Ethical Implications of Information Technology in Government: A Closer Look at GIS

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ABSTRACT

Information technologies (IT) are now central to the tools of government. As IT's become more prominent in the public sector, it brings new challenges to democratic decision-making. Using Geographic Information System (GIS) as the central example, the paper argues how ethics and technology is of contemporary relevance in public administration. This paper calls for a broader understanding of the role of IT in governance and the need for an ethical standard for the use of technology in public service.

Similar to other segments of society, the performance of government rests significantly on the acquisition and use of special kinds of information. Technology is simply the rational way – or technique – in which information is controlled, sorted and disseminated. A citizen's effective participation in a democratic society grounded in information technologies (ITs) is linked increasingly to his or her ability to understand both the nature of, and implications surrounding, the very technologies that are used in democratic decision-making processes.

Consequently public agencies face a two-fold challenge. They need to acquire and maintain new ITs in order to ensure efficiency and effectiveness. They must also conform the newly acquired ITs to democratic values and expectations in order to make the technology usable for the citizenry. As noted by John Kenneth Galbraith (1967) more than three decades ago, whoever controls information also has power. Because the creators and managers of IT have power, the issue of ethics in technology is of growing importance in the public service. Hence it is paramount to link a set of professional ethics to IT and, moreover, link the ethics of technology to the ethos of democratic governance.

This paper examines the need for a broader understanding of the role of technology in governance, and the need for an ethical standard for the use of IT in the public service. The paper is divided into three parts. The first discusses the role of technology in society and the theoretical underpinnings behind information systems. The second uses Geographic Information System (GIS), one of the most widely used technologies in local governments, as the central example of how ethics and technology is of contemporary relevance in public administration. The final part lays the foundation for a discourse in technology and ethics in public administration.

Understanding Information Technologies

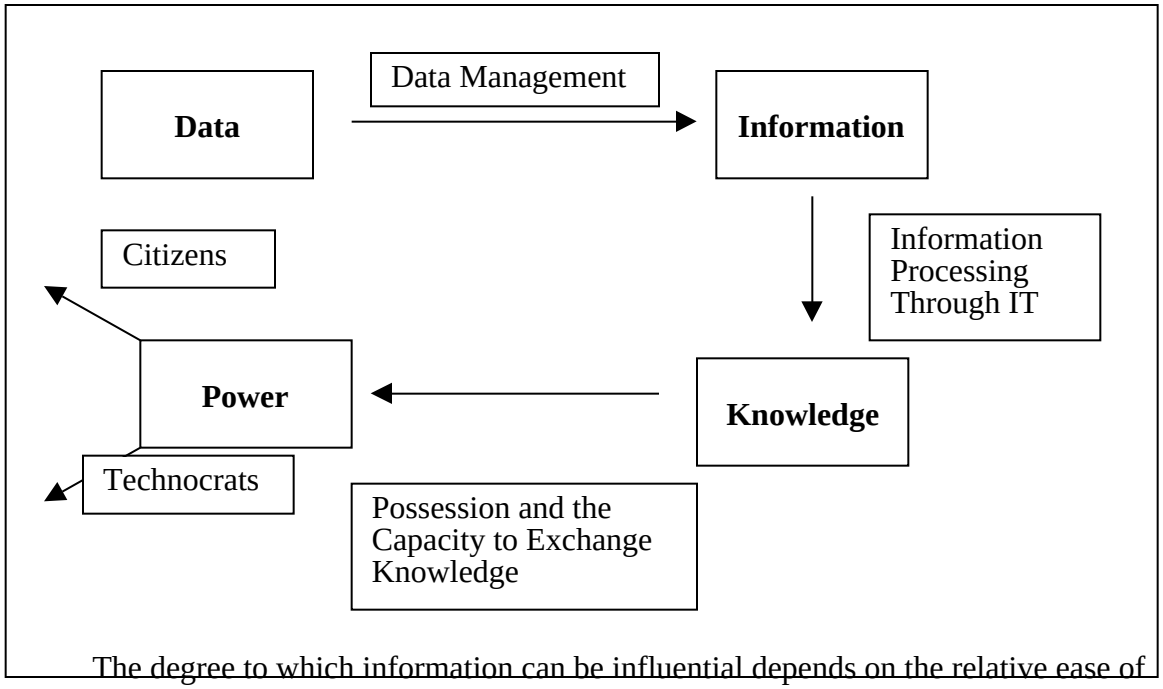
Information technologies (ITs) are now central to the tools of government. By the 1980s the federal government had recognized that computers were playing a vital role in administrative tasks. The Grace Commission (1983) observed that "at present there is no function in Federal Government – administrative, scientific or military – that is not dependent on the smooth functioning of computer hardware and software" (1). Overall the use of IT has created a shift from organizational capacity as a resource to organized expertise: giving rise to technically skilled personnel into governmental organizations. In 1983 about 41 per cent of the federal data processing budget was allocated to personnel resources (Grace Commission, 1983, ii). Ten years later federal government employed 113,300 information technology personnel, at a cost of $5.5 billion (OMB, 1994, 15). Governance has become dependent with IT to such an extent that failure of information technology can create disasters in government (Brown, 2000; ComputerWorld, 2000). As administrative functions are replaced by information systems, there is a disconnect between decision-makers and decisions. Information technologies are now playing the key role in replacing or reorganizing branches of government bureaucracy and introducing a new group of technical specialists into government. A closer look at the relationship between information technology and society will shed some new light on the role of technology in the formation of knowledge and power in government.

