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citidep@gmail.com

Streaming Media Delivery of Classroom Lectures *

Carl Jentges

BU

jentges@bu.edu

Abstract

Classroom lectures are the workhorse of college education. The typical course is taught as a series of 50-minute monologues illustrated with simple chalk diagrams. Questions are allowed and sometimes encouraged but few are asked; most are requests to repeat or clarify a statement. Students deconstruct the presentations and record them in their notes. Even when all substantive areas of a course are adequately addressed by the text, lectures identify what is central to a subject and what is peripheral. Should a name or formula be committed to memory, or is it enough to recognize it? Should one be able to derive a relation or theory? apply it? discuss it? recognize it? or can it be ignored? The lecture is the arbiter of what constitutes competency in a subject at the course level; access to it is indispensable to succeeding in a course.

Unfortunately, work, commute, child care, and so on introduce schedule constraints that prevent would-be students from attending conventional lectures. They may have time enough to take a course, but not the flexibility to leave work for two hours three times a week for the scheduled class meetings. If lectures were available asynchronously, schedule conflicts could be reduced from 30-40 per semester to perhaps 3-4; that is, to scheduled tests.

My objective is to develop methods to inexpensively produce and distribute a classroom lecture as a montage of streaming media files. Using a simple classroom model, that of a lecture illustrated with a series of still images (chalkboard sketches, transparencies, slides), I propose to develop procedures

* Submitted in 2001

to coordinate a RealAudio or RealVideo stream representing the lecturer with a RealPix or RealText stream representing the chalkboard or its proxy and to evaluate means of automating those procedures.

The RealNetworks platform is attractive for several reasons. Most (~85%) streaming media on the Internet today targets RealPlayer. Free players are available for the Windows, Mac, and Unix/Linux operating systems. So-called Basic versions of media production software and of a streaming server are also available at no charge. These, together with a text editor, are sufficient to produce a presentation from digitized video and stills and distribute it as streaming media.

The project can be tentatively divided into six overlapping developmental phases.

Phase I: *Develop and refine post-production strategies.*

This includes defining what different lecture formats should look like on-screen, developing standards for rendering primary media (video, scans) as low bit-rate streaming equivalents, and developing templates to systematize assembly of the complete presentation. The cost of replicating some media instead of duplicating it holographically (e.g., blackboard text) should be examined.

Phase II: *Generate content.*

Record and archive primary video of course lectures and images (or recreations) of lecture materials. This includes evaluating production options (how many cameras are needed? how many operators? should the cameras move or be fixed? can pan or zoom be a post-production effect? can web cams be substituted for more expensive camcorders?) and their effects on the ecology of the classroom as well as a scheduling methodology to insure reliable and timely delivery of primary media.

Phase III: *Deliver media.*

The value of a streaming media server is that it maintains the temporal integrity of a multi-stream presentation by compensating for the fact that different streams, even different parts of the same stream, may traverse the

Internet at different rates. A presentation can be delivered without a server from a local disk drive or over a local network with excess capacity. Delivery via CD-ROM may prove the best option in some cases, and so both CD-R and streaming server delivery strategies should be developed. Strategies for preserving access to content while conserving scarce streaming server resources should be considered.

Phase IV: *Open a back channel.*

Submission of completed assignments and papers by e-mail or fax, is still surprisingly uncommon. The reasons should be identified and any serious impediments should be eliminated. Methods of facilitating discourse between instructors and individual students may be investigated, including teleconferences, IRC (Internet relay chat), Internet message boards, and desktop video conferencing.

Phase V: *Evaluate results.*

Measuring use is key to demonstrating efficacy. Knowing who accesses content, how, how often, and with what effect helps answer the question of whether this is an effective educational tool; being able to estimate the technology resources and labor force needed to support a given student population permits an estimate of cost effectiveness. In addition, extra-institutional utilization and measures of satisfaction may indicate additional intangible or secondary benefits.

Phase VI: *Share the wealth.*

This includes producing instructional materials so that other institutions or groups can replicate our work, developing distribution protocols to facilitate greater access to presentations through local libraries and other community groups, and creating derivative works that selectively re-present lectures or parts of lectures to address specific educational goals.

The following possible research topics are proposed, in no particular order:

• Harvard researchers determined that the impression an instructor makes in the first ten minutes is predictive of her end-of-term evaluation. Is this true of lectures delivered remotely? If so, are there other contributors, can the effect

be modulated, and how does it effect student performance or a student's experience of the medium?

• How does traffic through a streaming server change throughout the day? the week? the term? What server capacity is needed to insure, for a class of N students, less than P% probability of being denied access? How do students respond when they *are* denied access?

• Are remote viewers different as a group from those who attend lectures? Are they more or less likely to succeed in the course? Do they have higher or lower expectations of the experience? Are they more or less satisfied at its conclusion?

• Does the lecture have a formal structure, as say drama or literature? What elements are preserved by our streaming media model, which are replaced, and what new elements are introduced? Are there consequences?

• What factors encourage utilization of online media by students? What discourages its use? Do some online users also attend lectures and if so, why?

• What factors influence an instructor's decision to participate? Are they different factors before participating than after? What are expectations before participating, and what is the level of satisfaction after the exercise?

• What is the cost structure of delivering lectures via streaming media? What compromises can be or must be made for the system to be cost-effective for the institution? To what extent is production quality traded against cost, and what is the net effect on efficacy as an educational tool? Are there hidden or secondary costs or benefits associated with the technique?

A partnership with UMass/Boston makes sense for several reasons. UMB is currently resource-bound [1, 2]. It lacks the physical facilities for conventional expansion of its programs, at least until additional space becomes available in 2003 [3]. As a commuter school serving a large urban population, it stands to realize the greatest benefit from remote delivery of classroom materials, both in terms of increased enrollment and of reduced stress on physical facilities. It has surprisingly good computer facilities, with semi-private departmental clusters complementing public machines running all three targeted operating

systems (Win, Mac, *nix), providing a wonderful test-bed for evaluating different content delivery strategies. The Healey Library wants to expand its role "as an interactive participant in the teaching and learning endeavor on campus rather than just [be] a repository of books." [4]. In short, there is need, desire, and potential at UMB for just this kind of project.

What CITIDEP [1] stands to gain is expertise in developing and distributing streaming media at low cost. Scheduling constraints are at least partly responsible for low attendance at public meetings and hearings which, like conventional lectures, are lost to the ether once they're complete. To the extent that streaming media can facilitate remote attendance of, and provide post-facto access to, public meetings, it is an important democratic tool.

This is not a novel proposal technically. The University of Missouri at Rolla did very much the same thing in 1996 [5], UMass/Amherst has experimented with combining an audio stream with conventional web pages for content delivery [6].

This proposal is though unique in three ways.

First, delivery is not "live," nor is there a provision for viewers to respond to the presenter in real-time, as in the UMR experiment.

Second, this process is intended to be transparent to the presenter. The UMR experiment required the presenter to use an electronic whiteboard, while the UMass experiment requires content in the form of web pages, content that isn't normally part of a "real" lecture. The former places an additional burden on the presenter, the latter additionally divorces the remote experience from the "real" thing.

