Executive Summary

The purpose of the study was to determine the feasibility of the organizational change of moving from a single-user mapping system to a full-fledged geographic information system (GIS) under the direction of the Register of Deeds. There was an exploration of the benefits and/or drawbacks of a true GIS through research of studies conducted at all levels of government. Additionally, primary data was obtained through a survey of Michigan counties. The purpose of the survey was to discover where other Michigan counties housed their GIS and how they funded it. The survey was also used to discover who benefited from the GIS and if there were external users that paid for the use of the GIS. Lastly, the survey looked at problems that others have found with a geographic information system.

Thirty three percent of Michigan counties completed the survey. From the survey, the researcher found that most Michigan counties had a geographic information system in place. There were several departments found to house the GIS, however, the Register of Deeds was not one of them. There were 42 different county departments identified as using and benefiting from the GIS. Most counties funded their GIS through their general fund and another source. Only 11% used the Register of Deeds technology fund as a source of funding. The majority (80%) had partnership agreements in place and of those 88% paid to use the GIS. Twenty percent of the counties cited unanticipated problems with a geographic system.

Interviews of the vested stake holders were conducted to ascertain their interest in moving to a true GIS and explore their willingness to explore the proposed organizational change. All the department heads interviewed indicated that they were willing to explore the possibility. Perceived benefits of the change included reduced duplication of work between the Register of Deeds and Equalization Department and increased efficiency from an information
technology standpoint from the standardization of information. Two department heads listed one item each as a concern of the proposed change, however, research showed that both concerns could be addressed and overcome.

The researcher recommended that the County Commissioner move forward with the proposed change of moving to a full-fledge geographic information system under the direction of the Register of Deeds. This was because research showed that there was never a perfect time to implement a GIS system. However, the benefits of a true geographic information system outweighed the costs. Further, getting the GIS underway was the key point. The location of the geographic information system may change in the future as its uses change and/or expand.

Research indicated that funding, was the major obstacle for staring a geographic information system. Therefore, it was suggested that partnership agreements with other government entities be explored to fully utilize the geographic information system and help fund it. From the survey of Michigan counties, it was discovered that 15.38% funded their GIS through another source other than the general fund. Thus, the researcher suggested that an additional study may be done to discover other ways to fund a geographic information system.
FEASIBILITY STUDY OF BRINGING THE GEOGRAPHIC INFORMATION SYSTEMS (GIS) DEPARTMENT UNDER THE DIRECTION OF THE REGISTER OF DEEDS/ABSTRACT OFFICE IN MONTCALM COUNTY, MICHIGAN

MSA 699 Project Report

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(Concentration in Public Administration)

by
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Chapter 1

The Problem/Situation

Introduction

In the world of public administration, government agencies at all levels are being asked to more and more with the same or reduced financial resources. Therefore, government agencies must find ways to become more efficient. Often, the increase in efficiency is due to the implementation of additional technology. Tsai, Choi, and Perry (2009) stressed the importance of instituting information technology to address the movement towards E-Government initiatives to effectively deal with environmental challenges both internally and externally. Montcalm County, Michigan is no different. It must look at ways to become more efficient.

Background of the Situation

The researcher worked at Montcalm County for the last nineteen years in the Register of Deeds office. Therefore, she had firsthand knowledge and observations of the work structure and financial struggles within Montcalm County. Montcalm County had several years of poor economic times because of a declining tax base and reduced revenue sharing from the State of Michigan. As a consequence, there were budget cuts, layoff of personnel, and furlough days. Almost every office was asked to do the same, or more, work with less resources. This made it even more important to increase efficiencies and reduce the duplication of work amongst various offices.

Montcalm County is one of the few counties in Michigan that has a working abstract office. An abstract office draws out legal descriptions of all real estate documents that are recorded within the county and subsequently creates an index that can be searched by legal
descriptions. In Montcalm County, the Register of Deeds was appointed by the County Board of Commissioners to oversee the Abstract Office.

Montcalm County employs a ‘Senior Mapper’ that is Montcalm County’s unofficial Geographic Information System (GIS) Department. The Senior Mapper draws out legal descriptions from recorded deeds onto a map. The Senior Mapper is currently under the administration of the Equalization Department. The Equalization Department assists the County Board of Commissioner in examining the tax assessment rolls of the townships and cities and ascertaining whether the real and personal property in the respective townships and cities has been equally and uniformly assessed at true cash value. The process of County Equalization is mandated by the General Property Tax Act (1893) of the State of Michigan. Additionally, Equalization Department updates tax maps (parcel lines, roads, subdivision lines, parcel numbers, etc) and aerial photo overlay, as splits and combinations occur. The maps that are currently being drawn in Montcalm County are tax maps. Tax maps are but only one component of a true GIS. A true GIS is made of many more layers and is capable of much more than what the Senior Mapper is currently doing.

For the last several years, there has not been a fulltime Equalization Director at Montcalm County due to its poor economic position. Therefore, Montcalm County has contracted with a neighboring county to have its director come to Montcalm County on a part-time basis. Both the Register of Deeds Office employees and the Equalization Department, including the Senior Mapper, employees’ wages are paid out of the general fund. However, The Register of Deeds Office does have an automation fund that was created by the Revised Judicature Act (1961). The automation fund is for the purpose of upgrading technology within the Register of Deeds Office with priority given to search capabilities.
According to Toskey (2003), legal counsel to The Michigan Register of Deeds Association, upgrading technology includes abstracts, maps, plats, and other items recorded and maintained by the Register of Deeds. Toskey (2003) stated that, “Expenditures from the automation fund are not limited to the purchase of computer equipment and software” (pg. 1). This could be interpreted to include the hiring of consultants, computer technicians, and systems analysts. Further, indirect cost that could be paid out of the fund could include the attendance at conferences for training for staff, and travel and lodging to access the conferences and training.

The Register of Deeds has enhanced all technology and does everything the automation fund allows for except maps. Maps would be the next and last item to upgrade technology within the office. As stated earlier, maps are currently being drawn by the Senior Mapper in the Equalization Department. The Register of Deed draws legal descriptions out but does not do so in a map form. Rather, it is put into an index form by lot and block with plats or by quarter, quarter in metes and bounds (used to describe larger parcels of land) descriptions. Employees of both offices are taking the time to draw out legal descriptions, but in different formats.

With the current organizational structure of the two offices there appears to be duplication of some work. Further, a change from the unofficial GIS Department to a formal GIS Department has numerous possibilities and benefits. There should be an exploration of the possibilities of reducing the duplication of work between The Register of Deeds Office and Equalization Department, namely the unofficial GIS Department, and ways of increasing county efficiency through the creation of a full-fledged geographic information system.

Purpose of the Study

Given its poor economic climate, Montcalm County must look within and see where it can become more efficient. The possibility of two or more departments that appear to overlap
and have duplication of effort must be looked into. It is sound business sense to reduce wasted resources. Also, even in good economic times, it is a responsibility of Montcalm County to allocate taxpayer dollars and resources in the most efficient manner.

The purpose of this study was to explore the feasibility of bringing an official GIS Department under the direction of the Register of Deeds/Abstract Office. The researcher needed to discover if there was a possibility of increased efficiency and benefits with the change in organizational structure. This was done by exploring what organizational structures other Michigan counties have in place. The intent of the study was to gain knowledge from other counties that already have a successful GIS in place.

Research Objective

The results of this research were intended for the Montcalm County Commissioners, the County Controller, the Register of Deeds, the Equalization Director, and the Information Technology (IT) Director. The objective was to communicate the benefits, if any, of a change in organizational structure. Many Michigan counties already have a geographic information system in place. The researcher surveyed other Michigan counties to learn how they utilized and funded their GIS. This information was discovered through the following questions:

- Under what department do other Michigan counties house their GIS Department?
- How do Michigan counties fund their GIS?
- Who benefits from the GIS?
- Are there external users that pay for the use of GIS?
- Are there any unanticipated problems others have found with GIS?
Assumptions

The researcher assumed that no matter the results of this study, it is at the discretion of the Montcalm County Board of Commissioners to make the change in organizational structure. Even if the Board of Commissioners recognized benefits to the change, there must be adequate financial resources allocated for its full potential to be realized. Further, it was assumed that there must be cooperation of the vested stakeholders for the organizational change and benefits to occur.

