Innovation-Online : A Vortal for Supporting Innovative SMEs within a Regional Economy

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Abstract. Assisting innovative SMEs with the continual process of transformation in the new economy is a key challenge for regional economic development. Traditionally, SMEs have not had the in-house resource to engage in innovation and development and have relied on external sources of such information. The Internet provides new channels for such knowledge distribution, but this paper argues that the Web is a difficult medium for SMEs to acquire knowledge. One answer to this has been the move towards Portals, or jumping off points for the Web and latterly there have moves towards vertical portals - vortals - which focus on specific industrial sectors. This paper outlines the development of such a vortal - Innovation-online - to provide mediated access to information for engineering companies and to assist with links into the knowledge-base provided by the Universities.

1. Introduction

We introduce Innovation-Online, an Internet service, which is being developed by the Regional Unit at the University of Nottingham. This work is in response to a perceived problem with Small-to-Medium-sized Enterprises (SMEs) acquiring knowledge via the Web and gaining access to knowledge diffusion networks within the East Midlands region. It is possible that SMEs will be left 'information-poor' through the problems inherent with using the Web as a business tool and, in particular, difficulties with search engines. This is being undertaken as part of the economic regeneration development in the former coal-fields area of Nottinghamshire. Our solution is a Web-based vertical-portal, or vortal, which aims to support SMEs in the engineering and manufacturing sectors. We aim to create a vibrant Web-based community of companies accessing focused and relevant technology information and research news. The site supports links into the local knowledge base, and provides infrastructure for network development.

1.1 The Problem : SMEs are struggling with knowledge acquisition via the web

It is clear from both anecdotal evidence and results of a survey undertaken by the Regional Unit, that SMEs in the East Midlands struggle with the Web. In particular they find using search engines difficult and have some concerns about the quality of information.

1.2 The Evidence from the East Midlands

Anecdotally we know that the majority of SMEs, like the general public, use search engines when looking for information. We asked a random set of 25 owner/managers of SMEs whom The Regional Unit has worked with over the last two years, to rate the usability and the quality of what they found using search engines. They were asked to score on a scale of 1 to 10 a series of five questions. They were asked to rate agreement (1) or disagreement (10) with statements, or to rate the materials they found on a scale where 1 was 'very good' and 10 was 'very poor'. The questions asked were as follows:

1. How easy do you find it to get the information you are looking for on the Internet?

2. How confident are you about using search engines efficiently?

3. In general, how would you rate the quality of sites found using search engines?

4. How strongly would you agree or disagree with the statement that `the Internet is just an unstructured mass of information?'

5. How useful do you feel you would find a Web site dedicated to providing information on innovation, research and new technologies?

Table 1 Percentage scores for five Internet questions

	Percentage Scores of Chosen Rating (1-10)									
Question	1	2	3	4	5	6	7	8	9	10
(1)Ease of use	0	4	8	0	16	4	24	16	28	0
(2)Confidence	0	4	20	16	8	4	24	16	8	0
(3)Quality	0	20	12	4	8	8	16	28	4	0
(4)Unstructured	0	16	12	20	8	4	20	12	4	4
(5)New Site	8	12	8	12	36	8	8	4	0	4

From these results we can see that there is an indication that the research set judged finding the information they were looking for to be difficult (question 1), although confidence in using the engines was fairly evenly balanced between being confident and not. This may show that although a lot of the SMEs know the mechanics of using the engines the results are not what they expected. The rating for quality of materials found, indicated some bias towards the poor end of the rating scale. There was also a slight bias towards agreeing that Internet was unstructured. The results also show that the proposal of a site dedicated to innovation has quite reasonable support from SMEs.

Table 2 Percentage scores for time usage of Web searches

Web Search Use	Time
Latest Business Developments	**14**
Research Technical material	**22**
Research New Markets	**25**
New Regulations	**9**
Find Collaborative Partners	**7**
Monitoring Competition	**23**

We also questioned SME owner/managers about the time they spent online each week. The hours online averaged four over a working week - with five owners clocking up quite large amounts of time - five to ten hours in a week. We also asked the managers what types of information they searched for on the Web and the results are set out in table 2.

From other EU projects with a related remit we know that training on the use of the Internet is a key issue with SMEs and in particularly for micro-businesses [1]. We aim to address the related issue that even trained users find information retrieval difficult because of the nature of search engines.

1.3 Searching the Web - Support from the literature

The problems that SMEs in the East Midlands have with knowledge acquisition via the Web are not isolated instances. The literature supports the view that finding relevant and high quality information on the Web is difficult. The phenomenal growth of Web page content has created an enormous source of potential information, but with an attendant problem-set. The ease with which a user can interact with the Web disguises to some extent the underlying difficulties of knowledge acquisition.