Third, while most distance-learning proposals assume that some if not most students will have little or no access to the parent institution, the working assumption of this proposal is that students do have access to instructors and facilities at the institution, but that work, commuting, child care responsibilities, and the like introduce scheduling constraints that make regular attendance of a daytime lecture inconvenient or impossible.

[1] Research Center on Information Technologies and Participatory Democracy www.citidep.net

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L'écriture Interactive comme pratique expérimentale de la démocratie *

Catherine Michel

CITIDEP

cmichel@netcabo.pt

Abstract

I present two designs where the interactive writing is used as a means for learning democratic. The first project, "Une saison, free un," reports an experiment held in Marseille (France): the creation of four books by a group of children of a housing estate, with the support of a facilitator and an illustrator, in the framework of the association's ACELEM. The second project is the proposal of an experience that explores interactive writing and new technologies for the practice of democracy in school: it is a virtual "treasure hunt" on the Internet, to be designed and undertaken by students with the support not only of teachers but also of external stakeholders in several areas (literature, computer, illustration, music).

Apresentam-se dois projetos onde a escrita interactiva é utilizada como um meio para a aprendizagem da democracia. O primeiro, “Une saison, un livre”, conta uma experiência realizada em Marselha (França): a criação de quatro livros por um grupo de crianças dum bairro social, com o apoio de uma animadora e uma ilustradora, no quadro da associação ACELEM. O segundo é a proposta de uma experiência que explora a escrita interactiva e as novas tecnologias para a prática da democracia na escola: trata-se de uma “caça ao tesouro” virtual na internet, a conceber e realizar pelos alunos com o apoio não só de professores mas também de intervenientes externos de diversas áreas (literatura , informática, ilustração, música).

* Submitted in 2001

1. Présentation d'une expérience d'écriture interactive non multimédia

Le cadre de l'expérience: *ACELEM*, Association des Espace-Lecture et d'Ecriture en Méditerranée.

Les missions de l'*ACELEM:*

- de créer des lieux d'animation culturelle autour du livre
- favoriser la lecture et l'écriture en direction des personnes ne fréquentant pas les structures de lecture publique
- constituer des points ressources autour du livre
- accompagner des projets de quartier autour de la lecture et de l'écriture
- lutter contre l'illétrisme

Son action : gérer et animer des espaces-lecture

Ses effets indirects:

Créer du lien social dans des quartiers défavorisés; un apprentissage de la citoyenneté dont la priorité est, que autour de l'écriture et de la lecture se développe un dialogue entre les communautés, entre les âges, entre les sexes, entre les élèves, bons et moins bons et entre les partenaires (écoles,centre social…)

Afin de remplir ces missions, chaque espace-lecture présente des projets en fonction de la réalité de son environnement social et de la qualité de ses partenaires.

Projet "Une saison, un livre"

Espace-Lecture La Viste, juin 1997- juin 1998, public : 3-14 ans.

Objectifs du projet :

faire connaître l'Espace-lecture structure jeune encore mal connue des partenaires du quartier de La Viste,

thème des saisons: très perceptible pour tous le monde, enfants, parents, qui souvent se sentent dépassés et partenaires.

"Une saison, un livre": un livre par saison dans la durée de la saison permettait un travail souple avec les partenaires et une multiplicité des activités possibles, tout en tenant en haleine le projet sur un an.

Travail sur plusieurs styles de récit et d'écriture, utilisation de différents matériaux et de techniques pour les illustrations.

Principes du projet:

Sur chaque livre devait participer au minimum un des partenaires du quartier: centre social, écoles, bibliotèque municipale de la zone, lycée éducation professionnelle, éducateurs de terrain (qui effectuent un travail de prévention et d'information).

L'excercice de la démocratie par les participants: celle-ci s'apprend en pratiquant ses idées qui la fondent: le droit de penser, de s'exprimer, de produire des écrits, des oeuvres…, le tout orienté vers une architecture politique commune. Chaque atelier mettait en action ses principes: discussion permanente, critiques, respects des productions tout en développant ses opinions, votation des propositions à la majorité, tout en gardant le consensus.

Le livre d'été : livre de poésie

Partenariat avec le centre social, écriture et illustrations en commun

Ateliers de lecture, ateliers d'écriture de poésie

Ateliers d'illustration: pour susciter des idées, visite au musée d'art contemporain de Marseille avec conférencier (familiarisation et accès aux loisirs et à la consommation culturelle).

Le livre d'automne: livre de conte illustré sous forme d'abécédaire

Partenariat avec l'école primaire (escola basica) pour l'écriture, et maternelle (jardim infantil) pour l'abécédaire.

invitation d'un conteur qui a raconté des contes au centre social, à l'école et à l'espace-lecture.

Le livre d'hiver: livres de comptines

Partenariat différent avec le lycée professionnel: le thème des saisons n'est pas un thème motivant pour les adolescents. Nous avons travaillé avec une classe de filles en filière "administration et sociale". Au cours de leur

pratique professionnelle , elles allaient avoir besoin de lire à haute voix, difficulté qui explique parfois leur problèmes scolaires

1. ateliers de lecture à haute voix: choix préalable d'un album pour enfants avec comme thème de fond l'hiver, appropriation du texte
2. lecture par chacune à un groupe d'enfants de l'école maternelle

Partenariat pour l'écriture avec l'école maternelle et primaire pour les comptines et les illustrations

Livre de Printemps: livre de devinettes (qui se cache…)

Partenariat : écoles, centre social, chacun choisissant sa devinette printanière, privilégiant une ambiance de surprise pour tous les partenaires.

Bilan

Outre divers effets positifs, ce projet a permis une rencontre d'un nombre infini de participants qui ont appris au cours des multiples ateliers d'écriture, de lecture et d'illustration, à se voir, à s'écouter, à se respecter. Les négociations au départ bruyantes, voir agressives, avec certains groupes ont été de plus en plus concertées, et sont devenues un mécanisme de fonctionnement au cours des ateliers. Chaque séance débutait par la lecture de la production des autres participants et la vision des illustrations; un cahier permettait de noter les commentaires, appréciateurs ou non, et chacun pouvait énoncer ses opinions, ses critiques. Certains se sont révélés être de vrais écrivains - poètes, ou illustrateurs en herbe, d'autres des âmes de d'avocats ou de négociateurs. C'est en cela que nous parlons d'une écriture intéractive comme pratique expérimentale de la démocratie.

2. Présentation d'un projet d'écriture interactive multimédia : une "chasse au trésor" interactive comme découverte des nouvelles technologies.

CITIDEP [1] invite tous les professionnels impliqués dans la problématique école / nouvelles technologies à se pencher sur cette première proposition de projet d'expérimentation pédagogique, projet appelé à évoluer en fonction des finalités de chacun des partenaires. Ce projet repose sur deux objectifs forts

[1] Research Center on Information Technologies and Participatory Democracy www.citidep.net

conformément au principe fondateur de Citidep de développer une démocratie participative par l'appropriation des nouvelles technologies.