The source of all digitized information is our observations that are coded in raw data formats using any of the available database software. Data are essentially sensory and perceptual. Information, on the other hand, refers to data processed, organized or classified into categories to serve some useful purpose. While Information Technology (IT) is an essential element in the processing of information transactions, information and IT are fundamentally different. Information is a far broader concept and refers to content, whereas IT refers to the instruments used to manipulate that content. The latter is an essential element in the processing of information transactions, where observation,

knowledge and expertise form a hierarchical relationship (Cho, 1998, 29). Information leads to knowledge and more knowledge about a particular subject leads to expertise. As more and more information becomes out of reach to the common man, it will give rise to a knowledge that is available only to a few privileged groups who can subsequently use that power to control (Antenucci et. al, 1991).

The control of the means of production of information becomes ever more important because that is what leads to power and ultimately control of knowledge. The central hierarchical relationship of information can be seen as a horizontal progression from mere observation (data) to information, knowledge and ultimately power and control. Figure 1 depicts the linear relationship between data, information, knowledge and power.

Figure 1



The degree to which information can be influential depends on the relative ease of access to the technology in question and the way it simplifies information for general use. In summary, information technology today plays a central role in the creation of knowledge and distribution of power among citizens and public officials. Therefore, the question can be posed as to what should be the appropriate role of technology in society that would guard against arbitrary use of administrative power.

In the process of creating knowledge, it is important that the role of IT in society is clarified. The preconceived assumptions about IT determine how and for what purpose IT should be used in government and society. The underlying philosophy of the role of technology in society and its implications were addressed by Martin Heidegger in his book *The Question Concerning Technology* (1977). Heidegger explains that technologies are means to an end, but the relationship can reverse if we do not understand its true nature (Heidegger, 1977, 4). Heidegger explains that users of technology must be aware of the fact that technology does not create new knowledge but opens up new ways of thinking and hence brings us closer to the truth (28). However, truth, to Heidegger,

cannot be revealed if our thinking is molded to conform to technology's demands. For example, at times more efficient technology is being created only for the sake of efficiency, and users fall into a trap of being "used" by technology when they are given no opportunity to become involved in the process but, in a way, being forced to act at the call of new technology. Given this scenario, efficiency becomes the *cause* and users become the *effect*. Indeed, as Heidegger explains, as technology improves, we unconsciously move towards that advancement and human beings become a resource to be used and enhanced.