Theoretical Framework

Geographic information systems have become commonplace and are a crucial resource in governmental agencies throughout the United States (Obermeyer, Ramasubramanian, & Warnecke, 2016). The researcher wanted to determine if this was true in Michigan at the county level of government. Through this process, the researcher intended to discover ways in which other Michigan Counties may have benefited from having a Geographic Information System and how it was structured.

Definition of Terms

**Geographic Information System**- is a computer system for capturing, storing, checking, and displaying data related to positions on Earth’s surface. GIS can show many different kinds of data on one map. This enables people to more easily see, analyze, and understand patterns and relationships (National Geographic Encyclopedia, 2011).

**Metes and bounds**- the boundaries or limits of a tract of land especially as described by reference to lines and distances between points on the land (Merriam-Webster, nd).

**E-Governance**-is the use of information and communication technologies to improve the activities of public sector organizations (Heeks, 2008).
Scope of Study

The research was focused on the feasibility of increased efficiency of a true GIS system under the direction of the Register of Deeds/Abstract Office versus the Equalization Department. It did not look at other forms of work duplication that could be reduced between the Equalization Department and the Register of Deeds/Abstract Office. As Montcalm County is a public agency, the study explored the benefits that may be passed on to other county offices, other governmental agencies, and the public. There was a survey conducted throughout all Michigan counties (there are 83 counties in Michigan), excluding Montcalm County.
Chapter II

Review of the Related Literature

Historical & General Background

A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. GIS allows its users to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts. Snellen (2001) predicted that information and communication technologies along with geographic information systems would play a major role in government agencies. According to Obermeyer, Ramasubramanian, and Warnecke (2016), GIS has become common in public agencies throughout the United States. They went so far as to say that GIS is a crucial resource for public agencies.

The purpose of this chapter was to look at the possibility of increasing efficiency by examining what a true GIS is capable of. This was done by investigating what benefits GIS may provide to government entities, discovering where other counties and municipalities housed their GIS, learning of benefits others have gained through reorganization/collaboration, and by examining drawbacks others have experienced through reorganization/collaboration. Geographic information systems have been around long enough that public agencies have concrete data as to its benefits and/or difficulties.

Benefits of GIS

The benefits of a geographic information system are numerous and vary with every government entity that uses it. For example, Johnson County Commissioners felt that its GIS system help them to pass a ballot proposal for a sewer funding project. Johnson County
instituted a full-fledged GIS, not only computer aided design (CAD) technology. This enabled their GIS to meet a greater variety of needs. The commissioners knew the main determinant for each taxpayer voting yes or no would be based on how much the proposal would cost the taxpayer. The commissioners wanted a telephone “hotline” to be established to answer the publics’ question on how much the proposed project would cost each property owner. Through the collaboration of four departments the GIS database generated a special file that was loaded onto a mainframe computer and then used to answer questions from the public. Over 3,400 calls were made to the “hotline” in the eight weeks prior to the election. The sewer funding ballot proposal passed by a small margin. The commissioners contributed its passage to the county's ability to provide specific and accurate information on the program's cost to each taxpayer (Hokanson, 1994).

A geographic information system can aid public agencies in protecting their citizens’ health. GIS can be helpful in finding where the contamination of a hazardous material started and the path it may expand to. That makes it a powerful tool in minimizing health risks. By minimizing the publics’ health risks, municipalities also reduce the probability of costly litigation that often occurs with contamination (Sementelli, McDonald, & Gardner, 2016).

England and Wales (United Kingdom) used GIS as a tool to monitor crime and aid in their community-safety planning. This was done by creating a map layer of crime “hot spots” and a map layer of public street lights. Then, by combining the two layers the municipalities were able to make a correlation and compare crime rates contained in areas with and without street lighting. British criminologists have determined that, if accurately targeted, increases in street lighting does lead to reduced crime. More, the additional lighting had created a sense of security and reduced its citizens’ fear of crime (Pain, MacFarlane, Turner, & Gill, 2006).
The benefits of a geographic information system can be seen across many county departments. The following departments were listed as potential scope of a county GIS application as presented by the Michigan Counties Association of Mapping Professionals (Kalnins & Sullivan, 2003). Counties with larger populations have more departments. However, the departments that follow are generally found in every county.

**Equalization Department**

Kalnins and Sullivan (2003) explained that a GIS system can help to maintain tax maps, map splits, and maintain annotation (dimensions, lot #s, etc.). Also, it helps to ensure quality control of tax database by verifying school district coding, parcel acreage verification, verify property class coding, and assist in conducting sales studies. Further, GIS can assist in property appraising and minimizing tax evasion by checking homestead exemption claim and checking for new construction without a permit.

**911 Dispatch**

According to Kalnins and Sullivan (2003), a GIS system can locate Emergency Calls/Computer Aided Dispatch (CAD) by on-screen locating and mapping of incoming emergency calls (extremely important for locating cell phone calls). Additionally, GIS can be beneficial in locating emergency vehicles with on-screen tracking of emergency vehicles using GPS enabled Automated Vehicle Location (AVL) technology. This could help to temporarily reposition available emergency vehicles to fill gaps in service created by emergencies that cluster and occupy multiple units. Further, GIS can aid in calculating response times for existing and proposed facilities by calculating the conditions of roads with length and speed, then conduct a network analysis to see how far vehicles can respond in a given time interval. Plus, GIS can help
determine if emergency facilities are correctly sited relative to the locations of incoming calls and population (Kalnins & Sullivan, 2003).

**Planning Department**

Kalnins and Sullivan (2003) presented that a GIS system can help create comprehensive growth management planning by generating maps for a county master plan. GIS can help by linking zoning ordinances, documents, and related information to map features to provide easier access to information. Additionally, GIS can aid planning departments in the tracking of redeveloping brownfield sites. The term “brownfield site” means real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant (Brownfield, n.d.). Bacot and O'Dell (2006) maintained that assessments of brownfield programs are complicated because of the intergovernmental nature of the program—implementation and records are locally based, contracts are executed at the state level, and program guidelines are established at the federal level. The Environmental Protection Agency detailed that proper planning and implementation of a brownfield program can increase residential property values 5% - 15.2% near brownfield sites when cleanup is completed. The increase in property values increases the county tax base (Brownfield, n.d.).

**Drain Commission**

A geographic information system can help to assess parcels in drainage districts by calculating parcel acreage and cut out parcels using watershed boundaries. It can also calculate runoff coefficients for parcels, locate new drains and drainage districts, and create preliminary site plans for proposed drains. Additionally, GIS can help to facilitate communication with the public to resolve drainage disputes. This could be accomplished by showing land owners how
they are being assessed using the surface runoff model (topography) and watershed boundaries overlaid on a parcel layer (Kalnins & Sullivan, 2003).

**Sheriff / Drug Enforcement**

As presented by Kalnins and Sullivan (2003), a GIS can be used to help reduce traffic accidents by tracking accidents by location and type and identifying accident prone areas. The Sheriff’s Office can track dangerous intersections and curves, wildlife crossings, and areas prone to speeding. These locations can be correlated to traffic counts to see if they are statistically significant or not and assess the effectiveness of remedial action. Further, GIS may assist in reducing crime by tracking crime by location and type and identifying crime hot-spots and crime patterns: Clustered burglaries, marijuana growing, meth labs, etc. And, assess the effectiveness of remedial actions taken by the Sheriff’s Department.

GIS can be used to generate maps for planning and conducting searches and training exercises. This could include military or other grids to make maps compatible with GPS coordinate readings. This can facilitate communication between all units involved (ground, air, and marine). This can also be used to support surveillance activities and search warrants (Kalnins & Sullivan, 2003).

**Clerk**

According the Alameda County’s Clerk GIS streamlined the processes of the office and saved the department time, money and labor hours and improved customer service (GIS software enables voters to see election results in real time, 2009). Kalnins and Sullivan maintained (2003) that a GIS can facilitate voter registration and support the election process by generating election maps for voting locations, district and precinct boundaries, election results, and the like. GIS can help to establish voter precincts, evaluate different precinct scenarios, and to evaluate
redistricting proposals. Additionally, GIS can help in maintaining cemetery records by linking a database to a map to locate plots and by showing plot availability (Kalnins & Sullivan, 2003).

