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Leading Edge Information Technologies and Their Adoption: Lessons from U. S. Cities

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Based on a national study of the adoption of leading edge technologies, this essay surveys the range of information technology innovation in American cities and outlines the management and environmental characteristics associated with successful innovation diffusion and adoption.

In part because city governments believe that leading edge information technologies produce largely positive impacts, one obvious future trend will be that more city governments will adopt these technologies. Additionally, more leading edge technologies will be adopted by cities. A third trend is that leading edge information technologies will continue to penetrate cities more deeply, and as deeper penetration occurs, so will greater payoffs from use. A fourth trend is that as new and more sophisticated information technologies are adopted by city governments, integration of and support for them will become even more critical than is currently the case. Finally, although more of a finding than a trend, city population as a measure of city size will remain a key determinant in the number and type of leading edge information technologies adopted. While the overall extent of adoption of leading edge information technologies among city governments can be expected to increase, the greatest extent of adoption will be among larger jurisdictions.

Recent studies have shown that nearly all of American city governments use information technology routinely in their operations. For example, a 1993 information technology ICMA

survey found that 97 percent of all cities used computers, including: 100 percent of cities over 50,000 in population; 97 percent of those between 10,000 and 49,999, and 93 percent of those under 10,000 (Kraemer and Norris, 1994). A more recent ICMA survey, this one conducted in 1997, found a similar pattern of computer adoption among U. S. cities. Here again, 97 percent of all cities had adopted computers. This included 100 percent of cities over 50,000; 99 percent of cities between 10,000 and 49,999, and 95 percent of cities under 10,000 (Norris and Demeter, forthcoming 1999). These adoption data compare with figures from a 1975 survey which found that 98 percent of cities over 100,000 used computers as did 92 percent of those between 50,000 and 99,999, while only 42 percent of cities between 10,000 and 49,999 used computers (Kraemer and Norris, 1994).

These surveys show that information technology has thoroughly penetrated an entire organizational sector of the American society — municipal government. Computer technology is used by nearly all city governments, regardless of size. Only the very smallest cities do not use computers. Moreover, computers are deployed for a wide array of activities covering most, if not all, of the functional areas of city government -- literally from accounting to zoo operations.

However, penetration tells us very little about the innovativeness and sophistication of information technology applications and even less about nascent trends in information technology use in city governments. City governments may make extensive use of computers and information technology in their daily operations, but they may use the technology primarily in mundane ways. It may also be that only a relatively few cities have adopted more innovative information technologies that do more than automate routine activities. And, what does the future hold in store? In coming years, are city governments likely to adopt more advanced and sophisticated information technologies?

In the past, most payoffs from computing were attributed to more routine applications, especially those with substantial recordkeeping elements (Northrop, et al., 1990). Today, however, because of advances in hardware technology and in application software, it is conceivable that payoffs may occur as the result of technological sophistication and the use of more advanced and, hence, more innovative information technologies. Indeed, the use of more advanced and sophisticated or what might be called "leading edge" information technologies may well provide city governments with results that could not be obtainable from routine applications. One example that comes to mind is AFIS technology. Police departments that have adopted Automated Fingerprint Identification Systems (AFIS) report stunning improvements in clearing cases in which latent fingerprints were essentially the only evidence available. Without AFIS, most of these cases would never be solved. This is because it would not be feasible to staff a police department fingerprint section with a sufficient number of personnel to be able to sort and match latent prints manually against all fingerprints on file. In this case, an advanced information technology is a necessary prerequisite to getting the job done.

Additional evidence to suggest that greater sophistication may produce greater payoffs from use comes from a recent study that found a direct relationship between whether a city had a central computer system and the extent that it had adopted innovative applications (Norris and Kraemer, 1996). The authors found that:

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