM region.

5.2.2 How this study will influence the regional adoption concerns

Regional Government intervention in this particular case is the ICT Cluster as they are tasked with growing the ICT sector in the West Midlands both in terms of more businesses established and in business growth. Many of the past initiatives concentrated on one of the following: business support through Business Link West Midlands, education through the support given by the Learning and Skills Council (LSC) and eSkills UK, e-business adoption initiatives and demonstrator projects in specific areas e.g. Photonics, Open Source Software. Most of this support is misguided and at the wrong level for ICT companies (Graham 2007, Martin and Matlay 2001) who not only need specific initiatives aimed at the technology related to their potential market, but more basic support to help with implementation and adoption of ICT. Currently such companies rely on 'gut instinct' (Powell, 1992) and/or customer-pressure (Merhten et. al.,

2001) which forces a situation which becomes costly and resource-intensive. Micro-companies also need help that they feel they can trust (Harindranath et.al., 2007) and skills initiatives designed to improve their business and help with particular technological advances; including embedding the ability to perceive the value of adoptions more strategically (Levy et. al., 1999).

The author's role as a higher education representative gives a unique opportunity to apply the results of the study in terms of influencing policy. Particularly given that a number of previous projects, with a value of more than £23m, have been commissioned some of which are demonstrator projects and many that have been put in place to help companies adopt particular technologies¹⁶. These initiatives increased concerns that companies were being helped to adopt technologies and trained in that one aspect, but subsequently when new technologies were introduced the company again faced the original issues. This was usually as they had not been educated in what they needed to address to adopt technology successfully in the future.

The research in this study was used by the ICT Cluster along with the Adroit (2007) report to help shape the Strategy for 2008-2011. The author's secondment has been further extended and hence, will continue to work with the ICT Cluster during this period with responsibilities regarding the implementation of the market focus regarding ICT adoption. This is a rare opportunity for a researcher to implement findings alongside a government agency developing policy given that these findings have shaped policy in a specific way. Other strategy bodies within AWM, including the ICT Strategy Board have also shown an interest in this research.

The new ICT Cluster strategy for 2008-2011 (see Appendix 10) will go some way towards being more specific and targeting innovative companies only. However, many of these companies still need support in the areas outlined in this study and working with them

¹⁶ www.wmictcluster.org

requires an understanding of the fact that ICT companies do not always recognise that they have problems in ICT adoption. The approach to this will be all important and regard for the specific market that companies are in will go some way to helping, as will an awareness of the owner-manager education and values.

The need to work with universities to help develop entrepreneurial aspects to courses is highlighted by the fact that so few owner-managers in this sector have an ICT related degree. This demonstrates that University computing departments may not be encouraging entrepreneurship in the same way as other departments (see section 5.5). The alliance that the researcher now has with the nine main providers of ICT graduates in the WM will also lead to the application of the results from the research.

Although, at regional level it is suggested that the ICT Cluster may work with Higher Education departments to achieve the above aims. It is also suggested that Central Government are mindful of this and work more closely with Higher Education with regard to curriculum development and the embedding of entrepreneurial schemes within courses.

5.3 Comparative evaluation of ICT adoption issues

What are the main issues surrounding the adoption of ICT infrastructure in ICT micro-companies? This question was explored through the initial literature review regarding adoption in micro-companies. This led to the assumption that not only do micro-companies need to be able to predict new technology with 'increasing velocity' (Fordham, 2001) but they also need to then educate themselves in the use as well as the application of the technology for their own business (Hassall, 1999). Most only recognise technological trends within their own sphere of technology. This means that many new technologies that could be of use to them e.g., Open Source software to reduce costs, may not be considered as the technological upskilling required is considered too great in

terms of resource cost and very little learning goes on during adoption (Remenyi and Lubbe, 1999).

In chapter 2 the main issues from the ICT adoption models were extracted and explored through the literature review, this was addressed within the survey by exploring each of the extrapolated issues. In this section these issues are further explored by comparing the outcome of the survey with the findings from the literature review. The section begins by examining the owner-manager issues and continues with an evaluation of the firm issues.

5.3.1 Owner Manager Issues in ICT adoption

Owner-manager education was found to be of prime importance within the literature (Storey, 1994; Levy and Powell, 2005; Van Akkeren and Cavaye, 1999a; Zinatelli, 1997) demonstrating perhaps that starting a small business is enhanced by the education of the owner-manager. Given that the work of Duhan et. al., (2001) demonstrated that the education of the owner-manager can impact on the role that ICT takes within a small company; in these micro-companies it was expected to take an even larger role given the work of researchers like Damanpour and Schneider (2006) and West and Anderson (1996). This then became a major area of investigation in this study.

This study has discovered that companies with an owner-manager with an ICT related degree are less driven by the need to find new customers than those with a degree which was non-ICT related or those with no degree. The reasons for this are not well understood from this research but could be that those with an ICT related degree are driven more by other factors as suggested by the results regarding the significance to the business of the latest purchase, with ICT degree holders showing a more even spread of results than those without formal ICT qualifications. Many of those who did *not* hold an

ICT related degree stated that the latest purchase had a significant impact on the business when it was more often that it impacted on processes.

Owner-manager education was also found to correlate with company turnover which supports the work of Storey (1994) and Cooper et.al., (1992, 1994). Although it was found that in the £1m+ bracket those with no degree fared better and may be a reflection on the entrepreneurial, risk-taking attitude of those owner-managers who are less formally educated. The impact of an owner-manager formally educated in ICT may influence the part that ICT takes in the business strategy (Duhan et.al 2001; Costello et.al, 2007).

Owner-manager education was also explored through a number of other issues and was shown to impact upon the perceived value of the adoption. For instance, having a degree in non-ICT related subjects was identified with recognition of issues relating to business strategy for example marketing, whereas having an ICT degree often led to the recognition of process improvements and gains in reliability. It would seem that education is of importance in the adoption process and this study has uniquely identified a tenuous link between the pre-adoption perception of value and post-adoption measures of success linked to the owner-manager education. This factor is worthy of further work beyond this study and has been incorporated into the proposed conceptual model in section 5.4.

In the literature review it was seen that internal pressure in a company of this size might come from new employees and also pressure from employees themselves (Costello and Thompson, 2004). As an ICT adoption would impact on employees (Ryan and Harrison, 2000), it would be expected that some pressures in the process may have been from this source. However, the internal pressure to adopt was not seen to come from these sources and often the company recognised no internal pressure at all.

If the owner-manager's education was an ICT degree then internal pressure was also less often seen as 'the need to attract more customers'. The educational attainment of the owner-manager is still a direct influence on the micro-company, although this research highlights that in ICT micro-companies having an ICT Professional in the company has an influence on the adoption process and of the success of the company in terms of turnover. It is suggested that this relates to the presence of an ICT champion active in the process (Farbey et. al., 1993; Mehrtens et. al., 2001). Levels of decision making then become of lesser importance in the new model proposed as the majority of owner-managers made the decision themselves (Bianchi, 2002), although the work of De Clercq and Arenius (2003) has indicated that human and social capital may be of importance in this. Although Joshi et.al. (1986) found that having users involved in the decision-making would enable technology to be more readily accepted this did not happen in the micro-companies in this study.

The evidence from the literature review suggests that decision-making for micro-companies surrounding ICT adoption is increasingly complex (Hillam and Edwards, 2001); however, their decision-making processes are simpler than larger companies (Swartz and Boaden, 1997). In the micro-companies examined for this study 97% of decisions were made by the owner-manager. This indicates that the owner-manager's knowledge and education is then of paramount importance in the adoption decision and for this reason was examined closely.

The social capital available to the micro-company was explored by looking at the source of advice that the owner-manager drew upon to make the decision regarding adoption. It seems that 46% of these micro-companies did not recognise the need to draw upon any advice, believing that they were the experts in this area. However, this confidence was not reflected when they were subsequently asked about implementation issues or support needs. The research does support the supposition by Martin (2004) that owner-managers recognise business value, this was apparent when exploring the perceived

value to the business. It was, however, also demonstrated that they are not aware of how to translate that into alignment of technology adoption as described by Levy and Powell (2005). This sector may be unique in not drawing strongly enough on social capital with 67% not seeking advice from anywhere outside of the company itself. This directly opposes previous research in other industrial sectors that shows that advice is drawn predominately from consultants, sales advisors, friends and family (Bennett and Robson 1998; Costello and Sloane, 2003). This may reflect the uniqueness of an ICT company in an ICT adoption situation. They may be assuming that the knowledge that they have is sufficient and will carry them through this situation. However, the results regarding support needs and implementation issues do not substantiate that premise.

The entire perception of success of an adoption may rest on the ability of the owner-manager to judge the increase in efficiency by instinct which has been described previously (Bannister and Remenyi, 2001; Glazer, 1993 *in* Bannister and Remenyi, 2001). This has been defined by this study where the perceived value (pre-adoption) to the owner-manager was ascertained followed by the subsequent measure of success (post-adoption). This has shown a tenuous link as described above although, a number of issues are inherent in this. There is a need to increase the awareness of ICT micro-company owner-managers about the importance of doing more than merely looking for the next sale or the being driven by customer needs. This study suggests that this will be a major hurdle to overcome.

5.3.2 Firm Issues in ICT adoption

The types of infrastructure that micro-companies are investing in on a regular basis is predominantly operational hardware specifically laptops, mobile telephones, and occasionally servers once a company grows to approximately 8 employees. This would appear not to fit with the explanation of ICT adoption by other researchers (Merhten et. al., 2001; Van Akkeren and Cavaye, 1999b; Poon and Huang, in Ai-Qirim, 2004) but that

could, in part, be due to the technology being adopted, as those researchers were studying eBusiness and Internet communications adoption. Given the speed with which technology moves each upgrade is significant to a micro-company, e.g. consider the move to graphical user interfaces some 14 years ago and the move to relational databases and now object oriented databases. Companies often keep infrastructure for many years and do not replace it until forced to due to the reasons presented in section 4.7.

Most of the purchases made by the companies in this study represent equipment upgrades and these are often instigated by the need to stay in contact with customers, to fulfil a customer order, to market more effectively or to improve the infrastructure in terms of reliability, additional storage, etc. These purchases are rarely considered as a strategic option, neither do companies consider changing their business model to utilise new technologies. This directly supports the work of other researchers (Ballantine, 1998; Dans. 2001; Levy et.al., 2005). This was revealed by the fact that companies believed that they were changing their business model by investing in mobile communications when in fact they were merely extending their working day and being driven by the customers need to stay in touch.

The study also looked at influences which may be affecting the decision-making process when sourcing ICT infrastructure. However, the question regarding specific decision-making in the organisation became irrelevant when the study began to focus on micro-companies as 97% of owner-managers made the decision themselves. Further, the influences on that decision remained relevant when considering their social capital (De Clercq and Arenius, 2003; Martin 2004; Cooke, 2007). It seems that the main influence for these micro-companies is customers or the need to upgrade infrastructure and this was also usually related to orders from customers. This was anticipated from the results of the literature review as most companies of this size will be reactive in their approach to investment in ICT (Cragg, 2002; Anderson, 2001). Indeed Levy and Powell (2000) found

that only one company was subsequently able to actually demonstrate added value. This is, however, disconcerting as many companies are established with an idea by an entrepreneur and as companies show a reluctance to invest in new ICT and are also not reacting to technological advances in a strategic way, opportunities may be missed.

Many of the external influences identified from the literature e.g. customers, contractors, direct competitors, trade associations, hardware and software vendors, consultants, government (Rashid and Al-Qirim, 2001; Barber et. al., 2000; Lefebvre and Lefebvre, 1996; Husein et.al.,1996) were simply not recognised by micro-companies in this study as being a direct influence. Where external influences were recognised, it was mainly customers highlighting concerns that micro-companies are not always reactive to the macro environment within which they operate. This strategy can often leave micro-companies very exposed when their one major customer has problems too. The difference highlighted here between this study and previous research may be due to the all-encompassing approach of this study. As this study included all infrastructure purchases and did not just concentrate on one technology as previous studies. Micro-companies may be aware of these actors in the environment but did not feel they were an influence on adoption of technology. Overall the predominant pressures in the external environment of micro-companies which influence the adoption were related to technological skills and the lack of ability of ICT micro-companies to recognise that they might need help in this area.

Thompson and Costello (2004) recognised that micro-companies with knowledgeable employees were more likely to feel pressure to implement new technology. In this study internal influences were rarely recognised within micro-companies with the exception of the employment of new members of staff leading to the need to extend the infrastructure and therefore adopt more technology. In fact 38% of companies believed there was no internal pressure influencing their adoption. Of those who did recognise internal influences, they were predominately related to business growth and enhanced

performance, although many of the replies could again be interpreted as pressure from a customer which supports a number of other studies: Harindranath et.al., (2007), Levy and Powell, (2005) Grandon and Pearson, (2004), Merhten et. al., (2001), Van Akkeren and Cavaye, (1999), Nathalie et.al (1998).

Implementation issues in this study were predominately around technological competence and lack of skills. This issue was also recognised by Mehrtens et. al. (2001) who found that in-house skills would support users during the adoption. This lack of skills in ICT micro-companies was not expected given the high education levels in this sector. However, the fact that owner-manager's are well educated does not mean that they recognise or can afford to develop the skills of their employees (Levy et. al., 2005; Mehrtens et. al., 2001; Proudlock et. al., 1999).

Levy et. al. (2005) claimed that many of the drivers for eBusiness adoption cited in the literature were related to perceived benefits and Harindranath et.al. (2007) found that the biggest influence on those perceived benefits were either customers or competitors. The perceived value to most companies in this study was seen as being able to be more efficient. This was also cited as the main influence on the purchase demonstrating that micro-companies can be very focused in their strategy and most are still trying to increase efficiency and are rarely focusing on innovative use; again aligning with the findings of both Levy et. al. (2005) and Harindranath et.al., (2007). This leaves a very precarious situation for most companies as they are influenced by the need to become more efficient, the perceived value of a purchase is in terms of its ability to increase efficiency and yet they do not subsequently measure that efficiency.

Although it is claimed that there is a lack of correlation between ICT and traditional measures of investment (Brynjolfsson and Hitt, 1996; Rai et al, 1997) more recently the work of Sheppard and Hooton (2007), Frisk (2007) and Ward and Daniel (2006) it has been shown that not only is it possible to measure value (benefits) but is preferable to

using mere 'gut instinct' (Powell, 1992). However, many of the micro-companies in this survey do not use any kind of measure. For example if they had received no complaints from customers then the adoption was considered successful. It is important that a measure is developed for micro-companies. The main post-adoption measure that companies sought was increased efficiency but this was in reality an instinctive measure and without metrics this becomes mere supposition.

Van Akkeren and Cavaye (1999b) called for ROI to be included in ICT adoption research and thus this research determined a measure of success from the respondents. However, most companies used a single 'perceived' measurement of success for post-adoption evaluation. In fact, many viewed the fact that they had achieved the implementation and that it was working as the measure. If profit or number of customers had increased, then this was considered a successful measure, although this was rarely using any econometric measure and was usually just 'gut instinct' which supports Powell's findings (1992). This often led to the attitude that technology was merely a cost and something that needed to be done in order to 'stay in business' as described by Levy et. al. (2005). There is a possibility that as a subsequence of a negative past experience of adoption relating to this image of ICT as a cost, that this then influences the perceived value in subsequent adoptions; thus, leading to negative feedback in adoption situations. This subsequently leads to a cycle of adopting only when necessary as the perception is not supported by solid historical data regarding success.

The inability of micro-companies' to see the need to measure efficiency in a quantifiable and repeatable way will stand in the way of improving the success rate of adoption. This measure does not necessarily need to involve a huge resource but without a measure of any kind the success of a particular adoption will continue to be proven or dis-proven on the instinct of the owner-manager. If the owner-manager does not have the skills and/or education to do this it could be disastrous for the company (see case study 3 in appendix 4).

5.4 Proposed ICT Adoption Model

This research has attempted to use previous models of adoption developed for EDI, Internet and eBusiness and apply them to all ICT infrastructure purchases. The issues summarised in table 2.3 were extracted from the models outlined in chapter 2. This study explored those issues within the ICT sector in the West Midlands and subsequently refined the elements as in table 4.10.

Many of the issues defined in table 2.3 have emerged from this research too. This study did not use a control group of non-adopters as it was left to each company to describe their latest technology adoptions. They were asked to describe their last three investments and then to talk about the most significant of those. This was a deliberate strategy as the exploration of the model intended to show that the technology under study was not an important variable. The main observation from this is that the technology is unimportant. The majority of the issues in the adoption situation for micro-companies are personal issues relating to the owner-manager or organisational issues inherent in micro-companies.

The factors evaluated through this research are shown in a conceptual model (Figure 5.1) which is based on the model described by Van Akkeren and Cavaye (1999b). This model was published at the International Federation of Information Processing Conference in Portugal June 2009 (Costello and Moreton 2009). The proposed model incorporates return on investment (ROI) as called for by Van Akkeren and Cavaye and which has not been included in previous models.

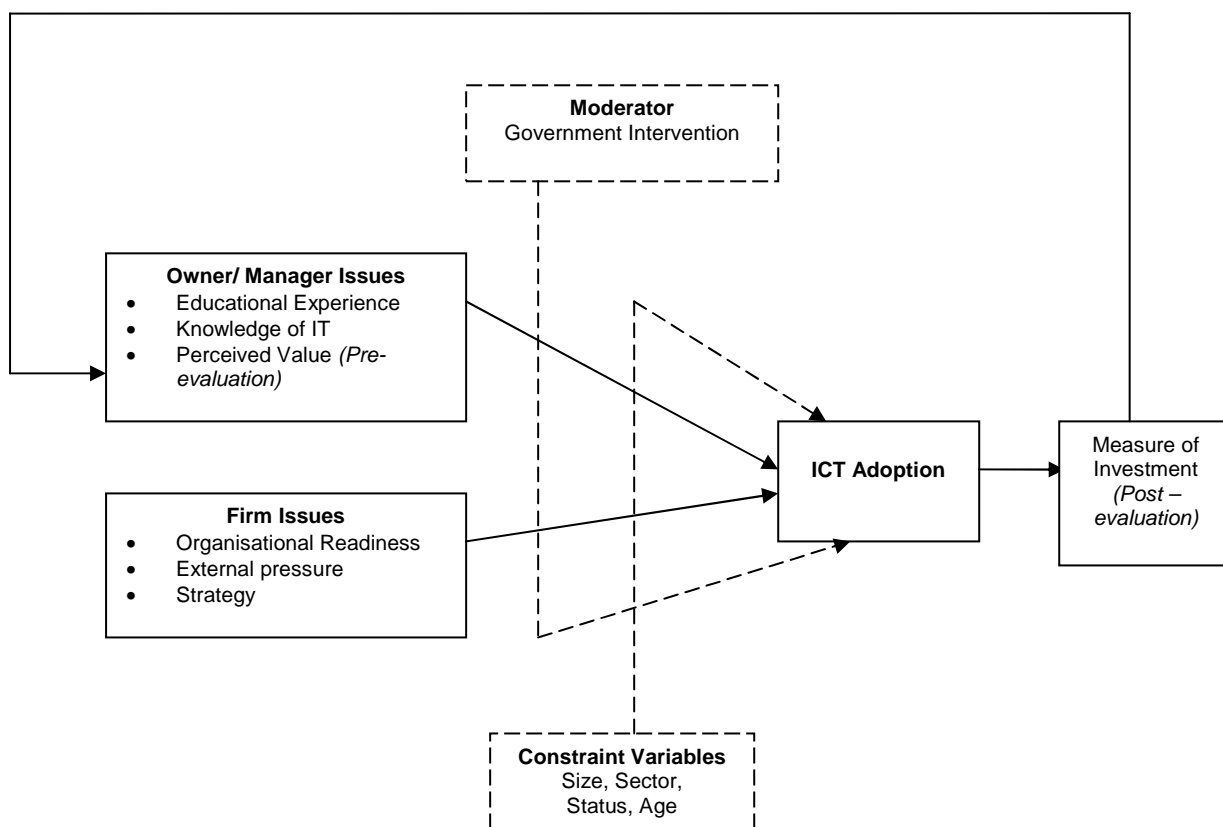


Figure 5.1: Conceptual Model of ICT adoption in micro SMEs.

Not all of the individual factors used in their model were explored, as this study has integrated a number of models to produce a more overarching model which will demonstrate to micro-companies issues that may need addressing in the adoption process. The proposed model demonstrates the impact of the owner-manager's perception of value both pre and post-adoption, which was shown to be of paramount importance throughout this study and is supported by numerous other researchers (Damanpour and Schneider, 2006; Levy and Powell, 2005; Sharma, 2004; Mehrtens et.

al., 2001; Van Akkeren and Cavaye, 1999b; Poza et. al., 1997; Schein, 1983; Jennings and Beaver, 1997; Storey 1994 Kirby and Turner, 1993). The owner-managers often makes ICT adoption decisions by using their perception of the value of the purchase as the main criteria in the pre-evaluation stage. In this situation the constraint variables are suggested as being those that impact on the company in terms of size, sector, status and age. Not all these constraints are directly tested through this research which concentrates on the ICT sector. However, they will provide the constraint variables for further testing in other sectors.

At the post-adoption stage the owner-manager uses as a measure either the 'perception' of increased efficiency, increased interest by customers or simply that 'it works'. This lack of measurement leads to the reinforcement of the perception that ICT is a cost to be endured and that feedback then leads to the same attitude in the next pre-adoption stage and reluctance to invest valuable resource. This is an iterative cycle where lack of historic data leads to the perpetuated attitude towards the next ICT adoption.

The moderator in this situation is Government intervention which attempts to alter the 'natural' course of adoption (Culkin and Smith, 2000; Mercer, 1996; Parker and Benson, 1987). This factor could also be further explored beyond this research. This intervention point is suggested as a way of providing major impetus to alter the course of the adoption process within micro-companies. By impacting the awareness and knowledge of an owner-manager at this stage and embedding that knowledge within the company, major paradigm shifts could be achieved which will improve adoption success.

5.5 Further research and development

Several themes emerged from the pilot study, but not covered in this study, have the potential to be developed further and might be of interest to subsequent researchers

- Given the SME community is vast, a possible area of research could be centered on whether Government is investing appropriately in technology adoption initiatives for micro-companies.
- The concept of the discovery of additional functionality post-adoption was an unexpected result from the initial case studies and needs further exploration as added functionality would influence the perception of adoption success. The effective use of packages such as email, Internet, groupware and desktop publishing would impact the way the business communicates and therefore the perception of its usefulness. For example it might be useful to know if there is an increase in profitability/productivity that informs the next purchasing decision or is it the increased functionality and therefore increased use that permeates the company culture and gives the experience of being more successful.
- The internal and external influences on purchasing with regard to equipment are an important consideration. Companies should always examine the business need first and that should drive the software purchase which then instigates the hardware purchase necessary to run it. However, as many managers relate, that is rarely the case in large companies as compromises are often necessary. In a micro-company the influence to buy is often much more basic, as can be seen from this study. The Internal and external influences in the macro and micro environment are another area of study.
- The competence and confidence of the users can also have a major effect on a purchasing decision. Selection of equipment will be strongly influenced by the owner-managers perception of ease of use. Training adds a significant and often unacceptable overhead.

This full study has also provided, like all other research, an opportunity to answer some questions but also to add others. This has also led to opportunities for further work in this field:

- This research was unable to use a control group of non-adopters as there was no single technology tested and instead all ICT purchases by micro-companies were explored. This was intentional as this research set out to explore previously cited issues and amalgamate them into a new model. This then could be the basis of further work using a control group of non-adopters specifically examining the issues proposed in the model at figure 5.1.
- Each of the issues discussed within the model could be examined in more detail. In particular by way of in-depth case studies, this could add depth and breadth of knowledge to the field. There have been many calls for further work in the area of ICT adoption and SMEs, in particular Martin and Matley, 2001; Levy et. al., 2001b; Dans, 2001; Farbey et. al., 1993; Brynjolfsson and Hitt, 1996; Ryan, 1997; Bannister and Remenyi, 2001; Costello et.al., 2007; Kai-Uwe Brock, 2000; Lee, 2001; Lefebvre & Lefebvre, 1996. The detail of the personal and firm competencies, for example, within each company is excluded from this research and it is possible that organisational readiness could be defined by the competencies inherent within the business (Caldeira 2006).
- This work has been carried out within the ICT sector in the West Midlands and therefore it replicable in other regions and in other sectors and results compared which could add significantly to the findings. By defining that this is a problem across sectors across the UK, specific Government initiatives could be targeted. Sheppard and Hooton (2007) has stated that the results of successful adoption can increase GVA for the whole of the UK and has highlighted what needs to be done at the macro level. However, an understanding of the intrinsic issues that can act as barriers to

their recommendations is invaluable to the success of any subsequent initiatives in the UK and indeed for the companies themselves.

- A further investigation of perceived value or perceived benefits in the mind of the owner-manager would elicit a further understanding of the intricate decision-making process in micro-companies. This could require looking at the psychological aspects or the education and/or skills and competencies of the individual owner-managers.
- The findings also show that among the postgraduate holders involved in the entire study of 203 companies, 81% were from micro-companies. This may indicate that in this sector in order to start a successful company a high level of education is a supporting factor. This study did not examine the reasons for this but further work could be indicated once more.
- All categories of micros demonstrated a random rise and fall of business turnover at different times during their business. This may indicate how competitive the business environment is for ICT companies. The adoption of new technology is paramount to business growth and especially in the ICT sector it may be necessary to help businesses understand why their turnover does not increase as the number of employees and number of years of operation grows. These issues are flagged as the sporadic growth of these companies may be directly related to their ability to successfully adopt technology and further investigation may uncover this.
- Many ICT micro-companies had implementation problems of one type or another. Some problems were anticipated and as these companies are ICT companies they may have fewer than other sectors. The main concerns are that problems are often due to lack of appropriate skills, which may be directly related to the fact that more often ICT skills are gained through experience only. Further research could

concentrate of the differences between this informal and formal acquisition of ICT knowledge and skills.

