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Designing Computer-based Writing Tools for Community Action

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BY DAVID FLEMING

Most word and information processing systems are designed for either large institutions or individual users. Institutions, of course, have benefitted greatly from emerging technologies. These users cover the spectrum of our economic, political, social, and cultural life: large corporations, banks, insurance companies, government agencies, schools, universities, armed services, hospitals, the media. Individual users have been more recent beneficiaries of technological advances, and the computer has begun to make inroads into the way people interact with one another, manage their affairs, and entertain themselves.

A third category of users has taken less advantage of emerging technologies. Here I include small, independent groups and organizations, voluntary associations of people committed to common political, educational, religious, social, cultural, or charitable goals. These are the intermediate bodies that so impressed Alexis de Tocqueville when he visited the United States 150 years ago, the organizations that worked to mediate between individual ambition and selfishness on the one hand and the encroaching power of the state and market on the other.[1] A more recent observer has defined "intermediate organizations" as institutions "which are not part of the state nor engaged in earning profits for owners." In both the 19th and 20th century perspectives, such organizations play an important role in increasing citizen participation in the public life of a democracy.

Because the definition of an "intermediate organization" provided above would include many non-state, non-profit organizations that, because of their size and power, act very much like government or corporate entities, I would like to focus my discussion here on small, independent, political and educational organizations involved in community action, service, and research. Such organizations offer possibilities for social change and democratic participation far beyond what their actual size or budget would indicate. It is in the context of these organizations that I would like to discuss some of the intersections of computer technology and written language.

I intend to argue, first, that community-based intermediate organizations represent potential for a revitalization of American democracy and public life; second, that such hopes are pinned, in our society, on the ability of these organizations to create and sustain a public language and use emerging information technologies to process,

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produce, and disseminate effective discourse; and third, that technological solutions to the problems of non-profit community action organizations should be informed by careful consideration of the social and cognitive aspects of computerization. Finally, I will attempt to move beyond theory and discuss potential applications of such technology at an independent, non-profit, non-partisan organization called the Youth Policy Institute.

1. Community Action: Implications for Democracy

A. Ware writes that intermediate organizations play a crucial role in advancing democracy. They can, he argues:

- serve as a countervailing power to the state and/or the market—trade unions, for example, are formed to counteract business interests;
- serve as arenas of participation—intermediate organizations provide for mass participation in policy making and give training in political skills;
- provide goods not supplied or not supplied effectively by the state or market—intermediate organizations are considered more appropriate suppliers of research, art, and religion than the state or market;
- facilitate social and political integration—intermediate organizations act as a kind of "social glue," e.g., neighborhood "block" organizations;
- facilitate diversity of opinion—intermediate organizations encourage individuality and aid in opinion and value formation;
- and mobilize interests in a society—intermediate organizations provide citizens with a forum for articulating their demands, e.g., civil rights groups.

This view of the democratic role of intermediate organizations was held by reformers in the Kennedy and Johnson administrations who, in the early 1960s, undertook what is often considered the most radical democratization project ever undertaken by the United States government: the Community Action Program of the 1964 Economic Opportunity Act. The CAP set out to create independent, non-governmental organizations that would foster local community problem-solving efforts. In his history of liberalism in the 1960s, A.J. Matusow writes that, by the time federal, state and local politicians realized the radical nature of the program, it had already passed through Congress and been signed by the president. Though powerful forces would eventually enervate the program, it still serves as a model for the kind of community action that will be discussed in this paper. As such, I would like to examine the program in some detail.

What the Community Action Program offered, first and foremost, was an experiment in genuine democracy. The program itself was modeled on projects undertaken through the 1962 Juvenile Delinquency and Youth Offenses Control Act, legislation drafted under Robert Kennedy at the Department of Justice. Influenced by the Chicago School of Sociology, officials at Justice had begun to see problems among inner-city youth less as psychiatric disorders (the prevailing view) than as the results of blocked opportunity. The solution to those problems lay in helping the poor open up new opportunities for their young people—in other words, helping them to radically reform the political, economic, and social institutions surrounding them. And institutional reform through "empowerment" of the poor was what program planners at Justice began to propose. According to one, poor people had to learn "how to speak, how to use the law, how to approach City Hall"—in short, they needed "community competence."[3]

By late 1963, the men at Justice began to pitch their juvenile delinquency projects as the basis for the administration's incipient anti-poverty effort. And in early 1964 they got their wish. Lyndon Johnson declared "war on poverty" and based his Economic Opportunity Act, in part, on the community action program developed at the Department of Justice. The centerpiece of that program was local participation in the planning and implementation of anti-poverty initiatives. According to the bill, a community action program is one "developed, conducted, and administered with maximum feasible participation of

residents."[4] Few politicians, either at the federal or local level, realized what was truly meant by those words. Robert Kennedy tried to tell them:

> The institutions which affect the poor—education, welfare, recreation, business, labor—are huge, complex structures, operating far outside their control. They plan programs for the poor, not with them. Part of the sense of helplessness and futility comes from the feeling of powerlessness to affect the operation of these organizations. The community action program must basically change these organizations by building into the program real representation for the poor. This bill calls for 'maximum feasible participation of residents.' This means the involvement of the poor in planning and implementing programs; giving them a real voice in their institutions.[5]

Congress appropriated $300 million for community action, and by 1965, 1,000 local community action agencies were in existence. Almost immediately, though, the program met challenges, mostly from local government officials who didn't like the fact that federal money was slipping through their fingers and into the hands of poor people, activists, and organizers. The *Community Action Program Guide* and *Community Action Workbook*, published by the CAP in 1965, made no effort to hide community action's reformist bent. The *Workbook* encouraged local organizations to help the poor form "autonomous and self-managed organizations which are competent to exert political influence on behalf of their own self-interest."[6] The *Workbook* even recommended protest demonstrations as a way to make "politically effective sectors of society" responsive to poor people.