Various researchers have looked at the problem of defining the Web as an information source and how to measure its usability, quality and relevance and for a rounded discussion see Cooke [2]. The discussion has not been confined to search engines (defined as a searchable collection of web site references that have been created by automatic processes using software); researchers have also investigated *directories,* for example Yahoo, and regional *gateways* to information, both of which use human editors [3].

Why is the quality and relevance of information found via search engines problematic? There is a consistent body of research work on the features of search engines and in particular on post-processing the results of commercial engines to look at the relevance and precision of the results. Key problems for the search engines have been shown to be the size of the Web-base and its volatility. It is clear that the search engines are being overwhelmed by the scale of the Web and that they cover relatively small amounts of the totality of the Internet [4], and that their precision is poor [5].

2. Why knowledge acquisition matters in the economy – the problem in context

The East Midlands is ranked 41st against other EU regions when measuring the GDP per capita [6] and has a number of rapidly declining industries including coal extraction and textiles. The growth of small companies and the subsequent employment potential is seen as crucial by development agents in order to arrest further decline. It is clear that knowledge acquisition is of increasing importance to such SMEs and that increasing numbers are using sources of innovation knowledge such as the Web and local Universities [7]. Many commentators have referred to this general move away from traditional large and information-light industry towards smaller companies where a 'public good' – knowledge - and its diffusion within a global economy is critical [8][9]. The challenge to regional economies, particularly in areas of decline such as East Midlands, is to deal with such globalisation and the rapid rise of the importance of working with knowledge. The keys to success are access to knowledge and, in particular, the creation of networks and diffusion paths for such knowledge [10]. Increasingly, innovation does not take place within a single company, but through networks of large and small businesses and through linkage to the 'knowledge-base' of the universities [11]. Leadbetter, for example, argues that Universities should become not just centres of research and teaching, but hubs for such innovation

networks - the ‘open-cast mines of the knowledge economy’ [12]. The ability of SMEs to be involved with such networks is important and the Web can be seen as critical in this process. As we have seen, however, the Web has drawbacks. Many commentators have remarked on the possibilities of personal social exclusion from these networks but it must also be recognised that SMEs may be left 'information poor' compared to bigger organisations.

2.1 Local Financial impact

It is clear from our research that SME owner/managers are spending relatively long periods of the working week using the Internet. In the main they are searching for information on technical matters, competitors, and new markets. Improving their access to such key information could reduce this time and this would have a definite, if difficult to measure, financial impact on individual companies. In addition, providing access to local knowledge diffusion paths will benefit the longer-term survival chances of small firms.

3. The proposed solution – the Innovation-Online vortal

We introduce Innovation-Online, (www.innovation-online.net), an Internet service that is being developed at the University of Nottingham. The service is a *vortal*, which aims to assist SMEs involved in engineering or manufacturing in the East Midlands area around Nottingham. The project builds on the concept of a human-organised regional gateway of information but also incorporates the ideas behind a vortal. Its main aim is to reduce the time spent online by busy SME owner/managers and help them link into networks of regional knowledge diffusion. It is a key tenet of the work on the Innovation-Online portal that currently SMEs will not only find it difficult to access the *know-what* and *know-why*, but that they particular need access to the *know-who* [13].

3.1 Why a vortal?

As the problems with search engines and generalised directories have become clearer, there has been a move toward the introduction of *portals*. Portals are general-purpose gateways to the Web which provide human-edited links and guided search for the most commonly required information. Portals have usually been developed as front ends to the existing general search engines, and their relevance increased as the Web audience became more consumerist in the late 90s. However, due to commercial pressures and the consumerisation of the Web these portals have attempted to be "everything to everyone" [14]. This again has led to problems of relevancy, and, in 1999 a new sort of portal started to appear – *vortal* – a contraction of vertical portal [15]. A vortal is defined by the Internet-based 'whatis?' service [www.whatis.com] as " a web site that provides a gateway or portal to information related to a particular industry, such as Health Care, insurance services, automobile or food."

Vortals serve as a resource for a particular sector and provide news, information, and act as an infomediary for business-to-business trading. The introduction of vortals provides a tool that can assist with the development of the knowledge diffusion and acquisition networks that are important.

3.2 Architecture

The InnovationOnline vortal consists of a number of major components that seek to support SMEs with the different categories of knowledge as discussed earlier. These are shown in

the diagram below. The site is organised into four major sections; 'clusters', 'themes', 'information' and 'learning'. All sections of the site aim to support the acquisition of the different knowledge types – know what, know-why, know-how but in particular attempt to support the know-who that is vital to build up knowledge networks.