**Treasury**

As explained by Kalnins and Sullivan (2003), a GIS can help in tax certification of deeds by check for delinquent taxes on-screen with linked delinquent tax databases with parcel layer to see which parcels of land have delinquent taxes. Also, it can track and locate forfeitures and foreclosures thereby generating maps for foreclosed property tax sales. From this, the treasurer can then send letters of notification to surrounding property owners by selecting adjacent owners. Additionally, GIS can assist with tax abatement by visually maintaining locations and boundaries of special tax zones such as Brownfields, downtown development authorities, commercial forests, industrial parks, enterprise zones, renaissance zones, PA 116’s, and annexations (Kalnins & Sullivan, 2003).

**Register of Deeds**

A GIS can assist in document retrieval and organization by allowing users to click on or select from a map rather than using a text interface to access documents and information. GIS can assist in creating and managing a parcel tract index and assist in verifying legal descriptions. Further, GIS can display an overview of site condos and subdivision plans. Also, assist in the locations of easements, utilities, and roads. More, a geographic information system can track the status of the county’s Remonumentation Program (Kalnins & Sullivan, 2003).

**Where Others House their GIS**

In local government, GIS may be operated by cities, towns, villages, or counties as its own department or under another department. In some cases, the GIS Department starts out in one location and is moved to another. This was the case in the town of Oro Valley, Arizona.
According to GIS in Local Government (2005), the Oro Valley GIS started out as a single-user system located within the planning and zoning division of the community development department. As other town departments showed an interest in using the GIS the town realized that an organizational restructuring was needed to support the increased usage. Oro Valley removed the GIS from the community development department and merged it with its IT department in order to meet its needs.

Some Florida counties had different places where its geographic information system originated and was housed. For example, as stated by GIS in Local Government (2005), in Lee County, Florida the Department of Human Services (DHS) led the effort in developing a GIS system. Accordingly, Lee County DHS housed the geographic information system. Whereas in Polk County, Florida the GIS was its own department and was started by its Board of Commissioners (Khan, 2013).

**Increased Efficiency/Organizational Benefits of Collaboration**

Pammer, Jr, Lightle, and Watson (2000) acknowledged that communication in county government does not happen naturally because of the fragmentation and compartmentalization of different administrative functions. Rather, county management requires a participative management approach that engages elected officials and appointed department heads in a collective discussion on priorities and strategies to meet goals and manage resources (Palmer et al., 2000).

Through collaboration, increased efficiency can be seen. Increased technology makes collaboration of various departments and agencies easier, according to Brown (1998):

GIS is a technology that allows governments to capture, manage, analyze, and use land-related data to solve complex planning and management problems. […] By combining a
map display with a data manager and multiple data bases, GIS offers a powerful tool for public managers. (p. 5)

Khan (2013), GIS Supervisor for Polk County, FL, stated that appropriate use of GIS makes it a cheaper, quicker, and more efficient way of finding information. Once data is inputted, it allows for a quick retrieval of information thereby saving time. The reduced amount of time it takes an employee to complete a task equates to money saved. Kahn (2013) maintained that a GIS application saves 12.5 employee hours every day in the building division alone.

According to Kemp (2008), an economy of scale results when county government offers services rather than having each municipality deliver such services. Likewise, counties should reach out to their cities when they can offer services that are less expensive to the taxpayers. Also, cities ought to encourage their respective county government to make available joint public services if a cost savings can be realized. Taxpayers are better serviced if county governments can supply selected public services on a regional basis at reduced costs.

Additionally, Somers (1991) suggested that a geographic information system offers great potential for improving the operations of local government. But, for the complete potential of GIS to be realized, it takes multi-participants in local government. According to Somers (1991), “Arrangements between the participants are a great deal of work to implement, but appear to be worth the effort in terms of the benefits that can be achieved through cost sharing and improvement of inter-organizational operations” (p. 29). Jain (2012) estimated that a consolidated GIS could help municipalities with a population range of 5,000 to 20,000 with saving approximately $75,000 to $115,000 per year in GIS staffing, software, hardware, and professional fees, depending on size of the jurisdiction.
Some local governments that have realized the internal benefits and cost savings and have turned their focus externally. According to Ammerman (1997), the city and county of Honolulu, Hawaii, launched a GIS data licensing program that provides an annual license with the option of purchasing quarterly updates of data as a source of revenue to offset the cost of the GIS. Another example Ammerman (1997) gave was that of Milwaukee, Wisconsin’s GIS resale of information. She stated that the target markets for their GIS data distribution program were the mortgage, lending, real estate, and insurance industries (p. 29).

**Drawbacks of Collaboration/Reorganization**

A geographic information system is a tool that pools large amounts of data into one location. The increased efficiency and the ease at which data can be retrieved may become a negative to citizens without their knowledge. Because of the potential of GIS becoming the primary decision-making tool for local governments, and essentially changing the face of local government management, local officials must address the question of privacy. This is because the multiple layers of data from various departments or organizations can allow the creation of new information, which causes concern. An example given was, “An automobile insurance company could use GIS data to determine the location of dangerous intersections and raise insurance rates for those living near those intersections” (Privacy! Managing GIS Data, 2000, p. A-6).

Another potential drawback is the accuracy of the information contained in the GIS. To error is human. However, local governments have been held liable for errors or uncorrected mistakes in the information that is disseminated to the public (Privacy! Managing GIS Data, 2000). Additionally, Grupe (1992) maintained that user confidence in the system diminishes
rapidly if the GIS contains substantial amounts of erroneous data. The accuracy of the data not only effects the organization but the public as well.

Somers (1991) also pointed to the issue of public access as an area of concern. She raised the point that because GIS, in local government, deals with public information it raises the issues of the public's right to access to the data. Particularly, she alluded to concerns of the format of delivery of the data, the related cost, and involvement of the private sector.

Collaboration of various departments and/or local governments can be problematic, depending on the number of partnerships. According to Brown (1998):

Partnerships do provide a reasonable approach to service delivery; however, the effectiveness of the arrangement is tempered by the number of partners involved, the degree to which decision authority is shared among the partners, the amount of resources shared among the group, the formality of the arrangement, and the level of leadership commitment (p. 2).

The New Jersey Meadowlands Commission (NJMC) is a regional planning agency with jurisdiction over 14 municipalities. Artigas, Elefante, and Marti (2009) conducted a study of the New Jersey Meadowlands Commission over a five-year period of their implementation of a centralized geographic information system that shared resources and technology infrastructure of the 14 municipalities. Artigas, Elefante, and Marti (2009) laid out the obstacles that the NJMC had to overcome for a successful implementation. Funding, typically the major hurdle to overcome, for the centralized GIS was provided by the state. Therefore, the major hurdle the NJMC had to overcome was getting the municipalities to buy into the idea of a centralized geographic information system and data sharing. This was not because of data sharing or system incompatibilities rather it was the “fear of losing autonomy, control over information sources,
independence, mistrust and “turf”” (Artigas, Elefante, & Marti, 2009, p. 136). Other obstacles included different needs/priorities among participants and different skill levels of the users. Therefore, NJMC had to facilitate more training sessions than it had anticipated.

The federal government realizes the importance of the data collected at all levels of government for the movement towards a national geographic information system. However, not all counties or municipalities have a GIS. Nor do all states, counties, township, and cites have GIS that are compatible with one another. This makes collaboration difficult. The federal government has made efforts towards adopting and implementing federal GIS standards. In 1990, the Office of Management and Budget established the Federal Geographic Data Committee to promote the coordinated use, sharing, and dissemination of geospatial data nationwide. In 1994, the National Spatial Data Infrastructure (NSDI) program was established by executive order to address the problem of the redundancy and incompatibility of geospatial information on a national basis. Developing standards that meet stakeholders' needs with the intent of achieving full participation across governments has been a challenge and will not be accomplished anytime soon (Koontz, 2003).

**Organizational Structure Change**

According to Král and Králová (2016), an organization must adapt to changes in its internal and external environments in order for its survival. They stated that managers often solve a problem by changing a single component without looking ahead to the wide-ranging consequences it may have. They stressed the importance of looking at the wide-ranging consequences of the change through a framework used for assessment of organizational structure change as seen below in Figure 1.
Figure 1. The framework used for assessment of organizational structure change. This figure illustrates all the variables that affect the outcomes of a change in organizational structure. Adapted from “Approaches to Changing Organizational Structure”, by P.K. Král and V.V. Králová, 2016, Journal of Business Research., 69(11), p. 5171.