1. La formation préalable de l'équipe pédagogique comme gage d'efficacité du projet et d'un acquis des savoirs-faire technologiques pour le long terme.

La formation de l'équipe pédagogique, éducateurs d'enfants et professeurs s'effectuera sur le projet en phase de préparation, au cours d'ateliers d'expérimentation afin qu'elle acquière les techniques requises pour ce projet, avec à terme un souci d'autonomisation totale. Ils seront également accompagnés sur le terrain lors d'animations ponctuelles avec les élèves.

2. L'excercice de la démocratie par les élèves

Cette idée repose sur le fait qu'une démocratie participative s'apprend très tôt autour d'un intérêt commun. Donc, ce projet doit mettre en pratique ce principe du construire ensemble autour de la discussion permanente, de la votation des propositions à la majorité dans un perpétuel souci de trouver un consensus, des alternatives lors des différends.

Comment remplir ses objectifs tout en respectant les programmes d'apprentissages et les compétences à aborder par les élèves lors de leur scolarité? Nous proposons en nous appuyant sur plusieurs théories pédagogiques (pédagogie du projet, pédagogie active, approche créatrice, centration sur l'apprenant, approche communicative…), la construction d'une chasse au trésor (ex: une chasse au trésor dans les archipels des Açores et de Madère) comme exemple d'application de ces idées. L'idéal serait la participation, pour commencer, d'au mois deux écoles (professeurs et éducateurs d'enfants. Ce jeu fera l'objet de la création d'un site internet.

Phase 1: formation complète de l'équipe pédagogique impliquée dans le projet:

Ateliers d'écriture pour le scénario

Apprentissage des logiciels nécessaires au projet : dessin, photo, son, scanner, traitement de texte

Phase 2: élaboration du jeu par les élèves :

Le rapport technologie / pédagogie

La création du contenu - énigmes, péripéties - favorise un sentiment de sécurité et permet à l'élève d'évoluer dans un univers familier, sur lequel il va ensuite s'excercer.

L'élaboration du jeu fait appel à des connaissances pluridisciplinaires et peut débloquer ou motiver certains élèves dans certaines disciplines.(pédagogie différenciée)

Le jeux permet de développer des activités de niveaux de difficultés différents, c'est en cela qu'il peut dynamiser l'ensemble d'une école.

Initiation à de nombreuses notions pédagogiques au programme par l'expérimentation créative et ludique associée à la découverte de l'ordinateur:

Exemples d'activités possibles: associer des images et des sons, des lettres pour constituer un mot, distribuer des objets (dénombrement) avec le cliquer - glisser - balayer, le positionnement dans l'espace avec le balayage de la souris pour colorier une forme ou dessiner un objet, repérer un objet en cliquant sur une zone précise en fonction de critères précis qui correspondent à un lexique spatial, temporel, utilisation du clavier pour l'écriture…

Le rapport technologie /citoyenneté

Communication d'élèves socialisés dans des écoles distantes, différentes de par leur implantation dans tel ou tel quartier et qui vont se retrouver par le biais du dialogue à créer un jeu en commun. Internet sort les écoles de leur références sociales, géographiques et culturelles.

Navigation sur le web pour chercher des images, des sons, de la documentation en rapport avec le projet, en respectant l'individualité de chacun (sous couvert d'un software gardien). Cette navigation leur permet de sentir la force d'Internet, la formidable possibilité de rencontrer des personnes traversées par les mêmes intérêts.

Réinvestissement de ces découvertes lors des différents ateliers. Prise de décision à la majorité pour le choix des activités récréatives de la chasse au trésor.

Chaque groupe, chaque classe, chaque élève peut tester les trouvailles de ses camarades et donner ces appréciations par le biais de la messagerie, dans le respect d'un dialogue constant.

Les différents niveaux favorisent une meilleure écoute et respect des autres.

Le site pourra servir de ressources à d'autres écoles interressées par le projet, en tant que jeux et conseils, et pouvant même à terme devenir un “site pilote ” pour les structures scolaires interressées.

Les ressources pour la réalisation du projet :

Pour deux écoles

Hardware : 10 ordinateurs multimédias moyens + deux serveurs, 2 scanners 2 imprimante2 branchés en réseau, 2 liaisons internet.

Software : Linux

Matériel pour le dessin, pour l'écriture et le son.

Intervenants : illustrateur, informaticiens, formateur, ateliers d'écriture, musicien.

About the author:

Directrice d'un Espace-Lecture à Marseille situé dans un quartier défavorisé, ce poste m'a permis de développer des projets avec les groupes scolaires autour de la lecture et de l'écriture, pour un public allant de trois ans à 14 ans. Diplomée en Sociologie, j'ai au cours de cette fonction effectué des stages de formation d'animateurs des lieux de lecture et des séances de formation en ateliers d'écriture.

Information Technologies for Grassroots Groups *

Lucie Laurian

lucie_laurian@unc.edu

Abstract

This is a first try of a research proposal to investigate the use of ITs by grassroots groups. I first argue that grassroots groups, because they are the channel through which citizens can get their voices heard outside of the traditional political system, are a key element of direct "bottom-up" democracy. Second, I propose a very brief outline of a literature review on the subject (obviously, if we decide to go ahead this will need to be expanded- and we may do that as a group). Third, I state the research questions. Fourth, I summarize some evidence about the access of grassroots groups to IT which suggests that IT may indeed make them more effective. And fifth, I describe the proposed study (as I see it now - and this will change as we discuss it).

1. The context

The importance of grassroots groups for democracy Civil society, as the domain of civil rights and freedom as guaranteed and protected by the state, or as the political realm of society, refers in the U.S. mostly to political associations; and social movements, the keystone of bottom-up political action in the U.S., are the embodiment of civil society at work. Grassroots groups create social movements on a large or local scales. They are the channel through which citizens can directly affect decision-making processes without relying on the elected representatives, often (and by essence) non-responsive to minoritiesí interests. Citizens usually do not participate in political decision-making processes as individuals, but rather as members of more or less formal citizens groups.

* Submitted in 1999

Despite the alleged current 'apathy' of citizens, private citizens organize in some instances into grassroots groups and build up movements to shape political decision-making processes, especially at the local level. Grassroots groups are the main (and maybe the most legitimate because they are by definition ìbottom-up organizationsî) representation of civil society in the US. They often represent local communities in political processes when elected officials fail to do so.

Tocqueville was impressed by the impulse he found among Americans to organize in grassroots associations around any number of causes and interests limited in scope. This would still impress him today, since there are tens of thousands of local and national associations in the U.S., who attempt promote direct participatory democracy through civil-rights type struggles.

II. Literature

Since grassroots groups and organizations are a key element of democracy, it is essential to understand how they are, and can be more, effective in their actions. Some groups are more effective (or successful?) than others, and this difference needs to be explained for the benefit of the least successful ones.

Many texts have been published about the potential of ITs to increase (or promote?) direct democracy. Some argue that IT can be empowering as the information-poor potentially become information- rich, and as increases in communication and contacts between people potentially widens expectations of a more participatory democracy (Williams and Pavlik, 1994). Others see IT as a tool for restoring a sense in local community vitality. For Barber, ITs have a great potential for democratic discourse because they can be used to guarantee equal access to information, tying individuals and institutions into networks that make discussion and debate possible (Barber, 1988).

