

# Barriers to Adoption of Advanced E-business in Welsh Small and Medium Sized Enterprises

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*Abstract — The eCommerce Innovation Centre (eCIC) at Cardiff University has a central role in Opportunity Wales, a programme providing e-business support to over 9000 Small and Medium sized Enterprises (SMEs) during the last five years. Uptake of advanced e-business adoption has been low during the programme as well as throughout Wales in general. This paper reports on the findings of a pilot study that was undertaken in the fifth year (2006) of the programme. The approach taken to identify the key barriers to adoption was through interviews with a cross section of expert delivery partners and a sample of SMEs that advanced e-business was relevant to. The key objectives were to understand the barriers to adoption in respect of the current programme as well to help planning for future support initiatives. In addition, the research would help identify and overcome certain barriers in relation to the objectives of the Lisbon Strategy. The paper concludes that varying definitions of e-business inhibit our understanding of uptake when comparing to other studies or initiatives. Also, the strategic planning of e-business, where relevant, will reduce barriers to advanced e-business adoption, as will the lessons learned from SMEs who have successfully made the transition.*

**Keywords — e-business, e-commerce, integration, advanced e-business, wales, smes**

## I. INTRODUCTION

A key challenge that has arisen within Wales is encouraging Small and Medium sized Enterprises (SMEs) [1] to adopt more advanced e-business applications and for these to integrate better with business processes and applications. In Wales, Opportunity Wales, Opportunity Wales Advance and Opportunity Wales in Objective 2 Areas [2] are co-existing projects that have helped SMEs adopt e-business. Over the last five years the combined projects have provided support to over 9000 SMEs. A Wales wide survey – State of the Nation (SON) [3] is conducted annually by the eCommerce Innovation Centre (eCIC) at Cardiff University and reports on the level of e-business adoption through the same route map used to assess the position of Opportunity Wales clients. SON findings and Opportunity Wales benchmarking data consistently show that the adoption of integration and advanced e-business is low. This appears consistent as the Information Society Benchmarking Report [4] concludes that Europe lags behind in the use of advanced e-business

applications.

Defining advanced e-business is not always straight forward but the integration of e-business processes with internal systems is a significant indicator used in the context of the Opportunity Wales programme. The term e-commerce has been used throughout the programme but e-business is now widely accepted as a more appropriate definition relating to SME uptake. The route map used by Opportunity Wales and the SON report benchmark the level of adoption from stages 0 to 6 with stages 5 and 6 being considered advanced e-business.

Despite the United Kingdom being the highest adopter out of the 26 European countries for both selling and purchasing products/services via the Internet, the linking of sales/purchases with internal systems still remains very low [5]. Also, the Information Society Benchmarking Report discusses how the United States is better at Information Communication Technology (ICT) integration. Although this is only one area of adoption, it describes the synergy of adoption with growth and productivity in comparison to the lesser extent of Europe's adoption. Various contributions to the Lisbon Strategy such as the Impact Assessment [6] acknowledge that in relation to e-business more efforts are needed to improve business processes and fully integrate ICT providing new opportunities to reduce costs and improve performance. The low uptake makes research into this area, particularly the barriers, very important in relation to future progression of e-business in general as well as in Welsh SMEs.

The objective of this study was to identify the key barriers to advanced e-business adoption for Opportunity Wales clients so they can be addressed through this or future regional projects. Interviews with project delivery partners and actual SMEs with differing requirements provided the primary source of data.

The paper reports on the pilot study findings of the barriers to SME adoption through Opportunity Wales, a data set that is a significant representation for Wales. The research will contribute to understanding how Welsh SMEs can achieve certain objectives of the Lisbon Strategy in relation to advancements in e-business adoption.

## II. PURPOSE AND METHODOLOGY

The research objectives are to understand the barriers to

advanced e-business adoption for Welsh SMEs based upon the experiences of delivery partners in the Opportunity Wales project, as well as a representative sample of SMEs that integration and advanced e-business is relevant to. The Opportunity Wales Programme consists of three projects all designed to help Welsh SMEs adopt e-business. The projects have trained over a hundred advisers who provide support to SMEs across the Objective 1 and 2 areas of Wales. eCIC has a central role in the project involving adviser training and quality control as well as a multitude of e-business research activities. The route map is a tool that has been used to benchmark clients through the duration of the projects by positioning them at a stage depending upon their e-business activities at the time. Adoption benchmarked for clients and responses through the Wales wide SON survey provide a strong indication of uptake and conclude that the two most advanced stages of the route map remain low throughout the duration of the project. In respect of the Opportunity Wales projects this research is a pilot study and makes up part of a "lessons learned" process for the programme. The findings from other European regional reports and projects are also discussed where appropriate in relation to the findings within Opportunity Wales and the future uptake of SMEs in general.