Král & Králová (2016) continued that managers will have better outcomes when using this comprehensive framework rather than focusing on desired results alone. Král and Králová (2016) maintained that using this framework does not guarantee successful outcomes but concluded that it allows for a more holistic approach to organizational change. Further, that communication is the key to any successful change. They found a positive correlation with the frequency of communication, both top-down and bottom-up, to desired and positive organizational change.

Lewis (1998) stated that organizational change is common but it rarely improves a problem. Rather, it creates new problems. Therefore, he focused on the negative aspects of organizational change. For example, employee loyalty towards a certain manager may cause hostility towards another manager. The change may cause unintended tension among employees. Also, change equals distraction. Lewis (1998) maintained that no matter the amount
of planning that goes into the reorganization, there will always be something that needs addressed because work crosses organizational boundaries.

**Existing Studies**

Sementelli, McDonald, and Gardner (2016) conducted a study in the city municipality of Nacogdoches, Texas. Their study used a guided cost-effectiveness analysis to determine the best solution for the city’s water borne asbestos problem. The city needed to find the most cost effective solution while also minimizing health and legal risks. “A logical approach to this problem would require communities to carefully identify potential problem areas, thus creating a natural niche for GIS applications” (Sementelli, McDonald, & Gardner, 2016, p. 209). They explained that GIS helped them to identify where the contamination originated and to accurately measure the length of the contaminated pipes. This was important because it eliminated much of the uncertainty of future costs associated with the scope of the demolition, the material costs, and the associated services that would be affected. Not only did GIS help to accurately predict costs, it also helped to track areas that may have potential health risks from the asbestos contamination.

Fernandez and Pitts (2007) conducted a study to discover the determinants that make public managers favor and pursue organizational change. The areas they focused on were the relationship between a public manager’s attitude and behavior relating to change and the following leadership, organizational, and environmental factors: leadership tenure and migration, financial resources, networking, buffering and dealing with external pressures, political support, discretion given to subordinates, and organizational size. They discovered that leadership tenure and migration did affect the frequency and attitude towards change. They found that public managers did not make any major changes in the first or second years. The study showed that financial resources directly correlated with the attitude towards initiating organizational change,
the more financial resources the more likely to favor change. Networking was found to positively correlate with a public manager’s attitude towards change. Further, the more a manager interacts with others in an external environment, the more likely he or she is to have a positive attitude toward change and initiate change. Fernandez and Pitts (2007) maintained that networking allows for learning the “norms” and expectations and about how to design and manage them. As for political support from the community, Fernandez and Pitts (2007) revealed that it had no impact on the degree to which a public manager facilitates organization change. However, they did find that influence of political superiors did affect managers’ attitude and implementation of top-down change. Additionally, they relayed that public managers that gave subordinates ample discretion may lead in micro-level innovations that in turn initiate larger-scale change. Finally, Fernandez and Pitts (2007) found no evidence that the size of the organization had any influence on a public manager’s attitude and behavior relating to change.

Methodology

Tsai, Choi, and Perry (2009) conducted a study on a county government moving forward with E-Governance by moving to a full-fledged web based GIS implementation. They conducted an in-depth analysis of an E-Government initiative to gain a deeper understanding of the movement. They observed and studied a GIS development project conducted by a county government over several years. Their case study analysis was done through observation, document review, and unstructured interviews.

Budic and Godschalk (1994) conducted a study of four public agencies within Cumberland County, North Carolina that had implemented a geographic information system. One of the four public agencies was a mapping section within a tax assessor’s office. The study was conducted over an eight-month period. They used interview, documentation, archival
records, direction observation of people and field environment, and physical artifacts as means for collecting data. They used a questionnaire with structured, semi-structured, and open ended questions to guide their research.

**Instrumentation**

Tsai, Choi, and Perry (2009) used the systems development life cycle (SDLC) to highlight the activities and decisions made during the process of implementing a county geographic information system. Further, they used concepts from the technology enactment framework (TEF). “TEF is an approach to capture the complexity of the interaction between cognitive, cultural, institutional structures and the individual player's assessment regarding every stage of adopting IT process” (Tsai, Choi & Perry, 2009, p. 26). Specifically, the observed how each instance of technology enactment was contingent on the organizational and institutional context, how the information technology was perceived, and who attempted to shape the use of information technology.

**Statistical Approach**

Budic and Godschalk (1994) used a questionnaire that had structured, semi-structured, and open ended questions. The structured question results could be compared statistically. However, the semi-structured and open ended questions required the researchers to report results as they understood them. Fernandez and Pitts (2007) facilitated their research by exploring the relationship between a public manager’s attitude and behavior relating to change through a formal statistical approach with the following control variables:

\[ C = T + R + N + B + P1 + P2 + D + S + I \]

where \( C \) = change-related attitude and behavior, \( T \) = leadership tenure, \( R \) = financial resources, \( N \) = networking, \( B \) = buffering, \( P1 \) = support from community, \( P2 \) = support from political
overseers, D = discretion, S = organizational size, and I = vector of control variables for demographic characteristics of public managers.

**Significant Studies**

Tsai et al.’s (2009) published their study, conducted at the county government level. Their study explained that movements towards e-government may encounter difficulties in overcoming organizational and managerial challenges with creating and learning new skills as well as the need for new organizational structures to deal with the new technology. Their study stressed the importance of information technology governance. Specifically, they stressed security, technology incompatibility, a shortage of qualified technical personnel, and the conversion of legacy information into a new system. Tsai, Choi, and Perry (2009), acknowledged that governments often suffer from limited resources, both financially and in human resources. Therefore, their study included exploring various options for implementing a GIS system. Options explored included outsourcing, off-the-self software package, in-house development, and the hiring of consultants. Finally, they stressed the importance of top management buy in and support in order to overcome organizational constraints.

Grupe (1992) stated that the success of the Washoe County, Nevada geographic information system has made it a must-see visiting site for organizations contemplating the creation of a GIS. He shared some the lessons learned from Washoe county’s GIS implementation project. Specifically, his advice may best serve information system managers who may be tasked with investigating or developing such a system for their organizations. The advice was as follows: Learn by doing, realize the importance of ongoing funding, communicate a vivid GIS vision, pick strategic projects, be sure the application needs a GIS, insist on high quality, encourage ownership of the project, and be prepared for the demands of data input.
Accordingly, learn by doing means that an organization should spend money on the actual implementation rather than spending too much money on feasibility studies. Grupe (1992) stated that an organization “should begin implementation when they are 80% confident, rather than waiting for the perfect solution. It may be better to risk a false start than to extensively study the concept and not produce a tangible system” (p. 38). Realizing the importance of ongoing funding cannot be overstated. This is because a partially completed geographic information system is useless. The use of applications will balloon as data is added, as staff members become more proficient in using the GIS, and as GIS technologies evolve (Grupe, 1992).

Grupe (1992) stressed the importance of communicating a vivid GIS vision. He maintained that the success of a project is often attributed in part to the active involvement of a geographic information system proponent. Said person keeps policymakers and GIS staff informed on project goals, the benefits to be gained, the requirements to be addressed, and the potential problems. Geographic information systems are visual in nature, and therefore visuals (e.g., maps, charts, and slides) can be used to communicate the vision and sell the idea. Part of selling the idea involves picking strategic projects. Geographic information systems take time to build and require a long-term commitment. Therefore, it is imperative to be deliberate in choosing projects. This means that one must be sure the application needs a GIS. GIS can become a huge expense with the required hardware, software, and employees. An organization must decide what is the sufficient application for itself rather than doing everything that GIS is capable of (Grupe, 1992).

No matter the size of the geographic information system the organization must insist on high quality. High quality computer equipment, software, training, and staff are all determinants of the quality of the outputs of a GIS. However, having high quality technology and staff does
not insure a successful GIS. Encouraging ownership of the GIS project is important to a successful implementation. For success, it takes commitment at every level of the organization. Commitment requires the willingness of commissioners to fund GIS, department heads readiness to share their department’s information, and the employees’ eagerness to input the information. The more people that are included in the implementation, and the more that they feel they are involved, the greater the likelihood of a successful implementation (Grupe, 1992).