By the end of that year, however, the Community Action Program was headed into trouble, mostly as a result of clashes with local government officials. Some accused the agencies of endorsing class struggle; and many local programs received too much money too fast with too little planning. By 1967, the program was all but dead. In its earlier days, however, it spawned real reform efforts in American cities, gave birth to genuinely autonomous grassroots democratic associations, helped conceive several important federal projects (like VISTA, the Comprehensive Community Health Centers program, Upward Bound, Head Start, and Legal Services), and mobilized the poor for political action.

For our purposes here, however, the community action projects are best seen as models of the kind of democratizing, citizen-led organizations envisioned by social theorists like Ware. They attempted to counteract state and corporate power, provide services, facilitate diversity of opinion, mobilize otherwise inarticulate people, and provide for genuine democratic participation in self-government.

What does all this have to do with information technologies? By bringing community action into the 1990s, I believe that will become clear.

2. The Role of Emerging Information Technologies

In discussing what has become known as "the information gap," R. Rubinyi writes that computer technology differentially benefits the resource-rich (large corporations and the government) and the resource-poor (small businesses and non-profits).[7] And because public bureaucracies, transnational corporations, the military, and other powerful institutions benefit disproportionately from the technology, those in control only further solidify their control; they experience increased power, increased centralization, and increased wealth. There are two responses to this situation. One is to see computers as simply another tool for hegemonic control. In this view, technology will always be co-opted by those who have the power to design, purchase, and distribute it. The other view is to acknowledge current trends toward an information gap but to see those trends as reversible. In this view, there are potential applications of the technology that could actually decentralize and destabilize political, economic, and social control in society and redistribute power more equitably. I would like to briefly delineate each of these positions and then

propose a third which sees democratic possibilities in certain uses of emerging information technologies but tempers enthusiasm for the technology with a sense of the difficulties in realizing these possibilities.

2.1 Technology Increases Centralized Control

In an influential article, Sterling argues that computerization almost always leads to increased centralization of power. Computerized packages (which he defines broadly as hardware, software, the skilled individuals and organizational units who supply and maintain the package, and the beliefs held by individuals who use and control the technology) are used by highly centralized enterprises to collect the detailed data needed not only for planning but for accountability. Even in enterprises with less central control, computers promote centralization by "coercing" a consensus among higher- and lower-level management, who influence the kinds and amount of data processed in order to consolidate and further their own power and win favor with those higher up. In addition, computers strengthen "reinforcement" politics in that technology is usually chosen by management, those choices being tailored to reinforce office politics. Computerization, Sterling continues, also limits participation and diminishes the ability of citizens to contribute to a reasoned, non-coerced consensus. One example given is that of the Reagan victory in 1984. Sterling claims that the use of computers enabled the Republican party to "manage" a diverse coalition of single-issue groups. Because of its capability to tailor messages to single mailing-lists, the party was able to create the illusion of a wide-based consensus. Class and interest lines, Sterling argues, were blurred, allowing a small group of politicians with control over the technology to form a strong coalition of what were, in reality, opposing forces. Finally, Sterling offers evidence that computerization makes it easier and cheaper for centralized bureaucracies to monitor citizens and workers, an occurrence surely antithetical to democratic development.

Sterling, of course, is not alone in his concern for the power of computers to facilitate anti-democratic movements. Joseph Weizenbaum argued 15 years ago that computers could be an instrument for the annihilation of memory and the destruction of history. In this view, those in control of technology—Weizenbaum's hypothetical example is an on-line *New York Times*—will legitimate only those data that are in one standard format. Sources of "illegitimate" data, then, would be shut out of knowledge development, preservation, and dissemination. Similarly, those in control can use the technology to exclude unpopular or radical opinions. Control over statistics is a case in point.

A more practical consideration in the "democratization" of technology is, simply, cost. Computer technology, despite recent price drops, is still inaccessible for the vast majority of citizens. A 1989 survey of home computer penetration in the English Midlands revealed that households in lower-income groups were less likely to have a computer, more likely to have a low-powered unsophisticated model, less likely to possess additional hardware like modems and printers, and less likely to have access to the kinds of advice and support networks enjoyed by more affluent users, a situation adversely affecting their commitment and skill development.[8] Similarly, J. Abramson, F.C. Arterton, and G.R. Orren have argued that, unless public financing is made available to support accessible and comprehensive data services, the information gap between rich and poor will continue to grow.[9] The cycle, then, seems to be complete: those with access to the technology further their control, not only over social, political, economic, and cultural forces, but also over the very development of the technology which facilitates their control.

2.2 Technology Is a Tool For Empowerment

All this has not deterred people from seeing in technology the very means of reversing this situation. Such theorists are part of a group that C. Dunlop and R. Kling have called the "techno-

logical utopians." They tend to see in technology the potential for radical transformations of society, not a further entrenchment of the status quo. Computerization, then, becomes for visionaries "the centerpiece of seductive dreams," users believing that "vast possibilities for information handling and 'enhanced intelligence' are readily accessible at relatively low cost and with little effort."[10]

Computer pioneer Douglas Engelbart is one of Dunlop and Kling's examples of such a utopian. About the computer's "intellectual potential," Engelbart wrote:

> By 'augmenting human intellect' we mean increasing the capability of a man to approach a complex problem situation, gain comprehension to suit his particular needs, and to derive solutions to his problem.[11]

A more recent vision would be that of Apple chairman John Sculley:

> We are on the verge of creating new tools which, like the press, will empower individuals, unlock worlds of knowledge, and forge a new community of ideas.[12]

These visions of computerization's capacity to transform human thinking have not been lost on those in the non-profit world, who see in the technology not only a tool to augment human intellect but a way to increase the social, economic, and political power of groups once oppressed by traditional holders of power. As Rubinyi notes, these visionaries see computers as a "great equalizing force."[13] They envision innovative community applications for technology, including on-line voting and databases with information on neighborhood policy issues, community events, and public hearings.[14]

J.D.H. Downing is one of those who believes that computers can play an integral role in democratic communication. He claims that those who see the technology as increasingly under centralized control have ignored several current developments: the plummeting costs of personal computers and modems, the wider availability of good software training, the development of such communication tools as desktop publishing, and the notion that, though still too costly for most people, computers can have great impact when "collectively" owned.[15] The last idea is particularly relevant for community organizers; it is also an idea ignored in the English Midlands study cited above, which focused only on individual owners of personal computers.

