CALIFORNIA STATE UNIVERSITY
MONTEREY BAY

OPEN SOURCE SOFTWARE USE IN MUNICIPAL GOVERNMENT: IS FULL IMMERSION POSSIBLE?

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David J. Ward

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Capstone Advisor, Signature_____Date _____

Capstone Instructor, Signature_____Date _____

Capstone Instructor, Signature_____Date _____

Program Coordinator, Signature_____Date _____

Program Coordinator, Signature_____Date _____

Abstract

This research investigates if it is possible from an organizational perspective for small to medium-sized cities to provide services and conduct business using only open-source software. We examine characteristics of municipal government that may influence the adoption of open-source software for the delivery of services and to conduct city business. Three characteristics of municipal government are considered to develop an understanding of city behavior with respect to open source software: capability, discipline, and cultural affinity. A city's capability to deploy open-source software is influenced by the technical staff and budget pressures. The level of discipline a city exhibits will influence the success of OSS deployment. The cultural affinity toward or against open-source software will influence whether a city will consider open source as an alternative to commercial software. This may be the most significant factor in the adoption of open source software by cities. The goal was to determine what organizational characteristics promote the adoption of open-source software and which characteristics influence municipal governments to choose commercial software.

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1.0 INTRODUCTION

All city governments seek to deliver services in the most efficient manner possible. Whether in direct support of service delivery or support of conducting the business of government, Information Technology (IT) has become and integral component of operations at all levels of government.

In the past 5 years there has been a trend by some national, regional, and local governments toward use of open source software (OSS) and open standards as a first choice rather than a curiosity. Recently, The Netherlands has mandated that all national government agencies will use open standards formatted documents by April 2009 (Associated Press, 2007). The U.S. Navy has clarified the category and status of OSS to promote a wider use of OSS to provide seamless access to critical information (Carey, R., 2007). Congress is recognizing the potential value of OSS in the National Defense Authorization Act for fiscal year 2009. OSS is identified as an objective in the procurement strategy for common ground stations and payloads for manned and unmanned aerial vehicles, and in the development of technology-neutral information technology guidelines for the Department of Defense and Department of Veteran Affairs.

Small to medium size cities, populations less than 500,000 (Henderson, 1997), may have serious limitations in funding IT efforts. Escalating costs of service delivery coupled with reduce revenue will force governments to seek novel ways to reduce operating costs.

With limited revenue their budgets seem to force cities to under fund IT infrastructure in favor of applying resources to increasing labor requirements to deliver services. Careful and deliberate selection of IT solutions can reduce the labor required for service delivery freeing that labor to be harvested for other purposes or to be eliminated.

As will be seen in the literature survey below there has been considerable research in to e-government and the development of models to explain e-government maturity. There as also been ample studies of the trends in adoption of OSS by government at various levels. There seems to have been little research into the characteristics of regional and local government that would promote adoption and successful deployment of OSS.

E-government, employing IT to delivery services, has the potential to reduce costs and improve service delivery. E-Government is discussed in greater detail later in this section.

The support of city leadership and management as well as the IT staff, are required for successful adoption of any technology, not just OSS. As Gichoya (2005) observed; vision, strategy and government support are important for success of IT projects, while insufficient funding and poor infrastructure are major factors for failure. This research focused on the perspectives of city leadership, management, and IT staff with respect to OSS and its adoption. While OSS was the focus, the approach used in this study can be applied to investigating the adoption of most technologies or practices.

1.1 LITERATURE REVIEW

1.1.1 Related Research

The literature review revealed little research with similar characteristics of this study. While much literature can be found on OSS in a wide variety of topics ranging from application comparison studies, economic benefits, enterprise adoption, developing country adoption, development theories, OSS community development, developer motivations, commercialization of OSS, and more, the body of research covering municipal OSS adoption

is relatively limited. Of the literature found relating to OSS adoption by government, a significant portion of that work examines the adoption of OSS by developing countries.

A fair number of studies have been conducted to examine the extent to which government entities are using OSS. The studies tend to collect, categorize, and report the current state of open source adoption. (Mtsweni and Biermann, 2008;Castelnovo and Simonetta, 2007). A study of Finnish municipalities (Välimäki, Oksanen, and Laine, 2005) had a methodology similar to the methodology we used in this study. While the Finnish study considered only IT managers as survey subjects, our survey considered city leaders, managers, and IT staff for subjects, as our focus is examining organizational behavioral influences on OSS adoption rather than technical and budgetary influences.

Government policies regarding open standards may influence the rate of OSS adoption. Politics influences the adoption of open standards. An open standards policy requires a knowledgeable and committed support based (Shah & Kesan, 2007). Adopting open standards can help reduce vendor "lock-in" as, in the case of document formats, open standards provides increased application/product choice, while proprietary standards is a limiting factor reducing product choice.