The approach taken for this pilot study to understand the barriers to uptake further was through the three phases described below:

Phase I – A summary analysis of the Opportunity Wales benchmarking data and SON findings in relation to advanced e-business adoption.

Phase II – Interviews with three Opportunity Wales delivery partners who have supported approximately one third of the Opportunity Wales clients. Their expert views on the barriers of uptake are an important part of the debate in relation to the project.

Phase III – Primary research through case examples of established clients who have been interviewed over time. This includes SMEs that have successfully implemented a level of advanced e-business or have barriers preventing them from doing so.

### III. FINDINGS

#### A. Phase I

In respect of the Opportunity Wales Programme and for discussion in this paper, advanced e-business refers to stages 5 and 6 of the route map:

Stage 5 - This can almost be seen as an internally facing development as Internet technologies are used to extend integration. Everything from the business on-line shopfront through to manufacturing and fulfilment are brought together and it is possible to gather information from all parts of the business. This allows the business to move towards a more integrated internal use of eCommerce.

Stage 6 -This can be considered advanced eCommerce, as developments stand at the present. In a

B2B situation the business could join on-line exchanges, eMarketplaces and related services, using the Internet to connect with business partners, suppliers and customers. B2C companies could offer personalisation to customers, consider affiliate programs or advanced eMail marketing campaigns and customer management systems. [7].

It has been accepted by the management team and the practitioners in the project that this is a guide and not an exact interpretation. Certainly Stage 5 implies that multiple organisational processes need to integrate but in reality if one significant process integrated to a back office system then this would be classified as Stage 5.

The problem of defining advanced e-business is not just an issue existing within the Opportunity Wales programme but is also evident in other projects.

The OECD proposes a definition of e-business as "(automated) business processes (both intra- and inter-firm) over computer mediated networks." Furthermore, according to E-business Watch [8], the OECD definition implicitly indicates that the focus and main objective of electronic business is to be found in business process automation and integration, and the impacts thereof.

The evolving definition of e-commerce and e-business has seen Opportunity Wales use the term e-business more recently, but the OECD definition of e-business with its reference to business process automation is what Opportunity Wales has defined as Stages 5 and 6 of the route map. Another UK regional initiative, ConnectingSW, commissioned the South-West ICT Benchmarking Survey 2005 [9]. This study identifies the areas that Opportunity Wales benchmark in Stages 5 and 6 but as different subsets of business functions which include supply and purchase functions, marketing and sales function and system linkages. A Scottish regional initiative also conducts an annual e-business survey [10] and benchmarks 'integration' independently of any business function but looks at the numbers of processes that are integrated.

The first phase of the Opportunity Wales programme 'Opportunity Wales', had a client base of 5456 after a three year period. Although this figure accumulated as more clients received support, clients were benchmarked at 6 monthly intervals. By the end of the Opportunity Wales project less than 1% of clients were at stages 5 and 6 of the route map. Opportunity Wales Advance is a continuation of Opportunity Wales and like its predecessor covers the Objective 1 areas of Wales. The project is currently 2 ½ years into a 3 year project and out of 4263 clients to date, again less than 1% are at stages 5 and 6 of the route map. Opportunity Wales in Objective 2 areas is a 2 year project running in parallel with Opportunity Wales Advance. After 18 months and currently 1099 clients, the benchmarking data is also concluding that less than 1% are at stages 5 and 6 of the route map.

The SON reports similar findings to the Opportunity Wales benchmarking data and represents a Wales wide sample. Only 3% of SON respondents are Opportunity

Wales clients so the data sample is clearly different. Less than 4% of SON respondents with an Internet connection are at stages 5 and 6 of the route map.

The comparison of how different UK regional studies have benchmarked e-business and advanced e-business adoption has confirmed that the approaches taken are very different. This concludes that not only is making a comparison of adoption difficult in respect of UK studies but the varying definitions and benchmarking approaches taken demonstrate that there is still uncertainty over how e-business should be defined and measured.

