WILL CONCERN FOR EQUITY BE A DEFINING TREND IN LIS/GIS IN THE NEXT DECADE?

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ABSTRACT

This paper presents looks at the role that "equity" could play in the future of multipurpose land information systems (MPLIS) development. We propose a model of MPLIS development that we feel conveys new ideas about the role of "equity" in community systems development. Additionally, evidence is provided, both anecdotal experiences and survey results, which contributes to this discussion. Finally, we discuss what this all may mean in the future for communities seeking to develop MPLIS.

INTRODUCTION

Whether directly or indirectly, a large portion of GIS research addresses the increased efficiency and effectiveness of systems within organizations. Much less concern has been placed on broadening the view of these systems to the community-wide context in which they exist. Within the community-wide context, a system's value is not simply measured by the benefits accruing to the operating organization -- efficiency and effectiveness -- but also by those benefits enjoyed by the community -- equity. Consideration of this broader context with its added benefits stream suggests that MPLIS development has not completed its full-life-cycle until the system reaches a final stage of development that we call democratization, characterized by broader community-wide participation in land management. Inherent in this concept is that a MPLIS that does not achieve democratization (i.e. the system produces outcomes of improved equity) should not be considered fully developed.

As a tool for studying MPLIS development within this altered perspective, we have proposed a model that describes the full-life-cycle of community-wide systems over time. It is based on a review of previous research on the nature of GIS/LIS development in organizations, the results of surveys of GIS/LIS implementation activity, and anecdotal and personal experiences of the authors. The model describes the necessary stages in a linear development process in a community as well as indicators of those stages, factors that determine a change from one state to another and benefits. The model is intended as a common basis for understanding of and communication about

system development by decision-makers, system developers, and academic theoreticians equally well.

In addition to the theoretical model, we provide survey results showing that local governments are beginning to achieve democratization and suggesting that more communities need to focus on reaching that final stage of development. We also provide anecdotal evidence showing ways that communities are already accruing equity.

MPLIS DEVELOPMENT MODEL

We have proposed a theoretical model of multipurpose land information systems development with a community-wide perspective (Tulloch *et al.* 1996). The MPLIS development model includes several elements which make it unique, including factors that determine change, indicators of status, benefits, and stages of MPLIS development. The model also makes strides towards satisfying a series of criteria which have been lacking in previous models. The model can only be described briefly in this paper but has been presented previously in detail (Tulloch *et al.* 1996).

Reasons for proposed model of MPLIS development

The model of MPLIS development seeks to establish a general description of the complex manner in which these systems develop in a community. While previous research provided an important foundation, there remained some specific questions about system development that were unanswered. One of the primary questions that is unresolved is that of the appropriate perspective for model building. Retrospective case studies and studies of the adoption and diffusion of technology typically emphasize the perspective of someone within the organization or agency (or a few closely-connected organizations or agencies) that introduce the system and is limited in its scope to that organization. The apparent nature and extent of system development at this time in many agencies at all levels of government strongly suggests that a perspective on system development that encompasses a larger segment of the community is appropriate and needed if the system status and direction of change are to be understood and used to the benefit of both the organization and community. Aside from Crain and MacDonald (1984) there was little recognition that MPLIS development in a community continues beyond some initial point of "implementation" or "operation" within an organization to be fully developed or successful. Today, we need a model that recognizes that the full life-cycle of system development includes non-technical development such as increased participation in land-related decisions based upon access to and use of geographic and land information by a broad constituency in a community and not simply the pre-operational and operational stages of development in an organization.

Among the other concerns were a lack of a common descriptive language for discussing this process, little recognition of the distinction between existing states of the system and the forces for change between states, a distinction that

requires a reliable and valid tool that identifies and measures the elements of system development, a need for clearer delineation of system benefits, and, finally, a model that serves as a stimulus to the intellectual pursuit of knowledge. In addition to these specific concerns, there was a separate broad criterion that must be satisfied by any model among a set of models before one emerges as accepted. The successful model, like all theories, needs to be tested, embraced, and used by the community of users. Even the best designed model is of limited value if it is not embraced and used appropriately.

As mentioned previously, much of the existing literature focuses on a system within a single organization, or within a few loosely connected organizations that establish an enterprise-wide system. Our model is intended to apply to community-wide multipurpose systems, within the concepts of a local government MPLIS as set forth by Brown and Moyer (1989). This implies that the system is being developed for a community of users and beneficiaries, not simply to enhance the performance of an agency.