In the current economic climate government at all levels are facing funding crises as costs of operations increase and revenue decreases. The question of what can be done to reduce IT operating costs is now a very important one. Thorbergsson, Björgvinsson, and Valfells (2007) conclude that there are more benefits to using OSS than just reduced acquisition costs. Restrictive licensing, vendor lock-in, and high switching costs can be eliminated, which, in the long term, also may reduce costs.

1.1.2 OSS, CSS, and COSS

The basic difference between OSS and closed source software (CSS) is source code is provided with OSS. Commercial open source software (COSS) is commercial software which the developer provides the source code under an open source license. For closed source software, usually commercial software, the source code is considered proprietary intellectual property, which the developer must protect to establish or maintain a competitive advantage.

OSS gives users the right to use, revise, change, and improve the software to suit their needs. (Open Source Initiative, 2005). However, OSS is increasing becoming feature rich and operationally stable, so much so that the primary advantage is that it is free to acquire. Although users can modify OSS if they choose, it is not necessary in order to benefit from using OSS.

OSS may also be commercial software, generally referred to as commercial open source software. Many companies have undertaken strategies to capitalize on the open source movement (Lerner & Tirole, 2005). While some COSS is made available under the same license models as OSS, many COSS products have restrictions on its use and distribution. Some COSS severely limits the capability of the free version requiring users to purchase an enhanced version of the software or add-on features to experience the full capability of the product. An example of this model is Zimbra, a provider of messaging and collaboration software. Zimbra offers five editions of its collaboration suite software. All editions come with the source code. However, the free edition is functional but very limited in capability.

1.1.3 User knowledge

The level of knowledge of a user with respect to OSS and CSS will influence their decision to use OSS.

> There are two typologies of consumers: a) the ”informed” users, i.e. those who know about the existence of both CSS and OSS and make their adoption decision by comparing the utility given by each alternative, and b) the ”uniformed” users, i.e. those who ignore the existence of OSS and therefore when making their adoption decision consider only the closed source software. (Comino, et al. 2004)

We can apply this observation to municipal organizations. The informed municipal organization, which knows about the existence of open-source alternatives to commercial products, may make adoption decisions based on the value provided by each. The uninformed organization either ignores the existence of open-source alternatives or is unaware of OSS alternatives to commercial products. The uninformed organization may have misperceptions of OSS. These misperceptions may include OSS usability, deployment, and support. A common misperception is that an organization must have a programmer on staff in order to deploy and maintain OSS. While in the distant past within the open source era, that may have been true, the current maturity of most open source applications may require only a competent IT technician.

Organizations that approach IT decisions in a deliberate and informed manner will choose solutions that provide the best value to their organization. These solutions increasingly include OSS products.

1.1.4 E-Government

A discussion of E-Government is necessary to provide context for this research effort. In the early years of the Internet much theory was developed with respect to government use of IT to delivery services, conduct the business of government, and reach constituents.

E-government is a concept that has several forms; each form services a different class of government customer. Government-to-citizen (G2C) generally provides access to government information and services. Access to government services is usually provided through a portal. Government-to-Employee (G2E) provides employees access to information and services to effectively communicate with employees with the goal of enhancing productivity. Government-to-Government (G2G) supports interagency and intergovernmental interaction by providing technologies and services to facilitate information exchange and sharing. Government-to-Business (G2B) provides capability for government to interact with businesses that provide goods and services. (David L. McClure, 2001). E-Government is a permanent commitment by government to improve the relationship between the private citizen and the public sector using ITC (Chen, 2006).

Many observers see e-Government in the near future as an enabler for better governance (Manuel Baptista, 2005). While developed countries have implemented a broad array of e-Government projects and services, developing countries are still far behind in implementing e-Government (Gichoya, 2005).

Government has an obligation to offer services universally (health care or primary schools) or to specific eligible groups (socially marginalized or elderly citizens). Therefore, service provision cannot be premised on a clients' ability to use the Internet as a means for communicating with the government to obtain services (Henriksen, 2006). Government must continue to serve all constituents regardless of their ability to access e-Government services.

Implementation of technologies to support e-Government efforts in its self does not guarantee success (Ebrahim & Irani, 2005). Organizations must change to embrace the new technologies in order to use them effectively (Murphy, 2002). E-Government cannot be achieved by just simply implementing available software (Alpar, 2005). Fundamental differences between the public and private sectors influence the rate at which ICT is employed (Swedberg, 2003). The real opportunity is to use IT to help create fundamental improvement in the efficiency, convenience and quality of service (Borras, 2004).