The researcher’s feasibility study for the organizational change at Montcalm County mirrored many of the characteristics mentioned in the study conducted by Tsai, Choi, and Perry (2009). Therefore, the researcher’s study was needed to discover the ways in which other Michigan counties house and fund their GIS departments. Information obtained from others provided valuable information in regards to the various ways Michigan county government’s geographic information systems may successfully be structured.

Summary of the Literature Reviewed

There is no doubt that geographic information systems have become common place in governments and are a powerful tool to aid in the decision-making process of public managers. The benefits of GIS can be seen in many departments within governments at all levels. The uses of GIS vary widely. At the county level, for example, GIS can be used to monitor locations of hazardous materials that may serve as a health risk to the public by the health department, to help 911 dispatchers aid ambulance drivers to find their destination in the quickest manner, to clearly show property lines as described in real estate documents recorded in the register of deeds office, to show where crime ‘hotspots’ are according to sheriff’s department records, to predict costs for sewer project for the drain commission, and so on.
There is no set place where GIS is located within counties or municipalities. The location is dependent on the public agency’s needs. GIS may start in one department and later be moved to another department or it may be its own department. Additionally, GIS can be shared by several public agencies through a web based system. A web based system allows for public agencies to share the cost of the system as well as share information with one another.

Having information in one place allows for users to quickly retrieve information. The quick retrieval reduces the time it takes for employees to perform their job which equates to efficiency and cost savings. Some public agencies have realized the demand for their valuable information and have decided to sell their information. In so doing, the agencies generated revenue from the geographic information system. So far, mortgage, lending, real estate, and insurance industries have been the target markets.

Although the benefits of GIS are numerous, having data from many departments available in one place can become problematic. Specifically, the accuracy of the information provided and the privacy of the citizens must be carefully considered. Government agencies have been sued over inaccurate information. Also, for profit companies have used the compiled data to their benefit and to the detriment of taxpayers within the geographic information system. Both situations must be considered by public agencies when deciding what information to include, share, or sell.

When making an organizational change, such as changing department and work structures. (eg. expanding from a single computer aided design (CAD) mapping system to a true GIS), managers must be cognizant of all the factors that affect the change. This includes looking at external drivers as well as internal factors. Internally, processes, people, and technology seem to play the largest role in determining the success of implementing a fruitful geographic
information system. When bringing work under the direction of another department the processes of the department should have similarity in the nature of the work. Next, managers must realize that employees (people) may have loyalties to one manager, which may cause resistance to the change. They key to overcoming this resistance is frequent two-way communication with employees. Lastly, technology is crucial to a successful GIS. GIS is a powerful tool that requires high quality equipment. Initially, GIS requires high quality, powerful computers and software. There are costs associated with the conversion of old data. Additionally, cost may be incurred to keep the data secure. There will also be costs for training of the staff on using the new technology. The long-term benefits of a geographic information system are greater than the large upfront costs of the system.

There is never a perfect time to implement a geographic system. An organization should move forward with the organizational change when it is eighty percent certain that it wants to move in that direction. There are obstacles with any organizational change but the best thing to do is learn by doing. However, policymakers must commit to ongoing funding for the system. Otherwise, the full benefits of a geographic system cannot be realized from a partial or fragmented system.

Others that have researched the implementation of geographic information system in public agencies have done so through studies. The studies relied on observation, survey questions, and interviews. Time frames of the observations have varied from several months to several years. Instrumentation used included structured, semi-structured, and unstructured survey questions. Interviews were also conducted to obtain information, some of which were unstructured. Results of the studies reported similar outcomes. They reported that the geographic information system was a benefit to the public agencies. The obstacles in getting to
the end-product were the same as well. These included funding, technology, and human resources. Therefore, a strong commitment by leadership was required for the organizational change. Managers needed to overcome the challenges of helping employees to acquire the new skills needed for the new technology and organizational change. Each researcher commented on the importance of frequent communication, at all levels, for a successful outcome.
Chapter III

Methodology/Procedures

Research Methodology

The research method used was a qualitative program review which included a survey to all counties in Michigan, excluding Montcalm County, which totaled 82. There were also interviews with the vested department heads within Montcalm county. Being that county government is not for profit, there was also a focus on intangible benefits and rationale thereof. Hence the choice for qualitative methodologies.

Instrumentation

Primary data was collected through a survey and interviews. Interviews are the dominant data collection technique for collecting data in qualitative methodologies (Central Michigan University, 2008). The survey had twenty-one questions that were a combination of closed and open-ended inquires. The purpose of the survey was to discover if there was a prevalent GIS organizational structure that Michigan counties had in place. Additionally, the survey explored the ways counties funded their geographic information system. Further, the survey discovered whether counties with a geographic information system had external users that paid to use the system. The researcher used SurveyMonkey to create an electronic survey. The survey was open for 14 days. It asked for the name of county and the title of the respondent. However, the survey did allow the respondent to skip these two questions to allow anonymity. The survey allowed for any question to be skipped. The survey and survey questions were created by the researcher and can be seen in Appendix B on page 59.

Telephone interviews were conducted with the vested department heads to ascertain their interest and level of commitment to a change in organizational structure. The interviews were
structured with set questions. However, some of the questions were open-ended which allowed the researcher to obtain more information. The researcher developed the telephone interview questions which can be seen in Appendix B on pages 60-61.

Field Procedures

The survey was sent to one department head per county using their county email addresses. The email contained a link that directed the respondent to SurveyMonkey to complete the survey. For the telephone interviews, the respondent called the departments heads. The calls were not taped; the researcher hand recorded the responses.

Sample

The target population for the survey was Michigan county administrators. The researcher obtained names and email addresses of county administrators from the Michigan Association of County Administrative Officers’ (MACAO) website. However, not all counties have an administrator nor do all counties belong to MACAO. Therefore, for counties that the researcher could not contact through an administrator, the Register of Deeds for counties were next in line for the researcher to contact for the survey. Email addresses for the Register of Deeds were obtained through the Michigan Association of Register of Deeds’ membership information. All the email addresses used were available to the public.

The target population for the telephone interviews were Montcalm County department heads that had a vested interest in the proposed organizational change. This included, the County Controller, the Register of Deeds, the Equalization Director, and the IT Director. As these individuals work for a public entity, their phone numbers were easily accessible and they were available to the public.
Data to Be Collected and Recording Procedures

The survey was completed electronically and results were submitted to SurveyMonkey. The researcher retrieved collected data from SurveyMonkey’s website. The website recorded information received from each completed survey as an individual record and as complied data. The researcher used the coding method of categorization (Central Michigan University, 2008) for the open-ended responses. The data figures from the open-ended questions were categorized and entered in Excel to create graphs for visual presentation of the data.

Data Processing and Analysis Procedures

Once the survey data was collected from the various counties, it was reviewed and analyzed for trends. From the data collected graphs and charts were made showing the number of counties that have a geographic information system and the most prevalent department in which it was housed. The unanticipated problems associated with GIS were too few to categorize so they were displayed in a non-pictorial format, as a bulleted list.

Methodological Assumption

Because the survey was completed by one county official and involved the explicit knowledge of the interworking of several departments, there was no guarantee of the accuracy of the person’s knowledge that completed the survey. The responses were taken at face value with the assumption that the individual took the time to supply complete and accurate information.

Methodological Limitations

The survey was developed by the researcher herself. Therefore, the survey was not tested for validity or reliability. Some of the survey questions were open ended questions so that the respondent was not limited in his/her response. This was done so that as much information could be discovered as possible as each county’s offices may be structured differently.
Consequently, the researcher had to assume and/or interpret some of the responses and place them in a category based on the assumption.

**Ethical Considerations**

For the survey, there were two questions asked (Name of your county? And, Title of person responding to the survey?) that when combined one may easily ascertain the identity of said individual. Therefore, the survey did allow the respondent to skip these questions. For the telephone interviews, the interviewee was asked if their title could be used.
Chapter IV

Findings

Data Analysis Introduction

The survey was emailed to 82 counties of which 27 participated. This equated to a 32.9% response rate. 25 or 92.6% of the respondents included the name of the county. All 27 or 100% of the participants listed their position title. The survey was sent to county administrators and registers of deeds. However, of the 27 counties that responded, only 7 of the responses were from administrators and 6 were from registers of deeds, 25.9% and 22.2% respectively. The remaining 14 or 51.8% of the responses came from others that were not part of the researcher’s target population. One point to note, 1 respondent listed his/her title as Register of Deeds and Equalization Director. However, this county did not have a geographic information system.

