



# E-Business Information Technology in Small and Medium Sized Enterprises in Rural Eastern Kentucky a Preliminary Survey

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## ABSTRACT

*This paper presents results of a pilot study assessing the prevalence and functionality of e-business and e-commerce information technology (EEIT) initiatives within small and medium enterprises (SMEs) in a rural, isolated region. Attitudes that business owners in the region have about the value and use of EEIT within their businesses were also assessed. Perceived barriers to implementation of EEIT in the region are discussed. The pilot survey's results show: 1) EEIT implementations are currently seen primarily as alternative channels for current business methods; the surveyed businesses are at early stages of the technology adoption model. 2) The most significant barrier to the implementation of EEIT appears to be a limited understanding of the capabilities and applications of the technologies.*

## INTRODUCTION

The focus of this initial research is to assess the current level of acceptance of e-business and e-commerce information technology (EEIT) among business owners in rural Eastern Kentucky. In particular we are focusing on EEIT adoption in businesses in geographically isolated and sparsely populated areas. The three main factors negatively influencing business growth in such settings have traditionally been the lack of physical infrastructure to support large-scale manufacturing, the absence of a sufficiently educated and skilled indigenous workforce, and cost- and time-prohibitive access to capital, suppliers, and markets. (Wood, 2000; WSA, 1998; Oden, 2002).

Three recent studies have examined changes in technology and technology infrastructure in the rural United States (MDC, 2002; Smith-Mella, 2000; Oden, 2002). These studies address how, in the course of the technology boom period of the 1990's, a yawning disparity between the wealth of urban and rural areas emerged. These studies also established how the rapid changes inherent in the development of the new economy only widened the economic gap between rural and metropolitan regions. Although big cities thrived during the rapid technological changes and globalization of the 1990's, small rural towns received little benefit. This, despite the fact that modern telecommunications offer the means to help rural areas overcome "one of the biggest barriers to participation in the global economy: isolation" (MDC, 2002). Appalachian Eastern Kentucky is a prime example of the isolated rural regions these studies examined. Studying businesses in this Eastern Kentucky region can then serve as a good model for looking at the influence of EEIT in businesses situated in similar isolated rural regions throughout the United States, and the world. The end objective of this research is to be able to assist in EEIT adoption in Eastern Kentucky businesses.

## PRELIMINARY LITERATURE REVIEW

In recent years significant research has been done applying innovation adoption models to small businesses considering adoption of EEIT. Research focusing on EEIT adoption in small business includes: Riemenschneider and McKinney (2002), looking at the belief differences between adopters and not adopters; Iacovou, et al. (1995), and Premkumar, et al. (1994) looking at the adoption and impact of EDI; and Nambisan and Wang (1999) discussing perceptions and barriers to EEIT adoption. Also, much has been written about implementation and strategies for EEIT in small businesses: Van Beveren and Thomson (2002) and Chaston and Mangles (2002) have done recent studies of E-commerce use in Australia and the UK respectively; and Mehta and Shah (2001) present an overview of implementing E-Commerce from a strategic perspective. The Office of Advocacy at the U.S. Small Business Administration agency has published reports examining the use of EEIT in small businesses (OA-SBA, 2000), innovation in small firms (OA-SBA, 1986), and a literature review examining e-commerce for small businesses (Williams, 1999).

Other studies of interest are those examining implementation and diffusion of information technology in general and EEIT in particular. The model of innovation technology acceptance used is the one presented by the U.S. Congress's Office of Technology Assessment (OTA, 1985). The three stages of technology adoption this model describes are: (1) Substitution, in which new technology is perceived and practiced simply as a new method of doing business without a significant change in business processes or a shift in expectations; (2) Adaptation, in which the adoption of new technology leads to new and unique ways of considering and implementing new business practices and ideas; and (3) Transformations - when the adoption of new technology leads to entirely new capabilities and original processes within the enterprise and old processes and conceptions are replaced by new technology. The seminal work of E. M. Rogers on diffusion theory (Rogers, 1995) proved particularly helpful to the development of an understanding of the attitudes of the technology adopters investigated in this study. Rogers described five stages of the innovation acceptance process: the Knowledge Stage, the Persuasion Stage, the Decision Stage, the Implementation Stage, and the Confirmation Stage. The Knowledge and Persuasion stages are heavily dependent upon company data gathering and research methodologies, these issues are researched in articles by Raymond, et al. (2001) looking at how small companies approach scanning technological issues, and Chaston, et al. (2001) examining organizational learning.