Finally, new modes of communication may also have the potential to change the traditional political processes and to create alternative institutions to challenge the status quo (Perelman, 1998). Perelman, however, seems pessimistic as he writes: ì " alas, I do not see any evidence that such developments represent a substantial threat to the corporate dominance of capitalist societies" (Michael Perelman,1998 p.11). One of the main reasons why IT may not increase citizens participation and democracy is the issue of

access to IT, and therefore of access to information. Pavlik emphasizes the importance of increasing the access of the poor to IT because ìNumerous studies have demonstrated that increases in the flow of information often widen the gap between the rich and the poorî (Pavlik in Williams, 1994, p.144)

The main practical issues represented in the literature about the role of IT for increasing democracy are issues of access to information and IT and the ability to use IT. Children and adults from poor households are less likely to have access to computers (and thus to access information) than persons from middle-class and wealthy ones. Furthermore, specific training and skills are necessary to use IT, and wealthy and middle class individuals are more likely to develop the appropriate skills than the poor (Michael Perelman, 1998, p.11). This gap is reinforced by the fact that rich and middle class children are more likely to go to schools that provide hands-on computer training and Internet access than children from poor neighborhoods (Schiller, 1995).

Since grassroots groups are the key to a more direct democracy, it is essential to understand how they, as social groups, access and use information and Its. James Madison wrote in 1822 that “A popular government without popular information, or the means of acquiring it, is but a prologue to a farce or a tragedy; or perhaps both. Knowledge will forever govern ignorance: and a people who mean to be their own governors must arm themselves with the power which knowledge gives” (James Madison, 1822, cited in Sussman, 1997).

If this is true, then the access to and use of IT by citizens groups would be crucial. Social activists have developed projects to empower communities by providing them computer access. Efforts in this direction have been made in a few American cities: Santa Monica, Glendale, and Pasadena in California, where online systems for public use have been set up. However, there seems to be no breakthrough in altering the imbalance of access to information and knowledge (Sussman, 1997).

Despite these documented efforts, the literature on the role of IT in democratic processes fails to explain how ITs are practically used to increase the effectiveness of citizens groups, and ultimately to enhance democracy.

III. The question

The research question is thus: How much access do grassroots groups have to IT and information? How much and how do they use IT to increase the effectiveness of their actions? And finally, does the use of IT ultimately increase their effectiveness?

IV. Evidence : preliminary work

There is very little evidence about groupsí use of ITs to further their goals.

A preliminary study of Environmental Justice grassroots groups in North Carolina (Laurian, 1999) described the use of IT by twelve groups which could be contacted by phone and interviewed about their use of computers, and email and the Internet in particular. The use of IT by these grassroots groups is extremely variable.

Six out of the twelve groups do not use computers on a regular basis, and the other half does. Among the groups who never or very seldom use computers, the main reasons given were, as expected, lack of skills and lack of access. Six out of the twelve groups do not use email on a regular basis (for daily communications), and six do. Without judgment as to whether half is a large proportion or not, this indicates that email has become a widespread and useful tool to grassroots groups.

In terms of Internet use, six groups use the Internet a lot, four use it sometimes, and two groups never access the web. Of the ten groups who use the Internet at least sometime, six groups use the Internet only to get information, and four groups use the Internet to obtain information and to put information out (including through a web page).

Examples given of Internet use were: to get information on available grants, to obtain precise information about the effects of pollution on health, and to get statistical data in a GIS mappable format to show trends in environmental injustice. The Internet has also proved to be useful to some groups mostly as a way of accessing information (only one third of the groups also use it to share information).

These results were contrasted with the use of IT by a student group (with unlimited access to Its and the appropriate skills), which showed how, when IT is available and used, it can increase effectiveness of mobilization. During a “civil-rights-style” student protest (with marches and sit in, etc.), students made intensive and imaginative use of IT. This indicates how IT can be used in social movements. This group used IT to enhance the effectiveness its actions in various ways:

(1) To facilitate media outreach. Press releases were sent out to local TV and radio stations and to local, regional and national newspapers sometimes several times a day by email and fax.

(2) To gather support from local and national personalities. The Internet, email, phones and faxes were used to contact elected representatives and personalities. The support of a local House Representative and of Noam Chomsky had a very significant impact for the group morale (and sense of pride) and for the groupís credibility.

(3) To network, and establish and maintain contacts within a broader network of groups going through, or having gone through, similar struggles.

(4) To keep the network of groups informed about progress of their struggle, the groupsís web page was updated after every significant event.

(5) To widely publicize the event. The sit-in was broadcasted over the web in real time via a web camera.

(6) To avoid isolation during the sit-in. To avoid relying on phone lines which could be cut, cellular phones were used.

While this is anecdotal evidence, it indicates that IT can enhance the effectiveness of grassroots groups actions by facilitating publicity, media outreach, networking efforts, and to gather support for the group and keep other groups and individuals informed.

It follows that since networking among groups is done both by mail, phone, and email, groups who never use email may be at a disadvantage in terms of contacts and potential support by other groups.

Furthermore, lack of frequent access to the Internet may put a group at a disadvantage. There are many programs to support grassroots mobilization efforts, and eventually to increase their access to IT. These include grants from private foundations as well as government programs.

However, when the government provides a service that can enhance mobilization capacity and/or access to IT, most of the information about these resources is announced via the Internet. Groups who use the Internet do benefit from these resources. Groups who donít use the Internet must rely on mailed documentation, which is sent to large groups, but often does not reach local groups. Groups who donít have access to the Internet wonít necessarily know about these opportunities. This may mean that groups which have access to IT and use it will receive more support from the government and non-profit organizations, will have access to more information and advice with regard to strategy, and may be more effective in their mobilization efforts.

The proposed research will test these hypotheses.

V. The proposed study

1) Objectives

1. To assess the access of grassroots groups to IT (and the channels of this access)

2.To compare the effectiveness of grassroots which use IT with the effectiveness of those that donít use IT.

3. To compare the use of IT (how much and how they use IT) by grassroots with use of IT by larger (more established) groups.

4. To compare how the use of IT has changed or increased the efficacy of actions for grassroots and large groups.

2) Methodology

The research would use a mail survey (with follow-up phone calls to gather the information from those who didnít reply).

The research would use two survey samples (one of grassroots groups and one of larger groups).

I here proposed two kinds of groups, and the potential sampling frames for each.

- Grassroots groups: Environmental Justice groups Grassroots Environmental Justice groups are local political grassroots groups which usually encompass environmental justice goals, sometimes including racial and social justice as broader goals. The survey sample frame can composed of the groups (or a subset of the groups) listed in ì1994-95 People of Color Environmental Groups Directory,î which is being updated currently for 1999.This directory is compiled by Dr. Robert Bullard at the Environmental Justice Resource Center (Clark Atlanta University), and includes listings for over 200 people of color organizations nationwide, in Canada and Mexico.