Data Presentation and Analysis

The data from the survey was used to discover ways in which Michigan counties house and fund their GIS. The survey also presented the scope of other counties GIS as far as benefiting internal and external users. This information was discovered through the following questions: Under what department do other Michigan counties house their GIS Department? How do Michigan counties fund their GIS? Who Benefits from the GIS? Are there external customers that pay for the use of GIS? Are there any unanticipated problems you have found with GIS?

Under what department do other Michigan counties house their GIS Department?

First and foremost, the researcher needed to ascertain whether each county had a GIS Department. There was a 100% response rate to the question “Does your county have a GIS?” 92.6% or 25 of the counties that participated in the survey indicated that they had a geographic
information system. 7.4% or 2 counties responded that they did not have a geographic information system.

Table 1

<table>
<thead>
<tr>
<th>Answer Choices</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>92.59%</td>
</tr>
<tr>
<td>No</td>
<td>7.41%</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
</tr>
</tbody>
</table>

These results showed that most of the counties have a geographic information system in place. Therefore, there was relevant data to contribute to the greater question of where other counties house their GIS.

Consequently, the subsequent question in the survey was, “Under what department is the GIS located?”. There were 25 responses and 2 counties that skipped the question. Therefore, 100% of the counties that had a GIS department responded to the question. 48% of the counties housed their GIS Department under the Equalization Department. The other places that counties listed for housing their GIS were 24% in Information Technology Department, 8% had GIS as its own department, 6% in Planning Department, 4% in Community Development Department, 4% in MIS Department, 4% contracted out for their GIS, and 2% were in the Drain Commissioner’s Office. As seen in Table 2, there were some departments listed with increments of .5. This was
because 2 counties listed their GIS as being in two department. The combinations given were Planning/Equalization and Equalization/Drain Commission.

Table 2

<table>
<thead>
<tr>
<th>DEPARTMENT LOCATION</th>
<th>Percentage</th>
<th>Number</th>
<th>(2 @ .5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equalization</td>
<td>48.0%</td>
<td>12</td>
<td>2 @ .5</td>
</tr>
<tr>
<td>Information Technology (IT)</td>
<td>24.0%</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Geographic Information System (GIS)</td>
<td>8.0%</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Planning</td>
<td>6.0%</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Community Development</td>
<td>4.0%</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>MIS (not familiar with this acronym)</td>
<td>4.0%</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Contracted Out</td>
<td>4.0%</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Drain Commission</td>
<td>2.0%</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td><strong>Total Responses</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>25</strong></td>
<td></td>
</tr>
</tbody>
</table>

The results indicated that, at 48%, the Equalization Department was the dominant place where Michigan counties house their geographic information system. However, more than half of the counties (52%) had a different location for their GIS Department.

**How do Michigan counties fund their GIS?**

There were 26 responses to the question of how each county funded its GIS. The researcher did not expect to see 26 responses when a previous survey question discovered that there were 25 counties that had a GIS, not 26 (see Table 1 above). 42.31% percent of the
counties used their general fund to pay for GIS while 15.38% paid for GIS with another source. The remaining 42.31% used both the general fund and another source to fund GIS.

Table 3

The results showed that 15.38% of the counties found a way to pay for their GIS other than using their general fund. This result surprised the researcher and indicated to her that this survey question may have proved more useful if it were an open-ended question.

Do any other counties use the Register of Deeds Technology Fund to pay for any mapping technology?

All 27 of the respondents answered the question. There were 3 or 11.11% of counties that utilized the technology fund for mapping technology funding and 24 or 88.89% did not.
The result indicated that some of the counties use the Register of Deeds technology fund. However, the majority did not. The researcher expected to see more counties tapping into the technology fund to help pay for mapping technology.

**Who Benefits from the GIS?**

To ascertain who benefits from the GIS the survey had the question “What departments use the information on GIS?” There were 25 responses and the 2 counties without a GIS skipped the question. There were 42 different county departments that were identified as using the information from GIS, see Table 5. Additionally, there were 4 respondents that listed “All” one of which indicated that his/her county had 33 departments. Further, there were 2 GIS users identified outside of county departments; they were the public and townships.
The data showed that GIS was used by several departments across counties. Thus, GIS was a benefit to numerous departments within a county, if not all. The data also reflected that users outside of the county benefited from the geographic information system. Therefore, the next step was to identify others that may pay to use a GIS.

Are there external users that pay for the use of GIS?

The researcher used two questions on the survey to discover what, if any, external users utilized a county’s GIS and whether they paid to use it. There were 20 respondents that indicated there were partnership agreement with other government entities. The external agencies were townships (60%), Road Commissions, and other (30%). The respondents were limited in their

<table>
<thead>
<tr>
<th>Departments that Use GIS</th>
<th># Used</th>
<th>Departments that Use GIS</th>
<th># Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equalization</td>
<td>19</td>
<td>WRC</td>
<td>1</td>
</tr>
<tr>
<td>County Treasurer</td>
<td>15</td>
<td>Wastewater</td>
<td>1</td>
</tr>
<tr>
<td>Sheriff Department</td>
<td>11</td>
<td>Surveyor</td>
<td>1</td>
</tr>
<tr>
<td>Register of Deeds</td>
<td>9</td>
<td>Special Assessments</td>
<td>1</td>
</tr>
<tr>
<td>Drain Commission</td>
<td>8</td>
<td>Solid Waste</td>
<td>1</td>
</tr>
<tr>
<td>Health Department</td>
<td>7</td>
<td>Resource Recovery</td>
<td>1</td>
</tr>
<tr>
<td>County Clerk</td>
<td>7</td>
<td>Property Descriptions &amp; Mapping</td>
<td>1</td>
</tr>
<tr>
<td>Central Dispatch (911)</td>
<td>7</td>
<td>Physical Plant</td>
<td>1</td>
</tr>
<tr>
<td>Administration</td>
<td>6</td>
<td>Other local governments</td>
<td>1</td>
</tr>
<tr>
<td>Prosecuting Attorney</td>
<td>4</td>
<td>Mosquito Abatement</td>
<td>1</td>
</tr>
<tr>
<td>Parks &amp; Recreation</td>
<td>4</td>
<td>Land Use</td>
<td>1</td>
</tr>
<tr>
<td>Emergency Management Services (EMS)</td>
<td>4</td>
<td>Housing</td>
<td>1</td>
</tr>
<tr>
<td>All</td>
<td>4</td>
<td>House Numbering</td>
<td>1</td>
</tr>
<tr>
<td>Facilities Management</td>
<td>3</td>
<td>Homeland Security Veterans Services</td>
<td>1</td>
</tr>
<tr>
<td>Department of Public Works</td>
<td>3</td>
<td>Finance</td>
<td>1</td>
</tr>
<tr>
<td>Building &amp; Zoning</td>
<td>3</td>
<td>EDCA</td>
<td>1</td>
</tr>
<tr>
<td>Road Commission</td>
<td>2</td>
<td>Economic Development</td>
<td>1</td>
</tr>
<tr>
<td>Planning</td>
<td>2</td>
<td>Construction Code Enforcement</td>
<td>1</td>
</tr>
<tr>
<td>Information Technology (IT)</td>
<td>2</td>
<td>Commissioners</td>
<td>1</td>
</tr>
<tr>
<td>Courts</td>
<td>2</td>
<td>Building &amp; Grounds</td>
<td>1</td>
</tr>
<tr>
<td>Community Development</td>
<td>2</td>
<td>Animal Control</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Airport</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 5
answer choices. An individual from one county took the time to send a personal email to the researcher indicating that his county had agreements with cities and authorities as well.

![Chart showing partnership agreements with other government entities](image)

Table 6

The data indicated that counties with a geographic information system had agreements in place with other government entities to use the GIS. The fact that the researcher had a survey respondent reach out to her to give a better picture of partnership agreements indicated that the researcher could have possibly discovered more information if this survey question would have been open-ended.
As seen in Table 7, there were 25 respondents to the question “Is there a set fee schedule for others using the GIS?” Eighty eight percent did have a set fee schedule while 12% did not.