The Internet has enabled governments to deliver services and interact with citizens, businesses and other government organizations (Janssen, 2004). Although e-Government has gain momentum world wide, a low level of attention is paid to sustainability of e-Government strategies and structure in most efforts. (Aichholer, 2004). Most e-Government implementation efforts focus on service delivery concerns with little emphasis on real transformation of the service (Chau & Gerald, 2005). Implementing e-Government as a major development can be a daunting task, since it can involve many factors of risk that could threaten the success of the project (Evangelidis, 2004). Government organizations are not that different from private sector organizations as they are essentially comprised of similar people and resources (Mitchell, 2001). However, the fundamental different between the public sector and the private sector is the customer. Providing a service or product to the customer at a profit drives the private sector. The private sector is not driven by profit to implement a service, but by directive or law, which sometime places no requirement on quality of the service, only, that the service is implemented.

The effectiveness of services provided by city governments can be measured in many ways. Developing metrics with an empirical approach may only provide a glimpse of a service's effectiveness through an artificial lens of collected data. The perceived effectiveness of a service can be influenced by the public's view of the social and cultural

implications of the technologies and services. (Asgarkhani, 2005). Future models of democracy are very open and almost all technologies can be used for implementation of e-Government (Keskinen, 2004).

Information and Communication Technologies (ICT) have become the foundation of modern society. How the general public communicates with each other, with business, and with the government, as well as how business communicates with customers, other business, and the government, and how government communicates with the public, with business, and with other governments relies on heavily on ITC. Governments are increasing the use if ICT in the area of law enforcement giving rise to the concept of e-Enforcement (Koopmans-van Berlo, 2004). Strategic use of ICT in government can have a critical impact on the private sector (Andersen, 2006).

The study of e-government has emerged as a distinct, multidisciplinary research field in its own right (Dillon, E, & Chen, 2006). Much research has been conducted in the area of e-Government. The field of e-Government is still nascent and provides great opportunity for research

1.2 IMPORTANCE OF THIS RESEARCH

Cities strive to provide services in an efficient cost effective manner. For cities seeking to reduce IT costs or provide more services at current funding levels, OSS may be a viable alternative to commercial software solutions.

A significant influence on the decision process for implementing and deploying IT is the budget that has been allocated for a project. Rarely will an organization start a project with an open-ended budget. However, IT projects rarely finish under budget and on time. In today's climate of increasing costs and decreasing revenues, cities should not ignore cost-effective viable alternatives to commercial IT products.

The rise in fuel costs during 2008 demonstrates that unexpected increases in the resources needed by cities to deliver services can introduce unexpected fiscal burdens. Cities with large fleets of service vehicles can be seriously impacted when gasoline prices spike.

For some communities that relied on the growth of housing, the subprime mortgage meltdown of 2007 and 2008 has had a great impact on revenue as housing developers terminate development projects and lenders forced foreclose on delinquent mortgages.

Given a choice between cutting the budget for law enforcement or safety services and IT services, cities will cut the IT budget first.

Municipal government may not have the option to raise taxes to increase revenue to cover budget shortfalls. Cities may need to seek novel ways to reduce their budgets. Where appropriate, deployment of OSS solutions can aid financially strapped cities in meeting service delivery needs within budget constraints.

2.0 PROBLEM STATEMENT

This research seeks to understand the characteristics of municipal organizations with respect to the adoption of OSS. Specifically, we look at three dimensions of municipal organizations in the context of IT and OSS; capability, discipline, and cultural. For a city to successfully adopt a new technology it must have the capability, discipline, and cultural affinity conducive to adopting the technology. This follows for the adoption of OSS. Cities must have the technical capability or IT support infrastructure that can implement and deploy OSS. Cities must demonstrate organization discipline and a commitment to IT adoption, deployment, and support. Lastly, cities must have a culture that embraces adoption of new technologies. In the context of this research effort, the culture of a city must be open to the use of OSS as an alternative to commercial software.

Figure 1 depicts the relationship of the three domains. A city with characteristics in