- Large groups: well established environmental groups The sample frame can be composed of large (well established) state and national level environmental groups based on Internet search (we would be assuming they have a web page).

3) Scale

This survey would be a nationally representative survey of grassroots and large groups in the US.

It may also involve some international comparison.

4) Issues of interest

This section provides examples of the issues to be addressed and questions which could be asked.

Access to computers:

- Does the group have access to computer(s)? - How does the group have access to computer(s) : computer belongs to the group and is in the groupís office, computer belongs to the group and is in a memberís home, private computer of a group member, group member(s) use computer at work, group members use computer in a public library, group member or relative of group member access computer at school or university... - How often do group members use computer for groupís activities?

Use of common software:

- Frequency of the use of computers for Word processing - Purpose of the use of word processing (e.g., flyers, letters, type petitions...)
- Use of accounting system for group accounting/ treasury

Use of email:

- Does the group use email for daily routine tasks? (e.g., communication between group members about meetings) - Does the group use email to communicate with other groups? - Does the group use email to influence decision-making processes? (e.g., email the senator...)
- Does the group use email as an action-tool? (e.g., swamp an elected representativeís email)

Use of the Internet:

- Does the group have a web page?
- Does the group use the Internet to share information with other groups or individuals outside the group ? (e.g., through the web page, through discussion groups)
- Does the group use the Internet to get information about the issue it deals with? (to document the issue)
- Does the group use the Internet to get information about potential resources? (grants, funding)
- What are the resources that the group accessed through the Internet? Data provided by local/ State/ federal government, Information provided by other groups, information provided in the media, grants provided by local/ State/ federal government, support and strategy ideas provided by other groups etc...

Actions with and without IT:

- Use of the phone for actions (calling elected official) - Use of the mail for action (sending letters, postcards to elected officials)
- Use of civil-rights type action (marches, civil disobedience, rallies...)

Uses of IT:

- For publicity
- For media outreach
- In networking efforts (horizontal networking with other groups in the same situation, vertical networking with regional or national groups)

- To gather support for the group
- To keep other groups and individuals informed. - To get grants or support from foundations and government programs

Perceptions of how IT affects effectiveness:

- What are the most effective actions the group has undertaken? Did they involve use of IT? How?
- How does group use IT to be more effective? - Has it made a difference?
- What are the groupís plans in the future in terms of use of IT?

VI. Wrapping up

With all the limitations of a first take, there is plenty of room to discuss and revise all this, but I think this will make this potential research project more concrete to all of us.

VII. References

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GIS Technology: new threat to privacy, new promises for citizen empowerment. *

Pedro Ferraz de Abreu

Massachusetts Institute of Technology
Department of Urban Studies and Planning

pfa@mit.edu

Abstract

When Geographic Information Systems (GIS) emerged, some authors have argued that the privacy issues raised by the advent of the GIS technologies are essentially the same as those raised by electronic databases of personal information. This perception is not hard to understand, considering that most of the issues raised by the advent of electronic databases are still currently challenging us, and have yet to find an adequate response within a legal and institutional framework inherited from an Era when paper based records and transactions were the (only) norm. In my view, these authors fail to realize that the extended capability of the GIS raises some new issues, and brings others to a new depth. What privacy issues are specific to GIS ? Can GIS endanger or instead help to protect and enhance privacy rights? How? The concept of privacy rights is cultural dependent, and it is reflected in the differences in legislation from country to country. What are the main trends? How does it affect the impact of GIS in privacy?

The context

Even authors, like Bishop Dansby, that admit a difference, still minimize the special role that GIS may play in issues like privacy and others: "*it is more appropriate to address all information technologies together, since GIS is only a subset of information that can impact privacy*" [Dansby 91]. Since any GIS

* Submitted in 1996. First presented at GE, MIT-DUSP, 1993

contains one form or another of an electronic database, it is only natural that they share privacy problematic; but, In my view, these authors[1] fail to realize that the extended capability of the GIS raises some new issues, and brings others to a new depth.

It is important to begin by clarifying what do we call a GIS, and what do we understand as a privacy problem. The hidden assumption that we are all talking about the same thing, or that the differences between definitions are irrelevant to the point in question, is probably one of the reasons of existence of these contraditory views.

1. The definition of a GIS; **2**. The concept of privacy; **3**. Tradeoffs privacy vs. free/easy access to electronic data; **4**. Tradeoffs privacy vs. free/easy access to GIS-based data; **5**. Cultural differences towards privacy.

1. The definition of a GIS .

Dana Tomlin [Tomlin 90] views GIS as a facility for preparing, presenting, and interpreting facts that pertain to the surface of the earth. Beng Chin Ooi [Ooi 90] defines GIS as database systems that allow the manipulation, storage, retrieval, and analysis of geographic data and the display of data in the form of maps. For Lyna Wiggins and Steven French [Wiggins, French 91], GIS combines the database management system's power to store, retrieve and analyze information with the ability to produce and manipulate the graphic elements of a map.

Laserna, Landis and others [Laserna, Landis 89] have identified five basic analytical functions that should be supported by a GIS package: forward data query, backward data query, polygon overlay, point-in-polygon overlay, and

[1] This article relies on extensive citations of many key authors, specially in domains like legal frameworks. Despite my critical views on some of these articles, they must be credited as an important contribute to this paper, besides the standard acknowledgment in the references section.

buffering. On the other hand, Les Worral [Worral 91] complains that currently GIS only provide some geometric tools for spatial analysis, compared to its full potential.

For all the different focus, these and other authors agree on the following: 1) GIS have some form of DBMS (database management system) built-in; 2) GIS handle cartographic data; 3) GIS have the capability to link spatial with aspatial data; 4) GIS have capability beyond DBMS to analyse spatial data and spatial relationships.

It is this extra capability of GIS to answer from the basic questions "Where is...", "What is at" [Dueker 88] to more sophisticated series of spatial manipulations that generate new information [Cowen 87], that is at the source of the new privacy issues raised by GIS. The most important of these is the new capability of GIS to provide information on the physical location of objects and individuals, and cross-reference / match (by means of this now known location), with a wealth of other information previously associated only with the location (or neighborhood), and not with the individual or object, where before (without GIS) this localization and cross-georeferencing was either impossible or too cumbersome or expensive to be practiced. This undoubtly has created a new perceived threat of invasion of privacy by computers.

It may be argued that one could obtain similar results through good use of DBMS data manipulation languages. On one hand, linking tabular data to cartographic data, or even to images (like remote sensing grid data in the case of raster GIS), is no trivial task and demands special handling of the storage, retrieval and manipulation. On the other hand, extending DBMS with routines in order to handle typical GIS queries, like the classes of queries suggested by Burrough [Burrough 86], "where is A in relation to place B?", "what objects are next to objects having certain combinations of attributes?", "what is the result

of intersecting different layers of polygons representing different attributes?", etc., is in fact one form of producing GIS software. In other words, if we try to extend more and more some DBMS software to handle what a GIS handles, in the end we have a GIS software, not anymore a plain DBMS. This is for example the approach taken by those who work on special extensions of structured query languages (SQL) to handle spatial relationships (e.g. adjacency), like GeoQL [Sacks-Davis 87].