Table 7

The results indicated that external government agencies used a county’s geographic information system for a fee. These results were what the researched expected to find.

**Are there any unanticipated problems others have found with GIS?**

To discover problems that other counties have had with their GIS the researched had the question “Are there any unanticipated problems you have found with GIS?” as an open-ended question. 23 survey participants responded while 4 skipped the question. 18 responded that there were no unanticipated problems found with their GIS. 5 participants indicated that there were some unanticipated problems. See Table 8 for the bullet list.
Table 8

**Telephone Interviews**

Telephone interviews of the vested stakeholders of the proposed structural change were done to ascertain the level of interest bringing the GIS department under the direction of the Register of Deeds. The interviewees included the County Controller, the Register of Deeds, and the Information Technology Director. The researcher was not able to secure an interview with the Equalization Director. The following are summarizations of the interviews.

The County Controller indicated that he had an interest in moving from a single-user mapping system and creating a true geographic information system. He expressed that was willing to explore the possibility of relocating the GIS department under the direction of the Register of Deeds if a series of circumstances created the need. Specifically, he mentioned the retirement of employees. At the time of the interview, he had no preference for the location of GIS being in the Register of Deeds Office or the Equalization Department. He stated that he felt that GIS would fit well under either department. When asked if he felt there was a benefit to the
organizational change, he stated that the two departments currently have a good working relationship. His primary concern, or potential drawback, for the organizational change was the fact that the Register of Deeds is an elected position. Future Registers may not want the responsibility of the GIS system.

The Register of Deeds indicated that she was willing to explore the possibility of bringing the GIS under her department. She felt there may be potential benefits to the organizational change such as reducing the amount of duplication of work between the Register of Deeds and the Equalization Department. When asked of any perceived drawbacks to the organizational change, she stated that there may be resistance from the Equalization Department employees. With that said, she was still willing to accept the added responsibility from the proposed re-organization.

The Information Technology Director was asked if he felt there would be any benefit in moving from the single-user mapping system to a true GIS. He relayed that standardization would be a benefit. He detailed that if the county could unify all its applications and hardware platforms to single items, it would be easier to specialize and troubleshoot issues that occur. Also, the standardization would help all departments involved to better work together. The only drawback of moving to a true GIS would be the initial cost to get it started. When asked what he felt the costs for the associated hardware, software, and storage would be, he said that there were a lot of variables to consider. Several are dependent on a locally hosted solution to a "Cloud" based hosted solution. Prices ranged from a few hundred dollars a month to a few thousand depending on the total solution and products requested. From and IT standpoint, it is cheaper, in the long run, to locally host but cost more up front as the county would need to buy all hardware and software. The cloud has the benefit of passing on the hardware responsibility to a 3rd party.
but tends to cost more monthly because of this. He was unable to give specific dollar figures because there was no defined scope of parameters of the proposed GIS.

Interviews with the department heads revealed that each were interested in moving to a full-fledged geographic information system. None of them were against exploring the possibility of moving the GIS under the direction of the Register of Deeds. However, each named potential drawbacks to the organizational change. The researcher’s conclusion from the interviews was that the department heads were open minded and were willing to consider the organizational change if probable benefits outweighed potential drawbacks.
Chapter V

Summary, Conclusion, Recommendations

Summary

The data in Chapter IV presented that 92.59% of the Michigan counties did have a geographic system in place. The geographic information system was housed in a variety of locations. The dominant location was the Equalization Department at 48%. However, a larger percentage overall (52%) housed it in another department. Of the other departments that housed the GIS, none were under the direction of the Register of Deeds. However, one of the survey respondents listed their title as Register of Deeds and Equalization Director but designated that his/her county did not have a GIS.

In looking at ways that GIS was funded, 42.31% of the counties used their general fund to pay for GIS while 15.38% paid for GIS with another source. The remaining 42.31% used both the general fund and another source to fund GIS. A small percentage (11%) of Register of Deeds used their technology fund to pay for mapping technology. 80% of the counties that had a geographic information system had a partnership agreement in place with external governmental agencies. Of those, 88% received money from the partnership agreement.

The data showed that many users benefited from the geographic information system. There were 42 different county departments that were identified as users of the geographic information system. This displayed the diversity and breadth of the benefits of a geographic information system. External government agencies, such as townships and road commissions, benefited from the GIS as well. The researcher acknowledged that additional public agencies may have been discovered if the researcher would have used more open ended questions. As it
was, one survey respondent emailed the researcher to explain that cities and authorities benefited from the county’s GIS as well.

The data obtained from the survey was qualitative in nature and showed that there were many benefits associated with GIS. It was the researcher’s observation that the benefits of GIS outweighed the drawbacks of it. Most survey respondents indicated that there were no problems found with their GIS. However, 21.7% of the counties had encountered unanticipated problems with GIS.

From telephone interviews, it was revealed that the Montcalm County Controller, Register of Deeds, and the Information Technology Director at Montcalm County all had an interest in moving towards a full-fledged GIS. The Controller and Register of Deeds were both willing to explore bringing the GIS system under the Register of Deeds. The Controller was fine with the current organizational structure but could see the GIS working well in the Equalization Department or the Register of Deeds office.

Both the Controller and the Register named a potential drawback that could occur with the change in organizational structure. The fact that the Register of Deeds is an elected position and may change every four years was a concern to the Controller. Whereas, the Register of Deeds cited resistance from employees as a potential drawback to the organizational change. A drawback that the Information Technology Directory specified was the initial costs of switching to a full-fledge GIS. However, he felt that the long-term benefits would outweigh the costs.

Conclusions

Obermeyer, Ramasubramanian, and Warnecke’s (2016), claimed that GIS has become common in public agencies throughout the United States was supported by the researcher’s findings that 92.59% of the Michigan counties that responded to the survey had a GIS in place.
More than half (52%) of those counties housed the geographic information system in a location other than the Equalization Department. Although the Register of Deeds office was not found to be one of the locations, the researcher concluded that GIS locations varied and could work in multiple locations.

The researcher determined that the benefits of a full-fledged GIS were realized by most, if not all, departments within a county. Data from the survey showed that 42 different county departments in Michigan used GIS. This supported Kalnins and Sullivan’s (2003) claim of the potential scope of a county geographic information system. Hokanson (1994) relayed that a GIS helped county commissioners to pass a ballot proposal by pooling information from four separate departments and making it available to taxpayers.

The Controller and Register of Deeds each expressed that they would consider the researchers proposed organization change of bringing the full-fledged GIS Department under the direction of the Register of Deeds. The Information Technology Director indicated that there were possible benefits, from a technology standpoint. However, the Controller and Register of Deeds did voice a concern to the proposed change.

The Register of Deeds concern was that the Equalization Departments’ employees may display resistance to the change. According to Lewis (1998), her concern is valid. Lewis (1998) maintained that organization change is common but may cause tension among employees. Further, that employees may exhibit loyalty towards one manager and hostility towards another. Král & Králová (2016) found that communication is the key to any successful change. They found a positive correlation with the frequency of communication, both top-down and bottom-up, to desired and positive organizational change.
The Controller’s concern with housing GIS under the direction of the Register of Deeds was that the Register of Deeds is an elected position and that future registers may not be willing to take on the added responsibility. His concern is valid and understandable. However, if a future Register of Deeds does not want to oversee the GIS Department, it could be relocated as other counties and municipalities have done. Per GIS in Local Government (2005), a geographic information system may start in one department but be relocated as needs change, or it may become its own department due to an increase in the usage.

Somers (1991) stated that for the complete potential of a geographic information system to be realized there must be multiple participants within local government. Further, partnerships agreement required a lot of effort to implement but were worth the work because of the benefits achieve in cost sharing and inter-organizational operations. Data from the researcher’s survey supported Somers’ (1991) claim with 80% of the counties having partnership agreements with other agencies. The researcher concluded that the partnerships agreements were beneficial to the counties and the external agencies.

Recommendations

This feasibility study was conducted to discover the potential benefits in an organizational structure change in creating a full-fledged GIS under the direction of the Register of Deeds. The researcher recommends that the County Commissioners make the move to a full-fledged geographic information system. Research of other studies as well as the data collected from Michigan counties indicated that many, if not all, departments benefited from a GIS.