### B. Phase II

Phase II reports on the findings from interviews with a representation of Opportunity Wales delivery partners who have had direct exposure to e-business adoption in their areas. This was preferred to a questionnaire targeting relevant SMEs due to the very small sample that Phase I identified.

The barriers reported have been classified below:

- Cost was a barrier to uptake but more so uncertainty of cost.
- A lack of understanding of the issues involved in adopting this level of e-business.
- A lack of confidence in supplier solutions.
- A lack of understanding on return on investment.
- Technical capability or internal skills required.
- The level of impact and risk this would have on existing systems.

The qualitative responses did not conclude which barriers were the most significant but it was clear that cost was not always the biggest issue.

Key comments made by interviewees:

- “SMEs need convincing that there is a need or something breaks before they consider investing or reinvesting. If there is a clean investment then maybe the ideal solution will be implemented”
- “In respect of the type of application and the company profile that advance e-business adoption is relevant to: Profile: “Companies with 25 or more employees in the retail sector”, Application: “1. Web site integration to database, 2. Web site catalogue integration to Accounts system, 3. Integration of e-business related Customer Relationship Management (CRM), 4. Supply chain related integration.”
- “Lack of confidence in marketplace and suppliers with testimonials”
- “Barriers to such implementations and the upheaval that the change may bring i.e. the replacement of key systems with new, security concerns of critical elements such as accounts becoming linked to on-line applications, the

impact it could have on a job role when someone has always performed this role manually so why change.”

### C. Phase III

The statistical data cited concludes that uptake is very low so to understand the barriers to uptake the first hand experience of relevant SMEs was considered important. Five SMEs with differing situations and requirements were interviewed over a period of time:

#### 1) Company A

A small retail outlet operating predominantly in the traditional retail market but with growing on-line sales.

#### 2) Company B

A small manufacturing company with both a domestic and international customer base that is diversifying in a declining market.

#### 3) Company C

A small automotive retail company operating a simple but successful just-in-time (JIT) system to fulfil customer requirements while remaining efficient within operating capacity.

#### 4) Company D

A small company with an overseas manufacturing operation with end products sold predominantly through B2B sales channels.

#### 5) Company E

A small manufacturing company that now makes significant on-line sales of its finished products.

TABLE 1 – APPLICATIONS IN USE BY COMPANIES INTERVIEWED EXPERIENCING BARRIERS TO ADOPTION

Company	Application
A	An Electronic Point of Sale (EPOS) system is in place for traditional retail sales. A Web site with on-line catalogue and payment facilities is present for the growing on-line market. An e-procurement system is in place with their main supplier. These three applications are not integrated.
B	Current application of e-business is an effectively marketed Web site and use of email. Web site is currently being reworked but a requirement has existed for five years to have an integrated customer support function.
C	Current applications include a Stock Control system and e-procurement system that are not integrated.
D	Currently a new accounts system with a stock management system that needs populating. An overseas manufacturing outlet with basic IT systems that are not integrated with the UK office.
E	A Web site with on-line catalogue with payment facilities and an accounts system that are integrated.

Companies A, B, C and D have looked at integrating some part of their e-business activities with their internal

systems but have clearly stated barriers to doing so whereas Company E has succeeded in integrating part of their e-business functionality to internal systems but experienced barriers in doing so. Table 1 summarises the applications in use.

#### *Company A Barriers*

The barriers reported by Company A were both business and technology related. Integrating their on-line catalogue to their EPOS system was seen as desirable but not essential. However, integration would help overcome the problems with linking stock availability to the Web site without worrying whether customers could be ordering items that were unavailable. Also, the time involved in manually checking stock availability against items for sale is further justification for investment. In respect of technology barriers the EPOS system and on-line catalogue are from different suppliers with the reality of integration remaining an uncertainty from both a functionality and cost perspective. The on-line catalogue supplier offers bespoke integration but how costly and feasible this would be has inhibited progress to date. Barriers to integrating e-procurement with their largest supplier are more strategic. If there was a greater commitment to this product range through existing sales channels a fully integrated solution could be provided by this supplier. This also represents a level of risk and uncertainty.