Elements of MPLIS development

The model was built largely upon the existing literature and related research performed by the authors. It consists of the following major elements; stages, factors, indicators, and benefits. The model began with a review and consolidation of implementation models that appear in the literature (e.g. Rogers 1962; Crain and MacDonald 1984; Vastag, Thum, and Niemann 1994) to produce a simple six-stage model. In this model, stages are identifiable and measurable states of MPLIS Development. The six stages, in order of progression, are: no modernization, system initiation, database development, recordkeeping, analysis, and democratization. Its is recognized that stages sometimes overlap but generally occur in the indicated order.

Indicators are the measurable variables that define the identifiable and measurable stages of MPLIS development. The model relies upon seven categories of indicators, further divided into fifty-three specific factors. For example, the nature and extent of data in a digital format can be used as an indicator of a system that has entered into the recordkeeping stage.

Factors emerge from both the practical professional literature (e.g. Croswell 1989) and the academic literature (e.g. Onsrud and Pinto 1993). Factors are the measurable social, economic, legal, institutional, technological, political, and cultural variables that determine the forces for change from one stage to another. The model relies upon twelve categories of factors, further divided into seventy-six specific factors. Funding is an example of a factor whose nature and extent can promote progress to more advance stages, prohibit forward progress, or even cause a system to retreat to previous stages.

The final element, benefits, are broadly defined as the identifiable and measurable components of the existing or anticipated community well-being achieved through MPLIS Development. It is not simply the well-being of a particular organization. Some specific benefits can also serve as specific

indicators of a particular stage when the existence of those benefits are common and specific to that stage. Benefits to the community are composed of three categories: efficiency, effectiveness, and equity.

The model of MPLIS development also further describes the relationship between these various elements. For this paper, we will simply point out a strong association between the final three stages of development and the three benefits. Efficiency is generally identified with recordkeeping, effectiveness with analysis, and equity with democratization.

BENEFITS: THE THREE E'S

How to describe the benefits obtained from system investments remains a significant issue. Economists recognize that benefits are both tangible and intangible. The identification of tangible benefits and their measurement in monetary terms make it possible to calculate a benefit/cost ratio for investments. However, economists also emphasize that it is equally important to identify and characterize intangible benefits and introduce these in any discussion of potential system investments. The model described in this paper is designed to incorporate attention to these aspects.

The model places the benefits of MPLIS development: into three broad categories: efficiency, effectiveness, and equity. Efficiency results where traditional activities are performed at a reduced cost, generate more products, are accomplished more quickly or in some combination. Effectiveness results when more or better information is generated from traditionally available data because of digitally stored data and the software for sophisticated analysis of that data. The emphasis shifts from benefits associated with traditional tasks to benefits associated with actions that rely upon system products. Equity results from a perceived or real increase in effective participation by citizens and organizations in decisions about land and resources. Although too space consuming to include here, the model also provides a mathematical expression of a system's total benefits (Tulloch *et al.* 1996)

Traditionally, attention to system benefits has focused on efficiency and effectiveness (Smith and Tomlinson 1992; Antenucci 1991; Gillespie 1994). Efficiency is an especially popular measure of benefits because is it easily expressed in monetary terms reflecting savings through system implementation. Effectiveness is somewhat more difficult to determine. However, estimates of monetary values of these benefits can be made based upon the savings associated with activities permitted by additional information generated from the old data. These are also popular measures of benefits because they relate closely to the internal needs of organizations and are easily understood by non-technicians and decision-makers in those organizations.

Recently attention has turned to the benefits associated with the broader use of system products beyond the organization and throughout the community. These related outcomes have been characterized as societal

benefits (Clapp *et al.* 1989), equity (Kishor *et al.* 1990; Cowen 1994), decision making (Pinto and Onsrud 1995), and democratization (Mead 1994; Lang 1995). As a general trend, this attention is evidenced by the amount of research concerning community issues such as public access (e.g. Epstein and Roitman 1987; Epstein, Hunter, and Agumya 1996) and concerns about the outcomes associated with the growing relationships between GIS and society (e.g. Pickles 1995; Sheppard 1995; McMaster *et al.* 1996; MSC/NRC 1997). Here the set of product users is potentially much greater in number and type than those users in the organizations that initiate and develop the system. The perspective encompasses the whole community of public and private organizations and people interested in the value to them in their land-related work that comes from the products of MPLIS Development. The context for these benefits is the full array of public and private policy plans, decisions, and actions where use of land and its resources are allocated.

The benefits from the use of system products by increased numbers of community members are labeled equity benefits. This label is appropriate because land-related decisions made by a more representative segment of the community means that GIS/LIS becomes democratized. This democratization represents an important advance in MPLIS development, holding out the potential for full community awareness, utilization and support for the system based upon a sense of increased and balanced participation in the allocation of land and its resources. Emphasis on these types of benefits is another important and different aspect of the community-wide perspective that informs the model.