There is no doubt in the minds of many authors that "*GIS is different from conventional DBMS in many ways*" which imply special programming [Ooi 90] [Davis, Palat 85]: the data types consist of complex objects, like lines and regions; spatial orderings of spatial objects are harder to define; the entities relationship (representation with Chen's entity-relationship model) is more complex in the sense that it must be computed or inferred. The differences are so extensive that in fact many GIS came to exist not as extensions of DBMS, but as extensions of image-processing programs, better prepared to handle raster transformations, or CAD/CAM, an easier transition regarding vectorial representation of topologies.

D.J. Cowen best sumarizes these arguments, when he writes that "*a true GIS can be distinguished from other systems through its capacity to conduct spatial searches and overlays that actually generate new information*" [Cowen 87]. But this is not all. GIS have also the ability of visualizing spatial data [Marble 87], particularly maps.

Visualization is important, because our eyes (the only "peripherical" sensor organ that is actually part of the brain) enable our brain to perform spatial analysis on its own with image-based data representation formats [Fischler 87]; a much harder or even impossible task with other data representations, for instance tabular files. By facilitating map transformations, GIS multiplies

the power of a map representation by several orders of magnitude. As H. Archer said, "once the map is in the computer, you can do an awful lot more than just plot it out again" [Archer 88].

2. The concept of privacy.

In the USA, the constitutional right to privacy is, as Justice Brandeis once said, *"the right to be left alone - the most comprehensive of rights and the right most valued by civilized men"*. However, the right to privacy is not explicitly granted by the US Constitution, and it is the interpretation of the Supreme Court that has granted this right based sometimes on the First Amendment or the Fifht Amendment (sometimes the Fourteen), but usually rooted in the Fourth Amendment of *"protection of persons, places, papers, and effects against unreasonable searches and seizures".*

So far, this seems to be relatively independent of technological issues. But in 1967, the US Supreme Court (*apropos* ruling a warrentless wiretapping as unconstitutional, Katz versus United States) while holding that the Fourth Amendment protects people, not places, set forth a standard for determining constitutionally protected *"zones of privacy"* [Berman 89]: whether the expectation of privacy in the area to be searched outweights the government's interest in searching that area. As several scholars pointed out [Marx 86, 90], [Berman 89], the problem with the *Katz* formulation is that its related standard - a "reasonable expectation of privacy" - creates a technologically dependent standard of privacy. Berman points that the Court in later cases "*often determined that an individual's privacy had not been violated by certain intrusions because society's 'expectation of privacy' had been persistently lowered by the circunstances of modern existence*" [Berman 89].

It follows that technological advances in gathering and processing

information, as an obvious "circunstance of modern existence", have in fact the consequence of lowering the court's standard of "reasonable expectation of privacy", as indeed it happened.

Because GIS extended the already impressive capabilities of electronic databases, the erosion of court protection over individual privacy rights goes several steps further. Under this standard, there is the risk that individuals fighting data processing initiatives that will potentially identify their address and relate it with potentially sensitive private information -- such as a economic profile (e.g. wealthy), a demographic profile (e.g. senior citizen, retired), a gender profile (e.g. female), a seazonal profile (e.g. months of less consuption of utilities, reflecting period of absentia), etc. -- may not object anymore on the grounds of invasion of privacy, since the recent proliferation of GIS tools and geographic data in private and public hands cannot give them anymore a "reasonable expectation of privacy".

Finally, this court privacy standard is further downgraded because GIS technologies brought with them the proliferation of new data. Not only old data becomes a new threat to privacy (because of the new ease to link several pieces of it, pieces that by themselves were harmless), but also new types of data are now colected, particularly geographic related data, because GIS provides a new convenient and (relatively) inexpensive tool to make good use of it. Furthermore, the role of GIS in coordinating and integrating existing data bases is increasing dramatically [Challender, North 91]; by providing a more powerful and efficient front-end to huge corporate databases, GIS is acting as an acelerator of the integration and cross-referencing of a variety of data sources.

3. Tradeoffs privacy vs. free/easy access to electronic data.

Despite these real threats to privacy, it would be a mistake to adopt a plain reactionary view and a strategy of systematic censorship, control and limitation on data gathering and processing. On one hand, it would be hard (and expensive) to achieve and enforce such strategy, and on the other hand it would banish many useful applications of the new technologies. As it often happens, the technology not only raises problems, it also brings the means to tackle them successfully. In this case, a clever use of the potential of information technologies and easy access to electronic data can act as an instrument of citizen control (or accountability checking) over government and corporation activities, verify the content of the information circulating that might affect individual lifes, thus directly or indirectly strengthening privacy.

US Federal law reflect this effort to balance the concern for privacy (Privacy Protection Act) with the need to allow public access to information (Freedom of Information Act). Because of several loopholes and gaps in this legislation (the federal act refers primary to actions at federal level and tends to exclude state, local, and private sector activities), several states introduced legislation of their own, tilting the balance towards one end or the other.

In Delaware, for instance, the law explicitly states that "*it is vital in a democratic society that public business be performed in an open and public manner so that our citizens shall have the opportunity to observe the performance of public officials and to monitor the decisions that are made by such officials in formulating and executing public policy, and further, it is vital that citizens have easy access to public records in order that the society remain free and democratic. Towards these ends, and to further the accountability of government to the citizens of this state, this chapter is adopted and shall be construed*" [Delaware Code Annotated Title 29 & 10001]. Several authors [Dangermond 88] [Marx 90] defend the importance of public access to electronic data to hunt a wide variety of illegalities, threats, hazards, patterns

of environment decay, inconsistencies of government, etc.

So the tradeoff here is between limiting and controling general access to information to protect privacy, and allowing the very same access, to further the cause of democratic accountability.

Another example of tradeoff is the compilation of databases of mailing lists by commercial entities, from data gathered through credit card buys, etc., and then sold in the market to anyone interested. On one hand, it allows citizens the convenience of mail shopping, and to obtain special dedicated services and information, making possible and efficient a market responding to variety and specific wishes (tailored market), as opposed to the times of mass production of T models. But on the other hand it also generates indiscriminated pressure to consume (e.g. targeting children), piles of unwanted junk mail, and the nuisance and sheer harassment of telemarketing, particularly by automated recordings run by computer programs. A real life example: during my Ph.D. General Examination, I was twice interrupted by the telephone ring, only to hear a recording asking me marketing questions. I can tell by direct experience how disruptive and annoying it is to be the target of this practice. According to Gary Marx [Marx 90], the latest tendency is to interpret the law as only obligating the data collector entity to inform the citizen if information like their address and telephone are going to be used for any purpose different of what is expressed.

Another example of tradeoff is the increasing centralization and generalization of use of individual identifiers, such as the social security number (SSN). The problem of a unique, universal, identifier was raised to new heights with the advent of DBMS technology, because it allowed quick inexpensive computer matching of multiple files indexed by such unique identifier. In several countries the legislative bodies passed laws explicitly

banning a universal identifier, on the grounds of endangering citizen privacy and facilitating all sorts of abuse. In the USA, by law, the only agencies that can demand a SSN are the social Security Administration, the IRS, employers, banks and the military. Other agencies such as credit bureaus, insurance companies, police departments and hospitals have no legal authority to request it. However, the practice of asking for the SSN is widespread, and many people do not realize the implications of satisfying the request.