- This research also highlighted some differences in approach and attitude by owner-managers formally educated in ICT or non-ICT degrees. This research has already highlighted the effect of education on particular issues. These could be interpreted as:
 1. non-ICT degrees holders are more aware of issues such as marketing and business value.
 2. ICT degree holders understand the application of the technology but are unaware of the business value.

Further exploration around these categories would aid the understanding these differences.

- The research is unique in its application using only the ICT Sector which was regarded as not having particular issues regarding adoption. This research has however shown that they do have considerable concerns and problems in this area. This could imply the need to do a comparative analysis using another sector.
- Further work would be recommended to develop a checklist of factors that need to be in place in micro-companies. Producing a framework as a guide form the factors explored here.

5.6 Contribution to Knowledge

The objectives set out in section 1.4 have each been achieved within the limitations set out in section 1.5 and each of the objectives is revisited here:

1. To review and analyse current research in ICT adoption: this was achieved through a thorough analysis of a selection of ICT adoption models based on an academic grounding in the history of technology adoption research and a further

literature review based on those issues within the wider field of SME research and ICT investment.

2. To review and analyse ICT adoption models and use these models to develop a new model which is more encompassing and aimed at micro-companies: the new model was developed by amalgamating the reviewed models and further refined through a broader literature review. This was then explored in a survey of 167 micro-companies and further refined.
3. To investigate ICT infrastructure purchases in the research as most adoption models to date examine specific technologies, e.g. EDI, eBusiness and Internet. This would not differentiate technologies reflecting the approach by micro-companies: ICT infrastructure was the defined term, however, the survey allowed the respondents to select their last 3 purchases and then the most significant of those. This ensured that infrastructure as defined by Rai et. al. (1997) and described in section 1.7 was used.
4. To explore the issues within the models by extending the research into the broader research area and exploring the categories and elements within the model: each issue was explored through the wider literature review to determine its place within the wider field and to refine issues that may be important. For example owner-manager education subsequently became of greater importance than in the original model. This came about through a combination of the literature review and the selection of micro-companies as a focus in the survey.
5. To provide a new model of ICT adoption for micro-companies within the ICT Cluster: The model that has been developed goes beyond those previously offered as it now incorporates return on investment (ROI) and a feedback loop

demonstrating the impact of the owner-manager on the pre and post-adoption situation.

This research also offers a contribution to the field in a number of areas:

- It explores a more encompassing ICT adoption model developed from previous models in EDI, eBusiness and internet adoption underpinned by a significant literature review. This is only the start of the effort needed and the further work suggested above would need to take shape to achieve a defined model and/or framework which will guide a micro-company in the adoption process. This model does however highlight the issues of which micro-companies and those working with them need to be aware.
- It draws together the areas of SME (micro-company) research, ICT adoption and Information Economics to inform the debate and thus adds significantly to the debate in this area supported by a number of already published papers.
- There have been criticisms that previous adoption models did not consider specifically a measure of success. Return on Investment (ROI) of any kind has not been previously examined. There are significant difficulties in doing this in SMEs and specifically micro-companies. Therefore the perceived value of the owner manager was employed as the value to a micro-company pre-adoption, although this was defined qualitatively. ROI was also discussed examining the measure of success post-adoption that the owner-manager perceived. This brings a fresh debate on the importance of raising awareness of the need to measure adoption success to inform future investment.

- Previous research has not described Government Intervention as an interruption to the normal process of Information Economics as described by Benson (1987) which is the driver for adoption. Although the survey did not reveal the work done in this area by RDAs, the research conducted has highlighted this debate, leading to a more industrial demand-led view to future discussions.
- Much deliberation has taken place on how this debate will inform Government intervention vehicles for the most effective way of enhancing adoption in this sector. There is still extensive discussion to take place but this research has helped to shape and define that discussion, highlighting where emphasis may need to be placed.
- Research has confirmed that these issues are of both National and International concern and therefore of interest to both academics and policy makers alike. This study has added to knowledge in this area.
- The conceptual model itself is a contribution to the field, building on previous work and including categories and issues that have not been explored in such a broad sense before. The model incorporates selective issues defined by the literature to be the main concerns in each of these categories, which is a unique perspective. This was done for a number of reasons, not least of which was to keep the survey manageable for the companies. It was also compiled in this way so that the widest possible combination of factors could be explored to give a more comprehensive picture of the issue.
- The approach taken by this research is also challenging as it takes both qualitative and quantitative methods and combines them. This is a difficult balance but entirely appropriate to add knowledge as the approach has

added validity and strength to the discussion and makes the research thorough.

5.7 Conclusion and reflection

This research began by defining research questions and the approach to be taken for the research. In this final section there will be a reflection of the research approach taken and the research questions will be revisited in light of the work carried out, followed by some final thoughts on the study.

5.7.1 Reflection on the research approach and survey

The approach taken to this research was the exploration of issues within a unique situation. This led to a number of issues proving difficult to anticipate along the journey. The initial work involved researching the area of ICT investment and information economics. This evolved as the major question which has driven the author became 'Why do small companies buy the technology that they do?' This question was derived from several years of working for and with very small companies. The initial work has given a small contribution to the final thesis as the work has predominately focused on the area of ICT adoption and ICT adoption models; but has still led to the original driver being satisfied.

The difficulties to be overcome have been many, including the secondment to the ICT cluster and the survey which involved working with another person. This can often lead to more bias within the research arena (Oates, 2006) and there were some difficulties overcoming this. In the latter case lessons were learnt both by the author and the researcher who has now gone on to publish in an aligned area. The reflections on this impact are addressed in chapter 3. It is worth reflecting that the approach would have been significantly less rich if it had not been for the involvement of the ICT cluster.

However, the size of the survey was increased by their involvement, and therefore proved to be a challenge in terms of manipulating data.

Hindsight would dictate that the survey should have been smaller or the issues addressed be less but that would not have led to the work being as broad which has allowed for a good overview of the area or the application of the work being so immediate within the strategy of the ICT cluster which will directly impact ICT micro-companies. This work was undertaken with a view to answering a question that has been answered but has also left the author richer for the experience and colleagues and other researchers with a significant amount of data and knowledge to develop further.

The research has involved qualitative methods which have followed a process of analysing the data both during and after the data collection. The findings were developed in a 'bottom-up' approach as is typical of qualitative methods (Myers, 1997; Glaser and Strauss, 1967). The conceptual model (figure 5.1) was developed as the data was analysed and the original model has been refined which supports the qualitative methods choice. The majority of the data was analysed using thematic analysis within the exploratory framework and has therefore had limitations which are discussed in chapter 1. Some of the data collected was quantitative and helped to support some of the variables in the model. A more rigid approach to the work would have not allowed for the nuances inherent in exploratory research or the rich picture from the qualitative approach. Validity has been achieved through triangulation of method (Myers, 1997).

5.7.2 Reflection on the research questions

The research questions were refined as

1. Is it possible to develop an overarching model of ICT adoption which can be applied whatever the technology?

It would appear that this has been achieved through the work carried out here and although that is within the limitations already defined and the further work advised; a conceptual model is proposed. The myriad of complex issues in an adoption situation often leads to a simplification of this for research purposes which other researchers have also identified (Costello et.al., 2007; Locke. 2004; Kai-Uwe Brock, 2000; Van Akkeren and Cavaye, 1999b). Previous researchers have applied models to the EDI, Internet and eBusiness adoption situation (Levy and Powell, 2005; Grandon and Pearson, 2004; Rashid and Al-Qirim, 2001; Merheten et. al., 2001; Van Akkeren and Cavaye, 1999b; Poon et. al., 1996; Storey, 1994) this has supported their work and demonstrated that technology is irrelevant.

2. Can a model be proposed which will help to guide a micro-company in the adoption process?

The model developed here was based on the Van Akkeren and Cavaye (1999b model at figure 2.3) and was developed using factors from several other models (table 2.3). It may be possible to produce a guide for micro-companies beyond this work that will help to outline the issues that are inherent in their environment which may need to be addressed in order to aid the adoption process and which may make success more likely (see further work above). However, there can be no guarantee of success as the variables at work in this situation are so diverse and complex. Levy et.al (2005) have described the fact that business sector is irrelevant to the adoption concerns and this study would appear to support that, demonstrating many of the factors found in their study are inherent in the ICT sector too. Zowghi (2003) stated that there is a lack of models that actually guide SMEs through the adoption process this work at least provides an overview of issues and a model that includes an indication of a feedback cycle in the adoption process.

3. Is it possible to change the process of adoption to help micro-companies realise greater benefits from the adoption?

The process of adoption in SMEs often relates to a specific need in a short time frame associated with the need to react quickly to customer demands, sudden growth or to meet short term objectives (Van Akkeren and Cavaye, 1999a; Anderson, 2001; Cragg et.al., 2002; Levy et. al., 2005). This study has again supported this amongst micro-companies in the ICT sector. Many government initiatives have attempted to help SMEs adopt technologies and their approach is to install the new technology without embedding the necessary skills to gain business value from the adoption or the knowledge to make choices in the future. It is possible to change this cycle of adoption as described in figure 5.1. The knowledge of the owner-manager in a micro-company is paramount in this and government initiatives have the opportunity to interrupt this cycle and educate micro-companies in technology adoption.

4. Why do micro-companies appear to invest in an ad hoc manner for their IT infrastructure?

This question became apparent during the literature review and has been pursued throughout this study. In SMEs the issues relate to the drivers and inhibitors of eBusiness adoption as summarised by Levy et. al. (2005) and shown in table 2.1 and 2.2, the drivers being business benefits and the inhibitors being management limitations. This study of micro-companies supports that citation, whilst also demonstrating the education and knowledge of the owner-manager, which is interpreted as management limitations in micro-companies as the main inhibitor and perceived value (business benefits) as the main driver. In this case the owner-manager education and knowledge is responsible for both the perceived value of the purchase and the limitations which act as the inhibitor.

5. Can changes to government intervention help ICT companies with technology adoption?

The model developed at figure 5.1 would appear to show that government do indeed have an opportunity to intervene in the process of adoption. This means that by changing the approach that they currently have of funding projects which implement technologies

for micro-companies, to educating them in the adoption process, more success will be achieved. ICT companies are particularly challenging in this as it appears that many have the conviction that they do not need help with adoption. Levy et.al (2005) demonstrated that sector is irrelevant in the internet adoption process; and this research has concentrated on the ICT sector, although pilot studies were carried out across other sectors. The ICT sector appears to have the same issues as other sectors. This is of major concern as they need to be ahead of other sectors to truly support those sectors and to achieve the "GVA uplift" discussed by Sheppard and Hooton (2007) that Government intervention projects aim to achieve. The answer to question 3 above is also of relevance here.

5.7.3 Final Thoughts

Research carried out by Harindranath et. al. (2006) on adoption issues concluded that

"progress in the deployment of ICT typically depends on a single individual with vision who takes full responsibility for ICT initiatives, as well as continuing with their regular activities"

Their research was carried out in the West London and Thames Valley area with over 400 SMEs in the food, logistics, media and internet services industries. The main conclusion includes the distrust of consultants, the predominance of operational purchases, the concern about costs and the ignorance of initiatives to help.

This research confirms much of their findings, specifically for ICT companies, which also displayed distrust of consultants, make operational purchases, are concerned about costs and are ignorant of government initiatives and/or distrust of those initiatives having had poor previous experiences. This study also adds as important elements in the adoption process for ICT companies: lack of strategy, lack of technological skills, the education of the owner-manager and the presence of an ICT professional.

Poon (2002) felt there were difficulties in obtaining sufficient objective data from small companies and this may have also been a limitation here. However, the study has elicited more from micro-companies than previous research and therefore provides a unique insight. This study has also addressed the concerns of others in this field such as Levy et.al (2001a) who stated that most ICT adoption research has been directed at large companies. Also the work of Martin and Matlay (2001) who argued that work to date attempts to treat all small companies in a similar manner. However, there are diversities even within sub-sectors and this is acknowledged.

SMEs in the UK play a major role in the economy (Hill and McGowan, 1999; Timmons, 1994) and constitute the bulk of enterprise also (Storey 1994) their needs can no longer be addressed in the manner they have been to date. Sheppard and Hooton (2007) summarised the problems as poor management, investment in and use of ICT and that awareness raising and education was needed on a huge scale to address this. This work has specifically highlighted the issues in micro-companies which form 74% of the ICT sector in the West Midlands (Rowe 2007) and as such would elicit a significant increase in GVA if they were supported and educated in the adoption of technology.

Finally, Van Akkeren and Caveye (1999b) stated that one of the concerns of companies in the adoption process is their mistrust of the ICT industry, Harindranath et. al. (2007) again discovered this to be a concern. This work confirms these findings in that the companies interviewed felt a mistrust of the ICT consultants upon whom they could call, and often did not because of this mistrust. This study has been aimed at the ICT sector and emphasises that there is a real need to educate and enlighten them in order that they can support other sectors in the adoption process if the West Midlands is to make required advances in its economic development. Researchers and policy makers need to work together to achieve this aim.

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APPENDIX

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APPENDIX 1: Interview Outline

INITIAL STUDY - INTERVIEW GUIDE
Main theme is WHY did they buy what they did?

1. Background:

Name of company

Type of Business

How many employees

Location

Name of Interviewee

Position of Interviewee

Date of Interview

2. IT INVESTMENT

When?

What was your last IT purchase?

How long ago was that?

Upgrade or new?

Who?

Who made the decision to buy?

Who advised that person?

Who actually bought it?

Why?

What internal influences were there?

What external influences were there?

What was the purpose of the IT / what was it intended to do?

3. IT INFRASTRUCTURE

What?

Where the skills available in house?

HW Skills

SW Skills

Did it link to something you already had?

What changes needed to be made to business processes?

What type of problems were encountered during implementation?

Technical and Organisational

What type of problems were encountered after implementation?

Technical and Organisational

Was more functionality discovered after purchase?

Did you the use that functionality?

4. BUSINESS PERFORMANCE

How?

How successful was it?

How did you know it was successful?

How did you measure the success?

What perception of its success was there?

Did you allocate a timescale to the success – was there a Payback period?

APPENDIX 2: Case Study 1

PILOT STUDY COMPANY 1 - The Solicitors

This firm of solicitors employs some 76 in total excluding the 9 partners and are still growing. This company adheres to the European definition of a 'medium – sized' company. The service it delivers would appear obvious as it sells the time of their experts to the general public in both the private and commercial sector. The use of IT is now an integral part of delivering those services and many of their processes and communications are conducted through that medium. Although this has been a very recent development due to the implementation of recent IT projects (see below). This company is 'technologically' innovative in comparison with many SMEs and also in comparison with many in their sector.

IT Investment

Company 1 had implemented its latest project using an Application Service Provider (ASP) that had subsequently gone into liquidation and are now in the process of re-selecting a provider, the estimated investment is 6% - 7% of total budget annually. This was a total re-engineering, as some years previously they had realised they could not continue to recruit "expensive IT experts". This was coupled with the added problem that the company who supplied and maintained the hardware had also gone into liquidation so maintenance was also needed. The original project to install a PC network which replaced the old infrastructure, a Unix server with 3 workstations for accounts and another Unix server with several dumb-terminals for word-processing, had been able to treat the company as a 'green field' site. This had taken place in 1997, when the company had employed an IT expert full-time for one year to work on the project. This project had, however, left a cabling structure that was still adequate (cat. 5, 100Mb) but the PCs were now antiquated with 16Mb RAM and Windows 95. The company decided the ASP route was the way to make the entire infrastructure invisible to the users and the business.

It was the IT 'partner' (so called as he was more enthusiastic than other equity partners) who was being interviewed in this instance and who had taken the initiative to purchase. He then needed to take his ideas to the managing partner followed by the rest of the equity partners.

This gives the 'appearance' of being a group decision, but in reality is probably the decision of this one individual, as no-one else has the IT knowledge and he could be interpreted as being an IT 'champion'.

At the time of interview, they were employing a consultant to source a new ASP company as the IT partner did not have the time and "there are too many decisions on my desk, I don't have time to review the market myself".

When asked about the major influences, he replied that the main reasons for investment in new equipment are normally that the company wants to do more with the business than the current IT can cope with. External influences tended to be just trying to keep ahead of the competition. They are now considering a two-year rolling cycle rather than three years to stay ahead of the competition. They have deliberately chosen to move into areas of the law that depend on IT. So IT and the business are an integral part of each other. The company now aims to do more commercial work as that aspect of the business is dependant on IT, this gives a much smaller client base with much larger cases. For example the private client side of the business now works directly for one of the large 'Insurance Farms' that have emerged recently, companies who harvest customers but do not directly employ solicitors, preferring to sub-contract. It no longer needs to search around for one more Estate Agent to do business with. The conveyancing arm has reached 500 completions per month and is still growing, since the decision to move to be more IT focused. Moving to ASP also means that they have been able to employ people with more knowledge of the law and very little IT experience.

IT Infrastructure

This particular area had been the main reason for the latest project, as the constant updating or purchasing of skills was required so the decision to take the ASP route was chosen. No skills are now available in house and specialist hardware and software skills are outsourced aided by a 512k leased line. After initial training in the use of the applications employees are self-taught on the job.

The interviewee was asked if this linked to something they already had? to establish if consideration had to be given to prior purchased IT as rarely these days are projects conducted on 'green field' sites. However, he felt that this was not applicable as they had employed an ASP.

The interviewee was asked about subsequent changes to business processes to establish if the purchase had been made with this in mind and explore any implementation problems subsequently. The answer here was somewhat unexpected "*Business processes and IT go hand in hand. Sometimes one drives the other but usually they are inseparable*". A particularly insightful and unexpected answer. However, problems during implementation mainly centred around two areas:

1. Printing, a problem for companies no matter what their size.
2. Relationship management with the supplier of the specialist software. The supplier was also at the point of branching into ASP and was not happy that their client had selected someone else to provide this service.

After implementation there were no perceived problems as they felt that they were usually sorted by the ASP. However the interviewee did say "*of course we have the usual complaints as you do from any users but they have learnt not to moan when we show people around the systems to showcase it*". (The company now sells their services on the strength of their IT set up).

The interviewee was then asked if further functionality was discovered after purchase and was that then used in the business? This question explores whether the respondent was attempting to use the full potential of the purchase and in this way establish the 'value' of the purchase by experimentation. In fact they had discovered more functionality through Outlook 2000 as part of Office 2000. This then progressed from one PC with a dial-up email account to desk-to-desk email and electronic diaries, which was a huge culture shock to the employees.

Business Performance

The final area of interview was business performance and was intended to establish both the *perceived* and *actual* value realised by the purchase. The interviewee was asked how successful they felt the purchase was? How did they know it was successful? and How did they measure the success? They were also asked: What perception of its success was there throughout the company? a question which was intended to capture the interviewee's view of the wider community in the organisation.

This reply was biased by the attitude of the interviewee: *"I think it was very successful"*. Knowledge of this success came from the doubling of profits in the year after the first project took place in 1997; we have not looked back since. Success of each project is not, however, formally evaluated, as IT is not perceived to be separate from the rest of the business. *"IT is a part of the infrastructure, like the coffee machine and phone lines"*. To the interviewee the perception of success was viewed with these criteria:

1. Resilience in the network.
2. The speed in the network is enough for the users
3. It is seamless from the users point of view (desktop, intranet and internet).

When asked if there was allocated a timescale to the success – was there a Payback period? The reply was that there was no timescale allocated for payback and relied on the fact that it would be successful, proof was through increased profit and an increase in client numbers.

APPENDIX 3: Case Study 2

PILOT STUDY COMPANY 2 - The Irrigation Specialists

This company have only 8 employees, plus 2 company directors (the owner and his wife), which makes it a 'micro' company. The service it delivers is the expertise and time of people again, but in a much more physical way. The service itself cannot be delivered through an electronic medium! The technicians from the company operate out in the field and therefore the company would gain many benefits from being more technically 'savvy' yet this is not happening. They have a workshop and offices, yet the majority of administration for the company is still run from 'the kitchen table' in their own home.

IT Investment

This company had purchased a Computer, fax phone and digital camera two years previously before that all processes were manual. This was a totally new venture and the company do not intend to upgrade in the near future, as long as everything is still working. In total contrast to Company 1 this company usually seek advise from a friend with computing knowledge for decisions, returning to the friend on several occasions until the owner manager is more familiar with computing terminology. The directors usually concluded by making the decision together, this was not always based on the best advice or complete advice. They also purchased the equipment together as it was not just intended solely for business use but for home use as well. The equipment is located in their home and not in their workshop premises. The main reason for purchase was volume of work, business was growing and it was taking too long to produce invoices on a typewriter. It is now felt that much faster invoicing and quotes are possible, the need to automate document production was a major influence. This is an interesting point as it was also the original driving force behind Company 1's decision.

This company found its main internal influences were the volume of work it was coping with manually. Business was growing and production of administrative paper work was taking too long, they now have much faster invoicing and quotes. The need to automate was the largest influence, although the thought that IT would speed up these processes was merely gleaned

from friends and the press, no major external influences were perceived as the majority of customers are farmers and they are happy to use fax. There has been no external pressure from suppliers either. Although since implementation the company accounts have been automated and the company accountant was an influence there. The IT equipment was bought with the intention of speeding up processes and the perception is that it has.

IT Infrastructure

There are no skills available in house and both employees and owners often learnt by experimentation and “trial and error”. A maintenance contract was purchased for the hardware but as with company 1 the support company had gone into liquidation, this left them with no support and that had not been resolved. Often they had either attempted a repair themselves or asked an IT literate friend. Software skills are self-taught with the help from two teenage sons, which provides another interesting insight as company 1 had had their original web-site designed by the teenage son of a partner. *“After some initial guidance from a friend ‘playing’ with the computer yielded some success, there is not enough time or enough money for training.”*

The question was asked did it link to something you already had? This was brought in to establish if consideration had to be given to this prior to purchasing. However, this was not applicable as they had only automated existing processes.

The interviewee was asked about subsequent changes to business processes to establish if the purchase had been made with this in mind. Many SMEs buy their IT and then realise they need to ‘fit the business to the project’ rather than purchase IT to support the strategy of the business (Costello 1999). With this in mind most of the answers to what type of problems were encountered during and after implementation, both technical and organisational aspects were expected to centre around this problem.

This company had automated the existing business processes and so did not perceive any problems during implementation. Three main problems areas were perceived:

1. Printing

2. 'Losing' documents until more training had taken place. (This was taken by the interviewer to mean saving work in the wrong place.)

3. Back-ups – as they have to wait until a friend has time to do them for them.

(1 and 3 may be related and are centred around lack of training)

The main problem after implementation was when the operating system refused to work and they could not access the computer at all. The main cause of this was allowing the two teenage sons to install games on the computer and play them. Since this a separate PC has been purchased for personal use. The maintenance company refused to help them without an exceptionally high price to extract data that had not been backed up. Again it was back to using personal contacts and friends to help sort it out, but unfortunately some data was still lost. This caused a lot of extra work.

The Interviewee was then asked if further functionality was discovered after the purchase and was that then used in the business? This question explores whether the respondent was attempting to use the full potential of the purchase and in this way establish the 'value' of the purchase by experimentation.

This company had discovered many new functions:

1. Email, although this is still only used occasionally for customers.
2. Desktop publishing, which has allowed them to produce many of their own marketing fliers, leaflets and invitations at a considerable saving whilst still looking 'professional'.
3. Quotes, which were historically never typed up and saved but that can also be done now.
4. The internet, although not often for business use unless it was for pictures to put into the marketing leaflets.

Business performance

Question in this section were again intended to establish both the *perceived* and *actual* value realised by the purchase. Interviewees were asked how successful was the purchase? How did

you know it was successful? and How did you measure the success? The respondent was also asked: What perception of its success was there throughout the company? a question which was intended to capture the interviewee's view of the wider community in the organisation.

Company 2 interviewee is quoted as saying "*Very successful*". When asked how she knew it was successful the answer was "*I don't, I just know*". They measured success by the amount of work they could now cope with in comparison to before the computer with 2 sales men instead of 1, 4 engineers and 1 person in stores who also sells. All the administration for that is done by one person, this would have been impossible before. Workload has increased by 5 or 6 times, this has not been measured and was just a personal observation and an estimate. This is mainly due to the ability to edit on screen and produce invoices and quotes quickly, plus the marketing which is now perceived as looking very professional.

Did you allocate a timescale to the success – was there a Payback period? Again a question to elicit the expected results from the purchase and if there had been an evaluation process prior to purchase or subsequently. This company had started the project as a trial to see if it would work, and now feel they could not do without it. As they do not intend to expand any more, they feel they would lose the personal service they presently give customers. The unforeseen advantage was that the equipment was intended to do one thing and the 'spin-off' is that it has permeated into many other areas like accounts and marketing.

APPENDIX 4: Case Study 3

PILOT STUDY COMPANY 1 - The Replacement Window Specialists.

Company 3, the replacement windows specialists, specialise in individually styled windows for the private sector. It has 17 employees and 1 part-time accountant and fit into the European definition of a small company. The company is run by the two directors who are owner / managers and are not related. The service they provide is again specialist. Most customers are gained through personal recommendation and they feel there is very little need to communicate electronically with them. The company is not technically innovative and is the one company who has not had contact with any IT professionals except a salesman who advises them. They like to deliver a 'personal' service and feel that this cannot include technology.

IT Investment

This Company had purchased a computer and scanner approximately one year previously.

This was not an upgrade but an addition as it already had 3 computers and a laptop, all of which are stand-alone. The company are not planning any more purchases at present.