Heidegger explains that we can utilize technology to our own advantage by creating an environment that opens the possibility for the search for truth. Unlike Habermas (1970), who sees the need to control technology and make it subservient to human needs and aspirations; Heiddeger sees technology as a "standing reserve, waiting to be revealed" (24). According to Heiddeger, as humans move technology forward, they take part in ordering as a way of 'revealing'. In the process of doing so, "man becomes truly free only in so far as he belongs to the realm of destining and so becomes one who listens and hears, and not one who is constrained to obey" (p. 25). Heidegger calls for preserving the environment where the essence of technology – revealing the truth – is nurtured. The true nature of technology, to Heidegger is not only revealing of the truth, but also of maintaining the continuity of further revelation of truth by not being trapped into a subservient position. Here search for truth becomes the *cause* and technology, in essence, becomes the *effect*.

According to Heidegger the appropriate role of technology in society is more a question of art than science. An environment conscious of the role of technology not only utilizes technology for a better understanding of society and their needs, but can also use the technology itself to protect the continuity of knowledge. As Heidegger explains, the origin of the word technology came from the Greek word *techne,* which was used by the ancient Greeks for art. It was a single word explaining the bringing forth of the "true

into the beautiful" and "the art of safekeeping the truth" (p. 34). As public sector information technologies become more sophisticated, manipulating technology for better governance and creating an environment for that cause becomes the most challenging endeavor. As Heidegger (1977) warns: "the will to mastery becomes all the more urgent the more technology threatens to slip from human control" (5).

Today, with the proliferation of technology, implications of Heideggar's insights into technology carry great weight. The sources of misuse IT must be discovered in order to avoid them, specifically in the field of PA where IT's use in government and society can be channeled to improve public policy decision making. Following Heidegger's notion of the appropriate role of technology in society, identifying the sources of its misuse would help preserve the environment so that technology can be fully utilized without the fear of separating it from human control.

GEOGRAPHIC INFORMATION SYSTEMS AND PUBLIC ADMINISTRATION

Geographic Information Systems (GIS) are one of the most widely used information technologies in government and is increasingly becoming a standard tool for information management, storage and data interpretation (Hoffman, 1998). About 80,000 local government agencies today are using some form of GIS technology (Masser, 1998, p. 73) and the federal government has given particular attention to the dissemination of GIS (Gore, 1994). The promise of GIS is increasingly reflected in mainstream Public Administration literature (see for example, Ventura 1995; Nedovic-Budic and Godschalk 1996; Brown and Brudney 1998; Masser 1998). By portraying real world data as maps, GIS provides unparalleled power to analyze social, economic, and political circumstances.

Geographic information systems can be defined as a method of map overlays. When several slices of information of one area are combined by putting one slice of

information on top of the other, previously unseen or even unanticipated relationships are revealed. By portraying data through maps, GIS have become a powerful tool for public agencies in targeting areas for policy intervention. Unlike other technology used to analyze or disseminate data, GIS allow real life data to be projected on a computer monitor, giving greater meaning and understanding through visual portrayal of the data. Indeed, GIS are the fastest technology that is making headway in the public sector (O'Looney, 1997).

Given the huge popularity and demand for this technology, the question remains whether GIS will prove to be a weapon or a tool in the modern technological society (Davies, 1991). Access to GIS mean more than just access to data, but a wealth of valuable information about individual activities and property. A simple tabulation of maps showing owners of land property may seem quite harmless. However, when such information is combined with other databases and queried, it reveals a series of related information about the individual and the initial intended use of the data is no longer valid. In providing instant access to vast amounts of data, GIS also provide the opportunity to abuse, to misinform and invade the privacy of individuals on a greater scale than ever before (Arnoff, 1998). The questions then become "who is going to be responsible for the consequences of the use or misuse of the data?" or "how could technology be used to its fullest advantage, yet provide a sound ethical basis for its use?" Such discussions are pertinent and must evolve from theory underlying technology and ethics.