## RESEARCH APPROACH

This pilot study sought to examine the extent to which EEIT is currently being employed in SMEs in the Eastern Kentucky region. It also assessed current attitudes towards, and the level of general knowledge about, EEIT and its effects on SME business practices. This was done by examining the current level of acceptance of EEIT in the region based upon the framework of the innovation and technology diffusion model given by Rogers.

This initial report is based upon results from a pilot survey distributed at a regional entrepreneur's conference, in Ashland Kentucky in August 2002. The attendees of the conference were owners of small businesses within the Eastern Kentucky region. The conference was hosted by the Small Business Development Centers in the Eastern Kentucky region and drew 93 registered participants. This survey was given to attendees in their conference packets, as well as promoted at individual sessions. Of the 93 attendees who received surveys 31 surveys were returned. Of these, 2 were discarded because they were incomplete. The survey responders represented 29 small to medium businesses in the Eastern Kentucky region. Based upon preliminary results from this trial survey a full survey will be developed, which will be distributed to all approximately 4000 businesses in Eastern Kentucky.

The survey instrument had 13 questions broken up into 87 sub-questions. The largest group of sub-questions (21) focused on the implementation and functionality of EEIT in the participant's business. Related topics also researched were: resources and services that the participant felt would be most beneficial to assist them in developing EEIT in their business (20 sub-questions), the participants attitudes toward, and perceived barriers to implementation of EEIT in their business (17), support and Implementation of other IT technologies (e.g. desktop PCs and software, servers, etc.) (12), the effect globalization and global markets on the Company's business (5). Twelve questions (12) were also included to assess familiarity with the many KY Innovation and New Economy state level initiatives (KY Office for the New Economy, 2002) to promote IT and EEIT in particular. This report will focus primarily on those questions dealing directly with attitudes and implementations of EEIT.

## RESULTS

Of the 29 respondents, 18 (62.1%) report that their company has a website and 15 (51.7%) reported a URL for their website; 9 (31.0%) stated that they do not have a website but are considering implementing one within one year, and 2 respondents (6.9 %) indicated they did not have a site and were also not considering "setting up a website". All of the 15 companies reporting website URLs had their own registered unique domain name. Of 18 companies that reported having a website, only one currently processes sales transactions via their website. One other company reporting that its website is currently underdevelopment also stated that it intended to process sales transactions via their website. These two companies reporting current sales, or intended sales, via their websites stated that the sales currently comprise, or would comprise, less than 10% of their total sales volume.

Participants were then asked about their current use or anticipated use of EEIT for certain other business functions outside of direct transactional sales. Table 1 shows the results of these questions, listed in order of the highest number of total positive responses to the question (i.e. the total number of people who indicated they currently used or might use a particular EEIT function.). Table 1 shows the three categories (Communications, Information, or Process) into which each function has been categorized.

The survey also examined attitudes about the impact of e-commerce and perceptions of current barriers to e-commerce in Eastern Kentucky. When asked the potential of e-commerce in firms in Eastern Kentucky, 23 (79.3%) respondents stated that e-commerce would have either a moderate (41.4%) to significant (37.9%) impact, only three respondents (10.3%) stated that they saw "little impact" of e-commerce on firms in the region, and 3 did not respond to the question. In a related question asking about the impact of globalization and international markets on firms in Eastern Kentucky, 21 respondents (53.8%)

Table 1. Perceived value of use of EEIT for business functions. N=29.