The interviewee was also asked who made the decision to buy? This was considered important as if the purchaser was an IT champion the outcome may be very different to a large customer insisting that a purchase was made to remain a preferred supplier. The question, who advised that person? Attempts to elicit the influence on that purchaser at the time of decision-making? Whereas who actually bought it? was incorporated to establish if someone else was involved at the point of purchase when the influence could again change.

In this company it was the interviewee, one of the directors of the company who made the decision about the computer and her counterpart who bought the scanner. A salesman from a local company advised the company about the purchases. The interviewee made the comment that she felt that the company could trust this person and so far have not been proven wrong, as he has always appeared to be helpful and honest. The reason for the purchase was to enable the scanning of pictures of windows in specific situations and then to print out copies to send to prospective customers. The company had been convinced to have another company develop a

web site for it because it *“seemed like a good idea”*. The site is not dynamic and is rarely used and purely provides information which itself is out of date. In two years two enquiries have been received from individuals who found the site. The one email connection is mainly for personal use, as they prefer to contact customers by phone.

This Company had yet another perspective with the main reason for purchase being to allow pictures to be taken, scanned and printed ad-hoc to send out to customers with quotes. Unfortunately that was not yet been deemed as successful, as an upgrade to the printers is needed to enable them to print pictures with quality. This has not been fulfilled yet due to shortage of time. The company are currently taking advice from the ‘usual source’. A separate computer is used to type letters; quotes are still hand-written.

IT Infrastructure

It was no surprise that this company had no skills available internally either. Software was learnt through trial and error with one director learning to use computers many years ago at college and trying to keep up to date by ‘playing’ with them. The main problem encountered was that already listed of the printers being unable to print picture quality.

Asking the question did it link to something you already had? was brought in to establish if consideration had to be given to prior purchased IT as rarely these days are projects conducted on ‘green field’ sites. The interviewee was again asked about subsequent changes to business processes to establish if the purchase had been made with this in mind (See Company 2). Again, they merely automated already existing business processes, they had had several problems with a software package many years before that had not solved their need to specify and cost individually designed replacement windows. This appears to have influenced their attitude and they now feel that they could not be persuaded to ‘experiment’ and would need to be convinced of the business benefits. They did not list specific problems but felt the general attitude in the company was *“we buy what we need to do the job and if it works great”*.

Further functionality as a result of experimentation was again explored this company had mainly purchased each PC as and when they felt the need to have them. The office had one PC for the secretary, one for each of the directors, a 'floating' laptop and another PC located in the workshop. These were not connected and they could not see the need to do so. The only further functionality commented on was the usefulness of the Microsoft games to wile away the lunch hour. This company appeared to have an entirely different attitude to the other two.

Business Performance

Again the final area of interview was and was intended to establish both the *perceived* and *actual* value realised by the purchase. Interviewees were asked how successful was the purchase? How did you know it was successful? and How did you measure the success? The respondent was also asked: What perception of its success was there throughout the company? a question which was intended to capture the interviewee's view of the wider community in the organisation.

This company had the same attitude as in previous answers with the answer to the question: How successful was the purchase being "*no not successful, it doesn't do what we wanted*". If any equipment is purchased and it serves the purpose it was intended to it is then perceived as a success. This company were also perceived by the interviewer as having the least knowledge about the potential business benefits of IT. This area was explored further by asking the perception of success of previous projects, which elicited a similar answer, "*if it works then we are happy*".

Did you allocate a timescale to the success – was there a Payback period? Again a question to elicit the expected results from the purchase and if there had been an evaluation process prior to purchase or subsequently. This company in line with the others also had no payback period allocated and the latest project is still not seen as successful since it still needs to fulfill the purpose it was bought for which is to produce copies of photographs.

APPENDIX 5: Draft Questionnaire for Pilot Study

PhD STUDY

IT Infrastructure Investment Decisions and their Impact on Business Performance for SMEs

This survey forms part of a study to investigate the investment in Information Technology (IT) made by small / medium sized companies in the West Midlands and the impact that the purchase then has on the performance of the business. The completed thesis will not identify individual companies; therefore if you wish to remain anonymous that will be respected. However, it is hoped that the results will produce a framework that will help companies decide if an investment is likely to be worthwhile. Thank you for taking part in this survey, if you would like a copy of the completed framework please tick here and supply a full postal address on the sheet attached to the back of this questionnaire. If you require help with completing this survey please contact: Pat Costello p.Costello@wlv.ac.uk or Jeremy Reece j.p.reece@wlv.ac.uk

SECTION 1: COMPANY BACKGROUND

Your position in the company =			
Cluster (please circle):	ICT	New Media	Professional & Business Services
	Food & Drink	Tourism & Leisure	Other
Industry Sector e.g. IT, Marketing, Retail, etc =			
No. of Employees =			
Approximate turnover =			
No. of years of operation =			

SECTION 2: IT INFRASTRUCTURE

1. What IT do you have that you use regularly in your business?
(place a tick in the first column for all that apply, place a tick in second column if you do not understand the technology)

a) None	<input type="checkbox"/>	<input type="checkbox"/>	h) other – please explain
b) Stand Alone PC(s)	<input type="checkbox"/>	<input type="checkbox"/>	
c) Networked PC's (one site only - LAN)	<input type="checkbox"/>	<input type="checkbox"/>	
d) Inter-networked PC's (inter-site - WAN)	<input type="checkbox"/>	<input type="checkbox"/>	
e) Wireless LAN	<input type="checkbox"/>	<input type="checkbox"/>	
f) VOIP	<input type="checkbox"/>	<input type="checkbox"/>	
g) Hand held devices (Mobile working e.g. Ipaq)	<input type="checkbox"/>	<input type="checkbox"/>	

2. What IT do you have that reaches outside of the business?
(place a tick in the first column for all that apply, place a tick in second column if you do not understand the technology)

a) Access to the Internet	<input type="checkbox"/>	<input type="checkbox"/>	g) other – please explain
b) Company Web Site	<input type="checkbox"/>	<input type="checkbox"/>	
c) Email	<input type="checkbox"/>	<input type="checkbox"/>	
d) Application Service Provider (ASP)	<input type="checkbox"/>	<input type="checkbox"/>	
e) EDI	<input type="checkbox"/>	<input type="checkbox"/>	
f) Extranet	<input type="checkbox"/>	<input type="checkbox"/>	

SECTION 3: IT INVESTMENT

3. Please detail below the last 3 **significant** IT Purchases you made

	Product	When did you buy it?	Who bought it? (position)	Who advised them? (internal, external, position, etc)	Reason for purchase?
1					
2					
3					

IMPORTANT NOTE: Choose the most significant purchase from the 3 you have named above and relate all your answers in the rest of the questionnaire to that purchase.

3. Which purchase have you chosen? 3	Purchase 1	Purchase 2	Purchase 3
4. Why is that purchase the most significant? e.g. cost, technical impact, business impact, financial impact, etc.			
5. Was advice sought prior to this purchase?		Yes - go to Q. 7 No - go to Q. 9	
6. Where / Who did you seek advice from?			
7. Why did you seek advice?			
8. What were the main influences in this purchase (why did you buy?)			
9. What implementation problems did you have? (please tick all that apply)			
a) Lack of skills	<input type="checkbox"/>	f) Other – please explain	
b) Technology	<input type="checkbox"/>		
c) Transfer of data	<input type="checkbox"/>		
d) Third party support	<input type="checkbox"/>		
e) Compatibility	<input type="checkbox"/>		

<p>10. Did you need to change any business processes to incorporate your purchase? Yes - go to Q. 12 No - go to Q. 13</p>
<p>11. What did you need to change?</p>
<p>12. Did you discover more features after you began to use the purchase? Yes - go to Q. 14 No - go to Q. 15</p>
<p>13. What were the features and how do you use them?</p>
<p>14. What are you planning to buy next?</p>

SECTION 4 BUSINESS PERFORMANCE

13. Please tick below to indicate how successful **you** feel the purchase has been.

Very Successful	Successful	No Change	Not Successful	Complete Disaster	No Opinion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p>14. How do you know it was successful?</p>
<p>15. How did you measure the success?</p>
<p>16. What perception of its success has there been from people within the business?</p>

17. What perception of its success has there been from people external to the business?

18. Did you allocate a timescale to the success? E.g. Was there a Payback period?

Please add any other notes you feel may help in this survey.

Thank you for completing this survey.

If you would like a copy of the resulting framework results please add a name and full postal address here:

Name:

Address for postage:

.....

.....

Return Address:
Mrs. P. Costello
School of Computing and IT
Univesity of Wolverhampton
Lichfiled Street,
Wolverhampton
WV1 1EL

APPENDIX 6: Email to Pilot Survey Companies

Dear

I am currently working as a full time lecturer in the School of Computing and IT at the University of Wolverhampton and also studying for a PhD in computing. The research I am undertaking for the PhD will attempt to examine IT equipment buying trends in small / medium companies including the way that the purchase decision is made and the perceived value of that purchase to the business.

It is hoped that this research will provide the data to test a model of IT adoption developed from established e-business adoption models and show its application to all technologies. This will prove useful to small companies as a guide to the likely success of their next purchase based on a specific IT Adoption model.

I would be very grateful if you would assist my research by completing the attached survey which should not take longer than 15 / 20 minutes to complete. If you do not have any responsibility for purchasing within your company can you please pass to someone else to complete. If you have friends / colleagues who also work for or own a small company and you think it is appropriate please ask them to complete this survey too.

If you would like more information about this research or guidance on how to complete please do not hesitate to contact me.

Regards

Pat Costello

APPENDIX 7: Revised Questionnaire (ICT Cluster)

Towards a Model of IT Adoption for the ICT Cluster in the West Midlands.

SECTION 1: COMPANY BACKGROUND

Company Name		
Company Location		
No. Of Employees:		
Approximate Turnover:		
No. of years of operation		
Your position in the company		
Legal Form of company: e.g Limited liability, sole trader, etc		
Level of education of interviewee:		
Secondary School		
A levels		
Degree		
Postgraduate		
Other =		
Are you an IT professional or does the company employ an IT Professional?		

SECTION 2: IT INFRASTRUCTURE

4. What IT do you have already that you **use** regularly in your business?
(place a tick against all that apply, place a tick in shaded column if you do not understand
the technology)

	Daily	Weekly	Monthly	Don't Know	Don't understand
a) Stand Alone PC(s)					
b) Networked PC's (one site only - LAN)					
c) Inter-networked PC's (inter-site - WAN)					
d) Wireless LAN					
e) VOIP					
f) Hand held devices (Mobile working e.g. Ipaq)					
g) Access to the Internet					
h) Company Web Site					
i) Email					
j) Application Service Provider (ASP)					
k) EDI					
l) Extranet					
m) None	n) other (please explain)				

SECTION 3: IT INVESTMENT

5. Please detail below the last 3 **significant** IT Purchases you made

	Product	When did you buy it?	Who bought it? (position)	Who advised them?	Reason for purchase?
1					
2					
3					

IMPORTANT NOTE: Choose the most significant purchase from the 3 you have named above and relate all your answers in the rest of the questionnaire to that purchase.

<p>10. Which purchase have you chosen? Purchase 1 <input type="checkbox"/> Purchase 2 <input type="checkbox"/> Purchase 3 <input type="checkbox"/></p>				
<p>11. In your view why was that purchase the most significant? Technology Impact <input type="checkbox"/> Financial Impact <input type="checkbox"/> Business Impact <input type="checkbox"/> Process Impact <input type="checkbox"/> Other please explain:</p>				
<p>12. Did you seek advice prior to purchase and if so who from? A company employee <input type="checkbox"/> External Advisor <input type="checkbox"/> Internet Research <input type="checkbox"/> A PC Magazine <input type="checkbox"/> Other please explain: ICT Cluster Project: IT Futures <input type="checkbox"/> Open Advantage <input type="checkbox"/> iCentrum <input type="checkbox"/> Cercia <input type="checkbox"/> WMita <input type="checkbox"/> West Midlands Mobile and Wireless (WMMW) <input type="checkbox"/> Photonics <input type="checkbox"/> Any other?</p>				
<p>13. What were the main influences in this purchase (why did you buy?) e.g. customer /supplier? replacement / upgrade for older equipment?, replacement for traditional methods of work, etc?</p>				
<p>14. Was there any internal pressure to buy and if so who or what? E.g. pressure from within the company, business growth, new employee, etc.</p>				
<p>15. Was there any external pressure to buy and if so who or what? E.g. technological advances, pressure from a customer, etc.</p>				
<p>16. What implementation problems did you have? (please tick all that apply)</p>				
<table border="1"> <tbody> <tr> <td>a) Lack of skills</td> <td><input type="checkbox"/></td> <td>f) Other – please explain</td> <td><input type="checkbox"/></td> </tr> </tbody> </table>	a) Lack of skills	<input type="checkbox"/>	f) Other – please explain	<input type="checkbox"/>
a) Lack of skills	<input type="checkbox"/>	f) Other – please explain	<input type="checkbox"/>	

b) Technology		
c) Transfer of data		
d) Third party support		
e) Compatibility		
15. What are you planning to buy next?		

SECTION 4 BUSINESS PERFORMANCE

11. Please tick below to indicate how successful **you** feel the purchase has been.

Very Successful	Successful	No Change	Not Successful	Complete Disaster	No Opinion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. What did you see as the benefits of the purchase?
13. What measure of success has there been?
14. If you did not measure the success can you explain why not?
15. Have others commented on the success either within the company or from outside?
16. Did you allocate a timescale to the success? E.g. Was there a Payback period? How long was this?

Please add any other notes you feel may help in this survey.

APPENDIX 8: Flyer for Companies involved in the Survey

ICT Adoption Research



Introduction

SMEs generate 98.8% of business in UK, accounting for nearly 55% of employment and 51% turnover to the economy. There are approximately 290,000 SMEs in West Midlands region and among these are 4,000+ ICT-oriented businesses. Such businesses are growing and provide an estimated employment of up to 72,000 employees in the region. For this reason, the West Midlands (WM) ICT cluster, in collaboration with the University of Wolverhampton identified the necessity to create extra advantage for ICT businesses, by empowering SMES with the means of adopting new technologies necessary for their competitive advantage.

ICT Adoption Research

For many SMEs, innovation is not about 'blue-sky' research and leading edge technology, but rather the adoption of technology that will enable new processes that will enhance their efficiency and effectiveness. The WM ICT Cluster has recognised this, and much of their successful work has focused on adding value and aiding companies to move up the IT adoption ladder. The aim of this project is to identify key factors necessary for successful IT adoption within the ICT Cluster SMEs and successful adoption of new innovations prevalent to competitive advantage.

In order for this project to address the needs of SMEs and understand how best we can benefit them, we need to conduct a short survey (approximately 15 – 20 mins) with representatives from SMEs. For accurate representation we will interview approximately 70-100 West Midlands ICT businesses, which will identify successful adoption factors, upon which recommendations and transferable practices can be established.

Benefit to SMEs

ICT Companies more than any other need to embrace and adopt new technologies at an alarming rate. Yet the issues that hinder progress in this area in ICT companies are no different than in any other small company. This project will firstly deliver a report based on insights from WM ICT businesses which will be used by AWM to inform their investment in projects which support ICT businesses to adopt new technologies. This will be achieved by establishing future projects that embed factors for successful technology adoption leading to a more sustainable effect on the region. A framework will also be developed which will help companies identify important issues within their organisation for successful technology adoption. This will lead to an ability to adopt more innovative solutions successfully. The report and the framework will be published on the ICT Cluster website and will be free to download.

For further information on the WM ICT Cluster go to register www.wmictcluster.co.uk and for regular updates.

Project Contacts

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Research Fellow IT Strategy for SMEs
(W.Midlands)

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WM ICT Cluster Innovation Manager

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Mobile: 07967128521
Email: p.costello@wlv.ac.uk

APPENDIX 9: AWM Report – A Summary of Issues

ICT adoption by ICT companies in the West Midlands

A summary of issues.



December 2007

Introduction

For ICT SMEs the adoption of new technology is crucial to their business and the assumption is made that the needs of this sector are different from those associated with companies whose core business is not ICT. ICT companies need to embrace and adopt new technologies at an alarming rate. The West Midlands ICT Cluster has recognised this, and has commissioned research aimed at identifying key factors necessary for successful IT adoption within the ICT Cluster.

This research is based on the known issues related to successful ICT adoption in SMEs and is a summary of the findings from research with 200 ICT companies.

The study was conducted through face-to-face and telephone interview. 83% of the SMEs opted for a face-to-face interview, while 17% opted for a telephone interview.

- 68% of companies in the study were micro SMEs.
- 20% were small
- 9% medium
- While 3% did not disclose this information

A summary of the main findings follows together with the main action points from the research.

1. Economic growth and company profile

- For micro and small companies there is a random increase or decrease in turnover which suggests that as the number of years of operation increases (or the number of employees increases) there is no guarantee that there will be a comparative increase in turnover. This is a matter of concern as it would be expected that some sort of stability in the turnover of the more experienced SMEs would emerge over time. These SMEs understand their markets and their competitors well, and can use that information to develop a solid business plan.
- For medium-sized enterprises there is an interesting relationship between the number of employees, the turnover and the number of years of operation. For example, some SMEs with 51-150 employees and 10 years of operation have a high turnover, while some (also with 51-150 employees) with more than 10 years of experience (up to 60 or 90 years) have a turnover which is considerably less. This may however, be a reflection of the markets they operate in or the products and services they supply.
- With higher number of employees (151-250), the results show some stability. As the company's years of operation increases and likewise the number of employees, so does the turnover of the company.

2. Owner/ Managing Director Profile

- It was found that 50% of the owner/managers are degree holders, 19% have a postgraduate education and 27 % of owner/managers have no higher education.
- Only 1% of the owner/managers hold a PhD.
- The findings show that, among all the postgraduate holders involved in the study, 81% are from micro companies, 14% from small, while 5% are from medium enterprises.
- 50% of the medium SMEs are owned by an individual with no higher education, while 50% did not disclose this information.

- There is also some evidence that the companies who employ an IT professional have a higher turnover than companies that have no IT professional. There could be an implied correlation between the owner-manager's educational field and the prosperity of the company.
- An attempt to measure the variable 'knowledge of IT' was dismissed as most claimed that they had knowledge of IT based on the fact that they ran or were employed by an IT company. Further questioning demonstrated that this may not be the case (see section 5).
- Most owner-managers who claim to be IT professionals have acquired their professionalism through experience, and not through a formal education. That is, 68% of respondents involved in the study claimed to be IT professionals. 23% of the IT professionals acquired their knowledge through education, while 53% obtained it through experience, 24% did not disclose this information.
- SME owners/managers who acquired their profession through their formal education achieved their degrees in the field of computer science or electrical and electronic engineering.
- For those which acquired their profession through experience, their educational backgrounds were from areas such as: business administration, business studies, financial management, chartered accountancy, mechanical engineering, automotive engineering, quality engineering, neural science, genetics, physics and applied physics, politics, education etc. These statistics do not account for market pressures.
- The study identified 4 main influences on SMEs purchases in infrastructure. These are: customers, replacement for traditional methods, upgrading of equipment and the perception that the purchase was 'essential to the business'
- 38% of micro, 30% small and 66% of medium SMEs see the main influence to their purchase to be the upgrading of the equipment. Very few SMEs (1% micro, 0% small, and 7% medium) see the influence to be related to technological advances. These companies intend to keep themselves ahead of technology so that they are able to advise and service their customers more efficiently.

3. Issues related to SMEs ability to adopt the technologies

- 48% of SMEs had implementation problems with new technology, 52% claimed that they had no problems but when subsequently questioned in which area they needed support they were happy to discuss this, indicating their true status in this area.
- Specifically, 47% of micro, 27% of small, and 77% of medium SMEs claimed that they did not have implementation limitations
- 53% of micro, 63% of small, and 23% of medium admitted to having implementation limitations in areas such as transferring data to new systems, third party support, compatibility issues and technology know how.
- Over all category of SMEs the results shows a percentage of companies with the corresponding limitations:
 - 9% - transferring data,
 - 4% - third party support,
 - 12% - compatibility,
 - 15% - lack of skills
 - 8% - technological know how.

Although lack of skills or access to skills could underpin most of these areas.

- 25% of companies seek advice internally if they believe that they have that knowledge in house.

- Other sources of advice include the Internet, PC magazines or an external advisor. The external advisor will usually be a friend, relative, a trusted individual from a fellow SME, a supplier, or a retail store advisor.
- The more specialist the purchase the more likely it is that advice will be sought externally. Advice will also be sought if the purchase is perceived to be expensive.
- 37% of SMEs believe that they have no internal pressure from within the company to invest in new technology. This may indicate no desire to improve or grow or they may simply be unaware of the need to improve services or the need to innovate to widen their market. They continue to serve the same customer base.
- 31% perceive internal pressure from within the company, while 21% of these state business growth as the pressure.
- Most stated that they had to invest in new technologies to enhance their efficiency and productivity and to satisfy their customers' needs.
- 44% of micros, 43% of small and 50% of medium companies stated that there was no external pressure to invest in new technology. This could indicate that they are coping. However, this is not necessarily true as they also have no plans to invest in technologies, and are facing various technological implementation limitations. It is not clear why they do not recognise external pressure from the wider environment.

4. Strategy

- The main influence on purchases was customers, and as the main purchases were laptops and handheld devices this may mean they are being driven by the need to keep in touch.
- The companies interviewed see applications programmes (software) as an essential tool to maximize profit but in reality there are several implementation problems (discussed in section 6) involved in the process.
- Most decided that business impact was the main reason for their latest purchase. Considering their lack of IT investment plans, their sources of advice and their problems related to IT implementation, this indicates a major misunderstanding of business impact in relation to strategy. There was also a lack of understanding and / or lack of recognition of the pressures inherent in the macro environment. The results demonstrate an emphasis on processes rather than strategy.
- Large numbers of companies had no plans for future purchases currently, stating that this would depend on customers. In fact, the majority, (80% of the medium SMEs) have no plans at all either for their business or for investment. This shows that they are mainly reactive to market demand and not proactive. If this attitude is displayed in other areas of their business the ICT cluster could have major problems with, for example, efficiency, productivity, innovation, etc.
- The main measures of successful adoption reported were the following:
 - Profitability
 - No Complaints (from customers)
 - High level of interest (more customers)
 - Efficiency (using less time to provide the same service)
- These are very loose measures and more work is needed in this area particularly in relation to raising the awareness of the need to measure success.

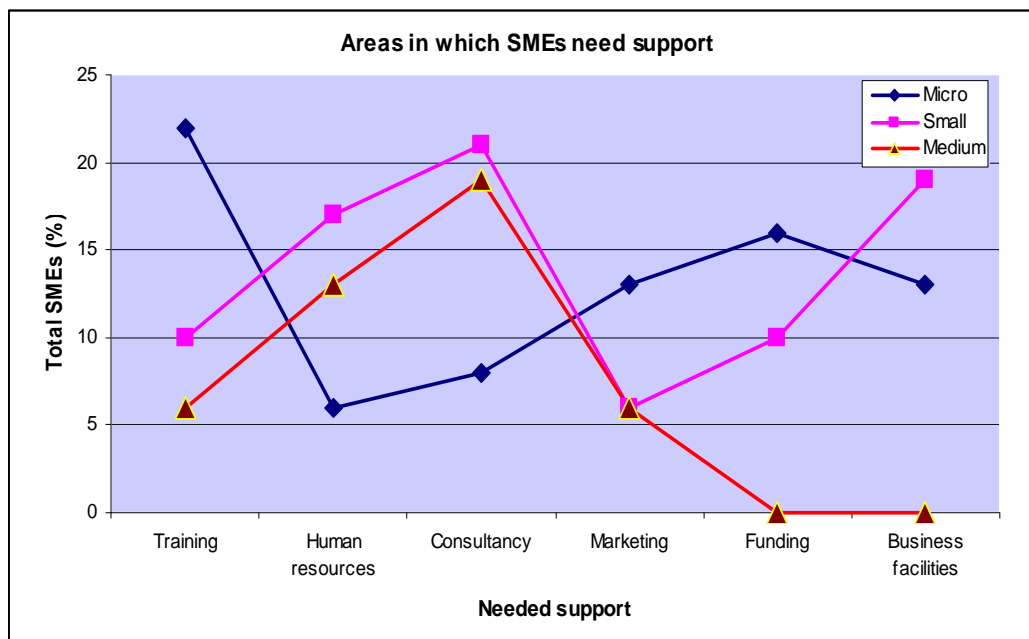
5. Other Factors.

- 88% of the companies surveyed have access to the Internet and their own website.

- 39% of micros, 60% small and 14% medium stated that they used Open Source Software (OSS). This is predominantly Linux, MySQL, and PHP.
- Some SMEs are reluctant to use OSS because of what is observed as a lack of technical support. This may need more investigation as it could be a means of cutting costs. There is a need for raising awareness in this area and this is a role that could be taken on by the National Open Centre.
- SMEs were asked about areas where they need support. This was an open question and the results were categorized and are displayed in the following table:

Type of the required support	Description
Equipment	Loaning equipment for short term projects, access to a server, hand-held devices
Training	Training on specialised software such as E-commerce, CRM, PHP, MySQL
Human resources	Need students for short term contracts, to develop company websites, or other online systems
Consultancy	Advice on networking, business performance measurement, wireless, innovation
Marketing	ICT for marketing purposes, ICT business marketing strategies
Funding	Help in financing business areas to allow growth

- Medium size companies did show investment in people, equipment, marketing, etc. however, although they are more experienced, have more employees, and more equipment, they need almost the same support as that required by Micro and Small SMEs

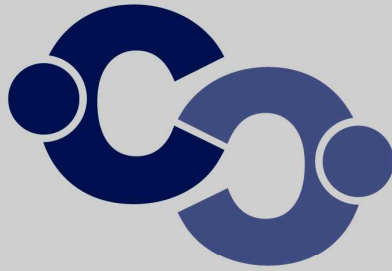


- Some companies require specialist training and they are not convinced that universities can supply this. They are aware that universities have specialists in areas that would be helpful. For universities it is not usually cost effective to provide training for one SME. The data shows a tendency for companies with more than 50 employees and a turnover of more than £2m to express this need, therefore they are companies who are contributing heavily to the economy.

