Bringing Census Data into the Classroom: World Wide Web Access and Teacher Networking

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A Social Science Framework for Technology Assessment. In order to carry out a complete assessment of the impact of computing technology in the modern world, social scientists should employ an organizing framework within which to place studies addressing the issue. Such a schema should be comprehensive in order to allow for research across the entire range of affects which this technology can and does have on all societies in which it is found. At the same time, it should be simple enough to allow for a parsimonious explanation of the cumulative evidence regarding the consequences of computers on social structure and behavior. A paradigm satisfying both criteria would provide a common context for comparing different analyses and would allow for building a coherent body of knowledge on the subject. In this paper, I would like to suggest a frame of reference which provides for an inclusive yet uncomplicated organization of studies assessing the social impact(s) of computing technology and which can be used to generate hypotheses for further research in this area.

We begin with the observation that technology can have two **types** of affects on human societies. One affect is quantitative- that is, it can influence the amount of activity(ies) in which people are involved, the time it takes to perform tasks, the economic costs and/or benefits of developing and/or adopting the technology, etc. The other type of affect is qualitative, which includes such factors as the types of social structures which encourage and eventually adopt technological innovation, the consequences of adopting the technology for the social environment, the moral, ethical, and legal implications of technology for the people and groups in society, etc. At the same time, the **scale** of the impact(s) of technology on society can be seen at two levels of analysis: a macro-level and a micro-level. Macro-level affects ramify through the entire society and/or its major institutions. Micro-level affects are felt by individuals, either singly or in the interpersonal relationships in which they are involved. The intersection of these two independently variable dimensions produces a two-by-two table, in the cells of which any particular study assessing the impact of computer technology can be arranged.

	Type of Affect	
Scale of Affect		
	Quantitative	*Qualitavive*
Macro-level		
Micro-level		

Before applying this framework to the assessment of computing technology, we should point out a major pitfall of all such schemata. This formulation implies that there are categorical distinctions between both types and levels of affects which technology has on social structure. It is probably more valid to conceptualize these categories as end-points of continua. Kaplan (1964) comments on the differentiation between "quantitative" and "qualitative" phenomena that:

> In general, even if we are working with qualitative variables, the frequencies of their occurrence may be of importance to our inquiry, and these constitute a corresponding set of quantitative variables. Similarly, the reliability of a classification into qualitative categories may itself be a quantitative matter. *No problem is a purely qualitative one in its own nature; we may always approach it in quantitative terms.* (emphasis added) (176)

For example, the term "information anxiety" has a primarily qualitative connotation- referring to a disorientation or malaise people feel when confronted with the overwhelming amount of mass- produced information to which they are exposed in contemporary society. (Wurman, 1989) However, as social scientists we may also determine the number of people who experience this condition- this is its quantitative dimension.

A similar criticism could be made of the distinction between macro- and micro-level affects of technology on society.That

is, phenomena which may be thought of as characteristic of entire societies penetrate the experiential world of individuals and small groups. People draw on such culturally "universal" concepts as gender, space, and time to structure their everyday roles, identities, and relationships with others. (See Robertson [1987], or any other introductory sociology textbook for examples and summaries of supporting evidence.)

Having indicated the strengths (comprehensiveness and ease of understanding) and weaknesses (oversimplification of differences between types and scale of affects) of the proposed framework, we can conclude that it has value as a heuristic device. Its principal virtue is that it presents a methodology for organizing research on the assessment of computing technology into a manageable number of categories which allow for the systematic development of a theory of the impact of technology on social structure.

The Framework Applied to Computing Technology.
When applied to the impact of computing technology on society, quantitative affects refer to the sheer amount of information generated and made available to people, the rate of growth of information and knowledge, the number of people who work in information industries, etc. as these are increased and/or accelerated by computers.Qualitative affects include such phenomena as the structural characteristics of information societies, as well as the "quality of life" issues which have been raised in analyses of the impact of computers on employment, privacy, health, etc. As stated previously, macro-level impacts have society-wide ramifications, including, in the case of computing technology, the transformation of contemporary social structure into an information society. Individuals or small groups are the locus of micro-level affects of computers, as exemplified by the creation of "newsgroups", "forums", and other electronic channels of communication between people.

In addition to providing a framework for organizing studies, this schema can also be used to generate hypotheses for research which can contribute to a theory of the effect(s) of the computer on the information society. The following figure is the previous table filled in with concepts summarizing potentially fruitful areas of study and/or generating hypotheses which can advance social scientific knowledge in this endeavor.

