Change and Adaptive Behavior in Organizations
Innovation in Non-Competitive Environments as Typified by United States County and Local Governments

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Abstract: This is an experience report that evolves into a survey of applicable theory that might be used for additional steps in the diffusion of artefacts into non-competitive environments. The non-competitive environment in this case is county and local government in the United States. The particular case is the office of the County Register of Deeds/ Recorder, which has not seen a major change in the way business has been conducted since the 1950's. The background of the decision to develop a document image processing system being is provided, and experiences in introducing this technology are discussed. There is a discussion of how business is conducted today, the barriers to adopting new technology, and how change management methods such as Kotter, Rogers, and Tushman and Romanelli apply. There is also a discussion of different models for characterizing culture such as Meyerson and Schein, and how these apply; theories of development and change such as Van de Ven and Poole, Zipf, and Davis, Bagozzi, and Warshaw; and the need for additional research in this area.

1.   INTRODUCTION

We offer this paper as an extended experience report and theory overview to call for additional research in a unique technology diffusion environment. We explore the interesting environment of non-competitive county and local governments. We do this by providing an example of a document image processing system being introduced into an environment, which has not seen a major change in the way business has been conducted since the 1950's. We describe the current environment and the barriers to adopting new technology in this environment. We overview various change

management methods such as Kotter (Kotter, 1996), Rogers (Rogers, 1995), and Tushman and Romanelli (Tushman, 1985); and look at their application in this environment. We also look at models for culture offered by Meyerson (Meyerson, 1987) and Schein (Schein, 1985), and how these apply. We examine theories of development and change of Van de Ven and Poole (Van de Ven, 1995), Zipf (Zipf, 1949), and Davis, Bagozzi, and Warshaw (Davis, 1989); looking for a theory base that provides additional steps to research in the diffusion of this technology. Finally, through the discussions we make the case for additional research in this area.

2.   EXPERIENCE PROBLEM DOMAIN

We seek to analyse and define the diffusion of an advanced technological artifact (document image processing) into a non-competitive environment as typified by rural county governments. There is a need for this technology.

We have extensive experience in with this organizational environment:

1. We constructed and administered a nation-wide mail survey on this topic. (A final report of this grant-funded research is available, please contact the author)
2. While administering the survey, we conducted the onsite interviews and workflow analysis in rural counties in South Dakota, Minnesota, and Pennsylvania.
3. Using the focused results of this research, we applied for and received grants to develop image-processing technology for this environment. We were very successful in creating systems that are extremely cost effective, (they will pay for themselves in a year or less), very easy to use, and provide huge potential benefits to citizen stakeholders. (A final report of this grant-funded work is also available, please contact the author)
4. We seek to diffuse the technology rapidly on a nation-wide basis, but realize that organizational issues can prohibit or inhibit this diffusion in a cost-effective and orderly manner.
5. Although the diffusion might be phrased as a marketing question, of far more interest are the structure and moves of the non-competitive organization. What we have a chance to record has been fascinating, and we are looking forward to discovering more.

Using the information gained from the research and our experiences in this particular non-competitive environment, we seek to explore perspectives and theory that could be used to understand this interesting environment These environments affect everyone; we are all stakeholders in some non-competitive environment enabled by government for our benefit. It could be

argued that everyone would gain if these organizations operate in a more effective and efficient manner. The eventual goal of this research is to develop a plan, based on theory, to diffuse cost-effective technology effectively and efficiently across a non-competitive domain.

3.   IMPORTANCE OF RESEARCH

Local governments are facing tighter budgets, while at the same time; they are being required to comply with more state and federal regulations. County and other local government entities face difficult choices between raising taxes to increase revenue or reduce services. A third option that can provide a partial solution to these problems is the affective use of technology to become more efficient.

The use of document image processing technology presents a potential method to increase worker efficiency, in some cases reduce the number of employees, improve service, comply with federal regulations, consolidate or eliminate duplication of work by different government offices. The use of document image technology has special benefits in rural areas because of the distance between many communities and county seats.