The Register of Deeds expressed that she would be willing to accept the added responsibility of bringing the GIS department under her office. She felt that in doing so there may be increased efficiency with the proposed organization change as there would be a reduced
amount of duplication of work that exists within the current organizational structure. The researcher recommends that the Commissioners capitalize on the opportunity to create a full-fledged GIS. There are many other intangible benefits other than the reduced duplication of work between the Register of Deeds office and the Equalization Department that a true GIS can provide. There may be a need to relocate the GIS Department in the future. However, in the foreseeable future the County could benefit from getting a full-fledge GIS up and running.

As funding is typically the largest hurdle to overcome (Artigas, Elefante, & Marti, 2009), Montcalm County should explore the interest of other government entities in creating a partnership. Partnerships with other public agencies may help to fund the geographic information system. Other Michigan counties have successfully implemented partnership agreements; therefore, partnerships are a viable possibility to supplement funding. Additional funding may come from The Register of Deeds’ technology fund as she expressed that she would support using the technology fund for mapping technology. Fifteen percent of the surveyed counties reported that they used a funding source other than their general fund or the Register of Deeds’ technology fund. Therefore, the researcher suggest that a further study may be necessary to fully discover ways other counties funded their geographic information system.
References


General Property Tax Act, MCL 206 § 211.34 (1893).


Lewis, B. (1998). Reorganizing is a common solution to problems, but it often causes more trouble. Infoworld, 20(17), 112.


Revised Judicature Act, MCL 236 § 600.2568 (1961).


Appendices

Appendix A – Survey Cover Letter

March 1, 2017

Dear Participant:

My name is Catrina Woodruff and I am a graduate student at Central Michigan University. For my final project, I am examining the feasibility of bringing a Geographic Information System (GIS) under the direction of the Register of Deeds Office in Montcalm County, Michigan. Because you are another Michigan county, I am inviting you to participate in this research study by completing the attached survey.

The following questionnaire will require approximately fifteen minutes to complete. There is no compensation for responding nor is there any known risk. In order to ensure that all information will remain confidential, please do not include your name. Copies of the project will be provided to my Central Michigan University instructor and to the Register of Deeds, the County Controller, the Equalization Director, and the Board of Commissioners of Montcalm County. If you choose to participate in this project, please answer all questions as honestly as possible and return the completed questionnaires promptly through Survey Monkey on the link provided. Participation is strictly voluntary and you may refuse to participate at any time.

Thank you for taking the time to assist me in my educational endeavors. The data collected will provide useful information regarding how other Michigan counties allocate their resources. If you would like a summary copy of this study please send me an e-mail request. Completion and return of the questionnaire will indicate your willingness to participate in this study. If you require additional information or have questions, please contact me at the number listed below.

Please note that if you are not satisfied with the manner in which this study is being conducted, you may report (anonymously if you so choose) any complaints to the MSA Program by calling 989-774-6525 or addressing a letter to the MSA Program, Rowe 222, Central Michigan University, Mt. Pleasant, MI 48859.

Sincerely,

Catrina Woodruff
Woodr1cm@cmich.edu

Dr. Calvin Lathan
Latha1ca@cmich.edu
Appendix B – County Survey Questionnaire

Name of your county________________________
County Population__________________________
County size (geographically) ___________________
Title of person responding to the survey______________

1) Does your county have an abstract office?
   Under what department is the Abstract Office located?
   Does the Abstract Office draw out legal descriptions in map form?
   Hand drawings? Computer aided drawings?

2) Does your county have a GIS?
   Under what department is the GIS located?
   Why was GIS located there?
   What departments use the information on GIS?
   Is the GIS paid for by the general fund or by another source(s)?
   Are there partnership agreements with other government entities?
      Townships Health Dept. Road Commission
      Schools districts EMS Other:
   If there are partnerships, is there a formal policy for deciding what projects take precedence? Is there a set fee schedule?
   What software is used by the GIS?
   Are there any unanticipated problems you have found with GIS?

3) Is the Register of Deeds technology fund used to pay for any mapping technology?
   If so, how did you feel mapping would help in the Register of Deeds Office?
   Do you index legal descriptions by Qtr/Qtr, Section, Town, and Range or Subdivision, lot, and block on ALL documents recorded by the Register of Deeds?
   Can the public search by legal description?
Hello, my name is Catrina Woodruff and I am a graduate student at Central Michigan University. I am conducting research on a Feasibility Study of Bringing the GIS (Geographic Information Systems) Department Under the Direction of the Register of Deeds/Abstract Office in Montcalm County, Michigan. This research will fulfill my master’s degree requirements. You were selected to participate in this study because you are a supervisor to an office that would be affected by the organizational change my study will be looking at. Participants must be age 18 or older. Please verify if you meet this criterion.

I anticipate that this survey/interview will take less than 15 minutes to complete. There is no compensation for responding nor is there any known risk. In order to insure that all information will remain confidential, I will not record your name. I will only record you as to what you give me permission to (title, or administrator A, B, C, or etc.). Copies of the project will be provided to my Central Michigan University faculty monitor and the Montcalm County Commissioners, the County Controller, the Register of Deeds, and the Equalization Director. Participation is strictly voluntary and you may refuse to participate at any time.

I appreciate your willingness to help with my project. The data collected will provide useful information regarding your thoughts and insights on the feasibility of the organization structure change. If you would like a summary copy of this study please let me know at the end of the survey/interview and I will add your name to a list that I will maintain separately from my survey/interview notes. If you have questions later, please contact me at 989-330-2568. My faculty monitor is Dr. Calvin Lathan and he can be reached at 904-307-8796.

If you are not satisfied with the manner in which this study is being conducted, you may report (anonymously if you so choose) any complaints to the MSA Program by calling 989-774-6525 or addressing a letter to the MSA Program, Rowe 222, Central Michigan University, Mt. Pleasant, MI 48859.

Let’s begin with the first question.

**Register of Deeds:**

May I refer to you by your title in my paper?

Would you be willing to explore the possibility of the organizational change of moving a GIS Department under the direction of the Register of Deeds?
Do you feel there would be any benefits of the organizational change?

Do you feel there would be any drawbacks to the organizational change?

Would you be willing to accept the added responsibility of the GIS?
Would you support using the Register of Deeds technology fund to support the proposed change?

**County Controller:**

May I refer to you by your title in my paper?

Do you and/or the Board of Commissioners have an interest in moving from a single-user mapping system and creating a true GIS?

Would you be willing to explore the possibility of the organizational change of moving a GIS Department under the direction of the Register of Deeds?

Do you feel there would be any benefits of the organizational change?

Do you feel there would be any drawbacks to the organizational change?

**Equalization Director:**

May I refer to you by your title in my paper?

Do you have an interest in moving from a single-user mapping system and creating a true GIS?

Would you be willing to explore the possibility of the organizational change of moving a GIS Department under the direction of the Register of Deeds?

Do you feel there would be any benefits of the organizational change?

Do you feel there would be any drawbacks to the organizational change?

**IT Director:**

May I refer to you by your title in my paper?

If Montcalm County were to move from a single-user mapping system to a true GIS, what do you feel the costs of the associated hardware, software, and storage would be?

As far as information technology is concerned, do you feel there would be any benefits of the organizational change?

Do you feel there would be any drawbacks to the organizational change?
Appendix D-Permission Letter

Research Review Application approval/C. Woodruff
GD
Gribben, Kimberley D

Reply all | Thu 2/16, 5:00 PM

Action Items

Hi Catrina:

Your Research Review Application has been reviewed and approved. You may start your data collection. This approval will not expire as long as your topic and methodology remain unchanged. If your topic or methodology changes, please submit a new Research Review Application and supporting documents to your instructor by e-mail.

Please contact your instructor if you have any questions. Also, be sure to check with your instructor concerning the due dates for your project.

Good luck with your project. This is the only notification you will receive. Please keep a copy for your records.

Kim Gribben
Assistant Director, MSA Program

WARNING: This message (including any attachment) may contain confidential information and is intended only for the individual(s) named. Please do not distribute, copy, or forward this e-mail without the permission of the sender. Please notify sender if you have received this e-mail by mistake and delete it from your system. Thank you.