The following sections offer commentaries on the types of studies which could be generated by this scheme.

Quantitative Macro-level Affects: Gross Information Product (GIP).
Information can be regarded as a commodity in the contemporary world. Rosenberg (1992) notes that "information [is] a commodity ... a product in its own right". (328) It is an object of commercial exchange- that is, it is produced, bought, sold, and used just as any other commodity. (An important distinction between information and other commodities is that information is not consumed [in the sense of being eliminated], destroyed, or reduced after it is used.) Given the central importance of information and its (at least possible) commoditization in post-industrial society, it is appropriate that we develop some measure of how much of it we produce. Wurman (1990) states that "[t]he amount of available information now doubles every five years..." (32) But, it is virtually impossible to find a *precise* quantitative measure (or estimate) of information available to people in the United States or any other contemporary society. In an attempt to provide such a gauge, I propose a concept termed *"Gross Information Product (GIP)"*, by which is meant the total amount of all final information output produced and disseminated in an information society during a given period of time, for example, each year. The concept is *analogous* to the "gross domestic product" (GDP) produced in an economy each year. GDP is defined as the "total market value of all final goods and services produced in an economy during a year". (Miller, 1994:170) However, it should be understood that GIP is *not* intended as an assessment of the monetary value of information (for a methodology for developing such a measure, see Porat [1977]), nor of its utility in facilitating decision-making, stimulating further research, etc. (These considerations are not unimportant; however, their use as components of a quantitative measure of information introduces complications which extend beyond the scope of this paper.) A society's gross information product is nothing more than the total quantity of information which it generates in a year, irrespective of its economic worth or its practical consequences.

	Nature of Affect	
Scale of Affect		
	Quantitative	*Qualitavive*
Macro-level	Gross Information Product GIP	Structural Properties of Information Society
Micro-level	Personal Productivity Measures	Techno-social Construction of Reality

I propose this measure in response to a "nagging" concern. In an industrial economy based on the manufacture of products, it is possible to ascertain the total number of units of output in any particular sector. For example, we can determine the number of automobiles, televisions, washing machines, etc. produced by companies in the United States, Japan, United Kingdom, etc. for a given year (or virtually any other time period). It seems fitting that we should have a comparable measure of output for a society in which the production, storage, and dissemination of information is a principal economic activity.

However, like many indices, GIP is more easily proposed than constructed. A major source of difficulty in constructing a measure is the multiplicity of forms in which information occurs in contemporary society. A starting point can be found in Porat's (1977) distinction between the primary and secondary sectors of "information activity", defined as "the production, processing, and distribution of information goods and services" (24) in the economy. Porat's concept of primary information activity refers to any "good or service [which] intrinsically convey[s] information or [is] directly useful in producing, processing, or distributing information". (Porat, 1977:25) We might adapt this definition to GIP to mean information goods or services made available to the general public, regardless of cost to either the producer or the user of the information. For example, most sites on the World Wide Web are freely available to anyone with a computer, modem, and web browser. Research on the "primary sector" component of GIP would include compilations of the number(s) of any or all of the following:

1) software programs, multimedia presentations, World Wide Web home pages, and other output intended for demonstration or dissemination via electronic media;

2) books, monographs, journal/magazine articles, reports, and other "hard copy" publications (including works of creative writing, such as novels, plays, etc.);

3) mass media broadcasts and productions.

This enumeration includes references to information presented directly through the computer, in print, and over television and radio broadcast(s). The role of the computer in the production and/or distribution of information via these media is evident- it is the principal, if not the only instrument employed in this enterprise.

The "secondary sector" of information activity is defined as "all the information services produced for internal consumption by government and noninformation firms". (Porat, 1977:4) The notion underlying this concept is that there are many individuals and organizations whose principal output is the production of goods and/or the provision of services which are not directly and immediately informational, but who still generate and rely on information to carry on their enterprise(s). The extent to which computing technology is utilized in this component of GIP might be assessed through such indicators as:

1) the number of inter-office memoranda and other documents intended for circulation*within* an organization distributed via computing technology (e-mail, fax machines, "floppy" diskettes, etc);

2) the number of documents (letters, reports, etc.) exchanged between individuals and/or organizations via computing technology (e-mail, fax machines, "floppy" diskettes, etc.).

This secondary component of GIP points up the fact that computing technology is brought to bear on the production and dissemination of information within and between entities whose main objective is not to generate publicly available information, but which nevertheless create and exchange information in the course of their routine activities.