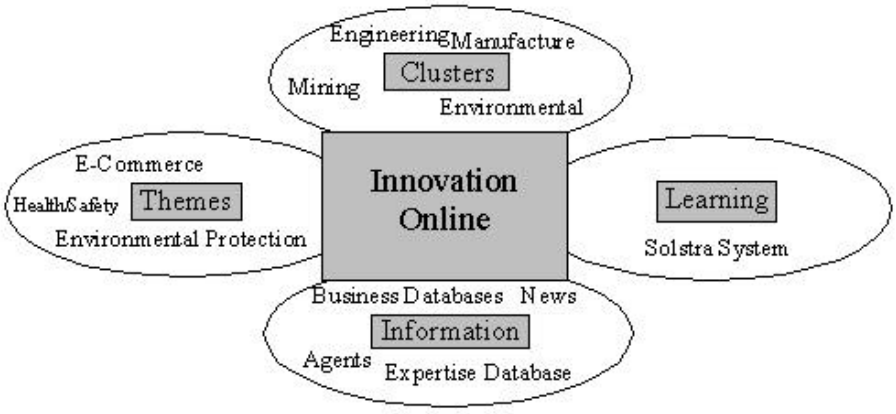

Figure 1 Diagram of Web Site Components

3.3 Clusters

This key component supports the development of a small number of industrial sector clusters. Each cluster will contain relevant news and information, and a human-edited set of links to reviewed content from the Web. The access to information specifically relevant to an industrial cluster aims to tackle the problems already outlined of SMEs using generic search engines. The proposed clusters are 'manufacturing', 'general engineering', 'automotive', 'environmental technologies' and 'mining-related'. Within each cluster section, SMEs will have indexed access to news, events, case studies, research information, opportunities for bids, technology opportunities and partner searching. In addition, cluster areas will seek to support the development of peer-to-peer networking and creation of virtual companies [16] within the sector through use of threaded discussion groups, e-mail lists and newsletters, and chat-rooms. The clusters area will support work being undertaken off-line to promote clustering in the region.

3.4 Themes

Themes are a small number of highlighted key business 'drivers', which relate to all SMEs in every cluster. The themes section will contain information relevant to the highlighted theme and contain a human-edited collection of reviewed links to quality information sources. In addition, University academics will provide up-to-date content on the themes. The on-line training will be linked into these themes.

3.5 Learning

A section of the vortal will be dedicated to provision of short, bite-sized, remote learning modules. This will utilise the Solstra learning framework, developed by BT (www.solstra.com) and will cover subjects to support the themes.

3.6 Information and Expertise

Information of a more general nature, such as business news and non-specific industry developments is catered for in the information section. Support for guided exploration of the local knowledge base is included and in particular there is an *expertise database* of local technical experts. The latter is modelled on work undertaken in Canada on the national Strategis site [17]. It is also proposed that the project will, at a later stage, introduce knowledge agents – software that will automatically aid information retrieval. This work will involve a trial of software developed by BT at their research labs, including Radar, which finds relevant information in a "just-in-time" manner, and Prosum, which categorises Web sites [18]. Again, these facilities will be aimed at reducing the online time of SME owner/managers.

3.7 Technical Architecture

The vortal is hosted on a Microsoft Internet Information Server (IIS 4.0) with an attached SQL 7.0 database. A database driven architecture is employed, using ASP to dynamically create the webpage templates and menu structure. An administrator tool provides the editor with the ability to quickly add new content such as news items, links, and information, without the need to generate a new html page. The tool is accessed via a standard web-browser and therefore can be used remotely.

3.8 Future developments

As the Innovation Online service is introduced and The Regional Unit undertakes work to ascertain its impact, we envisage an evolving site under constant review based on user feedback. It is clear that our great challenge is to encourage SME owners to participate in the cluster development and to use the Web site on a regular basis. Some of the future trends in Vortal development are already becoming clear – personalisation of access to the Vortal and automation of knowledge acquisition and transactions with agent software. We intend to introduce such measures as the project continues. Work is shortly to begin on a new cluster of recycling companies who will link into a Web-based waste exchange network.

4. Conclusion

The Innovation Online vortal's goals of supporting access by SMEs to the knowledge base and facilitating the flow of information around networks in the region has attracted wide-spread interest amongst both SMEs and regional agencies. We believe that by using the vortal we will be able to support SMEs and show them competitive benefits. SMEs will only use the system if this is forthcoming. The key challenges are to encourage SMEs to make use of this service on a regular basis, measure the impact of its introduction and refine the service. We will need to show that the vortal does indeed reduce the online time of managers and provides a useful resource to the business community.

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