The local governmental entities must maintain or have access to a variety of information. Some of the types of information such as marriage licenses, wills, mortgage encumbrances, deeds, veteran's discharge information and much more must be maintained forever. Some of the information needs to be accessed frequently while other information may never be accessed again. These governmental entities spend large amount of money, space and time maintaining this information and providing the information upon request.

3.1   Document Image Processing

An electronic document image processing system is a computer-based system that converts the contents of paper documents to digitised images that can be viewed at a computer workstation. The digitised images can be held and manipulated in the memory of the computer, stored on magnetic or optical disk storage media, transmitted over networks and telephone lines and converted back to a paper image by a laser printer.

The electronic document image processing system, as illustrated in figure 1, includes a scanner to convert a paper image to a digitised image, a computer with sufficient memory and monitor graphics capability to hold and present digitised image, a magnetic or optical media drive to store images for processing and retrieval and a laser printer. Additional hardware

components may include network interfaces, erasable optical drives, optical jukeboxes, digitised cameras and other output devices.
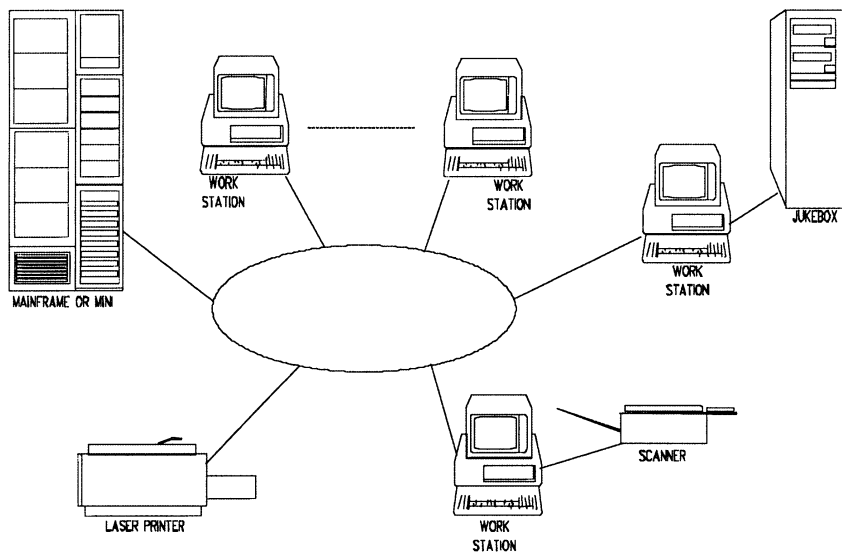

Figure 1. An Example Image Processing Management System

In most settings, documents are entered into the system by a scanner. A clerical person operates the scanner much like a paper copier machine. The scanner converts the figures on paper to a sequence of binary codes representing the presence of absence of ink on the paper. The coded image is displayed on a computer workstation to allow the person scanning it to view the image and make adjustments or rescan the image. When the document is scanned, the image will be compressed to reduce storage requirements. All images are compressed for storage and decompressed for viewing.

Document image processing technology had been primarily limited to large corporations, governmental entities and other large organizations because of the cost and proprietary nature of each system. The development of more powerful desktop computers and the development of networks have lead to the design of smaller desktop-based document image systems that can be easily adapted for office use (Sanders, 1993). The hardware cost of a desktop image processing system has declined, and is expected to continue to decline. Today, most counties can purchase the image processing hardware for less that $5,000. Many counties already have personal computers that could be integrated in the system, further reducing the cost.

These costs could be recovered in labour savings and potentially generate revenue if a remote access to records was provided and a remote access fee imposed.