Technological utopianism reflects a "democratic" theory of communication.[16] With roots in ancient Greece, Enlightenment philosophy, capitalism, and the modern welfare state, this view holds that citizenship "rights" are directly tied to communication "rights."

> Access to adequate information and to a diversity of debate and representation is a basic precondition for the effective functioning of a democratic polity and for the full exercise of citizenship rights.[17]

What specific communication access rights should citizens enjoy in a democracy? According to Murdock and Golding, they are three:

- access to information, advice and analysis that enables citizens "to know their rights and how to pursue them effectively";
- access to the broadest possible range of information, interpretation, and debate on political choices, and the ability to "use communications facilities to register criticism, mobilize opposition, and propose alternatives"; and
- access to a range of "representations" within which all citizens can recognize themselves.[18]

Many community activists see in computer technology a means to provide this wide and full access to information and debate and, through that, to greater participation by citizens in self-government.

2.3 Technology Can Be Adapted to Multiple Uses

We have reviewed, then, two perspectives on technology and democracy. One, perhaps best exemplified by Sterling, argues that information technologies will only increase centralized control in our society. The other, perhaps best exemplified by Downing and Murdock and Golding, argues that the technology can be used instead to

decentralize institutional control and empower the powerless. A better perspective, I believe, is one that takes both these views into account, seeing the machine less as villain or hero and more as an instrument able to be adapted to multiple uses. Some of those uses may only increase the information gap (a problem, by the way, that predates the computer era). Other uses may offer those without economic, social, or political power an accessible medium for expressing, developing, and disseminating their ideas. Though the computer applications explored in this paper unquestionably fall in the "empowerment" camp, they are proposed with a *caveat*: successful implementation of such tools will face real difficulties and meet significant challenges.

3. Computer-based Writing Tools: Some Social and Cognitive Considerations

In the preceding sections, I have attempted to establish two main points: that community action organizations can play a crucial role in revitalizing and advancing democracy; and that one way they can do that is through the development of creative and powerful information technologies. I would now like to discuss some social and cognitive features of an ideal computing environment for community organizations.

L. Flower and A. Dyson and S. Freedman have argued that a useful way to examine language and literacy "events" is from a perspective that attends to *both* social and cognitive activities. Research on computer writing systems cannot exclude itself from such a multi-layered theoretical perspective. To be effective, any writing "system," should be undertaken only after carefully considering both the context within which the writers compose and the cognitive strategies they will be called upon to use. Simply hooking up two computers and telling the users that they can now "talk" to one another, or installing an "outliner" and telling writers that they can now "plan" their documents better, will not by themselves produce more powerful written communication. What is needed in the design of computer writing tools, particularly in an area as "wide open" as community action, is a powerful theory to inform one's design, and carefully-considered applications that reflect those theoretical imperatives.

3.1 A Social Theory of Computer-based Writing Tools

The primary social application of computing for community action is networking. By "networking," I mean any technology that allows for information sharing among users. A truly effective computer-based writing environment must provide for significant user interaction, both "inter-agency" and "intra-agency."

Rubinyi writes that community organizations generally computerize for two reasons: to increase "internal efficiency" (word processing, file maintenance, accounting) and to improve communication with like-minded organizations (file sharing, electronic mail and conferencing). Though organizations are usually successful with the first application, the second has been more problematic. Networking, Rubinyi writes, is much more complex, more innovative, and more difficult to coordinate than "internal" applications of computing. And even when a networking system is "operational," it often only enhances existing interaction, failing to create new ones.[19]

Rubinyi reports findings from a study of 72 small, community-oriented nonprofit organizations which, through grants from Apple Computer Corporation, instituted networking systems. Over half of the organizations served poor populations, and nearly all were "resource-poor," with an average of seven paid workers and an annual budget of $200,000. With the project, Apple envisioned networked organizations "that would share information through collectively built databases of various community resource materials and offer services such as electronic mail, computer conferences, community bulletin boards, etc."[20]

The organizations developed office automation tasks rapidly, but many found it difficult to

implement the networking projects. The telephone was still the major means for inter-group contact. Rubinyi reports that, even after two years, "computer use for networking" was less than anticipated. There was only infrequent sharing of files and original software and little communication besides electronic mail, although a substantial number did create joint databases with other organizations. In all, Rubinyi reports that there was "no immediate impact on most groups' ability to form working coalitions with other groups." The "information gap" noted earlier between resource-rich and resource-poor institutions was present even in this relatively homogeneous set. In other words, the groups most successful at networking were those with larger staff, larger budget, and an urban setting.

What are the lessons of the study? Rubinyi does not give up on networking; in fact he continues to see important long-term benefits from computer cooperation among community organizations. But he posits four reasons why such cooperation may be slow in developing. Organizations experience difficulties coordinating efforts with other groups, especially when there are different levels of commitment to networking; they suffer from lack of time (office automation is almost always the top priority); there are numerous technical problems, caused mostly by a lack of adequate training; and there are budget constraints. But Rubinyi neglects what may be the most significant barrier to community groups' networking success: organizations are simply unaware of potential computer applications for communication and information sharing. Two such uses are shared databases and collaborative writing. Specific examples of these two applications follow.

3.1.1. Cooperative Databases

The following three prototypes could serve as models for community organizations interested in the creation of shared, cooperative databases.

Public Data Access. PDA was formed in 1986 to "market" publicly-available government information cheaply. It had two initial foci: to trace correlations between toxic dumps and minority communities and to identify financial contributors to Congress. Using "raw" computer tapes from such government agencies as the Environmental Protection Agency, Federal Elections Commission, and the National Institute of Health, PDA has made available more than one million pages of files. Though centrally housed in New York City, the organization makes its database available to subscribers for very low fees. The project was instrumental, for example, in helping a black community in rural North Carolina campaign against location of a toxic waste dump. Local groups can also "tap into" PDA files for a complete breakdown by congressional district of all financial contributions to political parties, candidates and political action committees.

