

Technological Infrastructure Needs in Rural Nebraska

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ABSTRACT: Firms in rural communities need to work together to share the cost of their technological infrastructural needs. One of the first steps that must be taken in order for businesses in a community to work together is to identify key areas that offer the most potential for satisfying unmet needs. An instrument was developed and a survey conducted of businesses in 3 rural Nebraska communities to identify which areas where a lack of information technology is currently placing the communities at a competitive disadvantage. Results indicate that rural Nebraska businesses generally believe that that will grow over the next X years. They are making effective use of the Internet to disseminate information but are not utilizing it for ecommerce. After the cost of technology, the two biggest hindrances businesses in non-metropolitan areas perceive are the lack of knowledge about current technology and supplying new employees who have an understanding of new and emerging technologies and how to use them.

INTRODUCTION

According to the U.S. Census Bureau, Nebraska ranks 10th in the nation in the outmigration of its population (Franklin, 2003). United States Senator Ben Nelson writes that only 54% of the graduates from the University of Nebraska at Lincoln's

College of Engineering and Technology remain in the state and much of this "brain drain" is "due to the lack of innovative job opportunities where they can put their education to work" (Nelson, 2007). Nelson goes on to call for the state of Nebraska to help companies that are "high tech" so that

Nebraska youth will have good jobs and the state will have economic development.

Allen and Cantrell (2004) note that while Greater Nebraska had a net population loss for the 1980-2000 time period several counties have shown a partial recovery since 1990. They hypothesize that part of the recovery can be attributed to new entrepreneurial activities that emerged in those areas to provide jobs. Henderson and Abraham's (2004) found that knowledge oriented jobs are growing at over three times the rate of other occupations and jobs with knowledge-based activities had an average annual wage or more the \$50,000 in 2001, twice the average for other occupations. Around a fourth of rural area jobs are considered high-knowledge and 95 percent of all rural counties saw a rise in high-knowledge occupations from 1980 to 2000.

Even for more traditional economic activities a sufficient technological infrastructure is needed to effectively compete in today's economy. For companies in the manufacturing sector that may be located in rural areas the continued spread of technologies such as EDI make it necessary for them to have broadband communications access just to communicate with their business partners. In 2005 Electronic Data Interchange (EDI) sales accounted for 83.5 percent of e-commerce wholesale activity for merchant wholesalers, excluding manufactures' sales branches and offices, and 11.1 percent of total sales. (United States Department of Commerce, 2007).

Crucial social and economic functions depend on secure, reliable access to telecommunications, transportation, financial, and other infrastructures (Amin, 2001). One of the biggest obstacles businesses in rural communities face in

adopting new technologies is cost. At the same time, failure to provide the required technological infrastructure will likely lead to out-migration which can eventually threaten the very existence of the community. One strategy to overcome the challenges that they face in regards to size and remoteness, rural communities may have to develop partnerships (Henderson and Abraham, 2004).

According to Van Horn and Harvey (1998) rural entrepreneurs need to find ways to harness the expertise found in their local firm and in the local business area in order to better compete in the wider marketplace. Two of ways suggested were strategic alliances and virtual organizations. For strategic alliances two or more firms agree to share resources to accomplish individual goals that are linked to the mission of each organization. Virtual organizations are formed for the purpose of accomplishing a shared goal. One particular form of virtual organization that is very similar to a strategic alliance is the entrepreneurial virtual megafirm (EVM). EVMs have a common goal of obtaining a benefit that would be difficult or impossible for the firms to obtain individually. The individual goal is generally infrastructural in nature and is not inherent to the core mission of the firms. An example would be community foundations that have a professional staff to help with fund raising for small not-for-profit organizations. The fund raising is not the primary focus of the non-profits but by having a shared fund raising function that is shared by several organizations all of the organizations involved share an increased benefit.

Van Horn and Harvey advocate an electronic community as one structure the shared resources can take. In an electronic community several firms share an asset,

such as an information center, across all firms. Kanungo (2004) advocates the use of knowledge centers by rural communities to share resources among the community while also breaking down preconceived reluctance to use technology because of the increased sense of community ownership. Cullen (2003) recommends that community resource centers in rural areas can also be used to help reduce the digital divide by also providing information technology training and access to the community. All of these strategies rely upon the ability of firms or individuals to find areas of mutual needs so that they can identify areas where the sharing of resources would be beneficial.