An effective document image processing system offers numerous benefits to rural county and municipal governments and its citizens. Some of the benefits include:

– reduced storage space needed to store large numbers of paper files.
– elimination of the need to refile microfilm and paper documents. This also eliminates the chance for misfiling or losing important documents.
– the user, either employee or citizen, can have immediate access to the document.
– worker productivity is increased by allowing users to share a document image with others and allows them to work on the same document at once.
– documents can be mailed or faxed electronically to remote locations.
– documents can be viewed or retrieved from remote locations. The retrieval from remote locations offers special benefits to rural areas when the courthouse could be 50 to 100 away. It also provides a means for state or federal offices to access county files without travelling to the site.

Information technology has progressed very rapidly over the last several decades. In the private sector, adoption of new technologies has progressed fairly rapidly. This adoption rate could be attributable to the need to remain competitive in a rapidly changing world, or that change is relatively easy to make in the private sector.

In the public sector, technology adoption and use is perceived to be far behind the curve of the private sector. The non-competitive environment allows exploration of new diffusion and adoption concepts.

In examining various theories, we are going to use as an example environment the Register of Deeds or County Recorder office in county government. The advantages of the adoption of document image processing are most evident here, and the other offices in county share most of the same attributes.

4.   THEORY BASE

Unfortunately, there are several impediments to implementing computer technology into non-competitive environments besides the cost. From experience and research, the most common impediments to implementation appear to be inertia, political problems in the department, and training. Thomas Koulopoulos (Koulopoulos, 1995), a consultant who has many years of consulting experience in document imaging, sums up the major issue:

The largest single obstacle faced by organizations planning to implement workflow is that of existing organizational culture. Unfortunately, most information professionals do not easily accept the fact that the real issues are not technology-based but rather are mired in human factors and organizational issues. The reality is that culture accounts for 67% of the obstacles identified by evaluators and users of workflow. If these issues are not addressed, the success of workflow is compromised to a substantial degree.

Workflow is the way people do their jobs. A document imaging system, by definition, changes the way people work. Great care must be taken to specify products that will be the most effective, while trying to minimize the change required.

A government department is often sheltered from the day-to-day demands of business competition and the need to adapt technology for the business to survive. The county will be in business for a very long time and paychecks will be good. The county employee's job has probably had a lot of commonality for decades and the employee resists large changes in this environment. Any major changes must be discussed well in advance of the actual implementation and the benefits identified. Cooperation of the employees is essential and the onus is on the department head. Most offices have more than enough work to do and some of the work is neglected because there are not enough resources to do the job.

The historical methods of introduction of technology into local government may likely be unsatisfactory, and the societal benefits of an open local government system are imperative. Our research seeks to find theory and methods to enhance the speed of diffusion and lower the cost of diffusion of technology by gaining economies of scale.

The popular press and almost every academic field have a change model associated with them. We did not find any specific model for introducing technological change into county and local governments. John P. Kotter provides an example of the type of change plan associated with business in his book, *Leading Change*, (Kotter, 1996) where he lists the following steps:

1. Establishing a Sense of Urgency
2. Creating a Guiding Coalition
3. Developing a Vision and Strategy
4. Communication of the Change Vision
5. Empowering Broad-Based Action
6. Generating Short-term Wins
7. Consolidating Gains and Producing More Change
8. Anchoring New Approaches in the Culture

Although we appreciate that this is a successful change cycle for management in a company, it is not a prescriptive strategy that would enable

the introduction of document imaging applications into government. Although we may have a sense of urgency and a vision, if we try to hammer these ideas into the heads of county officials, the result would probably be alienation - not change. The county officials may have gone for years and years without changing, why should they react now?

4.1   Perspective Lens of Rogers' Diffusion of Innovations

Everett M. Rogers literally wrote the book on diffusion of innovations (Rogers, 1995). We assume that the reader is already well acquainted with Rogers' work and there is no need to further discuss the theories here. We have experimented with Rogers' theories and have come to conclusion that additional theory may be necessary to achieve rapid diffusion in the non-competitive environment.