For Downing, PDA and networks like it (he also discusses PeaceNet and EcoNet) offer a new model of democratic communication, one that is simultaneously local in control (with "multiple centers of production") and national, even international, in scope. They represent, he says, "an alternative public realm, a space in which political movements can exchange and refine new perspectives and information in the light of practical projects."[21]

The Worm Community. Those in the scientific community have also developed electronic networking systems with features relevant to the non-profit sector. P.J. Denning has argued that the "science knowledge base" has become so large that it has exceeded anyone's ability to use it. "The body of scientific information is so far beyond the grasp of individuals and small groups that it is becoming ever more fragmented and disorganized."[22] Computers can help manage that information in two ways, Denning argues: by more expertly processing pre-packaged knowledge and by tapping into the "expertise that lives in people." For this latter goal, computer networks can support scientific conversations and collaboration, augmenting communication and sharing and thereby better enabling scientists to deal with information overload.

A prototype of such a community is already being developed by the Community Systems project at the University of Arizona.[23] Informally called "the worm community," the project is an attempt at building a science information system for scholars in one research community, in this case those engaged in the study of the nematode *C. elegans*. The network consists of a "complete" community library along with various ways for members to search, browse, share, and manipulate data in the system. Like all computer networks, it differs from a regular "paper" library in its interactive capability. The system not only facilitates the storage and retrieval of "published" data, it enhances community activity in more informal "information spaces." Members are able to access publications, to share intermediate research results, and to post messages. In addition, the data can be operated on with various degrees of manipulation. Members can take stored data and group it in new ways, browse selected units, analyze and filter data, and share syntheses and contributions with other members at various "levels of privacy release."

B.R. Schatz calls the project a "test of a nationwide electronic scientific community."[24] But here is where these intriguing ideas begin to show some of their limitations. Computer network systems may begin to outlive their usefulness when they move beyond their immediate constituencies. Schatz claims that, in controlling editorial release for the worm community, "appropriate editors will emerge who can provide appropriate levels of quality control for each data source."[25]

The National Policy Information Network. The NPIN is a network proposed by the Youth Policy Institute. According to YPI's proposal, there is a gap in this country between information about social, political, and economic problems and the practitioners and citizens who attempt to address these problems. According to YPI, we suffer not from a lack of proposed solutions, or even from a dearth of effective programs that implement those solutions, but from a failure to collect, organize, and disseminate information about solutions in such a way that our debates about policy are well informed and efforts to solve problems less forgetful. YPI has proposed an electronic network that would link foundations, university scholars, and the nation's libraries with citizens and practitioners. The goal of the network is three-fold: "1) To create a collective memory of our policy successes and failures. 2) To allow communities to work collaboratively in the battle against society's ills. 3) To provide every citizen and practitioner with access to a database of policy history and proposed solutions."

Students and researchers at universities around the country would collect "proposed solutions and records of success and failure" from community organizations, foundations, program leaders, government agencies, and activists. That knowledge, then, would be disseminated throughout the network by a computer system with terminals located in public libraries. Organizations and citizens (including school systems, employment agencies, government offices, community groups, and non-profit organizations) would have a central base of information available to them. The Institute believes that "Through an understanding of what has worked and what has not, we can avoid the replication of unsuccessful efforts and insist on the duplication of our successes."

But, according to YPI, the Network is not just a technology for more efficient public problem-solving. It has educational and democratic ramifications as well.

> Communities will now have easy access to a multitude of proposed solutions, rather than having to rely on the inevitably limited advice of consultants. A community leader will be able to examine a variety of complex issues through a basic consideration of what has been proposed nationwide. This empowerment of local leaders will significantly alter the role of communities in our political process. A community can become the *source* of policy instead of merely the recipient.
>
> Most importantly, this network will take the power to influence policy out of the hands of the few, locked away in the lofty inner circles of our nation's capitals,

> and give it to every citizen, whether sixteen or sixty years old, who has the initiative to push a button in the local library. *This* is democracy in action.

The NPIN, then, offers two electronic "solutions" to the kinds of information problems experienced by community action organizations. First, networks like this connect related organizations that might otherwise remain isolated, providing opportunities for coalition-building. Second, these networks can store and share information resources so that problem histories are not lost and researchers/activists are not constantly "reinventing the wheel."

3.1.2. Collaborative Writing

Another social application of computer-based writing tools is support for collaborative writing. Such applications enable writers to co-author texts, communicate about plans and revisions, and comment on one another's work. It is my contention that computer-based writing environments with easy and efficient co-authoring capabilities would be a benefit to workers in non-profit community organizations.

Programs like PREP editor[26] provide for flexible spaces in a single electronic document that can accommodate multiple plans, other authors' and reviewers' comments, annotations, revisions, multiple drafts, notes, and comparisons of different versions of a text. PREP researchers argue that these tools may help break down geographical and time constraints in collaborative work, broaden responsibility for text production, bring more resources to bear in group writing projects, support wider communication about plans and goals for writing, and help writers manage and use comments from reviewers and co-authors.

These activities would be especially useful in community work where mentoring is crucial in order to help "novice" policy researchers and analysts produce knowledge and where collective efforts are necessary both to save time and work and to build more powerful coalitions. Such co-authoring may also have pedagogical implications. In the CSILE environment for younger students, for example, writers take on more responsibility for contributing to each other's learning, an activity that CSILE researchers claim supports intentional—that is, purposeful and active—learning.[27]

Having explored, then, two specific applications—database sharing and collaborative writing—of a social theory of community action computing, let's turn now to some features of a cognitive theory of such a system.

3.2. A Cognitive Theory of Computer-Based Writing Tools.

A cognitive theory of computer-based writing would specify the "thinking supports" to be provided by an electronic system. In other words, theory-driven program design would identify the actual intellectual or cognitive activities desired from writers and design environments in such a way to facilitate, or at the very least not interfere with, those activities.