Together, these two components make up a society's Gross Information Product. What is called for is a composite measure of the total amount of primary and secondary information produced in a society in a specified time period.

Qualitative Macro-level Affects: Structural Properties of the Information Society.

In the category of "Structural Properties of the Information Society", I include analyses of the social structure of contemporary information societies, including examinations comparing this societal type with other social forms, such as agricultural societies, industrial societies, etc. Any such discussion should begin with an acknowledgment that there is not a universal consensus among social scientists that what is commonly referred to as the "information society" is a distinct type. (Kumar, 1995) Bell (1981) estimated that, in 1970, only 28.6 percent of the civilian work force in the United States worked in the "industry sector" of the economy, while fully 46.4 percent worked in the "information sector" and another 21.9 percent were in the "service sector". On the basis of these figures, Bell concluded that we have become a "post-industrial society" and, given the ascendance of the information sector, it seemed appropriate to use the term "information society" to describe the new social structure. An alternative interpretation which has been proferred is that what is termed the "information society" is simply an adaptation of capitalism to a social context in which industrial production has been replaced by information generation and dissemination. (Kumar, 1995) Among other observations, proponents of this viewpoint have pointed out that the so-called information society is characterized by concentration of capital in a few corporate structures (Microsoft has

replaced General Motors as the symbol of economic success), just as occurs in an industrial economy.

While it may still be an open question as to whether the information society represents a new and different social structure, contemporary developments have brought about certain changes in our social behavior(s). These changes have the potential to react back on society and have an affect(s) on its structural characteristics. I have in mind one relatively indisputable fact: the dominant locus of social activity in the information society is the household.

> Information technology, directed by a whole host of big business interests, has been increasingly put at the service of home-based consumption. Entertainment is the most obvious example. 'Going out' has been replaced by 'staying in'. (Kumar, 1995:155)

Television, VCRs, audio cassette players, and CD changers are obvious technological appliances which allow people to bring various forms of entertainment into their homes. Computers can also contribute to this phenomenon by enabling people to play a wide variety of games, either alone or interactively with a small or large number of others, as well as allowing people to learn and/or play certain (simulated) musical instruments. But, it is not simply in providing entertainments that computing technology makes for a home-based society. Other examples include 'tele-banking', whereby a growing percentage of the population utilize electronic funds transfer to have their paychecks deposited directly into their accounts and pay their bills electronically either through a direct-debit payment arrangement or some variant thereof, or through software which allows them to write checks from their accounts. 'Tele-shopping' makes it possible for people to purchase virtually the entire panoply of consumer goods available in the market without having to leave their homes. (See Forester [1981] and Rosenberg [1992], among others, for additional material on computing technology and "home-centeredness". For illustrations of the variety of software applications, see almost any introductory textbook on "computer literacy, for example, Capron [1992], Laudon, Traver, and Laudon [1995], and Shelley, Cashman, and Waggoner [1995].)

In a different, but related, vein, 'tele-education' enables people to study a broad range of disciplines and subjects, either for institutional credit or not, through their televisions and/or computers. "Distance learning" is becoming a popular mode of instruction in many institutional contexts. There are institutions at which students can earn baccalaureate, master's, and doctoral degrees through various combinations of correspondence, videoconference, and other technologically communicated courses. The Open University in England is an example; even the venerable London School of Economics offers a limited number of degree programs in this mode. People interested in learning some foreign language(s) may do so through instructional software. Those who want to prepare for certain college/ graduate school admission examinations can avail themselves of the relevant program(s). Those who wish to improve their skills in selected fields of mathematics, science, or the humanities may use their computers to run software or communicate with instructional resources via communications programs. (See the "Education" pages of any software distributor catalog for examples of the variety of programs available in this area.)

However, it is not simply as consumers or recipients of externally generated information that we observe this tendency toward a home-based society. Given the (growing) preponderance of the information sector of the contemporary economy, large numbers of employees are directly involved in information activity. It follows that many of these workers can, with a home computer, modem, and necessary software, do their jobs from their homes. Such work arrangements are termed telecommuting. "Telecommuters" may work entirely at home or they may simply take work home from their office(s). The category may include an extraordinarily wide range of employees, from computer programmers who must, of necessity, be in continuous contact with their offices, to part-time typists, data entry operators, and other clerical workers whose only contact with their employers may be limited to sending and receiving job assignments. In 1991, a National Work-at-Home Survey by Link Resources found that approximately 5.5 million part-time and full-time employees spend normal daily business hours working from their homes. The Conference Board has found that between 15 and 20 percent of the firms it studied offered formal telecommuting arrangements to at least some of their workers. Moreover, almost 80 percent of the surveyed firms allow telecommuting on an informal basis. (Filipczak, 1992) The growing numbers and prevalence of telecommuters in the work force has led some commentators to use the term "Electronic Cottage" to describe the trend toward home employment. (Toffler, 1981)