4.2   Perspective Lens of Organizational Adaptation and Change

Tushman and Romanelli (Tushman, 1985), among many others, characterize organizational adaptation and change as "punctuated equilibrium". From the punctuated equilibrium viewpoint, organizations have divergent periods of rapid and significant change, followed by longer convergent periods where the organization tries to maintain a more steady-state equilibrium.

Applying this lens to the non-competitive government environment that we are examining gives us a fascinating viewpoint – the last major shift in the core task that we are examining was in the 1950's when paper copiers were integrated into Register of Deeds/ Recorder office. The office changed from hand copying records of transactions (real estate, mortgages, liens, etc.) into ledgers to making copies of the documents and recording only indexing information in ledgers. There have been smaller changes ordered by the state, such as forwarding a copy of the vital records such as birth and death records to a state office, but the environment has been in an long-term steady-state since then.

The case could be made that people in the office do not know how to make this kind of change, because they have never seen it. The recording process skill is generally passed from the recorder to their deputies in on-the-job training, the recorder likely has a long tenure because of the tendency of voters to re-elect incumbents, and a deputy recorder is the most likely person to replace a retiring recorder. Although most states have codified law prescribing the duties of the office, we found in almost every case that we

examined that there was some small practice that did not fit with the legal prescription. The practices did not interfere with the day-to-day practice of recording and retrieving copies of documents, and we attributed the deviations as an artefact of the transfer of process information.

Tushman and Romanelli (Tushman, 1985) also identify the need for legitimation in the political economy of the organization. Of particular interest to the author are the issues of external legitimation of the technology and how an inadvertent and incorrect perception can lead organizations who may be risk adverse to be even more so. Yet, there is information that is available that would lead to the dismissal of the incorrect perceptions by more astute viewers.

Tushman and Romanelli describe the infrastructure for external legitimation as recognition of society's social and legal values and establishment of position with regulatory agencies. This introduces an interesting story in the legitimation process. Laws to make document imaging a legal form of recording documents were put into South Dakota law in 1986 and 1988 for the Register of Deeds and the Attorney General of the State of South Dakota. We are not aware why just these two entities are included, we assume that vendors sought to have the law changed for Register of Deeds and the Attorney General thought it would be a good idea for his office, too. Following is the applicable law for registrars:

> **7-9-1.1.   Recording, filing, and indexing of records by microfilming or computerization. The functions of the register of deeds, including but not limited to, the recording of instruments, liens, satisfactions and releases and the filing of records, as well as the index to any such record, may be accomplished by means of microfilming or computerization, as provided in § 6-1-11.**
>
> **6-1-11.   Form of certain public records -- Duplicate -- Computerization. Whenever the creation, maintenance or storage of any public record is specified by state law for political subdivisions, such record may be in the form of punched cards, magnetic tapes, disks and other machine-sensible data media within a data processing system. Such records shall be backed up by a duplicate, be accessible to viewing members of the public, and be retained in accordance with all applicable requirements for the retention of manual records. To the extent an office is computerized, the office need not keep a hard, paper copy. If current public records are converted to a computerized format, the political subdivision may destroy those records which the state records destruction board has pursuant to § 1-27-19, declared to be of no further administrative, legal, fiscal, research or historical value.**

When visiting with Registrars of Deeds in that state, copies of this codified law were provided as evidence that the process was indeed legitimised by the State of South Dakota. Last year, (1999) the state archivist spoke at the state convention of Registrars and made the statement that, "Document imaging is not archival".

It seems that under the law that pertained to her office, document imaging had not been legitimated, although state agencies had been giving her documents in digital form for many years, and her office had been frantically trying to convert them all to microfilm form, hence her remark.

This statement had two effects. For many registrars, who did not want to change the way they did business, this was an affirmation of their decision. For a second group, with whom the author had been working to diffuse the technology, there was an outburst of frustration, because the statement could affect their plans because one of their rivals at home in the county courthouse could use the information, although it was incorrect, in a political battle for resources. The consensus attitude for these registrars was, "Why does the State of South Dakota have to be so backward!"