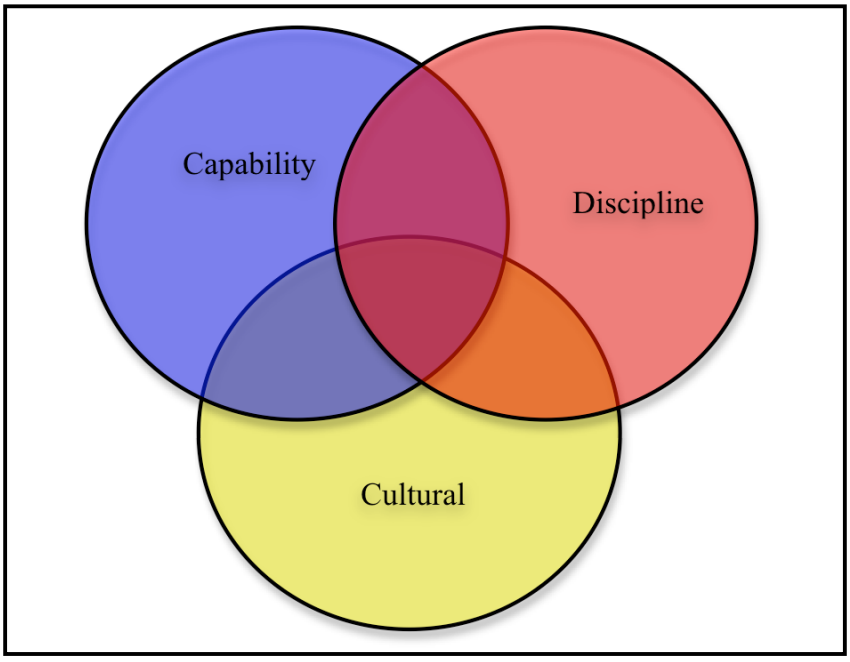

Figure 1 Municipal Characteristic Relationships

the three domains will fall in the intersection and will be in a better position to successfully deploy open source technologies.

When the capability, discipline, and cultural affinity are high, it is more likely a city will be able to successfully adopt and deploy OSS. When the capability, discipline, and cultural affinity are low, it is less likely a city will be able to successfully adopt and deploy OSS. A city with a low level in one of these dimensions, even when the other two dimensions are very high, will still be less likely to successfully adopt and deploy OSS. A city with high capability, and discipline, but low cultural affinity, will not be a candidate for successful adoption and deployment of OSS. All three dimensions, capability, discipline, and culture, must be at a high level for successful adoption of OSS.

2.1 PROBLEM SCOPE

This research effort focused on studying the characteristics necessary for cities to successfully adopt OSS. Software products, both OSS and commercial, were not examined in this study. Some software domains have OSS and commercial product solutions while others domains are devoid of open source solutions. For example, Office Productivity software has OSS and commercial offerings; Open Office (OSS) and MS Office (commercial) are two examples. However, the city planning software product domain appears to have only commercial solutions as well as the municipal resource management software domain.

2.2 RESEARCH QUESTIONS

The following research questions were generated:

1. Is it possible for small to medium cities to use only OSS to deliver services and conduct city business?

2. Do cities have the necessary organizational characteristics to adopt and use only OSS to deliver services and conduct city business?

3. What are the basic IT capabilities of cities? Do these capabilities support the adoption and deployment of open source technologies?

4. Do cities plan and budget for IT in a deliberate manner that would support the adoption and deployment of open source technologies?

5. Does the organizational culture of cities promote the adoption of open source technologies?

2.3 NULL HYPOTHESIS

The following null hypotheses were generated from the research questions.

1. Small to medium sized cities are not able to use only OSS to deliver services and conduct business.

    a. Small to medium sized cities do not have the prerequisite capabilities to adopt OSS for the delivery of services and to conduct the city's business.

    b. Small to medium sized cities do not have the prerequisite discipline to adopt OSS for the delivery of services and to conduct the city's business

    c. Small to medium sized cities do not have the cultural affinity to adopt OSS for the delivery of services and to conduct the city's business .

2.4 HYPOTHESIS

1. Small to medium sized cities are able to use only OSS to deliver services and conduct business.

    a. Small to medium sized cities have the prerequisite capabilities to adopt OSS for the delivery of services and to conduct the city's business.

b. Small to medium sized cities have the prerequisite discipline to adopt OSS for the delivery of services and to conduct the city's business.

c. Small to medium sized cities have the cultural affinity to adopt OSS for the delivery of services and to conduct the city's business.

3.0 METHODOLOGY

This chapter describes the methodology used for this research. We begin by describing in general the process, followed by the survey design, survey execution, and subject selection.

3.1 HOW RESEARCH WAS ACCOMPLISHED

A survey was conducted to collect data from municipal IT managers, IT staff, city leadership, city management, and city employees. The survey was administered online using SurveyMonkey.com. The collection period was initially scheduled for 30 days from June 1, 2008 through June 30, 2008.

3.2 SURVEY DESIGN

The survey required soliciting responses from subjects to provide insight into the characteristics of their cities with respect to IT capability, organizational discipline, and cultural affinity to OSS. Presenting direct questions would not produce useful data as subjects may not have the requisite knowledge in the subject areas.

One goal in the design of the survey was to reduce the number of aborted attempts by subjects. An aborted attempt is the failure to complete the survey once started.

We identified 6 subject classifications listed in Table 1.

These classifications were used to tailor the set of questions presented to the subject. Some survey questions were specific to IT managers and staff while all subjects could answer other questions. For example, questions regarding IT deployment such as numbers of servers and operating systems were deemed in appropriate for City Leadership and City Management subjects, as these questions are not in their domain. Other questions such as knowledge and awareness of OSS apply to all subjects.