As the preceding paragraphs suggest, computing technology has the potential to allow for the creation of a social environment in which people can carry on most, if not all, vital socially relevant activities without having to leave their places of residence. This might lead us to conclude that we are witnessing a return to a society in which the family and kinship institutions are the dominant forms of social organization. But, what appears to be happening is that people are engaging in these various computing technological behaviors as individuals, rather than in terms of their group roles as family members. (Kumar, 1995) One spouse may use his/her computer independently of or in isolation from the other; parents may not know about their children's use of the "family" computer. In fact, many non-family households have and use computers. The implication of these comments is that, because it is conducive to

individualized and private usage, computing technology in its present form may have the affect of weakening the bonds between people which are the foundation of any social order. If this proves to be the case, a distinguishing characteristic of the information society will be a relatively weakened solidarity in comparison with other types, such as agricultural societies, industrial societies, etc.

On the other hand, computing technology may also contribute to the integration of the information society, at least in its political aspects. Groper (1996) presents a rationale explaining how e-mail can bring about increased participation in the political process by facilitating communication between citizens and their elected officials. He cites two illustrative cases- the Legislative Information Network (LIN) in Alaska and Public Electronic Network (PEN) in Santa Monica, California- both of which appear to have this affect, at least initially. (The QUBE project in Columbus, Ohio failed to have the desired affect on political participation (Rosenberg, 1992) but it was not based on e-mail which allows for interaction between people and their representatives. Instead, it simply provided for a limited number of electronic responses to political speeches.)

It is my opinion that probably the most plausible resolution of this matter is to recognize that, under some conditions, computing technology may weaken the solidarity of information society, while, under other conditions, it can contribute to strengthening social solidarity. What is needed is research documenting which affects of computing technology are associated with particular social structural variables.

Quantitative Micro-level Affects: Personal Productivity Measures.

Studies of "personal productivity measures" would include research on the number of tasks for which individuals and/or small groups use a computer in the accomplishment of the task, as well as the number of times the computer is used for said tasks. In 1981, Weizenbaum, citing another computer scientist, wrote:

> For home use, [computers] have potential for catalogue shopping, activity planning, home library and education, and family health... family recreation, including music selection and games; career guidance; tax records and returns ... and budgeting and banking. (Weizenbaum, 1981:553)

This quotation suggests several questions for research on the ways in which individuals and/or families use their home computers today. For example, how many people purchase consumer products through a computerized shopping service? What types of products do they buy most often? least often? How many household members use "personal information management" software to organize their own or their family's daily (weekly, monthly, yearly, etc.) schedules? How many individuals use the computer to prepare and file their state and federal income tax returns? How many households keep track of their income and expenditures through a computer program? In a related vein, how many people do their banking and other financial transactions through a computer? These questions are a sampling of the possibilities by which individuals and families have come to replace earlier, non-electronic means of organizing their lives with computing technology.

An entire set of questions for research is suggested by the growing prevalence of the internet. How many computer users are connected to the internet? For those who are connected, how much time do they spend on a daily, weekly, monthly, or yearly basis communicating with others via the internet? browsing the World Wide Web? using ftp, gopher, or telnet to glean information from the internet? How many users regularly participate in newsgroups? "chat" rooms? bulletin boards? How many individuals have more than one internet connection (for example, an on-line service, such as CompuServe, and a local internet service provider) on their computers?

The essential concept underlying this category of analyses is that individual people and small groups can and do employ the technology of the computer as a tool enabling them to carry out more tasks more frequently and in more areas of their lives than was possible before the mass production, distribution, and utilization of the technology. Moreover, the tremendous interest in and growth of the internet demonstrates that they tend to use their computers to establish connections with others, albeit in different formats and for different purposes. It would be informative to devise a quantitative measure detailing exact patterns of computer utilization among individuals and households in the information society. This would be a measure of actual usage, not purchases of software, nor subscriptions to on-line services or other internet service providers. I have in mind a methodology by which a random sample of computer users would serve as a panel, analogous to the sample of television viewers whose program preferences are monitored by the A.C. Neilson Company. The procedure for such a study would follow these guidelines.