The author communicated with the archivist, and she really did not know that the registrars had enabling law that she did not have. And, the legislature quietly passed in the 2000 legislative session, and the Governor signed, a law to legitimise the technology for all the offices in the state. The archivist has not made public acknowledgement of her error, but we hope that she will soon.

This example brings forward a couple of issues. In many states, there are offices that are using document imaging that are not expressly legitimated by law, the officials are just going ahead because this is the way they have to go to be effective in their office. In the official's mind the process is legitimised in itself, there is no need for additional state authorization. Minnesota happens to be one of these states. Yet, for the risk adverse official, which many are, the lack of explicit legitimation by the state is one more reason not to adopt an innovative technology.

Greiner (Greiner, 1972) makes the case for five major cycles of punctuated equilibrium as the organization grows. In our experience, we found that rapid population growth in a county was a force for change; one would more likely see a document image or microfilm system in use in these counties. A possible scenario is that the rapid growth stresses the system, and when searching for solutions the county identifies the innovative technology as more effective and efficient than increasing space and/or employees.

4.3   Perspective Lens of Organizational Culture and Control

Culture is largely socially constructed as the individual interacts with his/her reference groups. In this case there are three cultures to examine: 1) the culture in the Office of the Registrar of Deeds, with the registrar and from one to five employees; 2) the culture in the courthouse, with the five to twenty different offices, depending on county size; 3) And, the culture of the registrars in any particular state. Each one of these cultures has a set of shared beliefs, values and norms and range from working at the will of the registrar, to competition for resources, to cooperation for a combined agenda.

The Office of the Register of Deeds is lead by the registrar and the tasks consist of primarily of routines (Cyert 1963), which are the behaviour in the organization. As we typified above, many of these routines have be practiced for decades, and changing them will be difficult, even if the registrar leads the change. It is almost impossible to imagine another organization environment with this kind of inertia. Another amazing point is that the routines are very similar across the country, we found the same tasks in South Dakota, Minnesota and Pennsylvania, it seemed like that there is more variation within a state than between states. Although routines are considered part of organizational learning, we use them here to help the reader understand the culture. The culture in the office is socially constructed around the routines and the deputy registrar(s) has some influence in the decision to adopt a new technology, but they do serve at the discretion of the registrar. If the registrar would decide to use new technology, such as a document imaging system, the staff size is small enough for her to change the culture without too much difficulty. In Meyerson and Martin's (Meyerson, 1987) taxonomy, this culture would be classified as the Integration Model: Culture is generally stable but leaders can successfully initiate and control organization-wide cultural changes.

The culture in the courthouse is a competitive one. Every courthouse we have visited has had some discord between two or more groups. The mainline offices such as Auditor, Treasurer, and Register/Recorder are elected positions (the Assessor, for political reasons, generally is not) and can be removed from office only by the voters. Yet, the offices compete for county resources distributed by the legislative body, the Board of Commissioners (Board). Each office presents an annual budget for legislative review, and if there are any requests for new technology, they are considered and allocated by the Board. In rural areas, it would be fair to characterize the Board as comprised of retired farmers and businessmen.

This is the culture in which the registrar operates, if the registrar wishes to introduce innovative technology into her office; she runs the gauntlet of competing with the other offices for the additional funds, getting the Board to understand the technology that she wishes to purchase, and hopefully the funds are readily available in the county budget. The author has had several registrars describe how they hate to run the gauntlet, even if they really need something.

They also dread being turned down by the board, both for the effects in the courthouse, but also because they have to be ever so much more careful when they bring the subject back to the Board again. This is different from culture described in the national survey we conducted. It appears that reports to the survey are different from interpersonal reports on a one-to-one basis. The author believes that the one-to-one reports are a more accurate representation of the culture we are studying. This is not a culture that encourages innovation. This culture would be classified as an ambiguity model in the taxonomy of Meyerson and Martin (Meyerson, 1987), where all the players are changing all the time.