The advantages of a unique identifier are obvious, in terms of the added value for many pieces of information by virtue of the new cross-reference capability. One example is the use by IRS to detect tax fraud, which is in principle an activity of great interest for the whole society, and for low-income citizens in particular. But in general this is a one-sided advantage, since governments and corporations are more likely to profit from it than private citizens, and frequent cases of police abuse raise the specter of the Orwelian "big brother" society. Also organized crime finds such low-integrity schemes as a social security number a "*positive boon in its aims to legitimize false identities*" [Clarke 91].

The press is full of examples of citizens that were harassed by the IRS or their bosses by virtue of fraudulent use of their SSN by someone else. Some authors attribute the increasing abuse of SSN to two main factors: undocumented immigrants, and the business world's increasing use of the SSN as a universal ID [Berman 89] [Clarke 91].

In general, the Privacy Act limits the use of the SSN for identification purposes but now courts are tilting towards other end, after enacting the Tax Reform Act and the Income Eligibility Verification System, with explicit recourse to computer matching through the use of SSN. It is interesting that the "tilting" was so notorious, that it was later felt the need to introduce an

amendment to the Privacy Act, The Computer Matching and Privacy Protection Act (1988), in order to balance the evident consequences of the new computer technology.

Yet another interesting tradeoff regards the collection of credit information by private business, that is then sold to other business and institutions, with far reaching consequences for the individuals listed.

On one hand, it may be argued that credit information is crucial in a market economy, and therefore contributing for the good health of the economy. But on the other hand, the advantages for individual citizens are minimal compared to the advantages for business, and the risks and consequences of mistakes are in general far more devastating for individuals than for business.

To make things worse, the proliferation of these credit bureaus makes harder for citizens to check the contents of credit reports, and puts the burden (and respective transaction costs) unfairly on individuals. Gary Marx refers that as if it was not bad enough to take an individual's personal information (e.g. data on credit, employment, consumption, life style, age, marital status, address, telephone and social security number) without permission and sell it, several credit bureaus actually make money selling back to the individuals a copy of their own record. "*It's even worse, though, when this is done with legal immunity for the seller for any invasion of privacy, defamation of character or negligence the subject may suffer on account of a false credit report. Then to turn around and charge the subject a fee to see what is that the company is telling others is truly outrageous*" [Marx 89].

In 1970, the US Congress passed the Fair Credit Reporting Act, and later (1978) the Right to Financial Privacy Act. The act requires the agencies to allow consumers to review their own records and correct inaccurate information,

and prohibits credit bureaus to disclose records to anyone other than "authorized customers" [Berman 89].

In general, the law tries to achieve some balance between the right to access information, business and state interests, and privacy concerns. But the overall pattern is that the burden of protecting privacy is left to the initiative (and imagination) of the citizens. Also, although many of these laws explicitly recognize their applicability to computerized information, most were enacted prior to the recent revolution in information technologies and the new ability to manipulate information.

Following the above considerations regarding the mentioned tradeoffs, I would say that the law is more protective towards privacy (in descending order) on credit reporting, privacy protection on free access to information, mailing lists, and unique identifier.

The more burdensome (in terms of real enforcement) are, again in descending order, privacy protection on free access to information, credit reporting, unique identifier, and mailing lists. The reason why I consider the unique identifier tradeoff as the less protected, is because it is the issue more easily dependent from Federal policy and actions (in this case with a strong contradictory interest, tax control), since by its own nature it depends on the degree of centralization intended by a central power, with the means and resources to do it. Credit reporting is fairly well protected by law, in terms of providing the most clear framework (with less contradictions), but poorly enforced.

4. Tradeoffs privacy vs. free/easy access to GIS-based data.

Practically all the above tradeoffs apply to GIS based data, but in some

cases with a new twist.

For instance, regarding the Privacy Act and free access of information, the power of GIS to handle geographic data raises a new dimension of concern. During the multiple debates around this act and amendments, representative Frank Horton of NY refers explicitly to this concern: "*one of the most practical of our present safeguards of privacy is the fragmented nature of present information. It is scattered in little bits and pieces across the geography and years of our life. Retrieval is impractical and often impossible. A central data bank removes completely this safeguard*" (US Congress, 1966). The plan of a central data bank was then abandoned; but nowadays, with GIS technologies spreading fast, there is no need anymore for a "central data bank" to achieve the retrieval of these pieces "scattered across the geography", neither to link geography to pieces of information. Consequently, neither is the simple refusal of a central data bank enough protection regarding privacy.

In question is again the particular ability of GIS to locate physically individuals and objects, from apparently harmless information. For instance, S. Aronoff thinks that the ability to produce a comparative map of the reproduction of dogs in a certain area (with the apparently harmless objective of finding which neighborhoods have higher rates of incidents of dog bites) can contribute to lower real estate value, damage the image of these neighborhoods and indirectly the image of the real estate owners [Aronoff 89]. The same author also refers to the ability to visualize small areas with higher concentrations of young single females as a potential nuisance.

Naturally, the tradeoff is with the positive applications enabled by GIS: Valerie Aillaud cites the case of spatial queries leading to the determination of the areas with high percentage of apartment buildings built before 1948 in France (predicting the presence of lead), from geo-referencing different census

files and tax information [Aillaud 92]. Dangermond refers to a citizen group in the city of Los Angeles that sued the city for having its general plan inconsistent with the legal zoning maps. This was discovered by overlaying land use zoning maps on top of the general plan and finding parcels which were zoned residential, but which had plans for being commercial [Dangermond 88].

Conversely, GIS technology also facilitate new solutions for these contradictory interests, by the ease of aggregation operations, that allow for legal measures establishing levels of aggregation open to public access, diminishing consequently the threat of individual localization.

Another example of a different twist to an "old" issue, is the mailing lists' tradeoff: the added ability of linking address information to geographic coordinates and then proceed to other spatial analysis of the data available, increases several times the chances of becoming a special target of special interests or sellers, in this case door to door marketing efforts in certain areas, besides telemarketing. Gary Marx acknowledges this effect: "*Mass marketing is inefficient and economic viability requires the pinpoint or 'segmented' marketing that computer analysis now makes possible by using 'point of sale' information*" [Marx 90].

Again the issue is that geographic-based matching is much more efficient than cross-referencing flat files indexed by address, an address which rarely is found in any compatible format. With the advent of GIS, public files dedicated to this geo-referencing (from address to geographic coordinates and vice-versa) are being produced and updated, like the TIGER files covering all USA, and standardization of address representation is gaining ground.

Other facets of these tradeoffs enhanced by GIS are the matching of records on applications to new jobs, front-end audits , school records, etc. , with

respective legislation (such as the Family Educational Rights and Privacy Act), trying to balance the right to know with the right of privacy [Clarke 91].