#### *Company B Barriers*

Over time important returns on investment have been made by effectively marketing their Web site and securing B2B sales. To reduce the amount of time spent providing customer service the idea of an integrated customer support tool has been evaluated for the last five years. The main barrier to adopting this technology is cost and uncertainty of cost. In addition to this and with a budget in place, reinvestment in a new Web site with associated marketing is a priority.

#### *Company C Barriers*

The two main applications in use are an order processing and stock control system as well as Web based e-procurement facilities from selected suppliers. The order processing and stock control system has some capabilities for supply chain automation and the e-procurement system support on-line ordering. The biggest barrier in this operation is business related where automatic reordering at previously fixed prices can affect profit margins in a marketplace that involves significant bartering.

#### *Company D Barriers*

For several years the company has talked about better process integration with their overseas manufacturing outlet. Any process or activity involving stock is time consuming and the primary business case for such an investment was time saving and a more fluid operation. The company had previously had a bespoke stock management system that they were heavily reliant upon but felt they did

need to move away from this at the right time. Despite the upheaval the new accounts system is in use with the transition of stock control to happen shortly. When the new stock system is fully operational, partial integration will be possible between both outlets. The primary barriers to this implementation have been a combination of cost and time. It is not the direct cost of the technology needed that is a problem but internal staff resources are limited. Staff time is always prioritised to tasks for maximising outputs so prioritisation has meant that it has taken this length of time to take one step closer to system integration.

#### *Company E Barriers*

At first a Web site and On-line catalogue were implemented and were a separate entity to the internal accounts system and order processing. Growth of Web sales were significant and an investment appraisal with the options of employing a new member of staff or investing in an integrated system were considered. Progression with one of the options was deemed critical to manage the workload but the integrated system was the most cost effective solution. It was a coincidence that an integration facility was available for the accounts application and on-line catalogue facility. The business case appeared correct but the main barriers were through implementation as the solution malfunctioned for a long time. Company E concluded that the solution was not completely fit for purpose and cited that cost was not the barrier but it was the unreliability and uncertainty of the supplier solution.

## IV. DISCUSSION OF FINDINGS

It has become clear that the ambiguity surrounding the definition of e-business and advanced e-business is a problem that impacts the measurement of adoption, progression and barriers when comparing on a wider scale.

The pilot study (Phase 2) revealed through interviews with Opportunity Wales delivery partners that there were common barriers to adoption. This was important to identify key areas for future work. Phase 2 also identified that adoption of ICT and e-business is not often thought about strategically and this lack of planning adds to the level of uncertainty as well as a multitude of different applications being implemented to achieve short term objectives.

The interviews with SMEs (Phase 3) highlighted the individuality of the barriers. E-business Watch refers to interoperability as “the ability of ICT systems and applications to work seamlessly together, and for diverse information resources to be systematically and consistently accessible to applications.” It also refers to “Technical” and “Business” interoperability [11] with the latter being the most complex. Phase 3 identified both technical and business interoperability barriers but these appear more relevant when a company has taken a step closer to adoption. Behind this, but in relation to progress towards adoption, there are early barriers such as lack of understanding of issues involved, lack of skills or lack of understanding of return on investment.

## V. CONCLUSIONS

Opportunity Wales has seen thousands of gains from the deployment of e-business by SMEs despite adoption of advanced e-business remaining low. This certainly questions how important advanced e-business is for all SMEs. However, to achieve certain objectives of the Lisbon strategy, greater adoption is needed by those SMEs who would benefit from it but experience barriers from doing so.

This pilot study within Opportunity Wales has concluded that early barriers exist preventing some companies even looking to adopt advanced e-business as well as barriers surrounding the actual implementation.

To increase the uptake of advanced e-business in Welsh SMEs this pilot study concludes that the following future work be considered:

- Clarification of the potential uptake of advanced e-business in Welsh SMEs is needed. This would differentiate SMEs who had a need to adopt but have barriers to doing so from those SMEs that are unlikely to adopt.
- Clarification and consolidation of suppliers that provide advanced e-business products and services. There is a lack of confidence in supplier solutions as well as evidence of uncertainty surrounding the end solution delivery. The gap between customer expectations and supplier delivery needs to be reduced.
- Strategic planning for e-business adoption needs promoting through support service. Proper planning for e-business aligned with business objectives will reduce certain barriers to adoption.
- A cross section of SMEs who have successfully adopted aspects of advanced e-business need exemplifying. However, the issues as well as the benefits need to be drawn out for other potential adopters to learn from.

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