There is also another important reason for describing these benefits as equity benefits. Its achievement depends upon wide distribution and easy access to system products. This fundamental characteristic of dissemination and access has always been a standard for public data and information and a subject of policy controversy (e.g. Epstein 1991; Brown 1992). The long-term democratic interest in the dissemination of records and information used by governments to execute their legislative and legal mandates is exhibited by the state and federal open records and freedom of information laws which are built upon the democratic principal that access to material used by governments for their public business is essential in a society where people need to know what their governments are doing. A negative view of broad, easy access by many to GIS/LIS data restricts the full development of systems. Access to information is the key to garnering the large unrealized potential for equity benefits.

RELATED FINDINGS

Survey Results

Recently, local governments in three states have been surveyed as part of a study of MPLIS development. Details of the survey methods and results have been provided elsewhere (Tulloch *et al.* 1996). However, a few specific results are directly relevant to this discussion of equity. The first of these is simply the perspective of respondents on the status of system development in their

local government. Approximately 5% of the respondents in both Wisconsin and Ohio indicated that their local government had achieved some degree of democratization (Figure 1). While any number of issues might be used to cloud the specific meaning of this response (e.g. respondents ability to understand the definition provided in the survey questionnaire), it still seems clear that a number of land information professionals recognized equity as an outcome of their system.

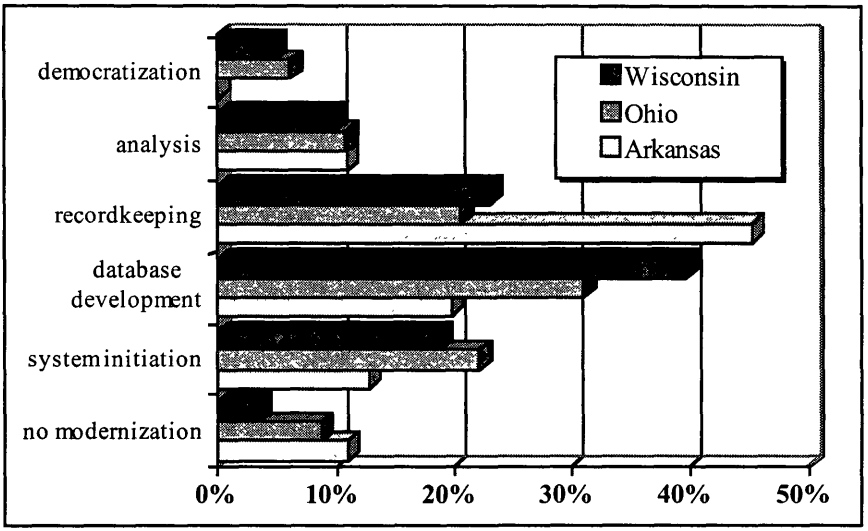

Figure 1 – The Stages of MPLIS development having been achieved by local governments in three states

Another question asked about the categories of indicators which might exist as a result of MPLIS development. Wisconsin respondents indicated that "use of technology" and "transfer of data" were the most commonly present indicators. In contrast, they also responded that "change in decision making processes" and "impacts on land related decisions" were the least present indicators, although they were shown as being present in some organizations. This seems to suggest, like the stages results, that most systems are not yet sufficiently developed to produce equity. It does seem to show the possibility of an increase in future societal benefits.

Anecdotal evidence

Because system benefits are usually accrued only after several stages of the MPLIS development process, it can be difficult to find examples of benefits, especially equity, as an outcome of system development in communities. However, we will endeavor to present a few recent occurrences which demonstrate the potential of this benefit.

When the land information officer in Waukesha County, Wisconsin automated the tax assessment records, a few "lost" parcels were discovered. These parcels accounted for thousands of dollars in lost revenue each year. The

first benefit generated was that of a more efficient operating office -- faster and cheaper to maintain. The second benefit came from the office's use of the system to "better" perform their traditional tasks, as illustrated by the discovery of the "lost" parcels.

For roughly a decade, Winnebago County, Wisconsin has been developing a MPLIS to serve its 140,000 residents in as many ways as possible. In recent years the database development has been completed and the system has been maintained and used for a variety recordkeeping and analysis purposes. One unexpected opportunity arose when investments in system development led to the discovery of inaccuracies in the FEMA produced Flood Insurance Rate Maps (FIRM) of the county. The maps are adopted by localities and used to determine whether homeowners are required to purchase flood insurance and also to determine where new structures can and cannot be built. In response to concerns raised about the maps, the county used existing data to construct new floodplain models and maps. The county system showed that, in fact, a number of homes had been inappropriately located in or out of various zones. Because of the high quality of the data and the "transparency" of the analysis, the county's efforts have been recognized as a suitable alternative to the old maps.