Finally, it is interesting to refer to a future development that is very likely to reformulate a tradeoff so far not directly related to GIS: the caller-ID technology.

Currently, in areas where it is offered, caller-ID can reveal the caller's phone number without his/her knowledge or consent. In some states, the phone companies must offer the ability to individual subscribers to block this information in all or some of their calls - for a price. In some cases, like Boston, the phone companies just gave-up in all of offering the service, when faced with such demands (they are now implementing it, but only after failing the lobbying efforts, causing a delay of several years). In others, they are actively leading away subscribers to block information to all calls by default, on the grounds that it may undercut the ability of emergency services to locate them in time to save life or property (Again, I had direct experience of this practice). This half-truth is obviously motivated by the fear of mass blocking neutralizing effectively any appeal to subscribe to this service.

The caller-ID has some evident advantages, even in terms of privacy - for instance, in deterring harassment calls. On the other hand, it undermines an instrument of communication in many cases where anonymity is not only reasonable but desirable [Marx 90]; and again multiplies by several orders of magnitude the nuisances of telemarketing. But this is only an emerging technology. There is already some reverse directories being offered by a fee that allow to obtain directly a name and address from the telephone number captured by the caller-ID. In my opinion, it will be just a matter of time before the proliferation of GIS software dedicated to further use this information in order to produce geographic matching with other files, presumably in real-

time. Undoubtedly, the damage to privacy will be even deeper.

Following the above considerations regarding the mentioned tradeoffs, I would say that when considering the use of GIS, the need of more privacy protection is (in descending order) on privacy protection on free access to information, mailing lists, credit reporting, and unique identifier. The more burdensome (in terms of real enforcement) are, again in descending order, privacy protection on free access to information, credit reporting, unique identifier, and mailing lists.

Note that in my view, the protection against a unique identifier is of less and less relevance, given the multiple abilities (enhanced by GIS) of cross-referencing and identifying individuals and objects. In this regard, what gains importance is not so much the control of the information open to public access (harder and harder to enforce), but the real ability of citizens to check all the information about them (and correct, or request to eliminate) easily and without cost. The ranking also reflects my view that regulating mailing lists becomes a more serious problem with GIS then with plain DBMS. As for the level of costs and difficulties to enforce, my view is that they will change, but it is not a clear case if the changes will affect my previous ranking for non-GIS settings.

5. Cultural differences towards privacy.

The situations and attitudes in many countries are very different from the USA case. Unlike in the US, where most protections are relative to how data is treated once they are collected [Marx 90], many European countries attempt to regulate data collection and use. The overall contrast can be expressed (even at the risk of oversimplification) the following way: in the US, data collectors are given more or less free hand in gathering information ("do first

and ask later"), and then each time problems arise (or citizens are successful in raising political attention), the state (federal or local) will introduce some regulation. In most Europe, political tradition and ideology induces the state to formulate a web of regulations forcing data collectors to "ask first and do later", and then, when a problem arises (with evolving technologies, for instance), local institutions and business press for regulation reform (or de-regulation).

This different tradition reflects also upon the strategies and approaches to handle tradeoffs of privacy vs. right to access information. In USA, the tradition is clearly one of relying more on market forces to find the right balance - and it is up to citizens to mobilize and try to counteract the dominant tendencies, if they are displeased by them.

After all, given the free market, one can buy technologies to prevent privacy invasion; personal information becomes just a commodity, to be sold like any other [Marx 90].

However, this strategy became more complex with the gradual transformation of the economy into an information economy, and the increasing economic value of public and private information. On one hand, the Free Information Act mandates public services to produce and maintain information, which is an increasingly costly operation, and then give it for free or only a nominal fee. On the other hand, some of this information is so valuable that private business can now reap huge profits just by repackaging the very same information obtained through this right, and resell it (some times back to public agencies!), even with little added value. Roitman comments on how the law (except in rare cases) fails to recognize the commercial value associated with computerized data bases and sophisticated information systems [Roitman 88].

The result is a mix of copyrights mess (further complicated by the need to separate software and hardware media from the actual "content" of information), with the pervasive questioning of old untouchable assumptions like the sovereign immunity.

The doctrine of sovereign immunity is an ancient one dating to the earliest days of the British monarchy. Sovereign immunity meant that the king as the embodiment of the state, could do no wrong, and could not be held accountable for his actions either good or bad. In current USA, it came to mean that the state could not be sued without its consent. Local governments can be sued without consent, but liability is restricted.

The problem arises when the public sector tries to introduce the most common-sense solution: to update charged fees for information, in order to reflect not only media costs but also capital investments and maintenance costs. Puissegur, among others, asks whether or not charging for public information will eradicate the government's defense of sovereign immunity for liability for errors it commits which harm a citizen [Puissegur 88].

European countries have their own headaches with the new emerging technologies. Taking the example of France, the strategy being followed involves the creation of special state organisms and special detailed regulations. The CNIL (Commission Nationale de l'Informatique et des Libertes), a super-committee within the Justice Ministry, supposedly independent but with members designated from the Parliament and other state organisms, is a mix of a supreme court specialized in information and privacy, and an executive body with vast powers regarding the authorization or destruction of information systems [Delahaye 87]. So far, its existence, composition and powers are generally accepted by the public.

As for regulatory strategy, it is directed towards avoiding the constitution of files identifying individuals and their address ("informations nominatives"), or the characterization of populations at fine levels of disaggregation, unless by the respective state organisms relevant to the information, and only used for its specific purpose. It has an impressive level of detail. For instance, the cross-reference of more than 4 variables is explicitly forbidden; if one of the variables cross-referenced has more than 10 modalities, the system cannot cross-reference more than 3 variables, etc., etc. [Aillaud 92].

Naturally, problems arise from this rigid framework. Recently, local governments (which in France have a certain autonomy in terms of local taxation and revenue), asked the CNIL authorization to adopt GIS software that would help them increase local tax revenues, both by fraud detection and better property evaluation. Because it involved cross-referencing several distinct files "property" of different national ministries, and because it involved spatial analysis at a disagreggated level allowing the identification of individuals and objects, the CNIL refused. Instead, it proposed a modified system allowing a similar analysis but at a much more aggregated level - totally useless for the local governments. Consequently, a fierce debate is in course, regarding local vs. national prerogatives, autonomous use of GIS software, etc.

It is an interesting contrast to observe that the debate in the US over a similar issue - use of GIS for local taxation purposes - is conducted over a totally different ground. For instance, Earl Raymond's article "Old Tax Maps: Are they Suitable for GIS?" [Raymond 90], reflects the dominant concerns of accuracy and detail of information.

The question is not whether using GIS to cross-reference tax related information will harm privacy, and how to get permission (!) to do it, but

whether the old maps are good enough for GIS, and whether more and better information can be obtained by the use of other modern technologies, like satellite-based Global Positioning Systems. If and when privacy is damaged by this dynamic, well, it will be up to the good old citizens of New England to first realize that damage was done, second to think of how to counteract, and third to engage in a campaign towards that end.

The new technologies pose therefore another challenge, and offer another promise: a tradeoff between one and the other extreme strategies.

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