Action Points

1. **Companies need to learn how to align the technology with their business plans.** Awareness needs to be raised in this area, as does the development of on-going partnerships with trusted consultants who can help align the technology and establish realistic metrics to help with future decisions.
2. **The Cluster needs a precise measure of adoption success.** This could take the form of identifying case studies from three companies (micro, small and medium), examining all company activities and relating this information to ICT adoption issues.
3. **Even ICT companies found it difficult to trust consultants.** It is therefore recommended that close alliance with the Business and Professional Services Cluster is developed to examine what may be done in this area.
4. **Skills are another major issue** and, in particular, training in specific technologies is often required on an ad hoc basis.
5. **There is a lack of future investment planning.** Most of the investment is customer driven. A programme of raising awareness is needed to show how IT can drive the business *even for ICT companies*.
6. **There are difficulties in adopting new technologies.** These are mainly related to skills, compatibility, inter-operability and lack of third party support. This indicates a major issue with technical competences.
7. **There is a lack of IT degree holders as entrepreneurs in the cluster.** The cluster could address this in a number of ways. One way could be to work with the universities IT departments to ensure that entrepreneurship, risk-taking and starting their own company are in the curriculum of IT degrees. Another could be to work with the other university departments who are producing students who start IT companies, if these can be identified.
8. **More support is needed for the use of Open Source Software.** This could act as an alternative cost cutting technology.
9. **More incentives for research engagement are needed** for the message to be passed to SMEs and to instigate real engagement. They are not happy to take part in research unless they see a return for their investment of time. It is therefore imperative that positive outcomes from research, such as this, are fed back to them along with suggested actions to address the issues raised.
10. **Increase awareness of the pressure from the wider economic and business environment.** Companies need to be made aware of the importance of understanding their external pressures. This will help the companies to develop a sound strategic plan within the current markets.

APPENDIX 10: AWM ICT Cluster Strategy 2008-2011



WEST MIDLANDS **ICT CLUSTER**

Strategic Plan

2008 – 2011

**Prepared by
Mike Musson, ICT Cluster Manager
with the support of the ICT Cluster Executive Group
on behalf of the ICT Cluster Opportunity Group**

December 2007

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1. Executive Summary

“The ICT industry is critical to Europe’s future both as a major industrial sector in its own right and as a driver of productivity and improved service quality in virtually all other industrial sectors and public services. The competitive challenge is sharper still in the face of a new wave of technological change and market opportunities, which carry the potential to reshape the industry and the ways in which its products and services are used.” EU ICT Task Force Report November 2006

Today, digital convergence – the marriage of computing, communications, content, and consumer electronics – is an over-riding influence on Europe’s ICT industry. The coalescence of these technologies is unleashing a wealth of opportunities, blurring the boundaries between market sectors, and proving to be a powerful driver for innovation and change. Consequently, a global market for all digital services covering communications, IT, and media is emerging.

Driven along by this wave of convergence, the structure of the global ICT industry is changing fundamentally. The industry is less and less identifiable as a discrete sector but is becoming part of a borderless digital system. In this system, firms are increasingly defined by their role within the converged value chain – as system developer, content provider, equipment manufacturer, aggregator, access/network operator, etc - rather than by traditional market segments¹.

The West Midlands has a tradition of producing innovative products and services and has the ability to play its part, both as a supplier of innovative ICT products and services, together with exploiting ICT as a major contributor to increasing regional productivity and GVA.

The ICT Cluster has in excess of 3000 businesses operating in six principal sub-sectors: Manufacturers of Hardware, Resellers, Software Developers, Installation & Maintenance, Outsourced ICT Services and IT Consultancy & Training. Whilst characterised as being comprised of primarily small businesses the Cluster successfully competes in a number of difficult sectors including international markets. The Cluster Opportunity Group’s (COG) three year plan is designed to unlock the potential to exploit this new wave of technological change and market opportunities. The COG has identified its markets through assessing the capabilities and capacities of the region’s businesses, the expertise and strength of the knowledge base and the potential scale of the market opportunities. The market opportunities have been categorised as being either **principal markets** or **emerging markets**.

Principal markets are:

- Strategic ICT Adoption – this market focuses on the provision of ICT services and products which enable businesses to become more productive and profitable through aligning ICT investment with their business strategy.
- Software Development – this focuses on businesses utilising vendor or open source software to create bespoke and tailored software for clients or products for niche markets.

Emerging markets include:

- ICT security – addresses the opportunities that arise from the challenges confronting all organisations as they increasingly create masses of centralised information and data
- Informatics – exploits the mass of data and information collected by organisations from perceived disparate data, profiles and identifies common actions, practices and other activities held within the data to identify patterns of behaviour.
- Mobile & Wireless – these technologies are fundamental in supporting a range of applications across all industry sectors, providing key infrastructure support, enabling business diversification and enhancing quality of life.
- Photonics – characterised as the 21st century enabling technology with the equivalent impact that electronics had on 20th century, opportunities are rapidly emerging across all sectors of

industry as well as offering solutions to environmental issues. A separate Photonics strategy is currently under development.

- Radio Frequency Identification (RFID) – exploits the growing need to track both objects and people and offers opportunities in niche markets particularly in logistics and the health industries.

The Cluster is already working in collaboration with the Screen Image and Sound cluster on CReATE a EU FP7 project designed to bring the benefits of ICTs to SMEs in the creative industry. Partnering with other clusters, including Building Technologies, Business Professional Services, Environmental Technologies, Medical Technologies and Manufacturing, will be an integral part of the ICT Cluster three year strategy.

The ICT Cluster’s 2008-11 strategy will continue to fund AccredITUK and WMMW together with establishing new initiatives to address all of the 7 key markets identified, by initiating actions across the following enablers applied to each market.

The key and actions adopted by the COG to deliver their strategy are:

- **Innovation** – through building mechanisms and providing incentives which foster improved links between the knowledge base and ICT SMEs reinforced by promoting a culture of innovation within the business community.
- **Enterprise** – through creating focused thematic business networks, promoting partnerships and collaboration with corporates & end-users and developing specialist support for fostering international trade.
- **Workforce Development** – through improving the supply and calibre of ICT graduates, addressing Continuous Professional Development of both management and staff in key business and technological skills.
- **Cluster Activities** – through continuing to support the annual ICT Conference and Awards. Maintaining the Cluster website and producing the quarterly e-newsletter in parallel with the sustained PR campaign to promote the Cluster, projects, good practice and new market opportunities. To continue to lead on the European Regions Research Innovation Network’s (ERRIN) ICT working group on behalf of the West Midlands.
- **Finance** – to address, in cooperation with other clusters, the issue of accessibility to finance appropriate to the needs of a fast moving and technologically challenging industry.

In order to ensure the strategy focuses only on businesses which will bring real prospects of growth and success to the Cluster, the COG is establishing a Technology Strategy Group (TSG) for each target market. Each TSG will be led by one or more members of the COG and supplemented by experts and specialists drawn from the ICT sector. Each TSG’s objective is to develop individual strategies by identifying the barriers and issues relating to the target market and the actions required to enable regional ICT SMEs to exploit the market.

The COG plans and budgets for 2008-11 relate to the following target markets and actions. Due to a number of existing projects, plus one project in development, utilising the first year’s funding (2008-9), no new projects will be contracted to commence until April 2009. New projects are however under development for delivery post-April 2009 as shown in the table below:

Market Focus	Market Priority	Projects	Status	Total 2008-11
Strategic ICT Adoption	Principal	AccredITUK	Current	451,000
Mobile & Wireless/RFID	Emerging	WMMW	Current	530,000
Software Development	Principal	iCentrum	Current	31,000

IT Security	Emerging	TBC	Under development	
Photonics	Emerging	TBC	Under development	
Informatics	Emerging	TBC	Under development	
Total emerging markets				702,000
Data Intelligence		ICT Directory	Current	120,000
Cluster Support		ICT Hub Executive Team	Current	100,000
Cluster Support		COG Support	Application	525,000
Cluster Support			Application	575,000
	All	INDEX	Under development	200,000
		Innovation Clubs	Under development	180,000
Budget Total				3,414,000

The success of the Cluster's strategy will be measured by:

- Creating a benchmark of the Cluster's prime characteristics by employee numbers, turnover, market focus, innovation and global sales.
- Establishing set targets where base line information is not available.
- Providing qualitative information where neither of the above is appropriate.

Richard Leary MBE
Chair
ICT Cluster Opportunity Group

28th November 2007

2. Market Analysis

The ICT industry in a European context

Today, digital convergence – the marriage of computing, communications, content, and consumer electronics – is an over-riding influence on Europe's ICT industry. The coalescence of these technologies is unleashing a wealth of opportunities, blurring the boundaries between market sectors, and proving to be a powerful driver for innovation and change. Consequently, a global market for all digital services covering communications, IT, and media is emerging.

Driven along by this wave of convergence, the structure of the global ICT industry is changing fundamentally. The industry is less and less identifiable as a discrete sector but is becoming part of a borderless digital system. In this system, firms are increasingly defined by their role within the converged value chain – as system developer, content provider, equipment manufacturer, aggregator, access/network operator, etc - rather than by traditional market segments¹.

The ICT industry has been steadily recovering since the shocks in the telecoms sector led to a dramatic economic downturn at the end of the last century. In a report released by the European Information Technology Observatory (EITO) in March 2007, it was stated “The European ICT industry continues to grow steadily, with IT services, software applications and broadband data services as the main drivers”. The report added, “the market for ICT in the EU will increase by 2.9% in both 2007 and 2008”². Commentary on the report states that the ICT sector remains one of the most dynamic sectors of the economy, with higher than average growth rates and research intensity.

The report also recognised that the EU has to face the global challenge and this can be achieved by exploiting its many strategic assets, such as the advanced communications infrastructures and services as well as the world’s largest market for education, comprising close to half a billion people. But at the same time it is recognised that Europe needs to address its present weaknesses: market fragmentation, too little R&D investment in ICT, limited high-tech start-ups and insufficient preparation and mobility of people with the right kind of skills.

The EITO expects new demand to be created, in particular, through IT innovations in the areas of people to people software, logistics and RFID, security technologies and e-health services, as well as through the digitalisation of public administration (e-government). Therefore strong growth of software and IT services, together with the diffusion of broadband networks, open new exciting opportunities for Europe in the next years of the decade².

The challenge for the West Midlands’ ICT industry within the European and global marketplace is to ensure that the region’s ICT businesses are able to exploit the opportunities derived from growing and emerging markets whilst simultaneously addressing the weaknesses identified in the EITO report.

The UK and Regional Perspective

Whilst the EITO anticipates the European economy to grow by nearly 3% per annum for the next three years, with software and IT services underpinning this performance with forecast growth of 6.5% and 5.5% in 2007 and 2008. The UK is well placed to benefit from this above average growth as it is Europe’s leading investment market for software and IT services⁴.

The UK ICT sector accounted for 19% of all inward investment in 2006/07 and recorded more software start-ups in the UK than anywhere else in Europe. The software market is further bolstered by public-sector engagement and with the UK Government investing heavily in pursuit of its transformational agenda. The software market is multifaceted in having a number of niche markets including IT security products where the UK controls 20% of the global market as well as being a prime centre for the development of biometrics and encryption software².

The West Midlands has a relatively large cluster of over 3000 ICT businesses, from large global companies to small and medium-sized software companies specialising in the provision of bespoke software solutions to the industry’s major players including global leaders like IBM, Oracle, Epson, HP, and CSC. However the characteristics of the Cluster are changing. Companies involved in development and sales of software segment now account for nearly half of all ICT business activities. This segment has seen recent rapid growth, an increase of 8% since 2005, whilst manufacturers of hardware, resellers, installation & maintenance and IT consultancy & training businesses represent a smaller percentage of the total Cluster than previous. The decline of these segments is however balanced by the creation of a new segment; IT outsourced services, to reflect this newly categorised sub-cluster which now accounts for 8% of all ICT businesses.³

The region’s growing software development segment means that the region has the potential to exploit the opportunities identified in the EITO report. The region also has leading-edge research and development in its universities and research institutions ensuring the region can remain at the forefront of global information technologies. The Universities of Warwick, Birmingham and Aston were all awarded the highest possible rating for computer sciences research by the UK’s Higher Education Funding Council, whilst Staffordshire University’s School of Computing is one of the largest in Europe and one of the best-equipped computer centres in the country⁵.

The EITO states the hardware market, where the region has only a 7% representation, is now recovering: it is expected to grow by 1.7% in 2007 and by 2.2% in 2008. It notes that the PC market is in decline whilst demand for laptops and multi-function peripherals are growing. The telecom market is another area of activity with mixed performances. The fixed voice services are shrinking by around 5% year. This however is offset by growth in the fixed data services and mobile traffic with the former achieving growth in excess of 6.4% per annum. In niche segments of the telecommunication sector the UK can be globally dominant being the world's leading internet gateway with 36% of internet traffic routed through UK servers.

Whilst the region does not have significant strength in the number of large companies headquartered in the region, the location of a number of key companies such as Fujitsu and Ericsson offer the region the potential to exploit complementary technologies, services and content. Ericsson's development of a new £60 million research and development base in the West Midlands by 2009 employing 600 highly skilled workers will, it is believed, act as a catalyst for other technology businesses. The telecommunications and mobile devices' technological capabilities are matched by a thriving creative sector in the region, which offers the potential of developers working directly alongside content creators.

The positive impact of ICT on the quality of life and ultimately on growth and competitiveness is widely recognised. The growth of the ICT sector itself is seen as essential for the growth of the economy as a whole. Beyond that aspect, a greater use of ICT by society as a whole can significantly improve the region's competitiveness on the global scene. This is why ICT is seen by the EC and UK government as a cornerstone of the global strategies for growth and jobs. The delivery of the benefits of ICTs to all segments of the economy and society is very dependent upon the capacity and ability of the ICT industry. The COG's strategy is therefore designed to ensure the region's supply base is both competent and capable of fulfilling its role in exploiting the opportunities.

3. Target Markets

As firms are increasingly defined by their role within the converged value chain the 2008-2011 ICT Cluster Strategy will focus on both horizontal and vertical markets. The COG sees the key issues to success and growth in these markets revolving around the specific needs of ICT businesses in five key areas; innovation, enterprise, workforce development, clustering and finance. To ensure the strategy is focused all initiatives and actions will be focused on businesses which have a structured business plan, or are willing to engage in innovation. Innovators view being first to market, conducting R&D, forming alliances, partnerships, or joint ventures as being an important part of business strategy. In short, innovating companies are; more competitive, risk takers and are more likely to be open to and introduce new and challenging ideas, all of which are required to substantially raise the profile and capacity of the region's ICT sector.

The market foci identified were derived by examining three key criteria:

- the capability and capacity of the region's ICT industry,
- the expertise and strength of the knowledge base
- the potential scale of the market opportunity

Through applying the above criteria the COG identified two primary markets plus five emerging markets. The two primary markets derive from the ICT sector's substantial capability and capacity, the critical mass of knowledge and the significant opportunity afforded. The five emerging markets reflect more the competence and capacity of the region's knowledge base together with the perceived market opportunities. The emerging markets will in many instances be resourced by businesses grouped in sub-clusters comprising of both ICT businesses and businesses from specific market sectors exploiting the relevant technologies. These emerging markets will provide an excellent opportunity for the ICT Cluster to engage with the other clusters.

Primary Technology Markets

Strategic ICT Adoption – This market focuses on the provision of ICT services and products which enable businesses to become more productive and profitable through aligning ICT investment with their business strategy. The COG will assist in enabling ICT SMEs to develop their products/services through the Cluster's ICT Innovation Clubs which bring together end-users, ICT suppliers and the knowledge base.

As evidenced by the EU ICT Taskforce and the EITO reports, the need for ICT adoption is critical to the performance of the economy as a whole. The two Adroit reports published by eSkills (January 2007) and AWM (November 2007) underline the significant GVA uplift that may be achieved; a 10% increase in productivity translating to a £3 bn increase in GVA for the region.

Within the region's economy Adroit identified two specific markets for ICT businesses; manufacturing and building technologies. Adroit consider these two markets as offering significant market potential, which as well as benefiting the sectors themselves, would also have the greatest impact on the region's GVA. In addition to ICT suppliers, the region also has extensive expertise in this area through the many information systems and information management departments within the universities affording an opportunity for knowledge transfer.

This represents a real opportunity to West Midlands ICT businesses, a market which they are already exploiting. Therefore this needs to be viewed as not just a regional market opportunity but as a global opportunity too, and one within which the region's ICT businesses have already established a proven track record. The region can boast that whilst the ICT Cluster is primarily characterised as being made up of small businesses – 74% employ less than ten staff – it has the capability and capacity to sell into difficult markets. The ICT Survey³ demonstrated that 28% of businesses (16% for companies with 1-4 employees) currently export and that sales are growing. In addition, 41% of all SMEs sell into the public sector (49% for SMEs employing 5 plus staff), a market often characterised as being bureaucratic to penetrate.

Strategic ICT Adoption can therefore be seen not just as a regional market opportunity (although extremely beneficial to the regional economy) it also offers a national and global opportunity.

However the COG is aware that the EC and Adroit reports identify the capacity and quality of the ICT supplier as being one of the four key factors which need to be addressed in order to realise this potential growth. Therefore there is a need to ensure the Cluster is able to demonstrate it is 'fit for purpose' and one measure adopted by the COG to assist in this objective has been the funding of AccreditUK, a project designed to raise quality standards across the ICT supply chain. The COG will also, by focusing on businesses which innovate or wish to innovate, address the capacity and competence of the Cluster by initiating projects to increase engagement with the knowledge base. Issues relating to skills, enterprise and finance which are seen as barriers to innovation will be focused on these companies.

Software Development – The software development community is the largest sub-cluster with approximately 1400 businesses. The majority of the businesses are involved in utilising vendor software to create bespoke and tailored software for clients or products for niche markets. Their ability to compete in a global market is demonstrated by the number of businesses operating in overseas markets with the largest number of businesses, by employee size, employing five to ten people. The 2007 survey identified that 65% of software development businesses were exporting with approximately two-thirds of them recording an increase in exports as a percentage of their turnover.

Within software development the Cluster strategy will be directed at three key areas:

- The Public Sector, in particular e-Government and e-Communities
- The Manufacturing sector
- The Financial and Legal services sectors

Because of the strength in the knowledge base and the critical mass of software developers, the COG recognises that this segment is a major driver of regional productivity and growth. However it is

recognised that to leverage maximum benefit in the above key areas a number of barriers need to be addressed ranging from business acumen and skills to the provision of software testing facilities.

Emerging Technology Markets

As stated above, the COG is also aware of the opportunities arising in a number of emerging technologies with the major beneficiaries being the end-user of the technology. This is reinforced by the EITO report which saw ICT innovations in the area of social networking tools software, logistics and RFID, security technologies and e-health services as offering potential markets in the near future.

The COG intends to promote and support these emerging technologies, both through developing partnerships with other clusters and also investing in and promoting specific initiatives. The five emerging areas currently identified are:

1. **RFID** – The COG intends to continue to educate, promote and exploit this technology for the benefit of the region. Having established the regional RFID centre and built a degree of expertise in this area, the COG will continue to promote RFID into niche markets particularly in logistics and the health industry. Currently the European market for RFID in the health industry is worth \$0.16b but is expected to increase to \$13bn by 2016.
2. **Mobile and Wireless** – This market opportunity will build on the knowledge afforded by the multi-institutional West Midlands Mobile and Wireless (WMMW) project, and the predominance of ICT companies specialising in the following areas: mobile applications development, wireless systems and technologies; location-based systems; mobile entertainment, sensor technologies and integration.

Mobile and wireless technologies are fundamental in supporting a range of applications across all industry sectors, providing key infrastructure support, enabling business diversification and enhancing quality of life. Market research suggests that the global growth of *mobile content alone* will rise from \$19bn (2006) to over \$64bn in 2009 - in the year to March 2007 UK consumers alone spent £203M on mobile content. Market opportunities will also increase as other wireless networks, such as WiMax are deployed as consumer-oriented technologies.

3. **ICT Security** – This emerging market addresses the opportunities which arise from the challenges confronting all organisations as they increasingly create masses of centralised information and data. It relates not only to the secure handling and processing of information and data within organisations but also the transactions and communications conducted in cyberspace and on the internet. Whilst the number of ICT businesses already focused on this market is small the majority of the Cluster's businesses need to address security as part of the development of their product or services. In addition, global expertise exists in the region with quantum cryptology at QinetiQ together with expertise in Cyber Security at Birmingham and Warwick Universities and e-Crime at Wolverhampton University.
4. **Photonics** – The Photonics Cluster (UK) is the business network initially funded by the COG and is dedicated to supporting the optoelectronics industry in the UK. PC (UK)'s main role is in supporting businesses across the whole photonic supply chain to meet their technological and commercial needs through technical assistance, workshops, networking, conferences and routes to skills, knowledge and finance.

The photonics market in the UK is currently in excess of £20bn with the world market growing to an estimated £500bn by 2015. In the West Midlands where there are around 1200 people employed in photonics related technologies, the PC (UK) activities have potential for knowledge transfer, increased opportunities for innovation and for exploitation of optoelectronics. The regional opportunities deriving from this new enabling technology are currently being addressed by a separate Photonics Strategy commissioned by the COG.

5. **Informatics** – Informatics is the practice of information processing and the engineering of information systems. Informatics studies the structure, behaviour, and interactions of natural

and artificial systems that store, process and communicate information. It also develops its own conceptual and theoretical foundations. Since computers, individuals and organizations all process information, informatics has computational, cognitive and social aspects, including study of the social impact of information technologies.

The COG has identified this area as an emerging market with the West Midlands having a small number of SMEs but with renowned expertise combined with global expertise at Birmingham and Warwick universities. The financial, retail, medical and IT security sectors, the latter specifically relating to forensics and anti-terrorism agendas, are seen as key niche markets. In the 'Drug Discovery Technology' market place, whilst informatics has the smallest share of the global market, worth \$725 million in 2007, the segment will see the largest compound annual growth rate of 15.7% (compared to an average of 8.2%), as its value rises to \$1.5 billion by 2012.

Partnering with other Clusters

The ICT Cluster is already engaged in discussion with the other clusters on common market opportunities, and will be developing further initiatives over the three year period. Currently the following opportunities have been identified to develop collaborative initiatives:

- Building Technologies & Environmental Clusters – The use of intelligent remote monitoring systems for building and facilities management. LED technology in street and building lighting; intelligent IT to monitor and reduce companies' overall carbon footprints (lighting, heating, transportation)
- Business & Professional Services (B&PS) Cluster – The adoption of ICT technologies to improve B&PS business performance and B&PS supporting ICT businesses through professional support in areas such as responsibility, liability and protection. The issues surrounding ICT security across all sectors of the economy, both in internal and cyber environments, also offers potential partnerships with BPS businesses.
- Manufacturing – The adoption of both photonics and ICT technologies in manufacturing systems, production and products, in particular addressing the low carbon and energy agendas.
- Medical Technology Cluster – The adoption of a number technologies offers opportunities including RFID and mobile and wireless in intelligent health and sensing technologies in assistive living.
- Screen Image & Sound Cluster – 3D virtual world and games technologies offer a number of opportunities for ICT applications in entertainment, training and business planning.

4. Achievements

The COG has two primary methods of engaging and supporting the ICT SME community, through sponsoring large scale projects and through the work of the Cluster Executive Group. The projects supported by the COG and which have come to the end of their funding are listed in Table 1 below. Projects which continue to receive funding from the Cluster's 2008-11 budget are listed in Table 3 in *section 7*.

Table 1.

PROJECTS AT THE END OF AWM FUNDING STREAM BY APRIL 2008:	
These projects will continue to work with the ICT COG to progress the Cluster strategy:	
CERCIA,	CERCIA exploits cutting edge research and has achieved world recognition becoming the world leader in Natural Computation at Birmingham University
IT Futures,	IT Futures have developed their expertise in e-Business adoption and have assisted in excess of 100 businesses, generating £5.4m extra sales and safeguarded and created 573 jobs.
Open Advantage,	OpenAdvantage has engaged with over 1000 businesses and individuals to help them understand the real business benefits of Open Source software creating a cluster of

	innovative companies in the process.
Photonics Cluster,	Photonics Cluster (UK) has a membership core of nearly 200 at the present time, and has built relationships with around 4000 businesses. In that period, the organisation has successfully completed projects with over 600 companies and has leveraged funding in excess of £4M.
WMita	WMita has evolved into UKita with 18 regional branches across the UK, 6 in the West Midlands with a network of 250 ICT organisations. Since inception some £850,000 worth of Business opportunities have been placed on the UKita site, and an arrangement with the Manufacturing Advisory Service (MAS), allow its members to access Government Funding to increase manufacturing production.

In addition to the development and fostering of the main Cluster projects the COG have delivered a significant number of outputs of direct benefit to Cluster stakeholders – from in-depth studies to SME support at events, from training to the launch of the new ICT Innovation Clubs.

The following highlights some of the smaller scale activities and achievements of the ICT Cluster Executive Group (CEG) during the period April 2006 to March 2007 alone.

Marketing and Promotion: ICT Conference: 250 delegates, positive feedback, good PR coverage, access to workshops and support for delegates. ICT Award: growing interest and prestige with a previous winner doubling turnover and employees in one year as a direct result of their achievement. ICT Cluster Newsletter with a circulation of 2000. Recognition of the Cluster by SMEs is recorded at 42% compared to 24% for eSkills'. The Cluster's ICT Innovation Club initiative has national recognition from an article in the Times HE Supplement.