Ethics and Geographic Information Systems

GIS codes of ethics have been the subject of much scholarly discussion (Monmonier, 1996; Onsrud, 1995; Esnard, 1998; O'Looney, 1997). Most of these discussions emphasize the improper use of GIS that is due to the lack of competence or limited knowledge about GIS technology. However, a large part of GIS use has to do with ethical issues that transcend technique, and highlight the need for a broader

understanding of the role of GIS in a democratic society. For example, for organizations implementing GIS, there is a tendency to overemphasize ethical concerns that arise from its technical aspects because these are visible and tangible manifestations of state-of-the-art technology.

According to Onsrud (1995), most GIS data manipulation falls under the category of unethical yet legal conduct. Given the fallibility of human decision-making, numerous sources of ethical misconduct can be identified when GIS are used. Oftentimes, such ethical concerns would be irrelevant if GIS were not used. Sources of ethical misconduct (conduct that is legal but deemed unethical) in GIS can be divided into three broad categories: (1) actions of the GIS user (or technocrat) that could be deemed unethical due to the technical incompetence of the user; (2) misinterpretation of results due to lack of information or understanding of the true nature of the real world phenomenon; and (3) concerns related to the quality of data the user is forced to use due to unavailability of an alternative data source.

(1) Unethical due to Technical Incompetency

Onsrud (1995) argues that a significant number of GIS developers and practitioners have preconceived ethical notions of conduct that are strongly at odds with the professional community and the public (p. 6). This in large part is due to lack of experience and knowledge in cartography. "A picture is worth a thousand words," but the picture can also mislead us in a thousand ways (Monmonier, 1996). Computer technology has allowed software developers to accept the challenge of cartography – they have made it easy for lay cartographers to select an inappropriate projection or a misleading set of symbols. Because of advances in low-cost computer graphics, inadvertent yet serious cartographic untruths can appear respectable and accurate. Mark Monmonier in *How to Lie with Maps* (1996) argues that maps, like numbers, are often arcane images accorded undue respect and credibility. Because maps are eye catching,

they have visual appeal and can easily mislead individuals who are not familiar with simple cartographic principles. As noted by Monmonier (1996), "a good map tells a multitude of little white lies; it suppresses truth to help the user see what needs to be seen" (p. 25). Once compatible data is obtained and loaded in a GIS software, the creator of the map has wide discretion as to how he would like to portray it -- projection, color, categories of theme, scale, and most importantly, selected shots, are literally all at the discretion of the user.

In all professions, experience significantly impacts the ability to make ethical judgements and cartography is no exception. However, ethical misconduct can be minimized if the GIS user's work is peer reviewed by the GIS professional community. The fact that accredited planning programs now require graduate students to learn GIS and cartography demonstrates that such a community will become commonplace.

(2) GIS and Misrepresentation of Reality

GIS is a specialized case of information systems in general, in which information is derived from the interpretation of data "which are symbolic representation of features" (Maguire, Goodchild, and Rhind, 1991, p. 10). The interpretive content of GIS should not be under emphasized because of its ability to help people understand what is being portrayed as reality. Misrepresentation is less likely to occur when the information being modeled consists of geographic facts (bridges, streets, buildings) than when it consists of geographic interpretation of complex phenomenon, such as urban/rural landscapes and more importantly, socioeconomic characteristics of the population. The danger arises when geography that accepts GIS too readily becomes a discipline dominated by facts rather than by understanding of the broader social and political phenomenon.

