



## The Rural-Urban Digital Divide

Mitch Renkow, *Associate Professor and Extension Specialist*

The widespread diffusion of information technology has brought about profound changes in the ways people work, do business, and communicate with one another. The so-called digital revolution – born of the interaction of advanced computer technology and communications infrastructure – is widely hailed as having played a leading role in the long-running prosperity of the past decade [1]. By some estimates information technology accounts for one-sixth of the total U.S. gross domestic product and is creating jobs five times faster than the rest of the economy [2].

While the overall benefits of the digital revolution are beyond dispute, there is growing unease over the distribution of those benefits. One aspect of this unease is the fact that until now the fruits of this revolution have been overwhelmingly concentrated in urban areas, while the inhabitants of rural communities have been largely by-passed. In addition, there is some concern that the rural-urban gap in the ability to take advantage of continuing improvements in information technologies continues to widen.

This issue of the *NC State Economist* examines this “digital divide” between rural and urban areas of the state. It first describes the nature of the problem. Next, the benefits of Internet-based technologies to rural areas are discussed. Finally, some basic impediments to “wiring” rural areas and some possible means of overcoming those impediments are considered.

### The Nature of the Digital Divide

The influence of the Internet cannot be underestimated. A new economy, driven by computer hardware and software and the telecommunications infrastructure that makes the Internet run, has

changed the way in which the world does business. But participation in the new economy requires access to the electronic infrastructure and computer technologies that underpin it. According to a 1999 report by the U.S. Department of Commerce [3], a number of factors determine access to advanced information technologies nationally:

- *Education:* Individuals with college degrees are twice as likely to have a computer at home, and three times more likely to have home Internet access than individuals having only a high school education.
- *Wealth:* Households with an annual income exceeding \$75,000 are three times as likely to have a computer at home, and five times more likely to have home Internet access than households earning less than \$25,000 per year.
- *Race:* Whites are twice as likely as African-Americans to have a computer at home and three times more likely to have home Internet access.
- *Rural/urban status:* Nationally, urban households are only 17% more likely to have a computer in the home than rural households. However, they are 41% more likely to have Internet access.

There are currently no similar statistics on computer or Internet use for North Carolinians. We do know, however, that the divergence between rural and urban North Carolina is wider than the national average in terms of educational attainment and average household earnings, and that minorities make up a greater share of rural North Carolina’s population than the national average. In addition, the state as a whole ranks 45<sup>th</sup> and 46<sup>th</sup> nationally in household computer

ownership and Internet access, despite the fact that its largest metropolitan areas – the Research Triangle and Charlotte – are consistently rated at the top of these categories. These factors all suggest that the rural-urban digital divide is, if anything, more profound in North Carolina than in the U.S. as a whole.

## Benefits For Rural Areas

There is widespread acknowledgement of significant benefits that information technologies could bring to rural areas in the areas of medicine, education, agriculture, business, and even governance. In particular, the Internet facilitates a number of important applications that have the potential to significantly transform rural communities. These include e-commerce, telemedicine, and distance education.

Nationally, the growth of e-commerce – the use of the Internet for commercial purposes – has been nothing short of astounding. It is estimated that by the year 2003 e-commerce will exceed \$3 trillion of U.S. economic activity, more than one-quarter of all domestic purchases and sales [4]. The growth of e-commerce is likely to have mixed effects on the rural economy. Benefits will follow from the greater access to and lower cost of goods and services procured by rural homes and businesses, as well as expanded markets for rural producers. On the other hand, certain kinds of rural businesses are likely to be negatively affected as it becomes cheaper and easier to shop on-line rather than at a local establishment.

Healthcare and access to education are areas in which the digital revolution promises large benefits for rural citizens. These are areas in which rural communities have historically lagged behind urban centers in terms of service availability and access to new developments. The ability of the Internet to mitigate the negative effects of distance and remoteness in the delivery of telemedicine and distance learning opportunities holds the promise of bridging rural-urban gaps in healthcare and education.

## The Broadband Dilemma

An important obstacle to the widespread use of the Internet-based applications noted above is that they require the transmission of large amounts of data at high speeds. *Broadband* is the general term for the physical pipeline capable of accommodating high-speed data transmission needed to exploit the potential of the Internet. The Federal Communications Commission defines a broadband connection as having speeds greater than 200 kilobits per second. By way of comparison, the fastest connection available using a standard telephone line and modem is currently 56 kilobits per second.