Innovation: ICT Innovation Clubs: A first in the UK, 9 HEIs engaged in 8 Clubs which provide a platform for tripartite engagement for ICT SMEs, end users and academics, searching for solutions to business problems supported by the HEI facilities and expertise. Innovation Support Activities: Barriers and facilitators of innovation were highlighted in a survey which identified where support was needed and this resulted in a number of spin off activities supporting SMEs. Signposts to Innovation Guide: 3,000 guides distributed and download available on Cluster web site

Skills: Business network training for SMEs & facilitators pilot education programme for both ICT SMEs and facilitators of networks for ICT SMES.

Strategic Relationships & Partnering: The ICT Cluster jointly chair the ERRIN ICT Working Group based in Brussels, with up to 28 EU regions as members, leveraging both funding and additional expertise into the region. Strategic relationships continue to be strengthened with other organisation such as: eSkills, EPSRC, Local Councils, NCC, Technology Corridors, Regeneration Zones, WM Gateway, KTNs, ContactKE, Science Parks and Incubators, HEFC, UKTI.

Market Intelligence: ICT Adoption Research, Photonics Strategy, Mapping of West Midland Universities capabilities and expertise, Learning and Skills Council ICT Skills mapping, Employer Skills survey, Innovation and Acceleration Centre research, mapping of Graduate Retention initiatives. Much of this intelligence has been used to activate further activity by regional stakeholders.

5. The Region's Strengths and Weaknesses

The core challenge is to create a continuum for economic development within the ICT sector and within this to address the following sub-goals:

- To innovate through the utilisation and marketing of applied knowledge;
- To reduce sensitivity to market fluctuations through diversification;
- To boost the region's international profile and reputation;
- To attract and retain quality knowledge workers. Worldwide there is a 'battle for talent'. It requires focused and coordinated effort to recruit and retain top talent within the West Midlands;

- To create a stimulating and entrepreneurial environment for individuals and companies within the sector.

Critical to achieving these sub-goals is the need to advance the close co-operation between the business community, the knowledge and education institutions and public sector bodies. This is a cornerstone on which the ICT Cluster 2008-11 strategy is built.

Table 2

Strengths

- Few but important large companies (AT & T, NTL, Celestica, SCC, Maxell, Logica, Ricoh, QinetiQ, Oracle)
- WM Conurbation offers locations of critical mass.
- Significant science park & incubation facilities
- No. and spread of HEIs (12)
- Research Assessment scores of 5 & 5* in Birmingham & Warwick, computer science & engineering.
- Technology transfer experience of some Universities (Wolverhampton 4th in UK for delivery to industry)
- QinetiQ in Malvern (PhD level staff)
- Customer base: in the automotive and engineering “magnet” and the public sector as a customer

Opportunities

- Individual promising growth areas & pockets of clustering behaviour, within the broad sub-sectors
- Initiate the strategic involvement of the existing base of large firms in the development of a clustering behaviour
- Develop accreditation regimes to maximise small firm prospects
- Opportunity to attract high calibre candidates into local SMEs due to the downsizing of big firms
- Pull factors to young people inc. quality of life and leisure offering
- Better, more focused use of science parks to encourage clustering, company spin-out and subsequent growth
- Science park & incubation space expansion
- Broadband offers access to global markets
- New market opportunities afforded by new technology growth areas e.g. RFID, mobile and wireless, virtualisation, etc.

Weaknesses

- The big names in ICT research are outside the region / UK
- University – industry links within the sector regarding recruitment, skills, etc
- The region’s business support structure is not adequate to meet the needs of early growth businesses seeking larger scale investments
- Domination of small firms (94% of total firm base with less than 50 employees).
- Some difficulties selling into the local market, as firms are not sophisticated in ICT adoption.
- Poor links between firms, weak networks between private and public sector and not strongly developed regional partnerships
- Lack of entrepreneurial spirit
- Culture: can be untrusting
- Poor image of the WM results in poor recruitment and retention figures

Threats

- Globalisation and international competition
- The WM does not attract investment on par with other regions in the UK
- Lack of early growth equity provision for SMEs in the region (of a value up to £250K)
- Lack of loan finance for SMEs for small loans up to £40K for working capital expenditure and start-up
- Business support is not easy to access and not sufficiently tailored to the needs of ICT businesses
- Equity finance is not adequately developed.
- There is a lack of understanding of the potential finance options.
- Leak of quality graduates to London / South East
- Lack of management maturity and a strategic approach on behalf of small firms
- Weak Government and University R&D.
- Regional failure to match R&D intensities achieved by the best performing UK and international competitor economies
- Lack of ‘big science’ (i.e. major new funded research projects or facilities)

Key Issues Identified

In order to exploit the key target markets, the COG has identified as being critical the need to synchronise these market opportunities with the region’s ICT businesses existing and potential competencies, capabilities and strengths; the need to increase engagement with the knowledge base in key areas and the need to maximise opportunities whilst also meeting the core challenges. The issues for the ICT Cluster are:

- **Innovation** – There are a number of barriers that exist which act as a brake on the industry’s capacity to fully exploit its potential. There is a need to both substantially increase the engagement of the knowledge base with the industry; in particular with centres of global expertise, and increase the capacity and capability in the research and development of universities that have excellent relationships with industry.

The majority of innovation currently undertaken is primarily funded through revenue due to venture capitalists and the banking sector’s lack of technological understanding. The poor uptake of R&D tax credits (only 25% of SMEs take advantage) has been identified as often attributable to a lack of understanding and capability by the smaller accounting businesses which typically serve the SME community. In addition, many businesses are constrained by their lack of resources and their ability to manage effectively the processes involved. The COG recognises that in order to fully exploit the market foci there is an urgent need to address these issues.

- **Enterprise** – Whilst innovation is important to the success of businesses there is a need to address complementary issues relating to the businesses themselves. Large ICT corporates offer the SME community access to global markets through their emerging technologies and partnering programmes. Similarly business networks have proven to be advantageous to developing partnerships and stimulating collaborations to access new markets and expanding product/services portfolios. Whilst the Cluster has a proven record of exporting, its research shows businesses wishing to expand their markets overseas require specialist support.
- **Workforce Development** – The ability to innovate and grow businesses both at present and in the future is constrained by issues relating to the supply and calibre of graduates entering the Cluster. Research shows that students graduating from universities which have global centres of excellence are less likely to remain in the region on graduating. In addition, the skills and competencies of management and staff also act as a brake on the capacity of businesses to grow. The pace of technological change, in particular within the market foci identified as Cluster priorities, requires skills to be constantly updated. Vendor accreditation is important to the ICT business community and is not currently a priority of the LSC or other training and education agencies and institutions.

Leadership and management skills are another area which can impact upon the efficiency and performance of ICT businesses. Whilst there are generic issues relating to leadership and management the technological nature of the services and products of the Cluster requires a more specialist approach. Similarly, sales and marketing are identified as areas of need by two-thirds of businesses because the complexity of ICTs requires sales and marketing staff to be technically competent.

- **Clustering** – The importance of clustering underpins the COG’s strategy of engaging with the ICT community. There is a need to build clusters of ICT businesses, end-users and the knowledge base around the identified market opportunities. The ICT Conference, ICT Excellence Awards, ICT Innovation Clubs and the Cluster website and e-newsletter remain potent weapons to promote opportunities, good practice, dialogue and exchanges of ideas and concepts.
- **Finance** – In knowledge based industries appropriate and relevant sources of funding remain a significant barrier to growth. The pace of technological change requires funding to be accessible with the minimum of delay and appropriate for all stages in the cycle of the bringing the product or services to market.

6. Strategic Objectives

The vision that underpins the three year ICT Strategy is: for the West Midlands to be known as “**Excelling in ICT Innovation and Delivery**”. To support this vision, the ICT COG has developed its own mission statement as being:

The ICT Cluster delivers a strong and vibrant framework to grow the regional economy by supporting technology companies in the West Midlands to strategically interact with business in the wider UK and international community, in short: “to build a Stronger Regional IT Industry”. The strategic objectives of the ICT Strategy 2008-11 are to realise the ICT Cluster Vision and are also strategically aligned to the priorities of the new Regional Economic Strategy.

In order to ensure the strategy focuses only on businesses which will bring real prospects of growth and success to the Cluster, the COG is establishing a Technology Strategy Group (TSG) for each target market. Each TSG will be led by one or more members of the COG and supplemented by experts and specialists drawn from the ICT sector. Each TSG's objective is to develop individual strategies by identifying the barriers and issues relating to the target market and the actions required to enable regional ICT SMEs to exploit the market.

The COG has identified the following *key enablers* and subsequent *actions* as necessary to build a strong regional ICT industry capable of competing globally:

Innovation

The need to innovate is paramount to compete in a global economy. The focus of the COG will be to:

- build stronger links between the Cluster's SME community and the knowledge base
- develop mechanisms to access the region's global centres of ICT excellence
- promote a culture of innovation in the region's ICT businesses
- engage the region's ICT businesses with EC R&D and Innovation programmes
- strengthen the resources and expertise of regional universities in key areas
- promote engagement between the ICT SME community and private sector capability
- engage with the relevant agencies to access R&D and innovation funding

Enterprise

Networking, partnering and collaboration are recognised by the COG as offering substantial benefit to the Cluster's businesses. The focus of the COG will be to:

- promote and support the partnering of the SME community with corporates to access new markets
- develop networks of ICT businesses focused on the market opportunities
- foster collaboration between the end-user and the ICT supply chain as identified in the market foci
- promote and support collaboration between the Cluster and UKTI to foster international trade

Workforce Development

In order to build and sustain a knowledge based economy requires both an adequate supply of skilled personnel entering the industry and a need to address the skills of the incumbent workforce. The focus of the COG will be to:

- promote graduate recruitment into ICT businesses by engaging with the regional universities to increase the calibre and the number of graduates in the region
- promote vendor accreditation in graduates and the workforce
- support leadership and management skills including sales and marketing
- support the skill sets required by both graduates and the workforce in the emerging markets

Cluster Activities

The ICT Cluster has developed strong brand recognition through the:

- annual West Midlands ICT Conference
- annual ICT Excellence Awards

- ICT website
- quarterly newsletter
- PR campaign

All are designed to engage with and promote SMEs to cluster. In addition to the above the Executive Delivery Team (EDT) represents the region as Chair of the ICT Working Group within the European Regions Research Innovation Network (ERRIN), a Brussels-based network designed to help regional representations to participate fully and effectively in the European Research Area. To ensure the COG's strategies are built on solid data intelligence, the EDT also project manages the ICT Directory & Strategic Survey together with other mapping and data intelligence gathering activities.

Finance

This is a regional weakness that cannot be addressed solely by one Cluster. Therefore the COG proposes to join forces with other Clusters to assess how best this issue can be addressed with the objective of developing an action plan late 2008.

7. The Action Programme The Road Map to Success

The COG intends to meet the challenges detailed above by going beyond its original Terms of Reference. It will fund initiatives but also influence and lobby through strategic partnerships for the benefit of the cluster. This change of strategy requires the COG to assign individual areas of responsibility to its members. In order to successfully achieve these objectives the COG has created an Executive Delivery Team (EDT) to both support the strategy on a day-to-day basis and to support each member in driving forward agreed actions or policies.

The COG, with support from the EDT, will identify supporting strategies and develop policies that enable the regional ICT community to fulfil its role as both an enabler and as a market to deliver the services and actions required to assist the wider economic community in achieving this goal. The market focus will ensure that the technology advantage is delivered in collaboration with specific market opportunities and as such will provide more impact through working with other clusters.

A crucial element of the strategy is to exploit existing initiatives through leveraging further funding opportunities into the region from both UK and EU streams, lobby strategic partners to influence their strategy and to manage small scale activities that will continue to promote, engage and improve the wider ICT community.

Specific Actions

The action programme builds on the successful projects initiated during 2002 to 2007. Some of the existing projects continue beyond March 2008 and are therefore allocated funding from the Cluster's 2008-11 budget. The Cluster will, during the course of 2008, develop invitation to tender specifications on a number of initiatives addressing the strategic objectives listed in *section 6* above. These will be contracted to commence from April 2009 reflecting the prior committed allocation of funding for the first year of the three year period. In addition to the Cluster budget, Innovation Technology Council funding is anticipated. The remit for this funding is for the development of proof of concept projects etc. Ideally the COG is seeking projects that will initiate investment of third party funding from the research councils etc.

Existing Projects

Table 3

Market Focus /Action	Market Priority	Project Name	Description
Strategic Adoption	Principal	AccreditUK	Accredit UK is a quality standard designed to help ICT Suppliers prove their competence and enable Purchasers to buy with greater

			confidence.
Mobile & Wireless	Emerging	West Midlands Mobile & Wireless	The project commenced in 2005 and is helping SMEs to adopt mobile and wireless technology to improve their profitability and has helped in excess of 35 businesses and more than 50 individuals in new skills to date.
Software Development	Principal	iCentrum	iCentrum has assisted in excess of 100 businesses, helped create 12 new businesses and a total of 197 jobs have been safeguarded/created.
Data Intelligence	N/A	ICT Directory & Strategic Survey	The project will continue to maintain the directory of ICT businesses in the region together with conducting research for intelligence purposes.
Cluster Support	N/A	ICT Hub	The project will continue to support and represent the ICT Cluster projects and act as a single access point for the ICT SME community.

8. Measures of Success

The COG has attempted several times to identify an appropriate methodology to measure the impact of its strategies and the projects commissioned. The obvious use of SIC codes was discounted because, as was described in the ICT Strategy 2002 document, the SIC classification initiated in 1991 predated a good number of ICT technologies. The 2007 SIC codes which come into effect in January 2008 are however also flawed being too general in classification to identify the businesses in the ICT Cluster.

The problem of capturing the businesses was, as indicated above, addressed by SQW in the original strategy document. The alternative classification adopted was a bespoke version based upon the Yellow Pages format. This classification has been used for the first two ICT Surveys and has proved to be more effective than the use of SIC codes. The establishment of the AccredITUK project enabled the Cluster to revisit the issue of classifications as these would be the basis of the accreditation process. Consequently a new coding classification has been introduced based on the 2007 SIC codes but refined to exclude non-ICT businesses.

The new classification has nine segments with a number of sub-segments providing a better categorisation of the Cluster. This new categorisation has been used in the 2007 ICT Directory profiling exercise and will provide the basis for capturing salient information about the Cluster. The COG has commissioned an economic model by Warwick Business School to accurately convert such profiled information into realistic predictions of the number of employees, turnover etc which will provide one of the measures of success.

Where accurate baseline information cannot be obtained the COG will use a mixture of quantitative and qualitative measures. In some instances this would be in the form of set targets against specific strategies. An example of this is the COG's intention to promote SME engagement in EC programmes. EC provides no information on the number of regional ICT businesses engaged in the earlier FP6 or other EC programmes (particularly as partners). The COG will therefore set a target of a given number of ICT SMEs over the 3 year plan period.

Examples of qualitative measures of success are the AccredITUK project, a regional initiative addressing standards across the ICT supply chain and WMita, the regional IT Trade Association. Both of these projects are now nationally focused, with other RDAs funding AccredITUK to develop further segments for accreditations of ICT businesses and with WMita evolving into UKita with branches outside of the region.

9. Budget

Market Focus	Priority Level	Projects	Status	2008-9	2009-10	2010-11	Total
Strategic ICT Adoption	Principal	AccreditUK	Current	451,000			451,000
Mobile & Wireless/RFID	Emerging	WMMW	Current	530,000			530,000
Software Development	Principal	iCentrum	Current	31,000			31,000
IT Security	Emerging	TBC	Under development				0
Photonics	Emerging	TBC	Under development				0
Informatics	Emerging	TBC	Under development				0
Data Intelligence		ICT Directory	Current	51,000	69,000		120,000
Cluster Support		ICT Hub Executive Delivery Team	Current	80,000	20,000		100,000
Cluster Support		COG Support	Application	175,000	175,000	175,000	525,000
Cluster Support	All	INDEX Innovation Clubs	Application	191,666	191,666	191,668	575,000
			Under development		100,000	100,000	200,000
			Under development	120,000	120,000	120,000	180,000
Total emerging markets					53,668	468,332	702,000
Total Per Annum				1,629,666	729,334	1,055,000	3,414,000
Annual Budget Total				1,213,000	1,146,000	1,055,000	3,414,000

19/12/2007

For further information on the ICT Cluster the following contacts, documents and websites are available for reference.

Reference Documentation

Reference No.	Document Title
1	EU ICT Task Force Report November 2006
2	The EITO 2007 Report
3	ICT Strategic Surveys 2005, 2006 & 2007
4	Adroit Report

All documents can be downloaded from: www.wmictcluster.org/library

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Cluster Manager AWM	West Midlands Business Link representative	Regional Higher Education representative
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Websites

West Midlands ICT Cluster www.wmictcluster.org
Advantage West Midlands www.advantagewm.co.uk

Appendix 1: Proposed Projects ICT Cluster Last updated

Title of project	Priority	Lead Partner (optional)	Total Year Costs £'000		2008/11 Total AWM	Anticipated non-cluster funding #		Annual AWM Cost £'000												VFM - Yes/ Strategic
			2008- 2011			2008/9		2009/10			2010/11									
			Single Pot	ERDF*		Single Pot	ERDF*	Total AWM	Single Pot	ERDF*	Total AWM	Single Pot	ERDF*	Total AWM						
			Capital	Revenue		Capital	Revenue		Capital	Revenue		Capital	Revenue							
EDT & Cluster Delivery Budget Index	VH	AWM	1,100		1,100			367		367		367		366		366	Yes/ Strategic			
Innovation Clubs	H	Aston	200	200	400			60	60	120		100	100	200		100	100	200		
Emerging Markets	H	TBC	180	180	360			0	0	0		60	60	120		60	60	120		
			702	351	1,053			0	0	0		157	79	236		545	273	818		
					0					0								0		
					0					0								0		
					0					0								0		
					0					0								0		
					0					0								0		
					0					0								0		
New Cluster Plan TOTAL			0	2,182	731	0	0	0	427	60	487	0	684	239	923	0	1,071	433	1,504	
AccredIT UK		NCC		451				451		451									0	
WMMW		Staffs		530				530		530									0	
iCentrum		BTL		31				31		31									0	
ICT Hub		BTL		100				80		80		20		20					0	
ICT Directory & Strategic Survey		UWSP		119				51		51		69		69					0	
								0		0				0					0	
								0		0				0					0	
								0		0				0					0	
								0		0				0					0	
Total Cluster Projects Carried Forward			0	1,232	0	0	0	1,143	60	1,143	0	89	0	89	0	0	0	0	0	
TOTAL Cluster Forecast Expenditure			0	3,414	731	0	0	0	1,570	60	1,630	0	773	239	1,011	0	1,071	433	1,504	

* ERDF is Cluster Mgr's estimate of amount that may be obtained.

Legacy projects: list ALL cluster projects that will spend in 2008-09

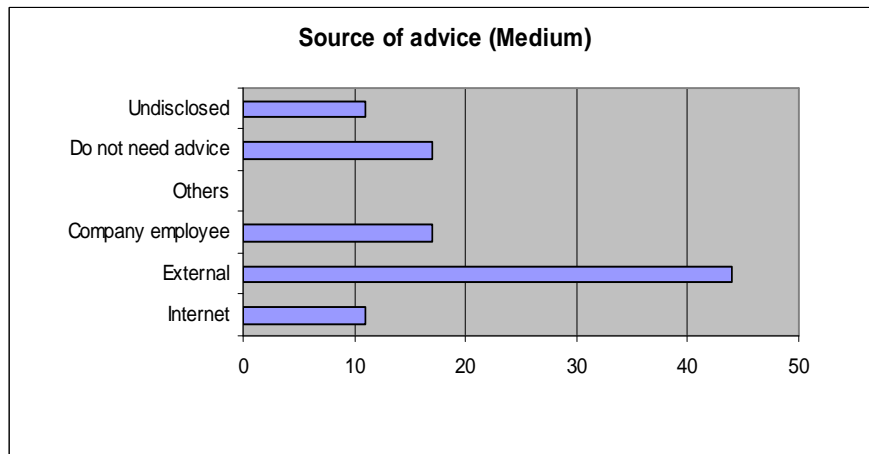
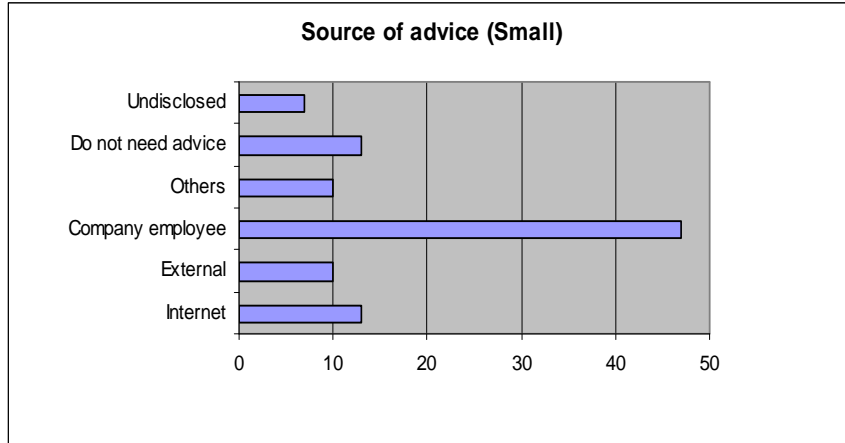
Anticipated other funding - optional columns- opportunity for you to indicate funds expected from other sources e.g.: Business Support, LSC, private sector. Only include probable funding. Exclude in kind funding.

** Please list all new projects in descending priority - lower priority projects may need to be omitted if final allocation is lower than anticipated

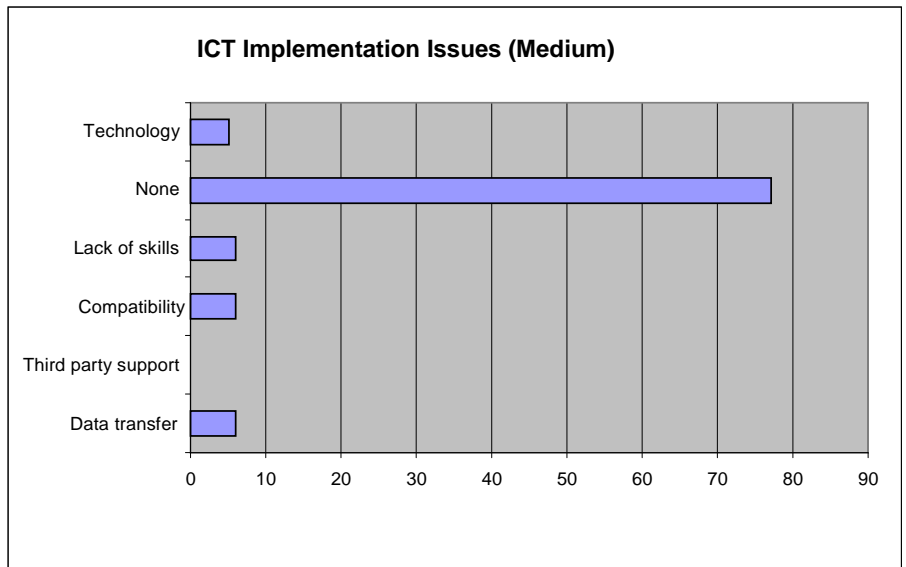
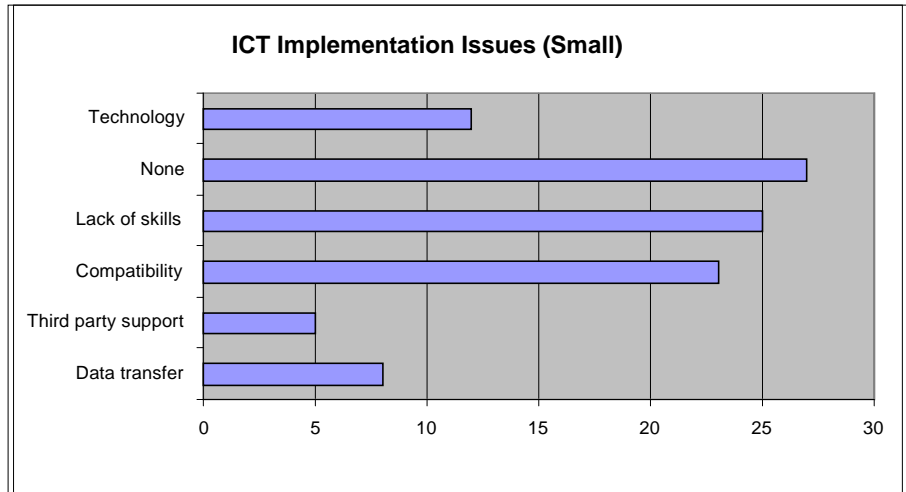
~ VFM - "Y" (Yes) indicates project expects to generate reasonable outputs