| Rank Order | Function   | Category Of Function  | Currently Use | Might Use    | No Reason to Use | Did not Respond |
|------------|--|-----------------------|---------------|--------------|------------------|-----------------|
| 1          | Advertising your products and services           | Communications        | 23<br>79.31%  | 5<br>17.24%  | 1<br>3.45%       | 0               |
| 2          | Customer support                                 | Communications        | 12<br>41.38%  | 12<br>41.38% | 2<br>6.90%       | 3               |
| 3          | Find information about competitors               | Information           | 13<br>44.83%  | 9<br>31.03%  | 4<br>13.79%      | 3               |
| 4          | Find information about customers                 | Information           | 9<br>31.03%   | 11<br>37.93% | 3<br>10.34%      | 6               |
| 5          | Online meetings and collaborative teamwork       | Communications        | 5<br>17.24%   | 13<br>44.83% | 4<br>13.79%      | 6               |
| 5          | Purchase goods and services from others          | Process               | 9<br>31.03%   | 9<br>31.03%  | 8<br>27.59%      | 3               |
| 7          | Continuing education for employees               | Information / Process | 8<br>27.59%   | 8<br>27.59%  | 5<br>17.24%      | 8               |
| 8          | Finding employees                                | Process               | 10<br>34.48%  | 4<br>13.79%  | 9<br>31.03%      | 6               |
| 9          | Vendor supply chain management                   | Process               | 3<br>10.34%   | 10<br>34.48% | 9<br>31.03%      | 7               |
| 10         | Manufacturing Enterprise Resource Planning (ERP) | Process               | 3<br>10.34%   | 4<br>13.79%  | 15<br>51.72%     | 7               |

stated that this would have a moderate (17.9%) to significant (35.9%) impact, only 6 respondents (15.4%) stated that they saw "little impact" of e-commerce on firms in the region, and 2 did not respond to the question.

Table 2 shows participant responses when asked about items perceived as barriers to e-commerce in the region. Participants were presented with a list of 15 possible issues (shown in Table 2) with which they were asked to agree or disagree in responding the question: "What do you see as the biggest issues that keep you and other businesses in East Kentucky from buying and selling of goods and services via the internet".

To provide further insight into needs and services that regional small businesses would find valuable in developing their businesses and applying EEIT, respondents were asked to indicate which of 19 possible services they would most likely use to benefit their companies. The results of these questions are listed in Table 3, in order of the highest number of positive responses.

## CONCLUSIONS

A review of the data in Tables 1, 2, and 3 reveals two general themes:

- 1) EEIT is primarily considered as a replacement or alternative method for current business practices. Very few of the businesses surveyed appear to have moved beyond the elementary stages in the technology adoption model.
- 2) In order for businesses in the region to fully adopt EEIT, the primary barrier to be overcome is the need for knowledge, education, and understanding about the opportunities and expertise to implement these technologies.

Table 2. Perceptions of issues that are barriers to e-commerce. N=29.

| Rank Order | Perceived Barrier  | Number of Affirmative Responses |
|------------|--|---------------------------------|
| 1          | Not comfortable or knowledgeable enough about e-commerce                                     | 16(55.17%)                      |
| 2          | No confidence in the security of the internet  | 11(37.93%)                      |
| 3          | Confusion over the many available opportunities and options within e-commerce                | 9 (31.03%)                      |
| 4          | e-commerce is too technical and complicated  | 6 (20.69%)                      |
| 4          | Finding sufficiently skilled employees to support e-commerce                                 | 6 (20.69%)                      |
| 4          | Uncertainty about profitability of e-commerce  | 6 (20.69%)                      |
| 7          | High Costs; insufficient Return On Investment  | 5 (17.24%)                      |
| 8          | E-commerce is too expensive to setup and maintain  | 4 (13.79%)                      |
| 8          | Internal resistance to adopting new technology   | 4 (13.79%)                      |
| 10         | There's a lack of network services and support infrastructure to properly support e-commerce | 3 (10.34%)                      |
| 10         | There's a lack of a viable market or customer base for e-commerce                            | 3 (10.34%)                      |
| 12         | Tried and failed   | 1 (3.45%)                       |
| 12         | e-commerce doesn't do anything new I don't already do some other way                         | 1 (3.45%)                       |
| 14         | Unfavorable political support or governmental regulation                                     | 0 (0.00%)                       |

As summarized in Table 1, the two EEIT functions that survey participants perceive as most valuable are advertising products and services and providing customer support. Both of these functions primarily serve as extended communication channels and generally involve minimal change in current business practices. Use of EEIT to extend communication channels provides an extra media outlet, but does not necessarily provide information that is new or different than that communicated prior to EEIT implementation. The next two highest value functions, reported in Table 1, are finding information about competitors and finding information about customers. It is difficult to ascertain from the survey, the extent to which these might represent an alternate method of performing the same tasks or the introduction of new tasks not currently being performed. To the extent that these represent new or expanded tasks, they might be indicative of an enterprise in the adaptation phase of the technology adoption curve. The fifth and sixth ranked items on the list were online meeting / collaborative teamwork and purchasing goods and services from other vendors online. These activities begin to suggest changes in business practice, but would still fall into the adaptation phase on the technology adoption curve. However, only 17 percent and 31 percent of respondents, respectively, indicated that they currently were using the Internet for these purposes. Only 10 percent of respondents were using supply chain management or ERP systems, which generally require significant organizational change to implement and might indicate an enterprise in the transformation stage of the curve. Overall, the results suggest that most SMEs in Eastern Kentucky are still fairly low on the technology adoption curve.