There are three types of broadband technologies, each of which has the potential of delivering data at speeds far in excess of the FCC's 200 kbps standard:

- *Digital subscriber line (DSL)* is supplied by telephone companies through the local telephone network and offers speeds up to 8 megabits per second (mbps).
- *Cable modems* are made available by cable television companies through their cable networks at speeds up to 10 mbps.
- *Wireless* broadband uses either fixed microwave transmission towers or satellites to transmit data at speeds ranging from 2 to 10 mbps.

Broadband represents an avenue for making services and opportunities available to rural citizens and businesses that were hitherto unavailable because of the physical remoteness. However, rural areas – especially sparsely populated rural areas – have limited access to broadband at present. This is depicted in Figure 1. Currently, broadband is available to fewer than 5% of communities with populations under 25,000 whereas more than 80% of municipalities over 500,000 in population enjoy broadband access via either cable or DSL.

Ironically, precisely the same physical remoteness and low population densities that make high-speed data transmission so attractive also renders provision of those services expensive. All of

the broadband technologies require very large financial outlays by service providers. Both DSL and cable require investments in delivery infrastructure, especially establishment or upgrading of transmission lines. The existing cable network does not extend into many rural areas; remedying this requires very costly network expansion. Even though telephone lines do extend to virtually all rural locations, provision of DSL to more distant locations still requires significant upgrades to ensure adequate network quality. Fixed wireless transmission doesn't suffer from these problems; however, it is constrained by sightline issues, topography, and even weather.

In addition, all of these technologies are limited by the fact that a central transmission point (in the case of DSL), node (in the case of cable), or broadcast tower (in the case of fixed wireless) must be located in fairly close proximity to customers. In this respect, wireless satellite delivery of broadband may represent the best long-term option for rural areas: unlike all the other technologies, the cost of satellite service is the same regardless of whether there are 20 or 200 customers per square mile. However, in the near term, availability of this type of broadband is extremely limited, and the costs of sending up a satellite are very large (\$4 billion to \$10 billion).

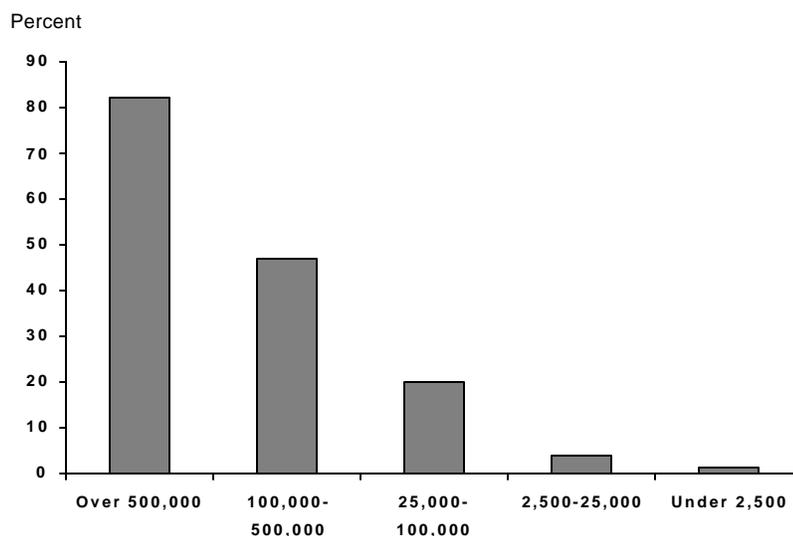
## A Role for Government?

Unlike telephone service and other basic utilities, the law does not require providers of broadband service to supply service to all locations. Consequently, the high cost of bringing broadband technologies to rural communities and the relatively small size of rural markets pose two important obstacles that limit the likelihood of the private sector bridging the rural-urban digital divide.

This has led many observers to call for government action to facilitate the deployment of broadband to rural communities. At the federal level, two bills working their way through Congress would redefine Universal Service to include broadband and make tax credits and low-interest loans available to broadband service providers. Here in North Carolina, Senate Bill 1343 has led to the development of the Rural Internet Access Authority, whose goals are to facilitate the use of both public and private resources to bring high speed access to the state's rural counties, especially those that are most economically disadvantaged.

As with other public policy issues, the key economic question about the desirability of such efforts centers on the extent to which the social benefits of

**Figure 1. Broadband Access by Size of Community**



reducing the digital divide outweigh the private costs. The answer to this question and the policy debates that surround it are likely to have important ramifications for North Carolina's rural communities for years to come.

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