This paper identifies areas which are most underserved and would thus be most likely to lead to opportunities for community businesses to either collaborate or recruit new businesses to locate in rural communities. In order to do this, a survey was designed distributed to 1,302 businesses in three counties in Greater Nebraska. Results indicated that the responding businesses are already using the Internet for the sharing of information but that ecommerce solutions have not been widely implemented. Most businesses are not using video conferencing or Voice over Internet Protocol (VoIP) and do not currently have a desire to do so. The main barriers to using technology perceived by the businesses were the cost of technology, a lack of knowledge about what new technologies are available, and a lack of qualified employees available.

METHODOLOGY

The survey instrument was developed based on a survey used by the Nebraska Information Technology

Commission (Nebraska Development Commission, 2001). The original survey was expanded and modified extensively. As part of the development process professors in telecommunications, computer science, information systems, and sociology met with community development professionals and businesses in Buffalo, Hamilton, and Cedar Counties to determine what areas the areas of interest were that had not been present on the initial questionnaire. The survey was then administered to a few business professionals to review for clarity. The business professionals were told that they were to review the survey to ensure that all items were understandable to a business profession with limited information technology knowledge.

The final question set consisted of 115 questions. Because some of the questions were branched no respondent saw all 115 questions. The test was administered to a test group to check for readability and time to complete the survey. The completion time was then estimated to be from 15 to 25 minutes. During the test session all participants finished in under 25 minutes.

Because of the somewhat sensitive nature of the survey questions, the local economic development professionals were responsible for contacting the local businesses in their communities. Most businesses were contacted via email. Businesses had the option of completing the survey anonymously online or by requesting a paper based survey that would include a stamped envelope. Using a local contact with established ties to the communities helped to increase participation.

Another motivation for using the local community economic development professional as a partner for conducting the

survey is that a large part of the motivation for the research was to build a tool that community could actually use to improve situation. By including the development person in the process they had more of an “ownership” stake and would thus both understand the results better and be more likely to actually trust and use the results.

RESULTS

The survey was conducted online. A paper-based survey was available but no businesses chose to take the paper based version of the survey. 1,302 companies were contacted by a local economic development person and encouraged to participate in the survey. 202 completed the survey for a 16% response rate.

Growth Outlook

Of those businesses surveyed 59% expected to expand within the next five years and 37% expected to stay the same size. One percent expected to get smaller while two percent anticipate a change of ownership and one percent of businesses were not sure. This would indicate that the businesses in the area are optimistic about the medium term economic outlook for their particular business.

Approximately 33% of businesses had an Information Technology (I.T.) department. Of those businesses that had an I.T. department 44% expect to expand in the next five years and 56% expect to stay the same size. One troublesome finding is that well over half of the companies that currently have an I.T. department reported have some problems finding qualified I.T. employees to hire. This represents a potential impediment to growth for those

businesses that have I.T. departments or might want to add one.

Web Presence

Sixty-six percent of businesses responding to the survey indicated that they have a website. Of those businesses that do not currently have a website 58% are currently considering developing a website within the next 3 years and around 76% of those would contract the development of the website to an external company. This represents an area of opportunity for the communities to recruit a company to develop websites in rural Nebraska.

Most companies are using their websites for getting information to their customers and not for ecommerce. The top three uses of the websites are all information dissemination related with companies indicating that use their websites to “Educate about products and services” (92%), “Give users the ability to contact us...” (84%), and “Provide online documentation” (37%). The most used ecommerce related items are “Makes available for purchase business products and/or services” with 24% of business offering that functionality, 15% can accept online payments, and 9% offer the “use of an eCommerce shopping cart.” See Table 1 for a detailed summary of responses.

Internet Access

Ninety-eight percent of companies that responded reported having access to the Internet. The primary means of connecting to the Internet was through Digital Subscriber Lines (DSL) with 66% of respondents reporting at least one line connected via DSL. Twenty-nine percent

connect at least one line through a wireless connection while 22% have a dial up connection. No other method of accessing the Internet was used by more than 20% of respondents. For complete results see Table 2. While there was an option for companies to participate using a paper based version of the questionnaire there is a possibility that the percentage of respondents having Internet connectivity is an artifact of the survey method.