Table 1 Subject Classifications

IT Manager	Chief Information Officer, Chief Technology Officer, Network Manager, Information Technology Manager, or other technology management positions responsible for managing IT personnel and IT resources
IT Staff	Computer Technician, Network Administrator, and others responsible for the installation and support of a city' information technology
City Leadership	Elected city officials
City Management	City manager, administrator, department head, and other positions responsible for managing city administration and operations
City Employee	An employee of the city not IT manager, IT Staff, City Leadership, or City Management
Other	None of the above

All survey questions were framed in the context of the subject and their perception of their city. This is an important aspect of the design as the survey questions solicit information that indirectly relates to the research questions.

Appendix D, Survey Design, lists each survey question with a short explanation of the rationale for each.

3.3 SUPPORT OF HYPOTHESIS IN THE RESEARCH DESIGN

The survey was divided in to four sections. The first three sections relate directly to the research hypothesis, the fourth section solicits demographic information.

The first section of the survey solicits responses related to the city's IT capability. The questions in this section address the capability dimension characteristic of cities.

The second section solicits responses related to the city's IT strategy addressing the discipline dimension characteristic of cities.

The third section solicits responses related to the subject's perspectives and opinions about IT and OSS and the subject's impression of the city leadership, management, and IT

staff's perspectives of IT and OSS. These questions are intended to reveal the city's cultural affinity to the adoption of OSS.

3.4 SURVEY EXECUTION

3.4.1 Announcement Strategy

For the announcement strategy we used three channels to contact potential subjects; municipal associations, magazines related to city management, and direct e-mail.

3.4.1.1 Municipal Associations

Municipal associations were thought to be the best vehicle for reaching the survey subjects. The rationale behind this was the belief that individuals affiliated with municipal associations might be more inclined to respond to a survey announcement received from their municipal association. The expectation was that the greatest number of responses would result from these. Individuals affiliated with municipal associations may also have greater interest in supporting this research as they may see a potential benefit for their city.

The researcher contacted 116 municipal associations requesting assistance with announcing the survey. The municipal associations appears in Appendix A. Of the 116 municipal associations contacted, 28 associations approved the request for assistance and forwarded the announcement to their members, 4 declined. We received no response from 84 of the associations.

The municipal associations were identified via a search of the Internet. Most of the associations found were regional providing representation within a county, multi-county, state, or multi-state area.

Each municipal association was sent an initial survey announcement with a reminder sent within seven days of the initial announcement.

3.4.1.2 Magazine Announcement

Announcing the survey through a magazine was deemed to have potential for generating significant level of exposure for those subjects who are more likely to read magazines. Several magazines were contacted for assistance to announce the survey. Two magazines responded, the Next American City Magazine and American City and County Magazine. The Next American city magazine provided a half page ad space to announce this survey. American City and County Magazine announced the survey in an article posted on the front page of its website. The advertisement and article are included in Appendix G. The number of potential exposures from the Next American city magazine advertisement was estimated to be 40,000 based on the published circulation statistics for the magazine. The number of exposures through the American City and County Magazine website was not determined. Although the potential exposure was thought to be high, the magazine announcement channel only produced 1.0% (20) of the survey responses.

3.4.1.3 Direct Email to City Personnel

To reach the greatest number of potential subjects a direct e-mail approach was used. Direct e-mail has proven to be a very effective means of reaching the greatest number of survey subjects.

Individuals were contacted via email addresses harvested from municipal websites. A commercial email-harvesting program, Email Spider (www.gsa-online.de), was used to collect the municipal email addresses.

The collection process harvested over 80,000 email addresses from the municipal websites. Invalid email addresses, those not associated with a city government, were excluded to produce a set of 60,000 addresses to which the announcements were sent.

Survey announcements were emailed to the potential subjects over a two-week period. Reminder emails were sent within seven days of the initial announcements. Kaplowitz & Kadlock (2004) found that survey responses could be increased with a reminder email that includes more than just a link to the survey. With this in mind the reminder email included the original announcement text with an introductory paragraph explaining the email was a reminder.

3.4.2 Duration of Collection

The collection period defined in the research design was for one month running from June 1, 2008 through June 30, 2008. Toward the end of the collection period, between 18 and 25 June, the response activity maintained a significant level (an average of 143 per day) prompting this researcher to extend the collection period 15 days ending on July 15, 2008. Additionally, many automated email responses indicated the recipients were on vacation during the month of June. In the days following distribution of the initial survey announcement email and reminder emails increased response activity was observed. The researcher anticipated response activity would increase during the first part of July as potential subjects returned from vacation. Figure 2 presents the daily response rate during the collection period.