Although the development and application of GIS have rarely been treated as having serious political and social implications, the diffusion of technology with massive amounts of government data that is easily accessible challenges that view. In order to make a sound interpretation of real life phenomena, technological analysis must be

preceded by first-hand knowledge of the situation. Annecdotal evidence suggests, as GIS users become more and more involved in the technical aspect of the technology, they invest less time in studying the real life situation. For example, technocrats who regularly use crime data to analyze crime "hot-spots" rely upon the data provided by police officers in the street. They make judgements about crime patterns and criminal behavior, having no direct clue about the real life in that hot-spot. Technical expertise appears to take precedence to sound knowledge of the situation. As so succinctly described by Taylor (1990): "Knowledge is about ideas, about putting ideas together into integrated systems of thought we call disciplines. Information is about facts, about separating out a particular feature of a situation and recording it as an autonomous observation" (Taylor, 1990, pp. 211-212). We need information to gain knowledge, but we must have knowledge to gather information.

Information technologies must be used to refine or narrow decision alternatives and act as supporting evidence to our final decision action. However, new information technologies are becoming so powerful that they are often seen as being superior to our limited knowledge and experience. Unfortunately, these information systems can be seen as a panacea to problems of governance and society.

(3) Data Gathering

Nearly 80 percent of the cost of GIS is in data collection and management (Sugarbaker, 1991). Due to budgetary constraints, public agencies tend to utilize data that are either old or whose quality is questionable. This poor data quality often produces highly questionable results. Yet, due to demand for the output made possible by GIS technology, practitioners are forced to produce results with the data they have.

Although information technology is being modernized at an ever increasing pace, the data that is the driving force of the technology is lagging behind. The U.S. Census generates most of the socioeconomic data and is updated every ten years. This limitation

of obtaining a frequent update of the data has forced many public agencies to look for alternative sources of data, mostly from private vendors. Dependency on the market for data makes this data-driven technology vulnerable to market-driven exploitation. In addition to the demand for frequent updates, GIS users are also focusing more on data at the individual level to identify clusters of targeted population. Commercial data vendors are capitalizing on this booming trend and are attempting to keep up with the market demand by supplying updated as well as more detailed data. The demand for individual level information raises fundamental issues of protecting personal privacy– a challenge that ultimately lies with public administrators dealing with this technology.

Data limitation can put the GIS users into the middle of a dilemma: not only must they produce information, but they must do it with available data. Martin (1991) explains that there are far reaching implications of using right data. He argues:
"Socioeconomic phenomenon such as ill health, affluence and political opinion undoubtedly vary between different localities, but we cannot precisely define the locations of the individuals which make up the chronically sick, the affluent or the politically militant. If GIS are to be used to store and manipulate such data, it is crucial that much care is given to ensuring that the data models used are an acceptable reflection of the real world phenomena." (Martin, 1991, p. 5).

Obtaining the most current data is a question of resource and a single agency will be unable to provide that on a continued basis. However, cooperative data sharing among public agencies and Intergovernmental Information Sharing (IIS) are efficient alternatives that are enabling public agencies to maintain data at a current level and also create an environment where quality of data can always be monitored (Dingwall, 1998; Dawes, 1996). By giving multiple agencies access to standardized data, arbitrary use of data can be minimized and the quality of interpretation of data increased. In the same breath, the quality and arbitrary use of data can also be checked by making the data publicly accessible.

Indeed the federal government can play a critical role in making standardized data available to the public. In recent years, the federal government has taken the initiative of organizing the Federal Geographic Data Committee (FGDC), an interagency committee organized in 1990 under OMB Circular A-16 that promotes the coordinated use, sharing, and dissemination of geo-spatial data on a national basis. The FGDC is composed of representatives from sixteen Cabinet level positions and independent federal agencies. A major objective of this committee is the eventual development of a national digital spatial information resource center, with the involvement of federal, state, and local governments, as well as the private sector.

Towards an ethics of information technology in public administration

Having identified the three sources of ethical misconduct, it is clear that a code of professional ethics for IT is needed. A code of ethics would inform individuals of what is expected of them by the IT profession and the public.