In community-based service, action, and research organizations, three types of cognitive support are needed to develop an ideal electronic information system. These are structural supports, pedagogical supports, and intellectual supports. Structural supports are electronic mechanisms that provide for appropriate organization and display of information. The specific structural support described here is hypertext. Pedagogical supports are those that not only assist users in organizing and producing text but also help them learn about the issues under discussion and the literate ways of dealing with those issues. The specific pedagogical support described here is the use of embedded prompts. Intellectual supports are technological devices that facilitate efficient processing of complex information. The specific intellectual supports described here are diagrammatic representations.

3.2.1. Hypertext

Hypertext is an electronic system for producing and displaying documents. Unlike traditional

information technologies that store text in linear order, hypertext documents store data in networks of information *nodes* connected by *links*.[28] The benefit of such a technology is its ability to improve "the management of loose collections of relatively unstructured information,"[29] such as that found in reference works. For readers, hypertext permits and encourages non-sequential processing of information. "A reader may follow a variety of links from a given entry to gain immediate access to definitions of key terms, cross-references, graphic illustrations, or commentary from previous readers."[30] For writers, hypertext may facilitate idea manipulation, experimentation with "idea clusters" and novel associations, the creation of electronically-linked notecards, annotation, and the guiding of users through heuristic activities.[31] Its proponents argue that the technology enables literate activities more closely modeled on the way the mind creates and pursues associative links. Hypertext provides readers and writers with greater freedom to structure text in other-than-linear ways, although research on the cognitive processes of reading suggest that this freedom may have some debilitating effects on readability, comprehension, and recall.[32]

If hypertext usefully exploits non-linear text structures, appropriate questions for system designers would be: what exactly are non-linear text structures, and when would such structures be more appropriate for a given document than a linear structure? I would like briefly to discuss the importance of information structure for the development of hypertext-based writing tools in a community action context.

There are two main ways that hypertext can serve the needs of community-based research and action organizations: first, by facilitating the creation of documents that provide for multiple entry points; and, second, by enabling users to efficiently share information and create new idea clusters or associations, either collaboratively or alone.

Most databases of political information consist of information structures that can appropriately be arranged in modular or hierarchical nodes. Of the other two structures that P. Wright and A. Lickorish discuss, linear arrangements would be appropriate for documents stored within certain nodes; but multi-theme arrangements would likely create the kinds of reading difficulties that trouble D. Charney. By storing political information in a variety of appropriate structures, community-based organizations can take advantage of both linear and non-linear formats. Most data could usefully be arranged in modular form (at YPI, different nodes could be created for different issue areas: education, employment, health care, etc.). Within each one of these modules, information could be accessed in more hierarchical ways (within the education module, for example, YPI could have different files for each of the ten questions—scope of the problem, past policy, current policy, options for the future, etc.). And within the current policy node, a full-fledged report could exist in linear form.

With hypertext, then, users could enter the database precisely at the point, or node, needed. In addition, writers could easily re-group, or cluster, information from different nodes into new arrangements of ideas. This not only makes for more efficient knowledge production, it encourages collaboration among users.

3.2.2. Embedded Heuristic Prompts

Pedagogical supports in a community-based writing environment would most likely take the form of structured heuristic procedures embedded in electronic writing tools.

Richard Young defines a heuristic as "a plan designed to help one in carrying out complex, non-routine activities for which trial and error is undesirable or unmanageable, and for which we lack a rule-governed plan...it helps us initiate and to some extent guide promising lines of inquiry—to pose good questions, for example." G. Hillocks defines a heuristic as "a systematic guide for investigating a phenomenon and may be as simple as the newswriting heuristic of who, what, when, where, why. More complex heuristics provide guidelines or procedures for analysis."[33] Hillocks reports that studies of the instructional use of

heuristics demonstrate their effectiveness in improving students' writing quality. One study Hillocks reports revealed that groups using heuristics showed increases in completeness, development, and length of written narratives. Another reported significant gains in "insightfulness, comprehensiveness, intellectual ability, and overall qualitative performance" among students using different kinds of heuristic procedures.

One kind of heuristic procedure often used by writing teachers is to ask students to attend to a series of questions, cues, or prompts while writing. A study by S. Benton, L. Glover, and M. Plake found that the use of such "adjunct aids" during writing facilitated elaboration of ideas in student writing. Students were trained in using "high-order" prompts, questions like "What is the gist of your paper?" "Do you have two examples for each subtopic?" and "Are there other approaches you haven't considered?" Students who used these "aids" while writing produced texts judged to have more ideas and to be more elaborated than texts of students in control groups. At least two studies have reported that students *enjoy* dealing with such heuristic questions.[34]

There are two reasons to suspect that the kinds of writing cues or prompts described above may be relevant for the design of computer-based writing tools in community action. First, embedded prompts may help offset decreased planning in word processing. Second, heuristic prompts may help inexperienced writers and policy analysts deal with the complex information problems in policy analysis. Let me briefly explain what I mean by each of these.

First: Embedded prompts in computer-based writing tools may help offset decreased planning in work processing. Two recent studies on the effects of word processing on writing suggest that composing on-line may significantly inhibit both the amount and type of planning that typically accompany "expert" writing and the ability to recall main ideas that may indicate a writer's sense of his or her text. In the first study, C. Haas found that writers "planned" differently, both quantitatively and qualitatively, when they wrote with word processing or with both word processing and pen and paper than when they wrote with pen and paper only. The study found less total planning, less initial planning, and less "conceptual" or high-level planning in the word processing and combined conditions than in the pen and paper condition.

In the second study, Haas tested the hypothesis that writers composing on-line also have a decreased "sense of text." The study asked writers to compose essays with pen and paper and with word processing and, after two weeks, to recall as many of the main points of the two essays as they could. There was a significant difference between number of points recalled for pen and paper and number recalled for word processing.