During the extended collection period 1443 response were collected, 43.5% of the 3316 total responses. The extension resulted in an additional 839 valid survey responses above the 1221 valid responses collected from 1-30 June.

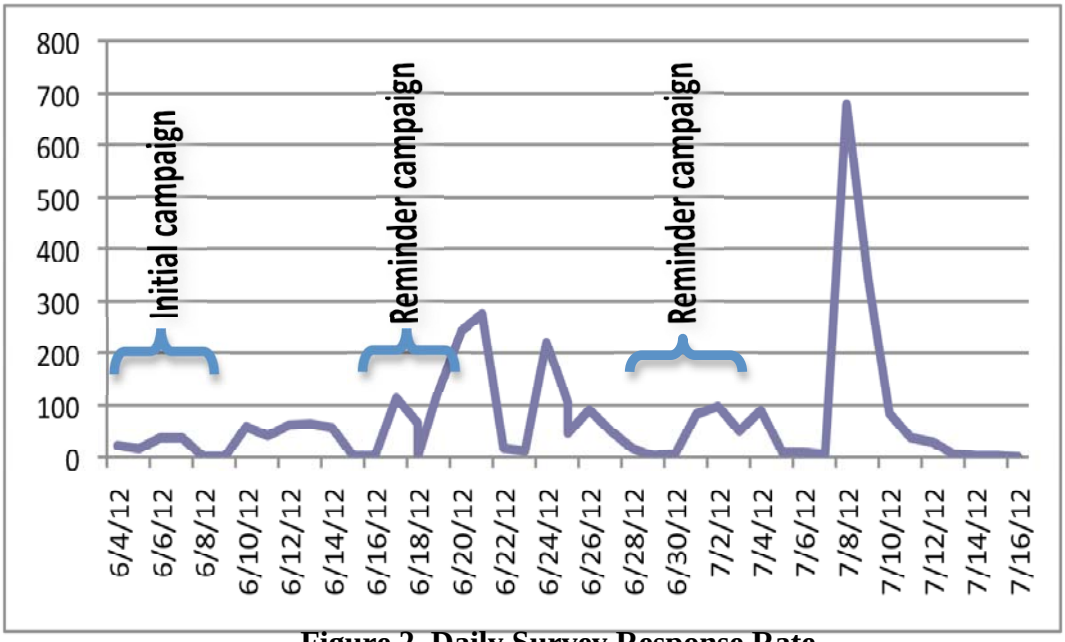

Figure 2. Daily Survey Response Rate

4.0 SURVEY RESULTS

The total estimated exposures to the survey announcement are in excess of 60,000. An exposure for the purpose of this study is defined as the delivery of a survey announcement to a potential subject. Several factors prevent an accurate tally of total survey announcement exposures. We did not have access to the membership numbers for the municipal associations that forwarded the survey announcement or access to the web site page hit counts for the article on the magazine website.

Of the 60,000 emails sent directly to city leaders, managers, and employees, 53,900 may have reached their addressee. 6,100 of the original 60,000 email announcements were returned as undeliverable, a non-existent address, or reported by an email server as “spam”.

A total of 3316 individuals responded to the survey announcement, of which 60.3% (2002) respondents completed the survey. The response rate for the survey is 5.9% for all responses and 3.7% for completed surveys.

The number of distinct cities in this complete survey response set was 1286. Respondents were requested to provide their Zip/Postal Code as part of the demographic data. To provide the subject with an opportunity to preserve anonymity the zip code was optional. 267 respondents chose not to provide their city zip code.

4.1 THE SAMPLE SET

The sample set was reduced to include cases from cities with populations less than 300,000 and an indicated primary duty of IT Manager, IT staff, City Leader, or City Manager. While the survey data included responses from cities with populations greater than 300,000, those responses were too few in number to permit valid analysis. Reponses from city employees and others (not affiliated with a city) were excluded from the sample set used for analysis. The responses from city employees had very limited or no value as these

subjects had little knowledge of city IT capability, strategy, or the views of the city leadership, management, and IT staff regarding OSS. These criteria produced a sample set of 1404 cases. Figure 3 presents the distribution of primary duty of cases in the sample set.