**APPENDIX 11: Graphical Representation of Data
(Small & Medium Companies)**

Sources of Advice Small and Medium Companies

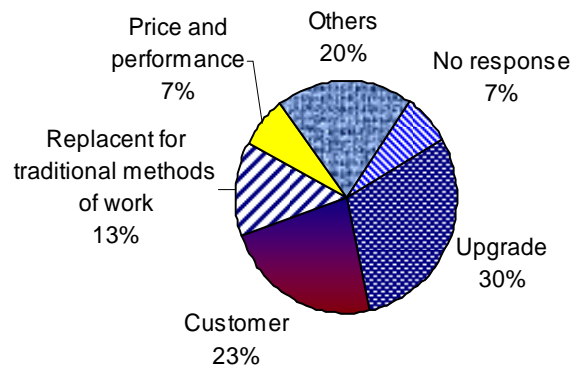


Implementation Issues - Small and Medium Companies

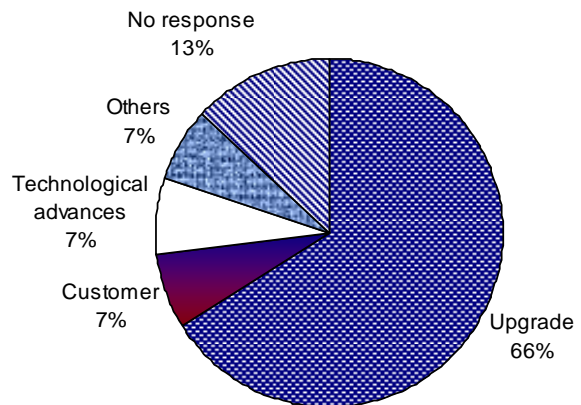


Main Influences to Adopt - Small and Medium Companies

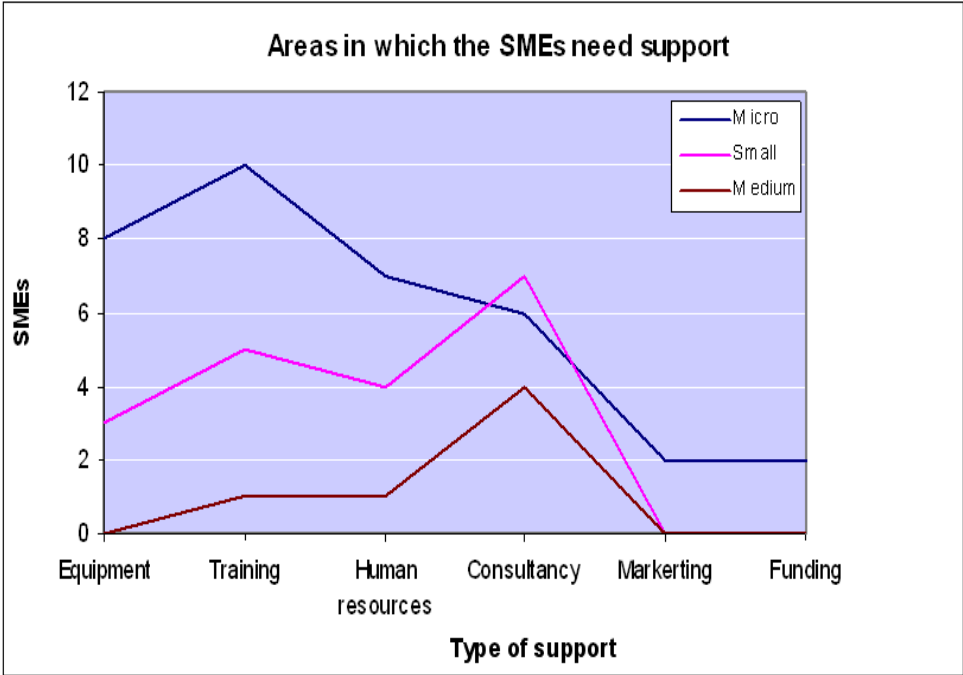
Main Influences on the Investment (Small)



Main Influences on the Investment (Medium)



Support Needs – all companies



APPENDIX 12: Tables of Survey Responses

Co. No.	No of Employees:	Turnover	No of years of operation	Your position in the company	Education	I.T. Professional	Product 1	Who bought it? (position)	Who advised them?	Reason for purchase?	Product 2	Who bought it? (position)	Who advised them?	Reason for purchase?	Product 3	Who bought it? (position)	Who advised them?	Reason for purchase?
1	1	£50,000	1	Director	A levels		PC Laptop	Myself	Shop	Business requirements								
2	1	£60,000	3	MD	Postgraduate	Yes	Laptop	Me	Research into Dell	Essential to be mobile	Virus Software				Router			PC Networking
3	1	£30,000	33	Director	Degree	Yes	Software Draw Plus	Myself	Myself		PC	Myself	Myself		Print Cartridges	Myself	Myself	
4	1	£20,000	3	Director	Degree	Yes	PC	Myself	Myself	Technology Impact	Hosting account	Myself	Myself		Colour Laser Printer	Myself	Myself	
5	1		6	Managing Director	Degree	Yes	Mobile Phone	Myself			Colour printer				White TFT Monitor			
6	1	£100,000	10	Managing Director	Degree	Yes	PCs	Myself										
7	1	£22,470	8	Director	Degree	Yes	Training Project PRINCE X2	A colleague			Components for a pc		Research on Web		Material to construct office	Myself		
8	1	£50,000	5	Managing Director	Degree	Yes	Printer	Myself	Internet		Laptop				Switch Gigabite			
9	1	£100,000	7	Managing Director	Degree	Yes	Monitors	Myself			Wireless Router				Computers			
10	1	£50,000	5	Proprietor	Degree	Yes	Software web design	Myself			Computers				Computers			
11	1	£100,000	20	Proprietor	Degree	Yes	Server	Myself			PDA				Wireless Router			
12	1	£80,000	25	MD/Company			PC	Self	Self		Printer	Self	Self		Mother Boards			

				Secretary														
13	1	£60,000	2	Managing Director	Postgraduate	Yes	New Desktop	I researched	I purchased		Laptop							
14	1	£100,000	9	MD	Degree	Yes	Colour Laser				PCs							Network Server
15	1	£100,000	15	Managing Director	Degree		Computer Hardware	Self	Self		Scanner for network							
16	1	£50,000	4	Managing Director	A levels	Yes	Video Software				PC Equipment							Communication Routers
17	1	£50,000	11	Director		Yes	External Hard Drive				DVD re-writer	The Company						Replacing internal hard disk
18	1	£60,000	14	Proprietor	Degree		Two PCs and Wireless Lan	Self	Local supplier		Installation & Skinning of open source CMS	Self	My supplier of web hosting					
19	1	£24,000	1	Director	Postgraduate		PC				ADSL Router							Scanner
20	1	£25,000	10	Director	A levels	Yes	Software creative suite				Laptop							Desktop
21	1	£70,000	10	Proprietor	A levels	Yes	Updating PC				CRM / LCD							
22	1	£70,000	11	Director	Secondary school	Yes	PC	Me	Me		Printer Memory							
23	1		7	Director	Secondary school		Computers				Servers							Hardware
24	1	£60,000	6	Managing Director	Degree		Laptop				Phone							Printer

25	1	£250,000	3	Director	Degree		Laptop		PC World		PDA				MS Office	Self		
26	1	£80,000	10	Director	Postgraduate	Yes	Laptop				PC				Plotter/printer			
27	1	£60,000	11	Managing Director	A levels	Yes	Laptop				Desktop							
28	1	£100,000	12	Director	Degree	Yes	Server				Laptop				PC			
29	1	£100,000	10	Managing Director			12 Computers				Monitors				Hardware			
30	1	£35,000	16	Managing Director	A levels	Yes	Upgrade development				Training and Development				New Server			
31	1	£20,000	12	Managing Director	Degree	Yes	PC				Laptop							
32	2	£60,000	1	Managing Partner	Degree	Yes	Database Package (Toad)	Ourselves	Ourselves	Essential to complete the project	Microsoft Subscription	Ourselves	Ourselves	Cheaper than buying the full package	Servers	Ourselves	Us	Essential to host people's websites
33	2	£80,000	12	Director	Masters	Yes	Microsoft Partner Program	Me	Internet and PC Pro magazine	Essential for business	Wireless Print Server	Me	Internet and PC Pro magazine	Essential for work	PDA	Me	Internet and PC Pro magazine	Essential for business
34	2		15	Sales	Secondary School	Yes	Laptop	Technical		To demonstrate software								
35	2	£30,000	5	Director	Postgraduate	Yes	PC Intel Duo Processor	Myself	Myself	Ram	New Printer	Myself	Myself	Print directly to CDs and DVDs	Security Updates	Myself	Myself	Updates
36	2		2.5	MD	Postgraduate		Laptop	Myself										

37	2	£150,000	8	MD	Degree	Yes	PC	Myself	People I know	Powerful PC Duo	Software - multimedia studios	Myself	People I know	Improve work	Mac Mini testing	Myself	People I know	For testing our product
38	2	£110,000	2	Partnership	Degree	Yes	Laptop	Company	Ourselves	Efficiency and mobility	2 editing suites	Company	Ourselves	Efficiency and mobility	Editing suites	Company	Ourselves	Efficiency and mobility
39	2		10	Director	Postgraduate	Yes	Laptop computers	Me	Me									
40	2	£20,000	3	MD	Secondary School		PC				Monitor							
41	2	£100,000	16	MD	Degree	Yes	Laptop		Internet and magazines		Server		Internet and magazines		UPS		Internet and magazines	
42	2	£50,000	0.5	MD	Secondary school		ecommerce	Ourselves	Wolverhampton Uni		Joomla template		Ourselves		Laptop	Myself	Myself	
43	2	£50,000	3	MD	Postgraduate	Yes	Computing	Self & Partner			PC	Self & Partner			Microsoft Visual Studio	Ourselves		
44	2	£400,000	10	Director	Postgraduate	Yes	Accounting Software	We do			Wireless Router				Server			
45	2	£35,000	18	Director	Secondary school	Employ IT Professional	Rock Laptop PC	Myself	Reading Tech Books		Mac + Media 100 Editing	Myself	Manufacturer		Oplay encoding software	Myself	Dealers	

46	2	£110,000	0.5	Senior Partner	Degree		Intel Technology for Internet	Myself	None	SW development	Servers Novell	Myself	None	Storage	Roller scanner	Myself	None	Evident
47	2	£50,000	2	Director	Degree	Yes	Remote Server	Other director	No one	access	Update PC				New PC			
48	2	£100,000	9	Managing Director	Degree	Yes	PC	Myself	No one	Home working								
49	2	£250,000	13	Managing Director	Degree	Yes	System to add to Loyalty system	Myself	Seller	More businesses	Global Procurement system				Financial Admin System			
50	2	£80,000	13	Managing Director	Postgraduate	Yes	PCs	Myself	No one									
51	2	£20,000	2	Director	Degree	Yes	Laptop	Myself	A friend		Photocopier /scanner							
52	2	£90,000	8	Managing Director	Postgraduate	Yes	Duo Processor PC	Myself	Network of acquaintances		Laser printer							
53	2	£100,000	12	Director	Postgraduate	Yes	Digital Imaging Equipment	Self	Vendor	customer contract	Laptop				Desktop			
54	2	£250,000	11	Director	Degree	Yes	Laptops	Other director	don't know		Windows Mobile Phone				Networking			

56	2	£350,000	1	Managing Director	A levels	Yes	Server				Racking UPS							
57	2	£150,000	20	Partner	Degree	Yes	Laptops				Development Software				Printers			
58	2	£50,000	12	Director	Degree	Yes	Wireless access point	My Colleague	My Colleague		Laptop				Printers			
59	2	£100,000	11	Director	Postgraduate	Yes	Web Server	Me			Audio Processing software				PC			
60	2	£50,000	7	Partner	Degree	Yes	laptop	me	no one	flexible working								
61	2	£20,000	2	Managing Director			Desktop				Laptop				Router			
62	3	£95,000	0.4	Director/Owner	Masters Degree		Laptop	Director/Owner	PC World	Business	Docking station printers	Director/Owner	PC World	Business	Monitors - Palm	Director/Owner	PC World	Business
63	3	£5,000	0.8	Director	Degree	Yes	Microsoft Visual Studio	Director	All Directors	Essential to operation	Web Hosting	Director	All Directors	Create awareness of company				
64	3	£50,000	2	Managing Director	Masters Degree	Yes	Server	BIC Grant	PC World	Host internet site and file storage								
65	3	£12,000	0.5	Business Manager	Degree	No	External Hard Drive	Business Manager	Off the shelf purchase	Extra editing space	Accounting Software	Business Manager	Microsoft Accounting Development team	Required				
66	3	£52,000	1	Director	Degree	Yes	3 Laptops	Individual	Nobody	Work								

67	3	£40,000	3	MD	Postgraduate	Yes	Software E-commerce	Myself	Internet	Provide a customer with e-commerce website	Sat Nav System	Myself	Internet	Drive to my customers	Printer - Colour	Myself	Internet	To replace the old one
68	3	£125,000	7	Operations Director	Secondary School	No	Server	Operations Director	External IT Support Company	Replacement	PCs	Operations Director	External IT Support Company	Replacement	Handheld	Operations Director	External IT Support Company	Replacement
69	3	£200,000	1	Director	Postgraduate		PC	Myself	Tutor	Research								
70	3		7	IT Engineer	Secondary school	BTEC	Server	Myself	Company									
71	3	£95,000	1	Director	Degree	No	Laptop	Gary Lennon	Retailer		Hard Drive	Gary Lennon	Retailer		VoIP system	Gary Lennon	Service Provider	
72	3	£500,000	15	Proprietor	Secondary school		Monitors	From people I know	Friends		Printers/scanners				Microsoft Windows anti-virus			
73	3	£70,000	6	Managing Director	Postgraduate	Yes	Servers	Myself			Mac Computer				Exchange Telephone			
74	3	£300,000	5	Director	Degree		PCs	IT Person			Laptops	IT Person						
75	3	£200,000	5	Managing Director	Secondary school	Yes	Server				Printer				Laptop			
76	3	£50,000	7	Managing Director	Secondary school		Laptop				24 port hub	Self						

77	3		20	Consultant	Degree	Yes	Laptop				Operating System				Help authorising software			
78	4	£200,000	1	Print Manager	Secondary school	No	Caldera RIP - Linux	Directors	Xerox Sales	To print wide format posters	Laptop for accounting systems	Directors	Ourselves	Administration purposes	Copy Shop	Directors	Xerox Sales	Software to create posters
79	4	£20,000	0.3	Sales and Marketing Director	Degree		Printer	Operations Director		Need one to operate our businesses								
80	4	£40,000	0.4	Sales and Marketing Director	Postgraduate	Yes	Apple Mac	Joint	University department	Essential for work	Video camera	University department		Essential for work				
81	4	£100,000	20	Director	A levels													
82	4	£100,000	1.5	Director	A levels		VOOP system	Myself	Resellers		PCs	Myself	Friend					
83	4	£10,000,000	14	MD	Postgraduate	Yes	Pc's	Myself	Software manager	Replacement	ADSL modem	Myself	Software Manager	Replacement	Monitors	Myself	Software Manager	Replacement
84	4	£100,000	20	Head	Postgraduate	Yes	PC		Orange	Essential	Mobile Phones		Orange	Essential				
85	4	£180,000	3	Director	Degree	Yes	Laptops	Director	Me	New Employees								
86	4	£300,000	23	Manager	Postgraduate	No												
87	4		35	Owner	Secondary school	Yes	Vista of system				Computers for our customers				Another computer for our customers			
88	4	£150,000	8	Managing Director	Degree	Yes	PCs	Ourselves	Ourselves		Software Microsoft Desktop Software				Printers			

89	4		8	Technician	Degree	Yes	Server	Ourselves			PC					Server Software			
90	4	£400,000	8	Director	Degree	Yes	Software	Me			Software AutoCab					PCs			
91	4	£90,000	8	Director	A levels	Yes	PC Windows Vista				Flat Screen Monitor					External hard disk drive			
92	4	£200,000	20	Partner	Degree	Yes	Larger screen for employees	Self			Software Visual Studio					Software Boolean Delph			
93	4	£60,000	3	Director	Postgraduate		Mobile PDA	Self			Small Telephone System					Shopping card Software Licence			
94	4		11	Managing Director	Postgraduate		Purchase equipment weekly and re-sell		Internet		Purchase equipment weekly and re-sell					Purchase equipment weekly and re-sell			
95	4	£150,000	13	Technical Director	Degree	Yes	Laptop		Internet		Desktops					Server			
96	5	£500,000	20	MD	Degree	Yes	Laptops	Myself	Internet	New Employees	Server	Myself	Internal	Customer	Server	Myself	Internal	Required	
97	5	£36,000	2.5	MD	Degree	Yes	Update Computer		Internet	Upgrading and expanding space									
98	5	£100,000	1	MD		Yes	Desktop PCs	MD	Nobody	Greater Speed	Laptop	MD	Nobody	Greater Speed					
99	5	£600,000	9	Managing Director	Degree		Upgrade the PCs	Ourselves	Company Employee	Increase Power	Upgrade the operation software	Ourselves	Company Employee	Upgrade was required by our software provider	Upgrade the hub	Ourselves	Company Employee	Reliability and speed	
100	5	£70,000	2	MD	Degree	Yes	Hosting Hardware		Internet		Upgrade								

							Comput er												
101	5	£200,000	7	Project Manager	Degree	Yes	Comput er Hosting		Internet		Computers					Standard Net PC			
102	5	£2,000,000	10	Managin g Director	Second ary school	Yes	Server	MD	MD		Desk computers					PDA's			
103	5	£500,000	23	Managin g Director	Degree	Yes	PCs	Oursel v e s	Oursel v e s		Laptops	Myself							
104	5	£2,000,000	15	Managin g Director	Degree		Mail defende r Filtering Spams				New Server					Laptop			
105	5	£250,000	5	Managin g Director	A levels	Yes	Server	Oursel v e s	Oursel v e s		Laptops	Oursel v e s	Oursel v e s			PC	Oursel v e s	Oursel v e s	
106	5	£500,000	16	Director	Postgra duate	Yes	Switche s	We did			Printers					Firewalls			
107	5	£500,000	16	Director	Postgra duate	Yes	Switche s	We did			Printers								
108	5		11	Director	Second ary school	Yes													
109	5	£200,000	11	Partners	Second ary school	Yes	Comput er Updates	Partner	Self		Laptops	Partner				Modem		Partne r	
110	5	£450,000	16	General Manager	Postgra duate	Yes	Server				PC					Laptops			
111	5	£250,000	25	Director	Degree	Yes	PCs				Broadband Services					Routers & Wireless Equipme nt			

112	5	£350,000	5	Director	Postgraduate		VOIP Phones	Self	External Consultant		Laptop	Self	External Consultant		VOIP Converter	Self	External Consultant	
113	5		4	Director	A levels	Yes	PCs				Infozoom Contract				Proalpha Contracts			
114	6	£500,000	16	Managing Director	College	Yes	New Server		Own experience	Upgrades	Desktop PC		Own experience	Upgrades	PDA		Own experience	Upgrades
115	6	£160,000	6	Office Manager	A levels	Yes	VOIP	Company Director	People in the building	Cheaper phone calls	Laptops	Director	Nobody	New employees	Printer	Director	No	Business
116	6	£350,000	4	Bus Development	Secondary School	No	G4 Macs				MP Proliant Server				ELMEG Phone System			
117	6	£350,000	30	MD	Degree	Yes	Apple G5 towers				Laptop							
118	6	£250,000	8	Marketing Director	A levels	Yes	Computer PC Server				Software Design	Ourselves	Ourselves		Monitors			
119	6	£400,000	20	MD	Degree	Yes	Mobile Phone	Ourselves	Ourselves		Database ACT System	Ourselves	Ourselves		Apple Mac	Ourselves	Ourselves	
120	6	£250,000	4	Managing Director	Secondary school	Yes	Server 1	Self	Self		Server 2	Self	Self		Server 3	Self	Self	
121	6	£500,000	11	Managing Director	Degree	Yes	PBX extending to locations				PC				Laptop			
122	7	£1,000,000	10	Financial Director	Postgraduate	Yes	7 PCs	Our IT expert	Our IT expert	Growth of the company	Microsoft CRM system	Our IT Expert	Our IT expert	Growth of the company	Microsoft Office	Our IT expert	His background is IT	Growth of the company
123	7	£600,000	22	MD	Degree	Yes	Microsoft Softwar											

							e											
124	8	£3,000,000	0.5	Director	Postgraduate		Toshiba Tablets	Director	IT Consultants	Essential business tool to record and retrieve information	Nokia Mobiles	Director	IT Consultants	Communication	3G Cards	Director	IT Consultants	Email internet access on the move
125	8	£10,000,000	5	Office Manager	Degree	Yes	3 Laptops	Ourselves	Ourselves	Required								
126	8	£350,000	17	Promotional Manager	Degree	Yes	Server		Ourselves	Replacement	Client Terminal Server		Ourselves	Enhance Service Provision				
127	8	£700,000	5	MD	Degree	Yes	Servers		Ourselves	Old system needed replacing								
128	8	£750,000	8	Director	Secondary school	Yes	Telephone		Providers		PC		Dell					
129	8	£300,000	5	Managing Director	Degree		Computers				Laptop							
130	8	£1,000,000	16	Managing Director	Degree	Yes	Laptops	Myself	Shop	Flexible working	Printer	Myself	None	Just needed				
131	8	£600,000	11	Technical Director	A levels		PCs				Paper				Tower			
132	8	£900,000	5	Director	Secondary school		Dell Server Windows SBS 2003	Director	IT Consultants	Consolidate Data	PC x 2	Director		Hardware underperforming				
133	9		3	Administration Manager	A levels	Yes	Laptops	Managing Director	Directors	Updating the old system	Servers	Managing Director	Director	Moving premises				
134	9	£500,000	25	Director	A levels	No	Website redone	Myself	We did research to look for a good company	Wanted to have access to our customers	Software for our graphics department	Myself	We knew what we wanted	Entrance productivity				

135	9	£500,000	19	Director	Degree		Email	Ourselfs	Nobody		Accounting Package	Ourselfs	Nobody		Finance Forecasting	Ourselfs	Nobody	
136	9	£200,000	5	Director	Other		New Server	Myself	Nobody	More storgae	Laptop	Myself	Nobody	Home work				
137	10	£2,500,000	2	Operations Manager			Blackberry	Director	Operations Manager	Required	Laptop	Director	Operations Manager	Required				
138	10			Marketing Assistant	Other		Server	Director		To Market	Scanner	Director		To Market	Barcode Printer	Director		To Market
139	10	£1,500,000	10	Director	Secondary School	No	Printer and Scanner	Myself	Nobody	Required								
140	10	£400,000	20	MD	A levels	Yes	New Server	MD	Hardware Co	Move to new premises	New PCs and laptops	MD	Nobody	Need to upgrade and new staff	New Software	MD	Telecoms Co	Move to new premises
141	10	£400,000	4	Operations Director	Postgraduate	Yes	Laptop	Myself	Employee		Server	Myself	Employee		Desktop	Myself	Employee	
142	10	£65,000	20	MD	Degree	Yes	Network server				Software for call logging				PC's			
143	10	£400,000		Chief Executive	Degree	Yes	Microsoft Partner Program	ISV			Switch KMV				Server			
144	10	£2,500,000	12 Years	Sales Director	Masters	Yes	Security Appliance	Operations Director	Researched internally	Required								
145	10	£1,000,000	5 Years	MD	Secondary School	Yes	Servers				NewCom Switch for telephones				Extra space at dot com location			
146	10	£600,000	11 Years	MD	Secondary school	Yes	Developing our manufacturing system					Ourselfs						
147	10	1.6 mill	11 yrs	General Manager	Degree	Yes	Firewalls	Head Office	Manager		Server				Laptop			

148	10	1 mill	10 yrs	Managin g Director	A levels	Yes	Cisco Router				Phone System							
149	10	£2,300, 000	7 Years	MD	Postgra duate	Yes	Server		Third Party Compan y	Replace ment	Laptop			New employee	Desk top PC			
150	10	£1,500, 000	3 Years	Director	Second ary School	Yes	Servers	Compan y	Self		Laptops		Third Party Compa ny				Third Party Comp any	New Employ ee
151	10	1.5 mill	12 yrs	Project Sales Engineer ing	Postgra duate		Wireles s Equipm ent	Ourselve s			Switches, Routers	Compan y	Self		Hubs			
152	10	£1,200, 000	2 Years	MD	Degree	No	Desktop PCs		Head of operation s	Expansi on	2 Macs			Expansio ns	Mac Editing software			
153	10	£3,000, 000	7 Years	Busines s Develop ment Manager	Postgra duate	Yes	Server	nFocus	Local Supply		Websites		Head of operati ons				Head of operati ons	Expans ion
154	10	£300,0 00	8 Years	Director	Degree	Yes	Worksta tions x 6	MD	IT Dept	Improve Speed	Design Software	Designer	Myself	Keep up to date	SEO Software	Director	Myself	Improv e working practise
155	10	£600,0 00	8 Years	MD	Degree	Yes	PC's	Ourselve s	Ourselve s	More Staff	Web servers	Ourselve s	Ourselv es		Phone System	Ourselve s	Vendo rs	
156	10	£900,0 00	6 yrs	Consulta nt Engineer	Degree	Yes	Dual p4 rack mount server	Technic al Director			Storage System	Technic al Director						
157	10	1 Mil	10 yrs	Director	Postgra duate	Yes	Desktop PCs		In-house team/out side company		Servers				Develop ment software			
158	10	£500,0 00	3.5 Years	Director	Degree	Yes	Content	Myself		For service delivere d	Mobile Phones	Partner		Testing	Software	Partner		Develop ment