Along with these results reported in Table 1, we need to consider that only one of the 18 respondents who currently has a website uses that site for selling online, and that respondent indicated that sales would be less than 10%. This data also indicates that the current adoption level of EEIT in these businesses is very low. Looking at all of these results in the context of the OTA model of technology adoption, it is clear that respondents are in the very early Substitution stage of technology adoption. The possible exceptions to this might be those 3 respondents who reported that their companies were currently using EEIT for supply chain management and for ERP (note: the same 3 respondents indicated current use for both of these items.). Further research is needed in examining these two business functions in more detail, in particular to try to assess how these small businesses are using EEIT to implement these functions.

The data from Tables 2 & 3 as well as the information about perceived impact of e-commerce and global markets provides insight into the current thinking and attitudes concerning implementation and value of EEIT. Examining these data collectively can provide insight as to where these companies are in adopting EEIT in terms of the 5 stage hierarchical model of innovation acceptance proposed by Rogers. The elementary "Knowledge" stage is where adopters come to an awareness and understanding of the technology and how it would function and be of value to their business. In the second "Persuasion" stage, this information is processed and an opinion is formed regarding the technology. From our results, we see that 79.3% of respondents see potential for e-commerce to have a significant impact in businesses in the region. Yet as seen in Table 2, the largest perceived barrier to e-commerce (as indicated by 16 respondents or 55.17% of total respondents citing lack of knowledge of e-commerce, and 9 respondents (31.03%) citing confusion over options for e-commerce), is a lack of knowledge and understanding about e-commerce. Overall, 19 respondents (65.5%) indicated that at least one of the following: not comfortable or knowledgeable or e-commerce is too technical and complicated, or confusion over the many available opportunities, was a perceived barrier. This data along with the implementation data in Table 1, and given that one of the number one services that respondents indicated they would use (from Table 3) was training and education, indicates that although respondents see a need for e-commerce they do not yet have enough information available to form an opinion about its use in their business.

Overall, the preliminary indication is that the respondents are currently at the earliest levels of the Rogers hierarchy of technology adoption, either the Knowledge stage or very early in the Persuasion stage. Though some have implemented the technology in a simple way

Table 3. Services responders are most likely to use if available regionally. N=29.

| Rank Order | Service   | Number of Affirmative Responses |
|------------|---|---------------------------------|
| 1          | Online Training   | 12 (41.38%)                     |
| 1          | Marketing Consulting                                      | 12 (41.38%)                     |
| 3          | Marketing Information                                     | 11 (37.93%)                     |
| 3          | Better Computers and Telecommunications                   | 11 (37.93%)                     |
| 5          | Business Incubator Centers                                | 8 (27.59%)                      |
| 5          | Conferences and Expos                                     | 8 (27.59%)                      |
| 5          | Technical Workshops                                       | 8 (27.59%)                      |
| 5          | Close link with State New Economy initiatives             | 8 (27.59%)                      |
| 5          | Matching, Guaranteed, and/or Interest-free Start-Up Funds | 8 (27.59%)                      |
| 5          | Clearing house for grants and other funding sources       | 8 (27.59%)                      |
| 11         | Technology Selection Consulting                           | 7 (24.14%)                      |
| 11         | Policy & Planning Think Tanks                             | 7 (24.14%)                      |
| 13         | Undergraduate or graduate student internships             | 6 (20.69%)                      |
| 13         | Commercial Loans  | 6 (20.69%)                      |
| 15         | High-Speed Internet Connection To The Home/Business       | 5 (17.24%)                      |
| 15         | e-commerce & Internet Consulting                          | 5 (17.24%)                      |
| 15         | Freely Available Research Information                     | 5 (17.24%)                      |
| 15         | Strategic Consulting                                      | 5 (17.24%)                      |
| 19         | Regional Demographic Information                          | 2 (6.90%)                       |

and so may have made it to the Implementation stage for very simple applications of the technology. They are still at a very early stage in the diffusion model when considering the full-scope and impact that EEIT could have in changing the way they do business on a global scale.