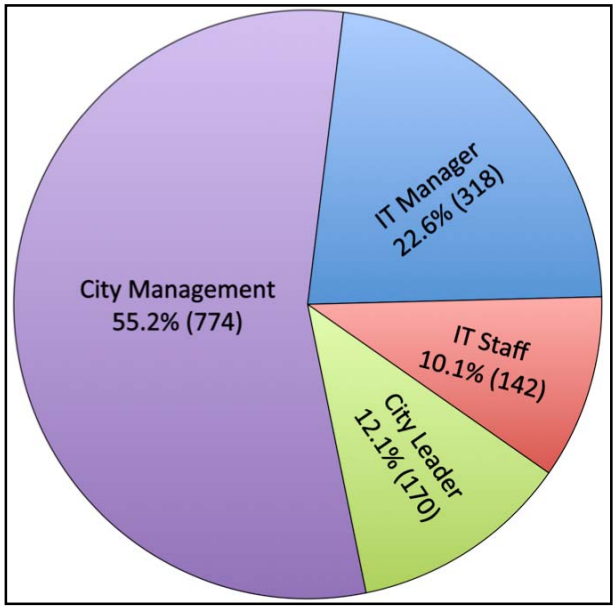

Figure 3. Primary Duty Frequencies.

4.2 GENERAL SAMPLE SET STATISTICS

Our survey announcement strategy targeted potential subjects in the United States and Canada. The number of responses from Canada was much lower than the United States. The Canadian response rate with respect to incorporated cities was 1.3% compared to a 7.4% U.S. response rate. The low Canadian response rate may be a result of a deficiency in the survey announcement distribution.

The sample set contains responses from 1206 distinct cities from the U.S. and Canada, 1136 and 70, respectively. The 1136 U.S. cities in the survey represent 6.3% of 18,500 U.S. cities. The 70 Canadian cities represent 1.9% of 3,800 cities in Canada. For the purpose of this study a city is defined as an incorporated self-governing entity.

Table 2 Individual Survey Responses by Country

Country	Frequency	Percent
United States	1332	94.9%
Canada	72	5.1%
Total	1404	

The sample set included responses from 49 states in the U.S., and from 7 of the 13 provinces and territories in Canada. Figure 4 presents the individual responses from the sample set plotted using GoogleEarth. The geographic coordinates for each response was obtain by translating the IP address to latitude/longitude coordinates using geolocation services provided by MaxMind.com. Table 3 and Table 4 on the following page provide the response distribution by U.S. State and Canadian Province.

Figure 4. Geographic Distribution of Sample Set

Table 3 Individual Survey Responses by U.S. State

State	Freq.	Percent	State	Freq.	Percent
Alabama	14	1.1%	Montana	11	0.8%
Alaska	19	1.4%	Nebraska	22	1.7%
Arizona	38	2.9%	Nevada	7	0.5%
Arkansas	9	0.7%	New Hampshire	18	1.4%
California	189	14.2%	New Jersey	14	1.1%
Colorado	27	2.0%	New Mexico	11	0.8%
Connecticut	24	1.8%	New York	12	0.9%
Delaware	3	0.2%	North Carolina	33	2.5%
Florida	62	4.7%	North Dakota	6	0.5%
Georgia	23	1.7%	Ohio	57	4.3%
Hawaii	0	0.0%	Oklahoma	10	0.8%
Idaho	7	0.5%	Oregon	50	3.8%
Illinois	34	2.6%	Pennsylvania	42	3.2%
Indiana	6	0.5%	Rhode Island	2	0.2%
Iowa	14	1.1%	South Carolina	16	1.2%
Kansas	23	1.7%	South Dakota	10	0.8%
Kentucky	4	0.3%	Tennessee	19	1.4%
Louisiana	6	0.5%	Texas	93	7.0%
Maine	24	1.8%	Utah	32	2.4%
Maryland	18	1.4%	Vermont	3	0.2%
Massachusetts	33	2.5%	Virginia	30	2.3%
Michigan	30	2.3%	Washington	68	5.1%
Minnesota	41	3.1%	West Virginia	11	0.8%
Mississippi	6	0.5%	Wisconsin	44	3.3%
Missouri	26	2.0%	Wyoming	17	1.3%

Table 4 Individual Survey Responses by Canadian Province

Province	Frequency	Percent
Alberta	8	11.1%
British Columbia	23	31.9%
Manitoba	0	0.0%
New Brunswick	5	6.9%
Newfoundland and Laborador	0	0.0%
Northwest Territories	1	1.4%
Nova Scotia	0	0.0%
Nunavut	0	0.0%
Ontario	33	45.8%
Prince Edward Island	0	0.0%
Quebec	0	0.0%
Saskatchewan	1	1.4%
Yukon	1	1.4%

4.3 INFORMATION TECHNOLOGY CAPABILITY

This section presents survey results related to city IT capability. The data in this section are responses from the 460 IT managers and IT staff represented in the sample set. In the online survey city leaders and city managers were not presented survey questions that generated this data because the IT Managers and staff were deemed to have qualified knowledge in this area. City leaders and managers in general are not considered to have intimate knowledge of the details of IT deployment within their city. A city's capability to implement and deploy OSS can be derived from the city's current IT capabilities.