Why does the technology seem to have adverse effects on writing processes? I would argue that there are several reasons. Word processing—as represented by most packages available today—deprives writers of several features of the writing process available to pen-and-paper writers: the spatial, physical presence of the paper itself (the "hard copy"); the tactile presence of the pen or pencil; the ability to *directly* manipulate graphic symbols (punching computer keys is, by comparison, indirect); the ability to record evolutions of thought, not available when one "erases" words on the screen; the use of an individualized, graphic vocabulary not available when one must rely on the limited set of symbols available on the keyboard; and the notion that word processing may simply be too fast for the kind of reflection necessary in conceptual planning.

One study of programs that attempt to facilitate more associative thinking found an increase in conceptual planning among writers using the programs. But what seems to have been most successful in producing high-level planning for the writers was embedded prompts, the kind of computer-based heuristic procedures being proposed in this paper.

Second: Embedded heuristic procedures enable writers to deal more effectively with large amounts of complex information and help students learn about politics. An example of the kind of heuristic procedure I am talking about is the ten-question problem-solving "formula" for pol-

icy analysis proposed in section 4 of this paper. This heuristic serves many functions. It is an organizational device, offering a fairly simple structure for documents about policy. As such, a report on "school choice," for example, would begin with the scope of the problem, proceed through past and current policy, summarize the various options for the future, discuss actual programs, and close with a listing of active organizations and relevant bibliographical material. The heuristic can also serve as a planning cue or memory aid, prompting novice researchers to attend to various aspects of the problem under discussion. The heuristic can also suggest ways of arranging data in hypertext, chunking information into one of ten nodes, ready to be accessed or borrowed for use in new documents.

3.2.3. Diagrammatic Representations

The third kind of cognitive support that a computer writing environment can provide for those working in community research and action is diagrammatic representations that help writers deal more efficiently with complex information.

Research in cognitive psychology has revealed that expert problem-solvers (whether playing chess, solving a mathematical problem, or analyzing options in making a decision) often construct "external representations" of those problems as an intermediate step in solving the problem. Human beings typically create "internal representations" of a problem whenever they imagine or create "objects and relations" in their heads that correspond to objects and relations in the "externally presented problem."[35] This happens, for example, when one does a simple arithmetic problem in one's head. For more complex problems, however, people might also need to store an intermediate representation of the problem on paper or a blackboard or computer screen. These are "external representations." J.R. Hayes writes that external representations serve two functions in solving problems: they act as memory aids, and they help problem-solvers understand the relations among a problem's parts.[36]

J.H. Larkin and H.A. Simon divide external representations into two types: sentential and diagrammatic. Sentential external representations are those in which the problem is described in the form of sentences in a natural language (an outline, for example). A diagrammatic external representation, on the other hand, is one in which the problem is described using the components of a diagram (a matrix or drawing, for example). Larkin and Simon argue that the fundamental difference between the two is that, while a sentential representation may preserve the temporal, sequential, or hierarchical relations in a problem, a diagrammatic representation preserves explicitly topological and geometric relations among the components of a problem.

Whether a diagrammatic external representation is better than a sentential external representation in facilitating the solving of a given problem—that is, whether the diagram is informationally equivalent to, but computationally more efficient than, words in solving the problem—depends not on the words or diagrams themselves but on what one does with those sentences or notations. More specifically, it depends on how one *searches* for information, *recognizes* relevant information (or "matches condition elements to data elements"), and *draws inferences* from the information. So why do diagrams sometimes make those operations more efficient than words alone? Because, Larkin and Simon argue:

1. Diagrams can make searching information easier because information is available in predictable locations. Information is indexed spatially, elements being adjacent to any number of other elements. Thus, all information that is used together can be grouped together.

2. Diagrams minimize the need for labeling. Elements are accessed by location, not by list, sequence, or hierarchy, all structures that require extensive labeling.

3. Diagrams can make relations among points explicit, thus exploiting perceptual cues. The human visual system can do search, recognition, and inference work relatively easily, processing information more efficiently than with words.

The use of external, diagrammatic representations in the writing process, then, may help

writers in community-based research organizations process complex information more efficiently and plan, draft, and revise their texts more effectively. What kinds of diagrams would be appropriate in policy analysis? Though hierarchical arrangements in "tree" structures might be useful, I believe it is matrix structures that would be most helpful in analyzing information about political, economic, and social problems.

3.3 Summary of a Social-Cognitive Theory of Computer-Based Writing Tools.

Before turning to an actual prototype of the kind of computing environment I am describing in this paper, let me briefly summarize the desired features of such an environment based on our tour of a social and cognitive theory of computer-based writing tools. I argue that, to be most effective in "empowering" people to define and solve their own problems, community-based service, action, and research organizations should develop electronic information systems that have the following five capabilities:

1. support for the creation and maintenance of cooperative community databases;
2. support for collaborative writing tools that enable community action workers to co-author new knowledge;
3. support for hypertextual formatting of information and ideas;
4. support for pedagogical tools that help writers plan and structure literate discourse more effectively; and

USERS / *APPLICATIONS*	*academic/scientific*	*community action*
1. cooperative databases	expanding the "invisible college"; sharing and storing resources, e.g., the Worm Community	building coalitions; influencing public policy; sharing and storing resources, e.g., YPI's NPIN
2. support for collaborative writing	efficient co-authoring; breaking geographical bounds, e.g., PREP EDITOR	co-authoring; mentoring; partnerships; breaking geographical bounds, e.g., PREP EDITOR
3. hypertext	display of non-sequential information; connectivity of ideas, e.g., Intermedia	provision for multiple entry points; display of modular and hierarchical information, e.g., YPI database
4. structured heuristic procedures	teaching and procedural facilitation, e.g., embedded prompts	making policy analysis more pedagogical, better structured, e.g., the Ten Questions
5. diagrammatic representations	efficient processing of information; teaching syntheses of information, e.g., synthesis grids and trees	more efficient problem-solving; broadening range of options to be considered, e.g., COMPARE

Figure 1. A comparison of five computer-based writing tools by type of user

5. support for intellectual tools that help writers augment their own internal cognitive strategies.