159	10	£980,000	14 Years	Chairman	Secondary school	Yes	Telephone exchange	MD	Internal	Company Expansion	New Server	MD	Internal	Improve response	Network infrastructure cabling	MD	Internal	New Server
160	10	£1,000,000	4 Years	MD	Secondary School	Yes	Server	IT			Outsourcing our support		Director		Server			
161	10	£1,000,000	6 Years	Manager of Aware (sub company)	Postgraduate		Sage 50											
162	10	£6,000,000	18 Years	Business Unit Executive	Secondary School	Yes	Server											
163	10	1.2 mill	5 yrs	Chief Executive	Postgraduate	Yes	Consultancy to develop Online Service	IT Team			Three Web servers				Monitoring System			
164	10	£1,500,000	14 Years	Director	Postgraduate	Yes	Remote access software	Ourselves	Ourselves		New PC Screens	Ourselves	Ourselves		VOIP telephone system and sever	Ourselves	Ourselves	
165	10	£1,200,000	22 Years	Managing Director	Degree	Yes	New PC	Ourselves	No	Increase Power	Upgrade of operation software	Ourselves	No	Upgrade required by software provider	Upgrade the hubs	Ourselves	No	System more reliable and faster
166	10	£2,000,000	15 Years	PA	Secondary School		Laptops	Company Employee	Managing Director	Replacements	PC	Company employee	Managing director	Replacements	Server	Company employee	Managing Director	Upgrade
167	10		5 Years	Project Manager	HND	Yes	Laptop computers	Ourselves	Ourselves	New Employees	DAT Drive	Ourselves	Ourselves	Failure of existing one				

Co. No.	3. Which purchase have you chosen?	4. In your view why was that purchase the most significant?	5. Did you seek advice prior to purchase and if so who from?	6. What were the main influences in this purchase	7. Was there any internal pressure to buy	8. Was there any external pressure to buy	9. What implementation problems did you have	10. What are you planning to buy next?	12. What are the benefits of the purchase?	13. What measure of success has there been?	14. Have others commented on the success either within the company or from outside?	15. Did you allocate a timescale to the success?
1	1	Business impact	A company employee	Cost, only a basic laptop required	None	None	No problems	Impatica Device	Business resource and necessity	Excellent		
2	1	Business impact	Internet research and a PC magazine	Customer/supplier	Business growth and established myself as a consultant	No	Straight forward	Handheld PDA	Mobility	No problem, we're efficient	No	Not formerly
3	2	Technology and business impact	No	Upgrade for older equipment	No	No	No	Nothing	Haven't used them yet			
4	1	Technology Impact, Process Impact, Others		Upgrade for older equipment	N/A	Technological advances			Increased efficiency	Time to deliver and operate decreased		
5	1	Technology Impact, the functions it has	Internet research	Upgrade	Efficient and GPS to locate the directions in difference areas where my customers are	No	No	Nothing	To get to places quickly	Quickness of getting to customers locations	I am happy because I get to my customers on time as I have GPS, so do my customers	No
6		Financial Impact, if I don't have the machine at home I can't do the work	External advisor	Upgrade	No	I need to upgrade because of security reasons, Firewall is used			Administrative purposes	I don't. It works	Absolutely fine- no problems	No
7	1	Process Impact, enabling me to work for local authorities, knowledge and qualification to be recognised	Colleague from another site	Customer supplier because I wanted to work with Local Authorities	Business growth, more customers who allowed me to continue operating in the	Pressure from customers	Dedicating a lost of time on it	Nothing	It hasn't yet	Directly will be by noting to us which work have PRINCE2 as a requirement in local authority project IT	Yet to be proved and valued	No I saw it as along term investment

					same sector							
8	1	I had a small printer now I take less time to print	Internet research	Upgrade	No	No	None	Nothing	Saving time and money	Extra free time	Invoices look nicer	Yes a few hours
9	2	Process Impact, more customers user so that can access the internet through us	No	Upgrade	No	No	Transfer of data, Compatibility	Large LCD display	Customers more convenient to use the internet. For us it is easy to upgrade and configure them	By how much use, we look at how efficient the items is working for us	I find it much easier, I do now have wireless access	No
10	1	Technology Impact using related tools and standards and keeping up to date with technology	Upgrade	Industrial leading software so we need to know how it works	A desire to continuously improve in providing good service to customers	Enable to diversify	No	No	Updating Companies	Been able to offer additional services to clients	Customers too early to day - me, additional training is required	Yes ongoing thing, each week to measure it
11	1	Financial Impact running window server, familiar with the operating system	We are a computer consultancy - we advise people not them advise us	Replacement of traditional methods of work	No	Our customers expect us to have experience with these EGPs	No	Software development package, new programming language	Enable us to make several sales	By how it helps us to develop new product it achieves sales of new products	Customers pleased	No, 12 months
12	1	Financial Impact, most expensive	No	Upgrade	No	No	No		Faster than older one			No
13	1	Business Impact	Internet Research	Needed desk top with more space and more capability to run graphics	No	No	No	Wireless Network	More back up, Graphics package fireworks runs more quickly on this PC than laptop, faster updates	Only results highlighted, No sophisticated metrics		No
14	1	We can do marketing for ourselves		Upgrade			No		Life much easier	Reasonable		
15	1	We buy to sell it out	No	Construct the machine to sell to customers - we sell Hardware and computer software			No	More computer hardware	More money coming in	By how much we sell or profit we make	Yes	Three Weeks

16	2	Business Impact, Business essential	No	Upgrade	Motherboard of my old PC died needed to change quickly	Replacement	No	UPS	Have work again after the motherboard died, unable to work	Produced services and profit	Happy	No
17	1	Backup	No	Backup	Have to, essential	No	No	A new PC and Large Screen	Ability to Recover from power cuts	It works	Employees happy customers don't see	No
18	2	Business Impact - Item 1 was an upgrade, item 2 lets us offer new interactive support to clients	External Advisor,	Replacement	Business Growth	Not directly as my customers did not know what to ask for. Indirectly as the solutions chosen are to enable to meet changing demands	Lack of Skills, Third Party Support	Services to provide video clips on the site	Too soon to say it is a 30year plan		Customers love the new service provided as a result of the purchase	Yes 2 years
19	1	All essential for my business program by invoice	External Advisor	Upgrade	Business Growth I need to move my business forward	Technological advances, I needed to upgrade	Transfer of data	Laptop	Been able to implement processes and develop marketing	It is a bit subjective	In my own, I am happy with it	No
20	1	Technology Impact - need to get a software package in order to train	No	Necessity	Pressure from Within the company, essential the recent release	Because client wanted to buy the software need to keep up	Lack of Skills	Upgrade the desktop	Allow me to teach about that software, enhance my skills	I doubt but I should	Customers Comments, a bit early yet	2 months
21	1	Connected with the development is to give me additional processing power	Not, I keep up to date myself	Upgrade	No	No	No	No plan	Improved the efficiency	I know the PC forms quicker	Customer doesn't see benefit	24 hrs
22	1	Bigger and fast efficiency	No	Upgrade	No	No	No	No plan	Improved process power and efficiency	The quickest it has been can do more	Happy	No
23		Business Impact - I buy to resell not to keep	No		No		I advise people and solve their problems					
24	1, 2, 3		External Advisor	Replacement	Replacement	No	No	IT cabling	I can work remotely	Did it work		Same Day

25	1	Impact Process	External Advice	Prince/Performance. Support being local	My business activities mean I require a PC and Laptop	Business Growth	None	More efficient	Amount of business - missed leads			
26	2	Financial Impact - was costing more	External Advisor	Upgrade	I had to do so to get more customers	Pressure from the customers I have to do the work form BBC	Lack of Skills, technology, transfer data, third party support, compatibility	CNC machine and router	Facilitation of doing software development to design software	I don't measure	If it works, it works	
27	1	Process impact to be running my business	Internet research and PC Magazine	Upgrade	No	No	Transfer of data	No	Look after my business easier	Time spent to do the tasks, the speed	Employee happy, Customer can't see	No
28	1	Business Impact - Enable build to software next generation using new technology	No	Upgrade	To grow the business	No	No	ASP so that offer a hosting facility	Rewriting the old system	It can't be measured	Employee happy, customers cannot see	12 month
29	1	Technology impact, changing technology for the cars, have to work in vehicles	I have	Customer supplier	No I try to supply the whole system	No	Supply special mother boards	Parts Microprocessor	I can carry more equipment	Repeat orders	Happy	No
30	1, 2	It is going to affect all our programs	No	We have to keep ahead of technology	Pressure from the supply and colleagues	External user group	Changes plug in programme and we needed to change		Move us from one type by programme	Improved facilities and performance to the customer	Nothing	A continuous Problem
31	1	Documentation of the business	PC Magazine	Upgrade	No	No	No	Printer	More efficiency	Its quicker	Customers can't see	Yes 1 week
32	3	Essential to implement the technology on the server and large financial profit	Internet research	Needed for our clients and needed a reliable system	Essential, without it there is no business	Customer	Compatibility	Better web server, new laptop, upgrade our Microsoft software	We managed to have more control of the website we produce and the software we deploy.	Turn over investment is satisfied	The customers are happy. The customers cannot see the web server so it is not a big deal.	12 Months
33	3	Technology impact and business impact	A PC Magazine	The faculty offered by the system are useful to the business		No	Lack of skills and compatibility	A server and/or smart phone	Doing well in my business as my diary is always well organised	It works, very useful to the business	Yes the other director wants one so we need to purchase another	Not really as it was immediately beneficial

34	1	Technology Impact	A PC Magazine	For demos					Prospective clients are able to clearly see our software	Everyone who sees our construction software is very impressed	Over software has been recommended to other construction companies	6 months
35	1	Process Impact, it takes a third of the time	Internet research, price wise not technology	Replacement/upgrade, more efficient	No	Technological advances	Transfer of data	No plans	More efficient, heavy processing power	More types of work, we can measure after 6 months	I am getting more and more jobs	5 years
36	1	Financial and Business Impact	Internet research	Work	No	No	Lack of skills		Small and mobile	None, just daily use	No	No
37	1	Process Impact	External advisor	Upgrade	No	Technology advances	None	Laptop	Increased work flow, work with multiple applications, increase the desktop area using dual monitors	Increased the speed of development and hence the production	Yes the users	No
38	2	Process Impact	We know what we want and we don't need advice	Upgrade for older equipment	Business growth, do more jobs	No	None	Laptop	Quicker	Exporting, quarter of the time	No	No
39	1	Technology Impact	No	Upgrade older equipment to provide on site development or demonstration	None	None			We can develop or show onsite	No measures required	It looks wonderful to customers but the battery lasts 55 minutes, for development work on the train its hopeless	No
40	1	Because of the operating system which allow us to load	No	Replacement for traditional methods of work	No	Technology advances	Learning, finding the information to implement software - Linux and Windows	Upgrades for the network and back-up facilities	It enables us to work concurrently with different client and operating systems	It hasn't gone wrong yet	Transparent/they can't see	No
41	1	Process impact and the old one blew up	Internet research and a PC magazine	Price and performance were the main influences	We needed one as the previous one blew up	We needed it to save our customers and to finish the projects in hand, also we	Transfer of data	2 new servers	Back to work it was vital for us to save the customers and finish the project	Productivity	Very good	No

						managed to upgrade it						
42		Technology impact	External advisor, internet research, IT Futures and WMMW	Supplier	Employee	Tech advantages	Lack of skills, technology, third party support and compatibility		Start-up	Online	No employee	Yes, 1 year
43	3	Financial, Business and Process Impact	PAC Magazine and internet research	to upgrade the customer systems with new technology so that work can continue on-line to the advantage of the business	No and Yes - the business is growing as customers demand more service we get more work	To supply customers with something better for them to be able to work out of their offices	Lack of skills, technology	Document Management system	Better software development, new developments of software to customers	It works or it doesn't Can't measure work	Employees Happy, Customers Happy	Yes, 3 months
44	1	Others (So that we can pay)	A company employee	Upgrade	No	No	No	Workstation for accounting staff	Cost saving	By cost, cost saving	Very Happy	No
45		A 21st Century way of communicating through the work wide web with video streaming technologies	External Advisor/A PC Magazine	Upgrade	No	Technology driven	Technology		Yes	To be able to broadcast to all users of multimedia on the internet		10 yrs
46	2	Moving from Novell to Linux training a lot of the time to understand	External advisor -Mentor Espider who is one of the partners. Linux look for a goal-web capture to develop your own line	Closely work with customers - know what they want, what the need so we need to provide them with a better solution	Development of the new solution and building the businesses we work with - liability is set up as and shared by all the Partners	Fear of losing the business, so we kept moving get new technologies so that we can give customer robust solutions	Lack of skills, Compatibility. Training is the biggest problem. Business is about inspiration want to find the Easier things to do so it takes a lot of time and financial strain	Finding more partners to fill the holes to do tele-sales, marketing and business development	Financially has not returned - increase customers should be at the end of this year the customers we have already we should be able to return our investment	The amount of customers which will roll in by December we should be able to then measure the size of market and financial profitability	Customers are saying it is good but will not see it. Partners are well excited and working hard to expand the market	Yes, December
47	3	Nature of business requires these items	Internet research	Upgrade	No	We are keen to stay up to date with the technology	No		Efficient and to keep up to date with the technology	Time saving	We are happy	No

						. This will help us to retain customers						
48		We can work from home	PC magazine, PC advisor	Upgrade	Just a business command and new business to make sure we can log in to the customers sites and provide them with proper services	Yes we needed to work remotely has to be done if we want to get work and satisfy customers		No	It enables us to get more Contracts, work from home and save more customers	It the hardware doesn't fail efficiency and productivity, then we look at it as a success	The customers don't see it, we are happy	No
49		Process and Technology, efficient to re-engineer the process	The customers know what they want they tell us and we choose what is best for them	Upgrade	Business Growth and driving the demand	To make more efficient, customers want the new technology which can help them to provide the right service	Transfer of data, Compatibility	More training new technology	1. Build reputation, 2. Gave us a hardware to move business. 3. Updated our skills	Productivity, speed which can help us write more programs	Employees happy using latest hardware. Customers happy as the hardware handles the load they want	Yes, 6 months period, depending on project
50		Technology Impact, Business Impact, Technology upgrade	Internet Research	Upgrade	No	No	None		Faster internet access, taster PC more storage	Subjective more efficient and much easier	Customers do not see the accessing their systems - I am happy	Yes, 2 day
51	3	Technology Impact as we needed the latest PC with the application for doing our jobs	Internet Research	Upgrade	No	Technological Advances	No	No Plans	Using new technology to do our job and improve our services	If Its doing its job we do not measure	We are happy	NO
52	1	Processing speed	External advisor	Testing new software	No	No	Third part support	No Plans	Reduce processing time	In terms of productivity	Content	Yes 1 Month
53	1	Process Impact to enable me to expand the processing		Customer	Opportunity, Technology support	No	Lack of Skills, Poor software delivery scope and manuals not very comprehensi	No plan	Enabled me to obtain the contract	Problems, not working properly	Not happy	No

							ve						
54	3	Technology Impact expanding the wireless	A company employee	Increase performance	yes	No	No	Apple Mac	Working environment has been working flexibly	Productivity	Employees have more flexibility customer don't notice	No	
56	2	Technology Impact, Modern Technology allows remote management	Internet Research	Customer, wants the service and support	Customer lead	Service that needed by the customers, best services and that can be managed remotely	Compatibility	A Van, Another PC	Allows more support for customer, business growth	The number of clients I have - The return on the investment	Working Remotely, the power of the internet	No	
57	2	Technology, Financial and Process Impact, creating the things which we need to see to our customers	Internet Research	Upgrade	It was a need to keep up to date	Pressure from customers to give them what they want	No	Laptop	We can offer new features to our customers, new products as well	It is very difficult to measure these things	Employees, we discuss what we want to buy it so no comment - Customers don't know we buy but see new features	No	
58	2	Financial and Process Impact, most expensive, had to allow us to support our customers		Customer/suppliers - we wanted to offer better services to our customers	From within the company we needed to fulfil a hole	No	None	No plan	Reducing the time taken for diagnostic customer problems	We do not, we feel that we offer deluxe service more efficiently	Employees easier and more efficient - customers they can't tell	No	
59	1	It was to improve the way we provide our services to our customers with flexibility	Our own experience	Customer influence to improve our response to customers	Growth for the business	External pressure for improved reliability	No	Web server doubling the size	Improved profits, reputation and reliability	We count the number of problems before and after	Employees Happy, customers better reliability this think it is good	2 years	
60	1	to be able to work from home	no	home working	no	no	none	3G phone	I can contact customers when they need me to	happy customers	no	2 months	
61	1	Allows me to create web applications	PC Magazine	Upgrade	Technical requirement	Technological advances	General Problems such as setting up networks	Scanner	Enable me to work faster	Performance speed of the machine and the software in it		Yes 1 week	

62	1	Business Impact	External Advisor	Upgrade to business laptop	Business growth and extra employees	Technological advances	Lack of skills, technology and problems with existing computer resulting in loss of business.	Laptop, printers, docking stations, monitors and server.	Wireless access allows me to show my customers my business online rather than from still screenshots.	N/A	Customers like the benefit of seeing my product working during the meeting.	N/A
63	1	Essential for business operation	Internet research	Essential for business operation	Essential for operation	N/A	None	Autodesk 3D Studio Max - for producing 3D models	Allowing us to develop or software efficiently.	Products released show success of software used.	All employees happy to use software.	Success was noticeably immediately in product output.
64	1	Business Impact - To put our business in the shopping windows via the Internet	PC World	Essential as the nature of our business is Technology Management	No	No	I have a strong computing background and have worked on this type of work before so its not a problem.	Software that can allow us to work away from the office.	Too early to say anything.			3 Months
65	1	Business Impact	A company employee	Upgrade to larger storage capacity for video editing	Business Growth	No		Website redesign and more storage space	Able to run more editing projects simultaneously	Amount of extra work that it able to be stored	Within the company it has been noticed that efficiency has been increased	No
66	1	Business Impact	Price Aspect	Customer	Business Growth	No	No	Upgrades Laptops Hardware	More Productivity	More Work	No	No
67	1	Business Impact	Internet research	Customer	New Project, No	Pressure from a customer	Technology, transfer of data	Consultancy support, business coaching, somebody to help the business grow	To develop a new application for our customer so that they can sell the product on the internet	Too early, the project is under development	Customers are happy.	3 months
68	3	Technology, financial, business and process impact	External advisor, Wmita	Replacement and upgrade of existing server; also an upgrade was crucial to upgrade our software to improve our working	Business Growth	Technology advances	Transfer of data	Very Successful	A growing workforce; additional PCs are to ensure improved working processes that in turn	Improved working processes; time saving and improved customer care	Yes internally a distinct improvement in communications; also the ability to work remotely	No

				processes.					will increase the profitability of the business			
69	1	Technology Impact	External Advisor			No	Lack of skills, technology and third party support		Get more technology skills			
70	1	Technology Impact	A Company employee	Upgrade	Internal pressure and reliability	No	Compatibility		Collaborations and centralisation	Time saved	High speed/reliability	
71	1	Business Impact, used for communication/presentations/research/operations and finance	Internet research	Upgrade	Business growth	None	Technology		Having also purchased software tools, productivity is higher, sales increasing	Performance and reliability. If it breaks down it causes problems	None	None
72	3	Stops a lot of viruses which stop me working efficiently in my work. I have deleted 300 spams this morning	Friends and people who I know to get concept of optimisation, also people with Businesses as well who have had same problem	Updating continuously	Pressure from within the company/ We needed to spend less/time to read and delete spams.	We need to keep ahead of the market by learning how to make ourselves efficient.	Lack of skills, lack of information and have to ask other people who have come across these problems	Software updates on Microsoft System	Stops the virus, scans and makes me more efficient	Difficult to measure it is an improvement which cannot be measured, but we feel it has reduced the viruses	We are two of us and we are happy because we spend less time now to load the computers as we have less spams	No
73	1	Business Impact, because I host website for clients it is important to have reliable server	Internet research	The service, which we give our customer should be of high reliability	Make sure that our data was safe also the upgrading the service	No a web server doesn't change that much	None	Nothing but employ people	Peace of mind, efficiency the customer support has been very efficient	I normally compare it with the older service provider, compare the service how much we get back	Great	No, it was pretty much immediate
74	1	Most business software's are installed on my machine I am able to use them and do all the jobs at once	Internet Research	Upgrade	No	No	No		I am now able to run the business using one PC		I am happy as I am not wasting money to employ more people	No
75	1	All - more efficient	External Advisor	Upgrade	No	No	No	Nothing	Increased efficiency	No metric, just that things are done quicker	No comments	No

76	1	Technology Impact it's bigger and faster	Internet Research/Catalogue	Upgrade	Wanted a new one	No	Compatibility	Inspection Equipment, production	More Portable and larger equipment can work at home	It is more pleasurable to use, big screen		No
77	1	Technology, Financial and Process impact	No	Essential	Needed for research and development	Technological advances	No	Apple Mac	I can get on with my work	It does what is supposed	Employee happy, Customer will benefit on the research	No
78	1	Financial Impact	External Advisor	Customer	Business growth	Pressure from customers	Technology, transfer of data and when the machine was installed the trainer came in but was not very clear.	Bigger poster machine	Gave us more customers, higher quality printing and improves production.	Doubled the company turnover.	Customers are happy.	2 years
79	1	Process Impact	A company employee	Need to carry out our service			Lack of skills	Website	Generates sales, the printer is vital.	Complete success	Everyone within the company thinks it was a success.	1 month after purchase
80	2	Business Impact	External advisor and internet research	Demands of customers added to the necessity of work	No	No		Steady Camera	We are able to fulfil our duties to a professional standard.	Glowing testimonials from customers.	Outside, customers.	No
81		Business and process impact	Not at all	New development	No	No	Operating Systems	Nothing	To enable us to do things quicker		No	No
82	1	Financial Impact	External advisor		No	No			Purely financial	80%	Yes	No
83	2	Technology Impact	A company employee	Upgrade	No	No	Third party support	PCs	Fast internet and reliable connection	Faster	Within and outside	No
84		Business Impact	My own judgement	Upgrade for older equipment	No	Technological advances	None	No plan	We can work faster and it is essential for the business	Yes how much money we get	Yes customers are happy	Annually
85		Profitable	Internet Research	New kit for new employee	Business growth, new employee	No	Lack of skills, technology	Laptop	Profit	Number of times, we get profit	Customer very pleased	1 month
86		Business impact	A company employee	Replacement for traditional methods of work	No	Technological advances	Compatibility	No	It reduces the manual work, efficiency is	We do not have a system in place we just measure	No	No

									increased	profitability		
87	1	Technology, financial and business impact. Being technically up to date to attract more customers	We had information about Vista from a Microsoft presentation I attended	That is the way the market will grow and we will make money out of it, we had to learn and wait	Market Growth	Technological and marketing advances to create a niche	Lack of skills and technology	Video and music editor	Increased sales	People will phone more and more to ask on how to be trained on Vista, we will measure through the amount of people	We are happy to learn about technology and the customers are becoming confident in Vista	
88	3	Business Impact, we will not be able to do what we do without	Internet Research	Upgrade	Employee's complained on the number of computer crashes - business growth	No			Efficiency	The amount we charge the customer / profit	The purchase was good, speed is good. Customers will not notice the difference	
89	1	Business Impact, it was replacement of our older server		Upgrade	Within the company, we didn't have a server at the time	No	None	No Plans	Have access to data, can have backups	Ease of use, access of data and ease of installation	Successful	Month
90	1	Because of the value the amount of training	A company employee, PC Magazine	The need to produce drawings which are acceptable to customer	Ease to be able to interact with customers	Yes	Compatibility	PCs	Reduction in time, and interaction with customer	Employees feedback and customer feedback	Positive comments ease of new projects as we are able to interact with the tools which our customers have	No
91	3	Added security, easy backup	Internet Research	Upgrade	No	No	No	Portable Laptop	Added security, not losing data all the time as I used to		None	No
92	2	Technology Impact change to different programs		Replacement for traditional ways of work	Pressure from within the company	To be competitive	Lack of Skills	No plan	We have created new programs which made us get new computer	We do not	Employees are happy, customers having good service	3 months

93	1	Business Impact, Calendar contracts, etc	Internet Research/PC Magazine	Upgrade	No	No	No	Office Furniture	Portability of Data which gives me more flexibility in giving my customers better service	By looking at duplication of the data from the PC and my PDA	I am happy it makes me be where I am supposed to be on time	No
94					To re-sell to companies	As above	None	A SAN for our Docklands server	It made none, from the sale	If the customer pays		
95	1	Financial and Process impact, were expensive but we use them a lot to generate business	A company employee	Upgrade	People needed a fast machine in the company	No	No	More desktops	More efficiency	We don't	Nothing	No
96	2	Financial Impact	A company employee	Upgrade	Business Growth	No	None	Depends what customers demand but maybe more servers	Increases the capacity to sell	More customers	No	Yes
97	1	Technology, financial, business and process impact	Internet research	Company expansion	Business growth	Technological advances	None - virus attack		Work a lot faster	More project	NEC exhibitions and we were funded for that	No
98	1	Technology Impact		Speed Centrino Technology	No	No	None	Laptop	Faster Processing	None	No	No
99	3	Process impact and we have a system which is more reliable and faster now	A company employee	Upgrade for older equipment and we needed faster processing and reliable system	Within the company		Compatibility	Further software or system upgrades	Speed and reliability of our networks	Less complaints from our users	In the company people say its better	No
100	1	We use it to host customer websites	A company employee	Increase capacity the server was full, to add new customers we needed this		None	None	No	Portability	The customers cover the cost	It is not visible, it just adds capacity	No
101	1	Financial impact		Customer	We needed to	The customers wanted something that worked	We didn't		Project cannot be completed without that server. We needed to do this for our customers and increase our turnover	It doesn't go down. If it does what it is meant to do than it is a success	Employees happy because we updated and researched ourselves. Customers are happy because we were able to solve their	No

											problem.	
102	1	Affects the whole company, efficiency	No	Upgrade	No	Technology advisor	Lack of skills		Efficient		Yes	Yes depends on things
103	2	Replacement of old equipment	A company employee - we advise people so we do that for ourselves	Upgrade	Pressure from the company, the Engineer was not able to do the job properly the computers were slow and had not enough space	No	Transfer of data	Access data much quicker - the job is done much easier and efficiently	Access data much quicker the job is done much easily and efficiently	Speed in processing data and download is much quicker as well	Pleased as they do not spend too much time to access and download stuff for their job	Immediately , we could download what we want without any problem and that is what we wanted
104	1	Business Impact, it allows us to have a safe e-mail	Internet research,	Upgrade	No	No	None	No	It can cut down the amount of false emails and spams. Our day to day is easier	From the e-mails trapped and less time we use to read useless emails	Good, Less	A week
105	1	Process Impact, Business benefits	We know	Upgrade	Business Growth	No	None	Management MIS information system	More secure, stable platform for our business operations	Observation, efficient to finish the job, not easy to do so but see if the server has done its job	Customers would not know, Employees have no comments	No
106	1	Bought for the technology		NHS tend to buy CISCO	Need to know how to run it before we supply to our customers	None	Laptops		We use as training exercise and save money	Support t our customer and be able to help them	We have supplied and programmed the switches in the hospital	No
107	1								We brought it for our business to be used as a training tool	When we sell products and manage to maintain them	We have supplied and programmed the switches in the hospital	No