In government, it is especially important to have a code of ethics in IT because the collective stakes are simply higher than in the private sector. Public funding is used to develop and implement in-house IT capacity for the sole purpose of using tax dollars in the most efficient manner. Decisions to contract-out IT capacity can make public agencies vulnerable to the desires of private sector players. Hence, whether IT capacity is developed in-house or contracted-out, public agencies have an obligation to the public to limit the arbitrary use of power stemming from the technology.

It is important to note that the rationale behind the call for an ethical basis for the use of GIS in public administration is not setting rules for practitioners to "stay out of trouble," rather to give the technocrats the ability to exercise discretion "to do good" based on democratic values (Rohr, 1978, 54). Contrary to the philosophy that codes limit the optimal level of ethical conduct and reinforce the coercive power of law and organizational leaders, here it is argued that ethical codes should only pave the way to

maximize ones ability to do good using technology as the means. Therefore, the challenge lies in creating an environment that does not limit the efficient use of this powerful technology but rather puts a limit on its arbitrary use that could undermine democratic values. To create a balanced environment where technology is optimally utilized without abusing it for ones own advantage, we must discover the sources of ethical misconduct. Ethical discourse here becomes the primary vehicle for identifying the main sources of such misconduct.

Ethical discourse brings order, direction, and idealism to public service (Chandler, 1989, 617), encourages high standards of behavior, and increases public confidence in government (Lewis, 1991, 143). Indeed, if governance were merely a technical exercise, such ethical discourse would be irrelevant because principles and rules of technocracy would take precedence to judicious decision making and ethics based on democratic norms. In an emerging information age, the role of discourse becomes increasingly evident. The very purpose of democracy is to establish a framework for engaging in open discourse and subsequently judging its quality. Underlying the disciplinary languages of the various professions, information technology experts, like other experts, should be committed to the art and science of their discipline. Discourse provides ground for legitimacy of disciplines, and also creates standards upon which its quality can be judged. In addition, it allows professionalism of the discipline. Such discourse is the central activity of academia, where methodological discussions give rise to the "politics of methodology" (Fischer, 1991). In this regard, an IT consortium incorporating public and private organizations as well as the university community is critical. Indeed, discourse has a subtle relationship to power, and that power gives rise to legitimacy. Academia can play the central role in initiating the ethical discourse to information technology and technocratic power. Once technocratic power is acquired and understood it can be passed along to citizens through education and training. Otherwise, we can see GIS or information technologies in general, being used in a way that would do more harm than

good. It can be argued that universities should take the lead in developing a platform for such a consortium and government agencies should play the role of a catalyst. Moreover, for professionalization of technocrats, the logical training could be given in public administration, planning, geography, urban affairs or other interdisciplinary programs. General citizens cannot be left out of this discourse. They are integral to the development of a profession bound by democratic values. Internet and email list-serves can be aptly utilized to open up the discourse between professionals and the public at large.

With the greater use of computers, digital data, and information technologies, many professional organizations have modified their code of ethics to address the ethical and legal issues that have emerged. Among them are the American Sociological Association (ASA), the Association of Computing Machinery (ACM), American Institute of Certified Planners (AICP), American Planning Association and the Institute of City and County Management Association (ICMA). The ethics code instituted by these organizations primarily address data handling issues, including data manipulation and exchange formats, product liability, and consistent terms and definitions. As with most codes of ethics, the primary objective is to bind the user to a particular course of action, reinforcing a sense of behavioral control. However, what is being proposed here is not to legislate new codes that would bind public officials or technocrats in data generating "machines," rather, as John Rohr (1978) argued, making them stewards of public service who would uphold democratic values. This is a difficult challenge. As Dennis Thompson (1983) so succinctly points out, many of the values that we associate with democracy stand sharply in contrast to the specialization and impersonality we ascribe to bureaucracy. Therefore, the professional code of ethics in public administration must open up possibilities for achieving a higher end-use of information technologies, which must be realized through a discourse on ethics and information technology in governance.

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