The quality of service available for the Internet Service Provider will partially determine how useful Internet access is. If a company does not have reliable connectivity with a reasonable amount of bandwidth then the Internet access is of very limited use. A question was included to determine the businesses perception of the quality of their Internet service. Businesses could rate their current Internet service as Excellent, Good, Fair, or Poor. Results indicate that the vast majority of businesses are happy with their Internet service with 39% indicating service is "Excellent," 51% choosing "Good," 9% selected "Fair," and 2% thought the quality of service provided by their ISP was "Poor." This would indicate that most businesses have a level of reliability and bandwidth that is enough to meet or exceed their needs.

While most companies have Internet access perhaps a more interesting question is what is the Internet access being used for that makes it so pervasive in the business environment. Participants were asked to rank the importance of twelve items using a 5 point scale ranging from "Not important" to "Critical." Judging by the number of companies that rated a factor as being "critical," it appears that business concerns fall into 4 main clusters and an "other" category.

Businesses are most concerned with reliability as evidenced by, "Availability of E-mail" (105), "Security of the connection" (104), and "Reliability of connection" (99) being the three critical factors most often selected. Businesses want to be able to conduct business through email but they want to know their Internet connection is reliable and secure.

The next cluster of factors is more closely associated with speed or ease of use. They are speed of download connection (84), speed of upload connection (70), and technical support (68). The Internet is easier to use when lag time is reduced. Businesses want fast Internet access and the want it to be available with little or no effort.

The third cluster is information. Companies feel that it is important to be able to use the Internet for research (54) and to provide information to their customers (54). This pattern supports the finding mentioned earlier that companies which have a web presence primarily use their presence for spreading information. It appears that the Internet is also used for gathering information as well.

The last major cluster is ecommerce. Selling products was listed as critical by 40 respondents while 28 listed buying as critical. This further supports the earlier findings of this report that while ecommerce has not emerged as broadly as information sharing it is important to those businesses that are using it and represents a potential opportunity for future growth.

The final two factors are "High speed connectivity between organization and employee's home" (22) and "To take or provide educational services" (15). Neither of these factors appears to be strongly desired by organizations. One useful implication is that as more educational

opportunities are offered online the educational providers will need to educate the rural businesses about the attractiveness of online education since it is not currently valued.

Video Conferencing

Once potential advantage of technology is that it breaks down some of the barriers of time and space caused by rural businesses remote locations. For example, email allows a rural business to communicate near instantly with a remote office or with clients far away without the delay that would be associated with other forms of communication such as mail service. Video Conferencing is a technology that would allow rural businesses to meet with associates or clients at remote locations while still gaining some of the social context that is lost in telephone or email conversation.

Of those organizations that responded only fourteen percent are currently using video conferencing in their business. An additional three percent of businesses are considering using video conferencing but are not currently doing so. Further, it appears that there is not a great demand for video conference because while 94% of respondents felt that video conferencing resources in the region were excellent 4%, "Good" (43%), or Fair (47). Only 6% felt that resources were "Poor." This would tend to indicate that Video Conferencing is not in heavy demand. Any entity that was looking to improve the infrastructure for rural Nebraska would probably be well advised to allocate their resources on something other than video conferencing. If a video conferencing service were to be offered an educational campaign to educate regional businesses on

how video conferencing could be used would probably be needed to help stimulate demand.

Voice over Internet Protocol (VoIP)

VoIP is an emerging technology that is not in widespread usage. As VoIP matures its price is expected to drop while the ease of use should increase. Currently, 8% of the respondents are using VoIP while an additional 8% plan to adopt it in the next 1 to 3 years and 5% are currently evaluating VoIP. 75% of respondents have no plans to use VoIP and an additional 4% were not sure about their companies plans regarding VoIP.