1) A device similar to the "people meter" through which the Neilson ratings are compiled would be attached to the computer(s) in a random sample of households.

2) The device would be activated every time the user boots up his/her computer and would record the following:

a) the date and time when the computer is operative;

b) the operating system in use during the session;

c) the application program(s) in use during the session, as well as the number of minutes each program is activated;

d) the internet connection(s) in use during the session, as well as the number of minutes each connection is active;

e) [For multitasking systems] the number and types of simultaneous applications and/or internet connections active during the session.

3) Provision would be made for recording certain demographic data about the sample of computer users- age, gender, income, occupation, race, etc.- which data could be correlated with the usage data.

The technology needed to implement such a plan exists and could be adapted for the purpose of gathering the relevant information. What is needed is financing and an institutional structure to carry out the project.

Qualitative Micro-level Affects: "Techno-social Construction of Reality.

The "techno-social construction of reality" category is intended to include studies of the ways in which people come to rely on the computer to validate their "knowledge" of the world in which they live, as well as to justify their actions. From the perspective of the sociology of knowledge, we know that interaction with and feedback from others are integral components of the process by which people develop a body of knowledge or world-view. (See Berger and Luckmann [1966] and Stark [1991] for detailed explanations of this process and its consequences for human society and behavior.) This is an ongoing process in which people create material and nonmaterial cultural products which become parts of "objective" reality and which are used to structure everyday interaction. Through socialization, these cultural products are passed on to and accepted by new members of society. The reality we know is thus created, sustained, and transformed through the give-and-take of organized social activity. If we apply this line of reasoning to the information society, it raises potentially interesting questions. How much of an individual's understanding of the world is, if not directly gleaned from the computer, at least mediated by his/her dealings with the technology? Furthermore, if the individual receives contradictory information from the computer and other sources of behavioral cues (for example, other people or institutions), to which source does he/she accord greater weight in deciding on a response? Allow me to sketch two possible (hypothetical) scenarios to illustrate the issues raised here.

Scenario 1 involves a bank officer who must decide whether or not to give a small business loan to a 35 year old African-American male who would like to open a music store on the border of a minority neighborhood in a large city. The manager presents the relevant information to a committee of bank personnel for review and evaluation. The committee recommends that the manager not offer the loan to the applicant. At the same time, the manager enters the same relevant information into an expert system computer program. Its recommendation is that the manager should grant the loan to the applicant.

The second scenario concerns an undergraduate student at an eastern university who must write a term paper for an English course demonstrating that a number of short stories written under several different pen names are in fact the work of the same author. (Assume that the student has started this paper sufficiently early in the semester so that he/she is under no time constraints; also assume that his/her primary motivation is not to get a good grade, but to write a correct analysis.) The student can take either of two approaches to this project. He/she can content analyze each short story him/herself, noting the occurrence of the same or similar phrases, terminology, or other evidence of the author's writing style and conclude, on the basis of his/her own examination, whether all of the stories were written by the same author. Or, he/she may enter the data into an artificial intelligence program designed to recognize word or grammatical patterns and base his/her decision as to the authorship on the results of the computer program.

These two scenarios are, admittedly, fictitious, but they are not completely out of the realm of possibility. (Indeed, readers of this paper may be familiar with comparable episodes.) In both cases, the individuals are in a position in which they face a choice as to whether to place greater confidence in their own or their colleagues' judgment or in the output from computing technology. By virtue of placing the individuals in such a dilemma, these scenarios may be thought of as 1990s updates of Asch's (1952) famous studies of group influence on individual judgments. For the bank manager, the advantage of trusting the human actors in this situation is that he/she can be assured of the social support they provide. For the student, there is the satisfaction of knowing that he/she was able to complete the project on his/her own. On the other hand, in both instances, the persons involved can point to computing technology as the basis for their behavior. Such an "explanation" not only rationalizes the chosen alternative, it also can be viewed as absolving the individuals of any responsibility for their conduct. Given the similarity between the nature of the subject matter here and in the Asch studies, it might be possible to set up small group experiments in which subjects would be placed in a setting where they would have to choose between a computer-generated recommendation for action and a contradictory one emanating from other group members (confederates of the experimenter).

We began this paper by presenting a heuristic two-by-two

table which could be used to organize studies of the impact of computing technology on society and social behavior. We noted its value as a device for generating hypotheses for further research in these areas. I have tried to demonstrate the utility of the framework in the preceding four sections. What remains to be done is the empirical research which can clarify our understanding of this most complex topic.

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