This is not an exhaustive list. There are other features of an optimal community-based writing environment that I have not included here. One such feature would be desktop publishing, an increasingly essential component of community action information systems. But like spreadsheets and word processing, desktop publishing is already widely used in the non-profit world, whereas the applications listed above are less well-known.

Figure 1 compares the use of these applications in an academic/scientific setting and in a community action context.

4. YPI: A Case Study in Designing Computer-based Writing Tools for Community Action

The Youth Policy Institute is a small, nonprofit, nonpartisan policy research organization located in Washington, DC. It is committed to two central goals: 1) to collect, produce and disseminate comprehensive, objective information about youth issues (education, employment, health care, community development, national service, housing, juvenile justice, etc.); and 2) to encourage young people themselves to become active participants in that process. The Institute was created in 1979 as a project of the Robert F. Kennedy Memorial and became completely independent in 1983. The organization's only overt political philosophy is that a citizenry engaged in informed debate is a prerequisite for effective, broad, democratic participation in community self-government.

Over the last decade, the Institute has been developing perhaps the only comprehensive, nonpartisan database on problems and programs affecting children, youth and families in the United States. The database is organized around a ten-question "formula" that places emphasis on defining the problems to be discussed and locating proposed solutions to those problems. But what makes the Institute truly unique is the way it goes about this work. YPI has a small core staff. The great bulk of the Institute's work is done by young people: college students taking a year off from school or working in Washington for a summer; young people just out of college and interested in politics, journalism, or social change; international exchange students; M.A. and Ph.D. students working on theses or dissertations. More than 700 such young people have worked at YPI. They come from many different social, economic, racial, ethnic and national backgrounds, but they all do essentially the same work: tracking more than 250 federal programs that affect children, youth and families; following legislation, regulations, funding, and program evaluations; locating, collecting, and disseminating information about state, local, and non-governmental programs; following foundation and corporate grants that offer solutions to problems; updating the YPI database with information on these programs and proposed solutions; and regularly producing three national publications: the tri-annual *Future Choices: Toward a National Youth Policy*, the biweekly *Youth Record*, a comprehensive update on issues and programs; and the monthly journal *Youth Policy*.

Earlier, I argued that community action organizations need electronic information systems designed with five central applications: cooperative databases, support for collaborative writing, hypertext formatting, instructional heuristics, and diagrammatic representations. Let me briefly describe how the Youth Policy Institute can benefit from each of these.

4.1 A Mini-NPIN: The Pittsburgh Research Network for Youth

YPI has recently proposed a National Policy Information Network, described above. In progressing toward this goal, several local-level demonstration projects are being undertaken. In Pittsburgh, for example, a "mini" NPIN will be established by linking electronically the same constituents that YPI intends to link at the national level: non-profit community action and research organizations, universities, and public libraries.

Following such examples of cooperative databases as Public Data Access, PeaceNet, the Worm Community and others, the Pittsburgh

network will link researchers, librarians, government officials, non-profit activists and organizers, and young people themselves through a computerized information link. Participants would be able to search, browse, manipulate, and produce knowledge on youth issues: education, employment, health care, housing, military service, drug abuse, etc. Information will be national/international and local in scope. Ideally, a junior at Allderdice High School could go into his or her high school library or the Squirrel Hill Branch of the Carnegie Library of Pittsburgh and access the Network through an on-site computer terminal. That student, then, could locate information on, say, proposals for a sub-minimum wage for youth working summer jobs. In the database, the student could find background on such proposals (perhaps compiled by a political science student at the University of Pittsburgh), a list of organizations active in the debate, the status of legislative proposals in Congress (provided perhaps by the Youth Policy Institute in Washington, DC), etc. The student could print out information or respond to the proposals in an "informal" comments area.

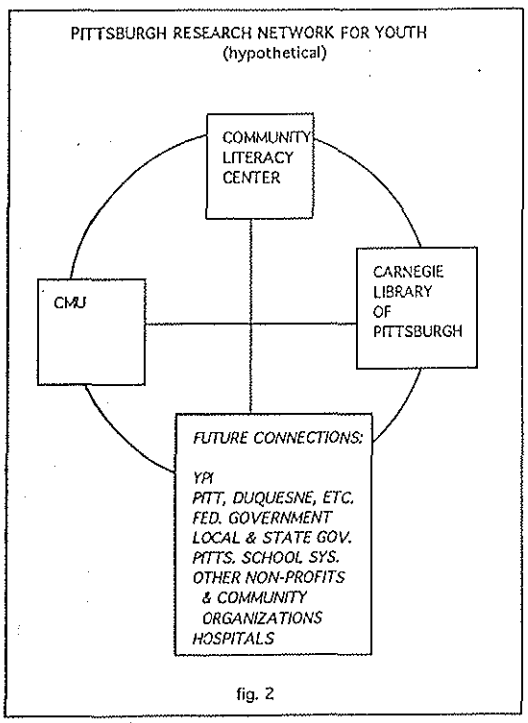

fig. 2

4.2 Support for Collaborative Writing.

One useful application of PREP editor[37] in a community-based setting would be as a tool for use over the kind of network described above. This would facilitate literate interaction among participants engaged in a common enterprise. It would also contribute to building the kind of mentoring relationships mentioned earlier. In a local network like the one proposed above, high school students at the Community Literacy Center could plan, draft, revise, and discuss their own documents with a "mentor" at Carnegie Mellon University, a student interested in community literacy or a professor doing research on argumentative strategies. The combination of the electronic network and specific collaboration tools like PREP would enable students and mentors to communicate with ease and efficiency.

4.3 Hypertext

Using hypertexts to organize and display information would enable workers at the Youth Policy Institute to "enter" the database at user-designated points; it would also facilitate the kinds of resource-sharing discussed here.

A hypertext format of YPI's database might look something like this: a "home" screen would have a modular display of various issues, problems, and projects. This set-up is already in place at YPI, originally suggested by the divisions in the U.S. Executive Branch: education, justice, labor, health, housing, etc. A worker at YPI, or a user tapping into this database, would choose an issue module, **education** for example, on the basis of interest, a school assignment, prompting from a mentor, or to complete a task for some specific project. This kind of "modular" information structure is an ideal "space" for hypertext.