Occasionally, we have seen a Board with a few enlightened leaders. Under this leadership, the culture represents the Meyerson and Meyer (Meyerson, 1987) differentiation model: Leaders' efforts to manage change have localized impact - both intentional and unintentional - but predictable, organization-wide control is unlikely. The mainline officials are too independent to serve the Board in other ways, once they have passed the budget hurdles.

The final culture that affects the Registrars is the culture among his/her peers who hold the same office. We have seen a wide range of these types of relationships, depending on the state and the registrar's involvement. In some states, the organizations are very active as a political body and have the respect of the Legislature and the Governor; in others, the opposite is true. In considering the adoption of technology, we would prefer the first culture, but this is something that is not easily changed from the outside.

How do we change these cultures? We can use Lewin's (Schein 1985) unfreeze-change-freeze paradigm to hopefully make rational changes in the culture to create a new culture. The environment can also change culture in an evolutionary cycle of variation, selection, and retention in a socially constructed environment.

If the external environment can be changed in such a way that would reward resources to the county that could not be obtained any other way, then it might be possible, or even likely, that the cultures would respond. For example, if a document imaging system could be offered free, the registrar could use this information to change the culture of his/her office. The competitors in the courthouse may assist him/her because the funds would

not be coming from their possible budgets. The Board would encourage taking the opportunity because it would be easier for them; and finally, the peer group of registrars would be embarking on a journey together. The positive impact should be enhanced by establishing a collective culture with a shared sense of purpose.

Culture is also a major contributor to organizational learning, some thing that is important as the opportunity to use innovative technologies becomes more prevalent. As citizens become more acquainted with technologies such as the web, there will be more pressures to change. The organizational learning aspect of culture leads directly to adaptations of organizations, particularly to change. The interaction of culture and change leads us also to organizational structure. Culture is difficult to locate, identify and change, but it is the one aspect of organizations that appears to really make the difference.

4.4   Organizational Frameworks

The organization is one of the most complex artefacts of human existence. Andrew Van De Ven and M. Scott Poole (Van De Ven, 1995) analysed more than twenty different process theories of development and change in the social and biological sciences. They identified four different "motors" of change: Evolution, Dialectic (Hegelian), Life Cycle, and Teleology (Goal – Oriented). Figure 2 is a framework for the four motors.
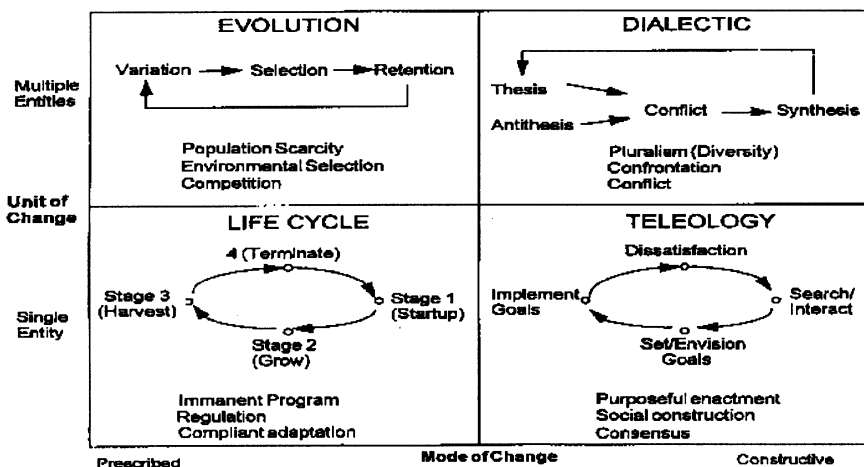

Figure 2. Process Theories of Organizational Development and Change (Arrows represent likely sequences of events, not causation of events)

Van De Ven and Poole then combined the four motors to create a macro-framework that more accurately describes the behaviour that we see as an organization learns and changes. They make the case that there are more patterns available in their model to explain the various behaviours that we see.