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## BIBLIOGRAPHY

- Chaston, I. and Mangles, T., "E-commerce in Small UK Manufacturing Firms: A Pilot Study on Internal Competencies", *Journal of Marketing Management*, 18(3), April 2002, pp. 341-360.
- Chaston, I. and Mangles, T., "The Internet and e-commerce: An Opportunity to Examine Organisational Learning in Progress in Small Manufacturing Firms?", *International Small Business Journal*, Jan-Mar. 2001, 19(2), pp. 13-30.
- Iacovou, C., Benbasat, I. and A. Dexter, "Electronic Data Interchange and Small Organizations: Adoption and Impact of Technology", *MIS Quarterly*, 19(4), 1995, pp. 465-485.
- Kentucky Office for the New Economy. *Kentucky Innovation: A Strategic Plan for the New Economy*. Frankfort, KY, March 2002.
- MDC Inc., *The State of the South 2002: Shadows of the Sunbelt Revisited*, Chapel Hill, NC, September, 2002. <http://www.mdcinc.org/sos2002report.pdf>
- Mehta, K.T. and Shah, V., "E-Commerce: The Next Global Frontier for Small Businesses", *The Journal of Applied Business Research*, 17(1), 2001, pp. 87-94.
- Nambisan, S. and Wang, Y., "Roadblocks to Web Technology Adoption?" *Communications of the ACM*, 42(1), 1999, pp. 98-101.
- Oden, M. and Strover, S. *Links to the Future: The Role of Information and Telecommunications Technology in Appalachian Economic Development*, Appalachian Regional Commission, April 2002. (<http://www.arc.gov/index.do?nodeId=1007>)
- Office of Advocacy, U.S. Small Business Administration, *Innovation in Small Firms*, Office of Advocacy, U.S. Small Business Administration, July, 1986. <http://www.sba.gov/advo/stats/sbinnova.pdf>
- Office of Advocacy, U.S. Small Business Administration, *Small Business Expansions into Electronic Commerce*, Office of Advocacy, U.S. Small Business Administration, July, 2000. [http://www.sba.gov/advo/stats/e\\_comm2.pdf](http://www.sba.gov/advo/stats/e_comm2.pdf)
- Premkumar, G., Ramamurthy, K., and Nilakanta, S., "Implementation of electronic data interchange: an innovation diffusion perspective", *Journal of Management Information Systems*, 11(2), Fall 1994, pp. 157-186.

Raymond, L., Julien, P.-A. and Ramangalahy, C., "Technological Scanning by Small Canadian Manufacturers", *Journal of Small Business Management*, 39(2), 2001, pp. 123-138.

Riemenschneider, C.K. and McKinney, V.R., "Assessing Belief Difference in Small Business Adopters and Non-Adopters of Web-based E-commerce", *Journal of Computer Information Systems*, Winter 2001, 42(2), pp. 101-107.

Rogers, E.M. *Diffusion of Innovations*, 4th edition. New York: The Free Press, 1995.

Smith-Mella, M., Childress, M.T., Watts, A. and Watkins, J. F. *Challenges for the new century: Trends that will influence Kentucky's future*. Frankfort, KY: Kentucky Long-Term Policy Research Center, 2000.

United States Congress, Office of Technology Assessment. *The*

*Automation of America's Offices*. Washington, D.C.: Government Print Office, 1985, p10.

Van Beveren, J. and Thomson, H., "The Use of Electronic Commerce by SME's in Victoria, Australia", *Journal of Small Business Management*, 40(3), July 2002, pp. 250-253.

Wilber Smith Associates, "Appalachian Development Highways Economic Impact Studies", Appalachian Regional Commission, July 1998. <http://www.arc.gov/index.do?nodeId=1039>

Williams, V., *E-commerce: Small Businesses Venture Online*, Office of Advocacy, U.S. Small Business Administration, July, 1999. [http://www.sba.gov/advo/stats/e\\_comm.pdf](http://www.sba.gov/advo/stats/e_comm.pdf)

Wood, L.E. and Bischak G.A., "Progress and Challenges in Reducing Economic Distress in Appalachia: An Analysis of National and Regional Trends Since 1960", Appalachian Regional Commission, January 2000. <http://www.arc.gov/index.do?nodeId=951>

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