Once in the module, the worker/student/analyst would choose from a set of sub-topics, for example, **elementary and secondary education**. In that module the user would be confronted with numerous projects, some specific reports and work done by YPI analysts, some controversial or important issues in that field, others major solutions suggested to YPI by national experts. An

overview file in this sub-topic would consist of a tree structure that would give the user an easily-perceived hierarchical tour of all the issues and projects developed in that module. By clicking on any of these boxes, the user could go directly into that file.

Back in the **elementary and secondary education** window, our user now clicks on the **school choice** file, desiring to access information about that particular issue. Here, he or she sees four new files: one-pager, reports, ten questions, and comments. Each of these serves a definite purpose, both in structuring information about policy and in helping users learn about policy. The one-pager is a concise, one-page treatment of an issue, offering a quick update on four of the ten questions: scope of the problem, past policy, current policy, and options for the future. This page is constantly updated and is included regularly in YPI publications. The reports are formal, written documents composed by YPI analysts or invited experts. Comments is a space for more informal responses to an issue. By clicking on the ten questions folder, one enters into the "heart" of the YPI database.

In the ten questions space, the user can browse, share, retrieve, re-group, or contribute information in any of ten information spaces, each space corresponding to one component in the ten-question problem-solving heuristic. By arranging information in a non-linear, hierarchical/modular way, users are better able to "pick and choose" the information that they need. The hypertext format may also facilitate sharing of resources. One student working on proposed solutions could "use" information from another student's contribution in the past policy space.

One possible direction for the user now would be to click on the options for the future file. Here, the writer could see various diagrammatic representations of relevant proposed solutions in the choice issue.

To sum up, a hypertextual arrangement of information in the YPI database will enable readers and writers to quickly access information relevant to their needs, "entering" an issue at various points, and use information arranged in various modular and hierarchical ways, adapting these "nodes" of information to their own textual needs and goals.

4.4 Heuristic Prompts

The central heuristic procedure to be utilized in the computer-based writing tools at YPI will be the ten-question problem-solving heuristic for organizing, analyzing, and producing information about social, political and economic policy.

As discussed earlier, this heuristic would be embedded in computer writing tools as a prompt for community action workers to better organize and structure information about policy. In this way, it can serve as both a memory aid, a cue to access information that is "missing" in a draft, and as a structuring device, providing an organizational scheme for producing documents. In addition, the ten questions can serve a pedagogical function as well, helping students learn about policy. Instead of asking a student to review research on school choice or write an article about deaf education, the heuristic helps the student access and create knowledge about the issue in a more organized, efficient, instructional way.

4.5 Diagrammatic Representations

The primary diagrammatic representation used in YPI writing tools would be the policy matrix, here called COMPARE. This matrix, formatted hypertextually so that individual cells could be "laminated" over more detailed information, would enable users to process information about various proposed solutions in more comprehensive, efficient ways. The matrix presented here would consist of rows of different options and columns of criteria for comparing and evaluating those options. The example shown is an empty matrix (to be filled by students) and one sample matrix for the school choice issue. Additional matrices could be created that would consist, more simply, of pros and cons or an Option/Goal matrix like that designed by C.C. Marshall.

The Ten Questions

1. What is the scope of the problem?

2. What has been past policy? How much money has been spent? What programs have been in place? What have been the evaluations of those programs?

3. What is current policy? How much money has been appropriated? What is the status of regulations and evaluations?

4. What are the key organizations? Political, governmental, non-profit, academic, neighborhood, corporate, labor, etc.?

5. What are the exemplary local programs? Which efforts and programs are proven to be effective?

6. Do the programs involve neighborhood people in the design and implementation? Are neighborhoods the starting point for the program?

7. Is integrated local planning used to inter-relate the effective programs? Is there a planning component to coordinate disparate elements?

8. What bills have been introduced in Congress?

9. What are the bibliographical references? Where can one find more background material?

10. What are the options for the future? What are the distinctly different proposed solutions, including legislation, demonstration/pilot programs, and concepts?

Issue: School Choice

	Programs	*Features*	*Evaluations*	*Criticisms*	*Contacts*
Option 1: Public	1989 Minnesota: open enrollment on a statewide basis; 36 states have legislation pending. Cambridge, Mass., and District 4, Harlem have intra-district choice.	Any proposal which allows parents some choice in school their children attend. Several types, ranging from "magnet" to inter-district programs. Funding follows choice.	Minn. schools supers: 23% favorable; 16% unfavorable. Magnet schools typically have high rates of achievement, low drop out. Not success of District 4, Harlem.	Will undermine public school systems and neighborhood schools; transportation a problem for poor; magnets skim best students/teachers; poor research in evaluations.	ED's Center of Choice in Education, Education Comm. of the States, Public School Choice: An Equal Chance for All
Option 2: Public/ Private	Milwaukee, Wis. has a voucher program which allows inner-city residents to attend private schools with government money. President Bush supports this.	Like above, except choice extends to private schools as well, most often in the form of tuition vouchers which parents may "cash in" at any licensed school, public or private.	Supreme Court has upheld Minn. law permitting state income tax deductions for private school, but Senate has rejected this on a federal level.	Many feel Reagan/ Bush administration preoccupied with public aid to private education. Exiting schools will not solve education problems, market-based education leads to manipulation by "suppliers."	AFT (Al Shanker), NEA, see report of William T. Grant Foundation
Option 3: Charter Schools	Minn. 1991 law grants three or more teachers in a 3-year charter. Conn. studying this idea; 1991 bill, S. 1606 would give $50 million in grants to help communities start charter schools.	Proposals which allow groups of parents or teachers to create their own publicly-funded schools.	Not applicable.	Not applicable	Sen. Dave Durenberger (R-Minn.)

Figure 4: COMPARE matrix for policy analysis

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