Figure 3. Interplays of Process Theories of Organizational Development and Change (Arrows represent likely sequences of events, not causation of events)

Figure 3 demonstrates possible interplay of the various motors.

Although Van De Ven and Poole give us a more comprehensive explanatory theory, this does not help us derive an action plan for introducing technology into governments and other non-competitive environments.

4.5   Principle of Least Effort

Additional research uncovered an interesting theory by a Harvard professor, George K. Zipf, in his book entitled ***Human Behavior and The Principle of Least Effort***, (Zipf, 1949). This work is most famous for Zipf's

discussion of the Civil War. He made the case that, besides slavery, there were so many contentious issues dividing the North and the South that the easiest path to solve all the issues was to go to war.

Zipf's theory in his own words:
> We shall argue that an individual's entire behaviour is subject to the minimizing of effort. Or, differently stated, every individual's entire behaviour is governed by the Principle of Least Effort. (P 6)

With the plurality of definitions of behaviour, it is probably unfortunate that the Zipf used the word "entire", for our discussions, we will assume that there are some exceptions. Zipf uses a simple discussion of travelling between two points to illustrate the start of his theory. If there are no intervening obstacles, the person will proceed by the most direct route between the two points. If there is an obstacle, for example a mountain, between the two points then the individual through trial and error will determine whether over the mountain or around the mountain is the easiest path and subsequently take that path. If a person is presented with an unknown path, the person will guess at the easiest path until they gain experience.

Of particular interest is Zipf's discussion of tools. With reference to a craftsman working on a task, he identifies Principles of Economic Abbreviation, Versatility, Permutation, and Specialization of tools. The idea is that the craftsman would organize his tool bench to maximize the work accomplished while minimizing the effort in using the tools. The descriptive equation is $w = f \times m \times d$, where f is the *frequency* of use of the tool, m or *mass* is the effort required to use the tool, and d or *distance* is the effort to access the tool. Zipf's hypothesis is if we introduce a productive new tool, it will initially located far down the bench and as the craftsman gains experience with the effort of its use and versatility it will be moved closer on the bench to the craftsman, moving other tools down the bench. If a tool is moved down the bench far enough, it eventually may be discarded. There are interesting implications if we apply this analogy to non-competitive environments, if the tool is productive and they begin using it, we would see a shift over to the tool and the outdated methods would be replaced. The issue is then that of introducing the tool into the environment.

Zipf's work seems obvious, but we have included it because people keep forgetting it. If the ideas are so obvious, why do we have to keep reminding ourselves?

Another take on Zipf's principle of Least Effort predicts that most people, most of the time, are turned back by modest hurdles that they know could be overcome with effort. To be habitual, an action must be relatively effortless or carry a particularly large psychic reward. In addition, opinions

and motivations vary widely across individuals in what constitutes a "large reward." These are ideas that the author would like to explore with this research.

Zipf's book is 550 pages; there is not space to describe other principles, corollaries and examples here. The discussion of the theory and building of subsequent theory will be left to the further discussions.

Additional support for Zipf's theory can be found in work by Davis, Bagozzi, and Warshaw (Davis, 1989). They review the theory of reasoned action (TRA), a popular theory used predict and explain behaviour. TRA describes the internal beliefs and feelings of the individual as the person's attitude; the attitude is combined with social norms (what people are supposed to think) to arrive at behavioural intention, which then is reflected in the actual behaviour.

Under TRA, we can try to change the individual's attitude or we can try to change the social norms in the environment. In system adoption these manipulations, if successful, should reflect more acceptance of a system.

Davis had previously defined a modification of the TRA, named Technology Acceptance Model (TAM). TAM drops the normative influence on the intentional stance of the individual, and selects two internal perceived values of the technical systems as selectors of intentionality. He defines **perceived usefulness (U)** as the user's subjective feeling that the system will increase his job performance within an organizational context. He defines **perceived ease of use (EOU)** as the degree that the user feels that the system will be free of effort. In reviewing the research, we get the feeling that much of EOU is the anticipated learning cost of effort, which drops in value as a predictor with experience with the system.