108												
109		Process Impact, Processes images for my product for the customers	External Advisor	Upgrade	We need	No	No	Computer updates we going to broadband for banking	It saves time, we had to unplug this to put in another computer	It is just much easier to download	Employees are happy customers no aware	
110	1	Business Impact, helps run our business	No	Upgrade	It was internal pressure	No	No	No comment	Easy access to e-mail and store files	Apparent use performance to use	Employee Happy customers don't see	Yes a week
111		Technology Impact we work more quickly	Me	Upgrade	Pressure from Within the company from the business driven by my customer	Technological advances to work with the customer	No	More Suited people	More efficient but it is not the advantage but we needed to advance the technology we have to work with	Self evident without it you can't work.	Much faster to develop software so staff are happy.	Yes, few months
112	1	Business Impact, Crucial for establishment of overseas office	External Advisor, PC Magazine	Required for operation of overseas office	Business development		Lack of Skills	On-line credit card payment acceptance	Too early to say	Reduction in communication costs	So far very confused, customers unknown as yet	
113	2	Technology, Financial impact - highly innovative cost effective	None-based on 30 plus years experience	Additional business in new markets	No	No	None	A/v Equipment	New revenue streams and new markets	Revenue marketing -v- costs	When using very satisfied	No
114	1	Process Impact	Internal Research	Customer	Business Growth	Technological advances	Transfer of data	Projector	Improved working practices, productivity and technological advances	Improvement in productivity and service offering	No	Yes 3 months
115	2	Process Impact	Internet research	Upgrade	No	No	Technology	Nothing	Working from home	Turn over has increased	Yes, readers	A year, annual
116	2	Technology, business and process impact	External advisor, IT futures	To store all clients artwork files, daily back-ups and link macs and pcs	None	Technology advances	Compatibility	Large format printer	Made the company safer	How often it is used and the cost to the company of not having it	Employees very happy, now dependent on the purchase	No
117	1	Because of extra power with the purchase of hardware	Internet research	Capability speed processor is much faster and bigger hard drive	On time, it was holding us back	None	None		We can output work faster	Do more jobs	Pleased as the prices are down and the jobs are delivered quicker	Immediate

118	1	Technology impact	Internet research	Price, reliable supplier	Essential	Technological advances	Research	Software design and hardware	Use new technology day to day for development of work	The more visible aspects. Maintenance and security.	Selection of things which they want to use combine more operating system.	
119	3	Technology impact.	A company employee and internet research	Upgrade for older equipment and we needed to stay in the market by upgrading our equipment to make them faster and more reliable	No we needed it to keep up with technology changes	Technological advances and pressure from a customer. You will fall behind if you don't catch up with the technology. Also to keep our customers.	Compatibility	Another Mac	Speed and ease of use, open several pieces of software and use them at the same time	We don't, we look at the work which it does. Increase turnover	The job is easier and faster for the employees and the customers are impressed with the new technology. Its more efficient and a higher quality service.	No
120	1	Process Impact, expand range of servers	Self	Expand range of servers	Yes, Limited services		None	More servers	Increase in profits	Financial/Reliability	Everything works and is reliable	3 months
121	1	Business ability for people to work from home	Company employee, External Advisor, Internet Research and PC Magazine	Replacement	No	No	No	Network servers	Working from home the customers can call and be transferred to the right person	Customer satisfaction	Customers great can reach people they want at the right time	Yes 3 months
122	2	Process impact	A company employee	Upgrade for older equipment	Business growth	No	Compatibility	Laptops and PC because the business is growing	Having a database allows the employees to access the data. Different department can use it as an implementation tool	If there are no problems then this is a success.	No	Yes
123		Business impact	Internet research-engineering group		No	No	None but nothing runs smoothly		Improved income	Improvement of our income		

124	1	Business Impact	External advisor	New work practise	No	Yes as part of the partnership	Third party support	A server	Effective business process to enable work on the move.	Ease of access of the move and ability to draw and note-take	Yes and several of our clients are now purchasing tablets	Yes, 3 months
125	1	It wasn't significant but it is essential.	No	Replacement	No	No	No Problem	I have no idea	Ease of work	No	Yes, from the customer	No
126	2	Business impact. Enables us to make the best use of the system internally and remotely	A company employee	Replacement for traditional methods of work	Business growth	Technological advances	Compatibility	Another server for a different location	Enables us to utilise the existing hardware which might be out of date	Time and effort saved	Yes, both	Yes less than one month
127	1	Technology impact	We are IT Consultants	Upgrade for older equipment	No	No	No	Nothing	Better performance	Profitability	Yes internal	Yes 1 year
128	1	Process Impact, write a software for handheld devices and speed is required for solving customer problems	Research for ourselves with the individual suppliers then choose what impresses out application	We were expanding and updating what we have	Speed linking to our PDAS	No	No	Nothing at all	Speed	Performance, we measure how quickly the item performs as compared to the older equipment	Fine, the employees are happy because they could work faster, the customer as well	A month
129	1	Process Impact - most business software is on my machine it helps to work efficiently	No, price	Upgrade	No	No	No		Means we can run it for person to person to do all activities		I am happy	No
130	1	More flexibility	No	Good reviews	Can contact customers	No	None	Don't know yet	We can work from home and from a customers	It just helps	No	No
131		It enables us to work faster and more reliable	No	Upgrade	It had to be done	No	No	More paper, Monitors TFTs	More Efficiency	How quick, more application	Happy	
132	1	Business Critical	Server had to be correctly sized to deal with e-mail, database and web demands	Poor performance by web hosting provider	Internal pressure mainly poor pc performance	External Pressures are our visibility to our customers in terms of response	Transfer of data		Purchase successful due to easy migration on to new platform	Success is measured by web site availability and database speed	Migration a little laboured but continuity of services were protected	Payback period
133	2	Business Impact	Internet research	Upgrade	No	No	Transfer of data		We now have faster communication	Can't tell	Yes, the customers	No

134	1	Business impact	We did research from different companies and decided what we wanted	Customers wanted to contact us and access our business	Business growth	Technological advances	Transfer of data	Updating the graphics server	Accessibility to the customers and ourselves	We have just implemented the only thing I can say is that we have more customers and profitability	We have positive feedback from within and our customers are happy	No
135		Business impact	No	Replacement for traditional methods of work	Yes staff pressure	Technological advances		Server replacement	Faster communications	None	None	No
136	1	Business Impact	No	Expanding storage needs	More space	No	Data transfer	No idea	Efficiency	None	No - no need	No
137	2	Process Impact	A company employee	Brand	No	No	Transfer of data	New PC's	Easier access to information and a quicker process	Considerable	Yes Internal	3 months
138	2	Business Impact	No	To Market	No	No	None	More of the same	For Marketing	Good		
139		Technology Impact	A company employee	Replacement for traditional methods of work	No	No	None	Nothing	Efficiency	100%	No	No
140	1	Technology Impact	Our hardware company	Move to new premises	Expansion of facilities required	Expansion of extra services to customers	Not implemented yet	Nothing for a while				
141	2	Business impact	A company employee	New equipment for our use, need to establish quality produced from a reputable supplier	No		None	Probably desktop or another server	Allowed us to offer hosted services	It keeps working	None	12 Months
142	2	Process impact and more efficient	Internet research	Customer service	Pressure within the company - wasting time having to call back	No	No		Efficiency	Better control of issue and customer response	Better response, because we are very happy and things are more manageable	Yes straight away
143	1	Technology Impact it gives access to all Microsoft software we use as a development	No	No we needed to have a latest software,	To enable the business to grow	Technological advances	No	A Laptop	Enables the required staff to have all the software they need to work	Speed of delivery of project	Happy	Yes less than a week
144	1	Technology Impact it gives access to all Microsoft software we use as a development	No	No we needed to have a latest software,	To enable the business to grow	Technological advances	No	A Laptop	Enables the required staff to have all the software they need to work	Speed of delivery of project	Happy	Yes less than a week

145	1	Technology, business, financial and process impact	A company employee and internal experts	Replacement	No	No			Improved network reliability	Very successful, monitors the network more efficiently	Within and outside the business	No
146	1	Gives us great capacity	A company employee	Expansion	Business growth	No	No	Nothing	More resilient	More guaranteed up time	Employees comment when things break but there is no difference with the customers	Yes 2 months
147		Process impact and efficient in supporting our clients and development	A company employee	Improving the service for the customer	Business growth	Take advantage of technological advances	No		Remote support. Saves us time and made us more efficient with our customers.	We don't as it is obvious	Both employees and customers are impressed	
148	1	Business Impact - Cost it £4,000	A company employee, external advisor, I T Professional	Upgrade	Pressure from within the company, from head office.	No	Lack of skills	New photocopier fax and printer combined	We haven't finish installing it so we can't answer the question	We haven't because not u used yet	Can't answer this	
149	1	Business part of my business to make it run better	No	Performance	Business Growth	From Customer	Lack of skills	Another one	Raised our profile getting more customers, efficient way of working	Network	Employees more eager customers can't see	No
150	1	Cost impact	External advisor	Upgrade for older equipment	Business growth	No	None	Nothing	More resilient and faster	Backups done remotely off site. No failure.	No	No
151	1	Technological Impact	A company employee	Customer supply	No	Customer Requirement		Depends on project	Supplied as Spec	Met Specifications	None	No
152	3	Technology Impact, consultancy group as well as designing	We are skilled people, we design to solve Business Problems	Our customers give us specifications and we develop a system accordingly	Business growth	We advise our customers on the technological advances and change their systems to be more efficient	Our providers give us training before installing the equipment	1. Whatever customers - biometric problems. 2. Our internal Needs	Add value to what we sell, the technology is part of your overall package design	By profit	Happy, have long term blue shop companies and are happy	3 to 6 months

153	3	Financial Impact and Business Impact	A company employee	Customer/supplier	New Employee	Technological advances	Transfer of data	More hardware upgrades	Increased capacity in our IT processor	Volume of output. Number of projects completed in the month	Yes Outside, clients	Yes straight away
154	3	Business impact	Internet research	Upgrade	No	No		Electronic Whiteboard	Time saved, professionalism	5 clients		No
155	2	Financial Impact and Business Impact	No	Customer/supplier, quality of service	Better hardware	No	No	Upgrade the service, Microsoft upgrades.	Better customer services and increased profit	We monitor the service. Reliability, time, availability have improved greatly.	Recommended, to get more business.	18 or 18 months
156	2	Most significant due to valuable business data	None	Storage decreasing to improve performance	Internal pressures are to decrease recovery time and protect data	External Pressures are our visibility to our customers in terms of response	Compatibility issues arose with on Unix platform sharing storage system		Purchase was successful in terms of ease of installation and quickly providing to all servers	Success was measure in ease of management and recoverability	Visibility of service	Payback period
157		Increase the efficiency and make us change with technology	A company employee/ Internet Research	We have to do it because the business will suffer, the industry needs us, customer pressure	Business growth - growing more - efficiency and decent quality of services to customer	Customers care moving with the technology and we needed to do the same	Lack of skills, compatibility, having the knowledge to do all these	Acquiring a number of software companies to develop what we want off shore	Increasing fastness, easier and efficient, quantitative, having modern screens and more space	Directly download times of the project - well been of the software	One of appreciation because the work became easier and more efficient	No, we just simply felt that this is what we needed, as soon as it was in
158	2	Technology Impact	A company employee, WMMW	Testing Mobile Applications	No	Customer	Compatibility	PC	New Platform to test app.	Number of bugs/faults with mob app.	No	No
159	1	Business impact and we wanted to merge our two companies together, extra extensions and capability	A company employee	Replacement for traditional methods of working, higher specification	Business growth and more employees	Improving services and technological advances	Services from BT	Upgrading PCs and the website	Using internet technology which can be used to sell to the customers	Level of interest in customers is very high. Internal use is ok	Yes, perceived successful internally	6 months
160	1	Financial impact and service levels	A company employee	Customer/supplier. We want to keep our services at high levels	Business grow	No	No		Maintain clients satisfaction and managed to keep our customers by clients satisfaction		Improved our performance. Customers have made no comments	No

161	1	Process impact	We asked at the shop	Replacement for traditional methods of working	Pressure from within the company because we are under resourced	No	Lack of skills and technology		Not much, we are wasting a lot of money buying software which is not needed	No we do not	Both employees and customers were unhappy as jobs were delayed	No
162	1	Technology impact, to catch up with technology	A company employee	Upgrade for older equipment and we needed a faster, more reliable system.	No	Also want to be up to date to be able to give a better service	None	Nothing	Allows some processes to be done more quickly	If the migration to the new servers is successful we would have to fall back to the old ones	Happy launch	No
163	1	We are changing our strategy for our Delivery of our online services to our clients	External advisor	Customer, to keep them and get more	System we were using became too old	From customers	Lack of Skills, Technology	Generator	Early days, we will retain customers and all trade	We will	Strategic change there is a lot more opportunities	Launching in July - 9 months new services
164	3	New telephone system is business critical investment this one was leading open source software	A company employee	We also wish to install and support this product with other clients so we wanted first hand experience of using it	Business growth, new staff and need to replace the old system				It's a very good system and being VOIP means we don't need as many network outlets in the building as the phones and PCs can run from one	Day to day improvements in ease of communication	Employees like it, customers see the benefits of new facilities like voice mail and DDI	We set a timescale of one month for initial implementation with enhancements planned over following 3 months. It over ran a little.
165	3	Process impact and the system was more reliable and faster	A company employee	Upgrade for older equipment	Within the company, we needed to make the system faster and more reliable	No	Compatibility	Further hardware upgrade systems upgrade	Speed and reliability	Less complaints from users	In the company people say its better	No
166	2	Business impact and using it daily, processing is faster	Internet research	Upgrade for older equipment		No	No	More laptops and PCs	Better for the employee	No	No	No
167	2	Business impact	Internet research	Replacement	New employee	No	Compatibility	No plans	Business need			

Small and Medium Companies

Co. No.	No of Employees:	Turnover	No of years of operation	Your position in the company	Education	I.T. Professional	Product 1	Who bought it? (position)	Who advised them?	Reason for purchase?	Product 2	Who bought it? (position)	Who advised them?	Reason for purchase?	Product 3	Who bought it? (position)	Who advised them?	Reason for purchase?	3. Which purchase have you chosen?
1	26	£2,000,000	10	Managing Director	Degree	Yes	Servers	Technical Director		More capacity	Laptops				Software CM Ware				1
2	30	£1,000,000	3	Sales Executive	A-Levels	No	Laptops	Myself	No one	More Powerful	Printer/Fax/Scanner			The old one broke					1
3	30	£1,000,000	1	Systems Manager	Degree	No	Development Computer	Systems Manager	N/A	Development of net applications	Dell Server	System Director	System Manager	Development of applications and internet storage	PDA's	System Director	N/A	Development	1
4	30	£2,000,000	5	Business Development Manager	Postgraduate	Yes	XDA	Company		Portable Office	Hard drive	Myself		Increase workspace	Blue tooth headset			Communicate better	1
5	35		2.5	Telemarketing Executive	Degree	Yes	Servers	Myself	No one	Storage									1
6	40	£700,000	10	Director	Degree	No	Main File Server	Myself	IT Support Company	Last one blew up	12 PC's	Myself	IT Support Company	Upgrades	1 PC	Myself	IT Support Company	To develop another service for business	2
7	48	£9,000,000	14	Marketing	Degree	Yes	Remedy Co Logging software	Sales Mgr.		Storage	Dormine CRM Package				Sage				1

8	50	£650,000	16	Chief Executive	Degree	No	Laser printer	IT Manager	Special Offer	Cost effect and environmental	Wireless internet	Company	Person who we know	Access to the internet					2
9	50	£2,000,000	21	Admin and IT manager	Postgraduate	Yes	Server	IT Manager		Host new systems	Sage CRM	FD	IT Manager and marketing	Replacement CRM	Gigabit switch	IT Manager		Improve network / server performance	2
10	50	£500,000	5	Sales Manager	Secondary school	No	Laptops	Myself		New staff	ISP								1
11	50		1	IT Manager	Degree	Yes	Recabling the new office	IT Manager		Increase capacity	PCs	me	none	new staff					1
12	51	£2,000,000	25	Operations Manager	Degree	Yes	Changed our ASP	IT Manager	Our network support company	Better service	New Server	Ourself	Our network support company	Out of date, new one needed	New laptop with Vista	Ourself	Ourself	Mobility	1
13	70	£5,000,000	23	Business Manager	A levels	No	Server	IT Manager	Ourself	Expansion									1
14	70	£5,000,000	23	IT Manager	Degree	No	New Server	Myself	Myself	More storage	Exchange server 2003	Myself	Myself		Combination firewall software	Myself	Myself		3
15	75	£6,000,000	19	Regional Manager	Degree	Yes	Server	Myself	Unigold 2000		Desktop Computers	Myself	Unigold 2000		Printers	Myself	Unigold 2000		1
16	100		11	Director		No	Server	IT Manager		Increased speed									
17	120	£100,000	15	IT Manager	A levels	Yes	File Server	User	Consultation with the end user		Software application Trados			Business requirement	Laptop				1
18	123	£9,000,000	18	Research projects group manager	Postgraduate	Yes	New accounts server	Accounts Dept	Unknown	Greater speed of operation	New Laptop	My Dept	Nobody	Greater speed of operation					2

19	123		15	MD	Postgraduate	No	Laptops	HR	don't know	home working	laptop	I did	no	as before home working						1
20	130		6	Business Developer	Degree	Yes	Technology to take to events	IT Manager	don't think so	events										1
21	130	£44,000,000	9	Account Manager	Degree	Yes	Epicore £300k	Directors	Nobody	Improve efficiency	Mobile home with broadband technology enabled for demonstrations	Directors	Nobody	Better demonstration of our services	London grid for learning	Directors	Nobody	Improve revenue stream		3
22	150	£1,100,000	9	Executive Assistant	Degree	No	IBM RS6000 Server	I did	No	To meet customer needs	Tape Library	I did	No	To meet customer needs	High Spec PC Servers	I did	No	To meet customer needs		1
23	150		10	MD	Secondary school	No	Server	IT Manager	me											
24	153	£1,000,000	6	Director	Degree	Yes	Email Server	IT staff		Customer										
25	190	£13,000,000	15	BDM for public sector	Secondary School	Yes	Upgrade to PCs	IT team		bring staff up to date										1
26	200	£2,200,000	9	Executive Assistant	A levels		Colour Printer	IT Team at Head Office			IMAX apple Computer									2
27	200		3	MD	Secondary school	No	Laptops	IT staff		New employees										1
28	250	£30,000,000	18	Contract Manager	Degree	Yes	Server	Within the company			Software Microsoft				Laptops					3
29	250	£60,000,000	20	Business Development Manager	Degree		Hosted Exchange	General Manager		To meet customer needs										1

5	We needed more space	No	Reccomendations	Needed it	No	Just the usual - I think	not sure	faster	none really	no they wouldn't have known really	no
6	Technology Impact	External Advisor	Upgrade to improve customer services	No	No	None	Nothing	Speed of customer services has improved. Operation satisfaction	Subjective measure	Yes from within	No
7	We are able to log with our software and see when was used tracking piece of software	Company employee, external advisor, internet research, PC Magazine	Recommendations from our partners	Internal from management to audit all calls, track and manage	Pressure from customer and our partner (CISCO) piece of software to log on	Lack of skill, compatibility	a Microsoft share point and new CRM package - the existing not suitable for our business requirement	Able to track all the support calls, support from the beginning to the end, better customer service and monitor progress	Interims of how many support calls	Successful but there is room for improvement	Yes, 9 months development and implementation
8	Technology Impact	External advisor	Replacement for traditional methods of work, to do research	Pressure from within the company, to do research	No	Lack of skills	Main frame server	We have much better access to research for our clients	Much better communication system	Everybody is happy	No, we did a lot of research
9	Business impact and change to use and availability of sale information throughout company	External advisor	On comparison with other systems it appeared to be the best	Yes Managing director, improving sales process	No	Lack of skills, technology, transfer of data, third party support and compatibility	None	Remote access of all features of CRM	It working	Negative so far due to delays, positive now starting	It was meant to be up and running by Christmas but customisation problems and difficulty in transfer data from old system mean it is only just going on line.
10	Because I can work from home and office	No	Upgrade	No	No	Vista and compatibility of software	No plan	More flexibility to work where we are	Quality of work	Happy	No
11	cabling is cheap but putting it in is expensive	No	the old cabling did not have enough capacity	yes - users		none	another server we are still growing	faster and more efficient	just speed of working		
12	Business impact, provides us with a website that gave all the facilities to our operations and	External advisor, our network support company	Better service to us and our customers	No	No	No	New computers for our training rooms	Its cheaper and easy to manage technically	The bills are reduced. We measure the success by looking at money available in the budget	Yes within the company. The bills are well reduced.	No

	customers										
13	Financial impact	We provide Microsoft advice to other companies so we do not need to be advised	Upgrade for older equipment	Business Growth	No	None	Account soft upgrade	Larger working space	We have a server management team recording profitability and efficiency of the project	Yes, very	Yes, the server management team does
14	Technology, business impact	Internet research and my own experience	Name of the security	No the company needed the technology to secure its position in the market	No	No		Firewall - Informant REP implementation	The amount of downside reduced, before we use to have a lot of spam etc which made our network collapse	Nothing	Project plan, 2 months
15	Business impact	External advisor	In order to network the PCs and for the security benefits	None	None	None	No plans	Better security and improved efficiency	Improved efficiency	None	No
16	Business Impact	No	Upgrade	Needed more capacity	No	Configuration issues	Nothing currently	More storage and it worked in that respect	None - we got what we needed	No - not applicable really	straight away
17	Technology Impact	A company employee	To replace the older equipment for efficiency (upgrade)	We have a budget and have to change the old	Customer	None- very skilled in house	We don't know, we may relocate the company may change the network conversion of the system	It gives the user a more stable reliability	Lack of downtime	The don't see it, they don't comment	Project managed so it is measured properly, by the plan which is there
18	Business impact	Internet research	Upgrade for older equipment	No	No		New file server	Greater speed of operation	Increased productivity	No	Unknown
19	Business Impact	no	being able to work from home	not really they wanted to	Customers	none		being able to work remotely when necessary	more flexibility	no	no
20	Business Impact	We supply IT and AV equipment so make many regular purchases	New technology for events	no just to be able to do more to demo at events	no	none		being able to do better customer demos and get more sales	hopefully more sales		

21	Business impact	External advisor	We bought this grid which consists of a network of fibre connections in London connecting all 2500 schools so that we could improve our revenue stream by offering more services to these schools.	Only a desire to grow the business and increase national footprint	No	Lack of skills and transfer of data		Better national footprint and national awareness of our company	Turnover and profit	Yes	Yes
22	Most expensive	A company employee, external advisor and our suppliers	Customer and supplier	No	No	No		We can cover customer contracts and increase market place	We have signed new contracts	Yes, the directors internally	No
23	Business Impact	me	storage needs	users needed more space		Lack of skills and the technology was problematic		no more complaints from users	as I said - no complaints		as soon as implemented
24	Cost	Internet research	customers	no	already said customers	a few technical ones but we managed	nothing at the moment	being able to give the customer what they wanted	some very happy customers	just the customer who instigated this - they are happy	no
30	staff need training now which will cost	No	keep up to date with IT	just need to up date and stay ahead	no	just getting staff up to speed	not sure we may need more PCs as we are just taking on some more staff	keeping staff up to date and compatability with other document formats	Improved efficiency	no	upgrades happen all the time
26	Financial and Business Impact	No	Upgrade	Technological advances,	No	No idea	Upgrade for training purposes only				
27	there were quite a few to buy	no - just our IT staff	not sure	yes flexible working arrangements	no	looking at data security issues	more - if this works well	flexibility and employee choice	none yet see how it goes		
28	Process Impact, to be able for mobility	No	Upgrade	No	No	None	Depends on the day	Mobility, helps our engineers to be mobile	We do not we need it for work we do not need to measure any of its success	They need the equipment and efficiency	No
29	Business Impact	External advisor	Upgrade	No	No	Technology		Improved email and sales			
30	Process Impact, to be able for mobility	No	Upgrade	No	No	None	Depends on the day	Mobility, helps our engineers to be mobile	We do not we need it for work we do not need to measure any of its success	They need the equipment and efficiency	No

31	Technology, financial, business and process impact	None	Replacement for our old methods	Essential	Technological advances		Home PC	Remote communication	Very successful, communicate and get more work	Yes both	No
32	Business Impact	No	It should allow us to do more for our customers	yes we needed to grow our capability	not this time we needed to do it	just the usual technical ones - lack of skills didn't help	nothing at the moment	being able to do what we needed to do for our customers	efficiency gains and faster times for customers	not really	we need to make everything we spend payback so quite quickly
33	Cost	Internet	efficiency gains	just needed to expand again	no	a few issues around the technology		increased efficiency	it seems faster		pretty much straight away but we have capacity now too