Barriers to I.T. Usage

Respondents were asked to select from a list which factors were the greatest barriers to maximizing their organization's use of technology. Of the 173 respondents 74% indicated that the cost of technology was a major factor. A lack of knowledge concerning what technologies are available was the second most commonly selected option with 32% listing this as a concern. The lack of qualified employees was list by 23% of respondents and further reinforces results covered earlier in this paper. Lack of local support and lack of commitment from management were tied for the last spot with each being selected by 13% of the respondents. There was also an "other" option but only 6% of companies selected "other" indicating that the choice set was reasonably comprehensive.

Limitations

One limitation of this study is that only three counties chose to participate thus reducing the generalizability to other

counties. As with any descriptive research, the results of this study are not meant to imply causality. It is suggested that the results in this paper be used by communities as a place to begin discussion among businesses in the community. The survey is available for use by other communities at no charge by contacting the lead author. Another concern is that the sample is somewhat biased because the vast majority of businesses invited to participate were invited via email. For all businesses invited, having an Internet connection to take the survey online would be easier than taking the paper based survey. This is not a major concern because the purpose of the study was to identify technological infrastructural needs so the vast majority of the population we were wanting sample would have had the chance to participate.

SUMMARY AND CONCLUSIONS

One troublesome finding is that well over half of the companies that currently have an I.T. department reported that they have some problems finding qualified I.T. employees to hire. This result was reinforced by lack of qualified employees being listed by as a major barrier of using technology by 23% of respondents. This represents a potential impediment to growth for those businesses that have I.T. departments, those who might want to add one, or for companies who want to hire skilled I.T. workers to work in other departments.

The results also indicated that there was widespread Internet access and that almost 2/3 of businesses had a website and 58% of those without websites are considering adding one within three years. Most businesses with a website use it

primarily for providing information to customers with only 24% making products available over the Internet. This would seem to indicate that there are web development opportunities available in rural Nebraska for skilled entrepreneurs. There was a relative lack of interest in web-based training. Since there are several initiatives to deliver more college classes to rural communities that is cause for concern. Future research would need to see if online education is viewed negatively in rural communities of if it is only training classes that are so viewed. The findings also suggests that if educational or training companies decide to target rural communities for distance learning it might be prudent to first engage in some marketing activities to try to increase the perception of online training.

Video conferencing would seem to be a technology that could help rural businesses overcome some of the obstacles associated with their physical location. However, it appears that companies that are interested in video conferencing are already satisfied with their current solution and other companies are not interested in video conferencing. Whether the low penetration rate for the use of video conferencing represents a lack of business usefulness or a lack of knowledge by the businesses about the technology it does not appear that video conferencing is a priority for businesses.

VoIP is a relatively new technology and is still somewhat complicated to use for some applications. At least 79% of companies indicated they have no interest in VoIP at this time. It is likely that this is a function of the newness of the technology and that as the price of VoIP services goes down and the ease of use goes up interest will increase. Advances in VoIP usage will

likely not be driven at the consumer level but will rather increase when a provider makes a compelling case for VoIP as a service.

When looking at factors businesses identified as the biggest barriers to effective use of technology it is not surprise that cost is the primary factor identified. After all, if cost was not a constraint then any technology problem could easily be solved by just spending money on it. But the second and third most selected barriers are areas that point out the vital role that the higher education institutions in the state of Nebraska play. Both the lack of knowledge about current technology and supplying new employees who have an understanding of new and emerging technologies and how to use them, are functions that community college, colleges and universities are well positioned to address.

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Table 1

Website usage by businesses

Website is currently used for:	Percent "Yes"
Educates about products and services	92%
Gives users the ability to contact us or request more information via a web page form	84%
Provides online documentation	37%
Offers a SEARCH feature	34%
Includes a Site Map	33%
Makes available for purchase business products and/or services	24%
is well optimized for search engine indexing (like Google)	23%
is also used for internal business communication (intranet)	23%
Delivers audio or video clips	16%
Can accept online payments	15%
Presents polls or surveys	12%
Provides discussion boards or forums	9%
Makes use of an eCommerce shopping cart	9%
Other	4%
Allows for "live help" chat between business representatives and the public	2%

Table 2
Internet Connections by Type

Connection Type	Percent connecting at least one line:
Dial-up	22%
Cable	13%
DSL	66%
Wireless	29%
Cell Phone	4%
Dedicated Line	19%
Satellite	6%
Other	1%