Davis constructed an experiment using adoption of a word processing tool by MBA students over a two-year period to test **behavioural intention (BI)** as a predictor of use and comparing TRA and TAM as predictors of BI. The results indicated that BI was indeed a good predictor of subsequent adoption, and that TAM was a better predictor of adoption than TRA. TAM predicted approximately 50 percent of the variance in BI, rising on subsequent tests.

Davis conclusions were that intentionality (BI) is a good predictor, usefulness (U) is a major determinate of the intentionality, and that perceived ease of use (EOU) is a major secondary determinate of the intentionality. This gives support to the theory of Principle of Least Effort as a determinate in the adoption of technology in the governmental sector.

Using the hypothesis that people will change if the effort to resist change is less than the effort to maintain status quo, we are going to proactively design a plan for more rapid diffusion of technology on a statewide basis. If

we are successful, we will establish a blueprint for other states to follow in implementing new technology into their local government infrastructure.

4.6   Using the Principle of Least Effort in Tool Design

We have constructed applications with a World Wide Web interface for the user that are available as prototypes for use in this research. A major part of the success of the Web has been because of its ease of use. One the goals in the design of the applications was the ability to train the typical user to use the application in an hour or less. When design issues arose, we applied the principle of least effort to try to achieve the easiest to use approach in the tool or application. The applications were also designed so that the information could be provided to other offices very easily with an inexpensive network connection. The other offices could start a browser, query the database, and look at documents without going to the originating county office. This should help diffusion throughout the courthouse. A policy decision by the commissioners/supervisors could easily be implemented to make the information available on the Internet for the consuming public.

4.7   PRIOR RESEARCH AND DEVELOPMENTS

There has been little research done in the organizational and technological environment of county and local governments, leading one to conclude that this research should be done. Particularly interesting is the diffusion of the technology.

4.7.1   National Science Foundation's Digital Government Project

In response to congressional mandate and federal, state and local government needs, the National Science Foundation (NSF) in 1998 established a program for research in Digital Government. This program will be ongoing, providing funds for research in this most important of governmental issues.

Recently, a digital government workshop, co-sponsored by the NSF and the Center for Technology in Government (CTG 1999) at the University at Albany, brought researchers and government practitioners together. There were eight issues identified at the workshop that the participants believed must be addressed in order for any digital government program to be successful. Those issues are:

Development of trusted and secure interoperable systems -- Research is needed to understand system integration in technological, organizational, and political terms.

Matching research resources to government needs -- Both theoretical research and fieldwork are needed to create practical ideas that government can use.

Better methods of information technology management -- This includes management of software development and upgrades, outsourced development, and operations and leadership.

Citizen participation -- How will the emergence of the Internet enable greater involvement of citizens in democratic processes and institutions of governance?

Electronic public service models and transactions -- The Internet's potential to offer new integrated services and self-services makes it is necessary to develop new methods of authentication, record keeping, security and access.

New models for public-private partnerships -- Given the diverse players involved in delivering public services, developing effective information technology systems will require new partnerships across the public and private sectors.

Intuitive decision support tools for public officials -- With technologies and data standards that encourage information search, selection, analysis and sharing, how will leadership decisions be affected?

Archiving and electronic records management -- Now that most information is stored in electronic files, issues such as record definition and content, version control, and public access affect how government functions.

The NSF actions give the indication that there will be research funds available for research into innovation and diffusion of technology in the government environment. As citizens demand more of their county officials, the near future should be interesting.

5. CONCLUSION

We have described a unique environment for the diffusion of technology. We have also described a survey of theory that could be used as a basis for research efforts in diffusing a tool that we have constructed. We have found some merit in using "The Principle of Least Effort" (Zipf, 1949) as a basis for further steps in this environment (we have submitted grant proposals to provide free systems and training).

We invite any comments that might be appropriate in this context. We also encourage others to explore research in this area, and we will assist anyway we can.

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