System efficiencies allowed for the timely production and update of necessary maps, address lists, and other system products. The result of the analysis -- a complex hydrologic modeling process not previously feasible – was a more effective means by which the county could fulfill its mandates. Both of these examples also have the subtle potential for the social benefit of equity because they may have both altered the public's confidence in those government agencies and may have a long-term impact on participation.

The Register of Deeds in Dane County, Wisconsin, has automated the title records and indexes for the county and maintains the digital material as the county's official property records. The entire database is available in digital form at the cost of reproduction (as mandated by state open records laws). Title insurance companies, for whom a complete copy of all relevant land transactions is necessary for competitive operation, are able to cheaply acquire the entire database for their use. While the existing firms are able to use this database to update their existing data at low cost, thereby increasing profits, new firms are able to enter the market avoiding the previously prohibitive start-up costs associated with building a database. The result has been the entry of new title insurance companies and an increase in competition which appears to have driven the cost of title insurance for homebuyers down about $300. This system, with an estimated cost of $500,000, results in a savings for homeowners of an estimated $6-7 million annually.

The Register of Deeds Office finds that the system makes its basic recordkeeping activity more efficient, requiring less time and space. Effectiveness is harder to judge because the primary duties of the office are recordkeeping and promoting access to data rather than an application that requires sophisticated data analysis. The automated system allows the general

public to access land records easier and faster with an increase in direct citizen participation in use of the material and an indirect increase in participation through the added title insurers. Hence the accrual of the equity benefit. The reduction in title insurance illustrates and provides measures for the benefits of this increased participation.

SO WHAT?

A fundamental lesson learned from the model's development and application concerns the relationship between time and equity. The results suggest that only after MPLIS development is well advanced does a system tend to produce its single most valuable benefit, equity, in the form of increased participation in land decisions with the resulting sense of greater fairness that characterizes a democratic society. Since recent measures of systems status indicate that few systems have yet reached democratization, it seems likely that the major societal benefits have yet to be realized by communities. Experience with many systems indicates, however, that an increasing number of communities should soon be able to capture this benefit at increasing levels.

For those working with communities to develop MPLIS, the model and its application provide a means to demonstrate and measure the outcomes of the development process. Moreover, the model shows the importance of continuing MPLIS development beyond "operationalization". Only through complete systems development can a community reap these most important benefits.

A community-wide perspective is becoming increasingly important. Potential beneficiaries are often people without technical knowledge who will be dependent, implicitly or explicitly, on the products and services of systems for their land-related activities. As they become aware of these systems, they will be in a position to influence the establishment of mandates and standards for MPLIS Development in the community. They, as representatives of the larger community, are likely to play an increasing role in determining the nature and extent of system development.

MPLIS Development is at a point of transition from system development initiatives that arise from the efforts of technically-oriented system builders to initiatives based upon the demands of many outside the organizations who want and need products for their decisions about land and resources. These potential users are greater in number, financial strength, and societal impact than the typical GIS technician in a traditional organization. These users, some of whom want data and products so that they can better participate in land and resource decisions in a community, represent groups that have yet to benefit in great numbers or to great extent from system development. However, many are increasingly aware of what the products of GIS/LIS can provide for them and are now prepared to exert influence on MPLIS development from outside the domain of traditional GIS/LIS organizations. Their interest, involvement, and impact is now crucial to the pace of development.

Finally, the model suggests that systems that are not fully developed (i.e. do not achieve the level of participation that represents democratization) are also most likely to eventually fail. It seems apparent that communities who recognize, demand, and plan for equity will be those communities whose systems are most likely to experience continued success and community support. We would go so far as to assert that, if these technologies are to experience continued success throughout the coming decade, a clear recognition of equity as a key concept in MPLIS development must emerge.

While efficiency and effectiveness alone can justify the cost of a system, the benefit of equity has the potential to be the largest of all when received by the community. In the long term, failure to secure the democratization associated with increased participation exposes systems to threats of cuts and elimination. A full realization of equity can lead to community-wide acceptance and even embrace of a system thus providing support for system activities.

Equity has many emerging, embedded concepts. A significant element is more extensive involvement by organizations and citizens in land related decisions. Indeed anecdotal evidence of minority groups being empowered by this technology is already emerging (e.g. Native American populations in Wisconsin). However, equity also includes public access to data, increased participation in government processes, altered community resource-related decisions, increased confidence in government and reductions in home owner land records processing costs such as title insurance. This trend, especially when viewed within a community-wide context, suggests not only the potential but the absolute need for community application of systems in order to see their use continued. As recognized by the FGDC's NSDI initiatives, this also suggests that local governments are becoming increasingly vital players in the production, use, and dissemination of land information.

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