4.3.1 Desktop Environment

The survey design intended to collect data regarding the numbers of desktop machines. This data would have been correlated with the number of IT support personnel to provide a metric to gage IT management capability. A deficiency in the survey question soliciting the number of desktop machines for the respondent's city had incorrect banding resulting in 78.5% of the responses indicating the city had greater than 100 desktop computers.

Cities use a wide variety of desktop operating systems. Within the IT staff sample sub-set, 15 different operating systems were identified. Virtually all cities (99.7%) deploy one or more versions of Microsoft Windows on desktop computers. 20% of the respondents indicate Linux is used on desktop computers. The survey instrument did not collect the degree to which Linux is deployed on the desktop in the respondents' city.

An interesting result was 13% of the IT managers and staff indicating that Mac OS X was deployed on desktop computers in their city. Since Mac OS X can only be installed on Apple Inc. hardware (Apple, 2008), we can conclude these cities are using Apple computers to support service delivery or to conduct city business.

Figure 5 lists the frequencies of responses for the operating system families. A

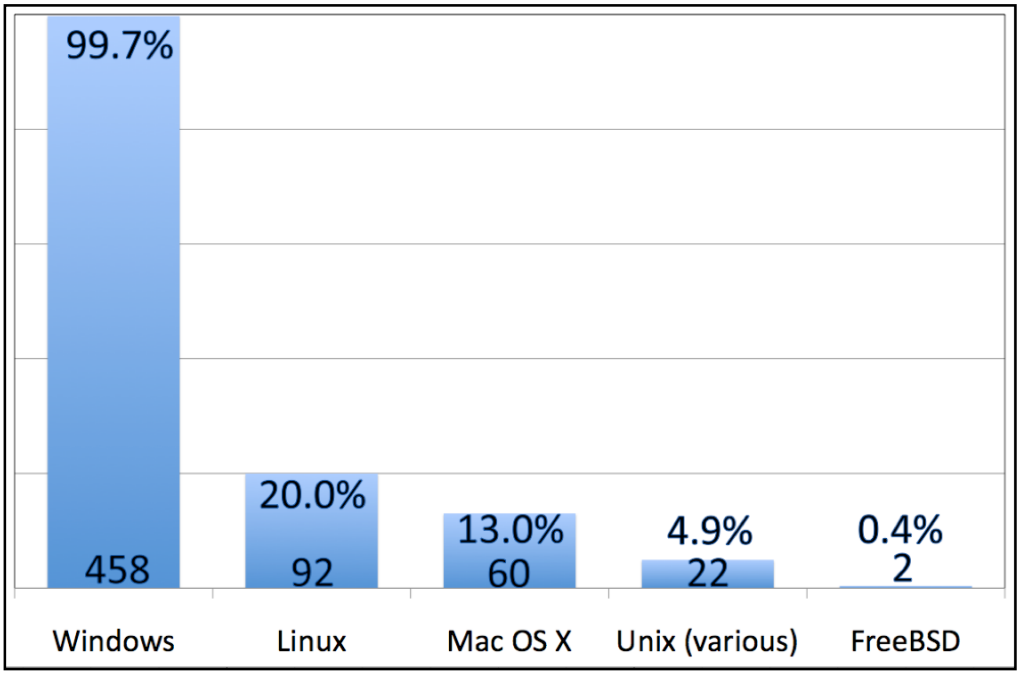

Figure 5. Desktop Operating System Families

comprehensive list of operating systems can be found in Table 9 of Appendix F.

In the survey the subjects were asked to rank the desktop operating systems by the number of installations within their city and to indicate the number of years each ranked operating system had been in use. Versions of Microsoft Windows operating systems overall were most widely deployed being ranked 1st, 2nd, and 3rd in number of installations. Table 11 through Table 15 in Appendix F list the desktop operating system rankings.

Windows XP was ranked 1st by 91.1% of the IT managers and staff followed by Windows 2000 with 5.2%, Windows Vista with 1.1%, and Windows 98 with 0.2%. Only one city ranked a non-Windows operating system as most widely deployed, the City of Largo, Florida ranked Linux 1st.

The Office Productivity suite favored by cities is Microsoft Office. 97.4% of the 460 IT managers and staff indicated MS Office was deployed on their city's desktop computers. Open Office, the free open source office productivity suite, is deployed by 24.1% of cities.

Table 16 in Appendix F lists the full set of results for the Office Productivity Suite deployed by cities.

Web browser deployment data shows Microsoft Internet Explorer is deployed in 98.7% of cities. This is expected as Internet Explorer is bundled with Microsoft Windows and, as the survey data indicates, Microsoft Windows is the OS most widely deployed by cities in this study. Table 17 in Appendix X lists the full set of results for the web browsers in use by cities.

84.8% of IT managers and staff indicated a browser other than Internet Explorer was used on city desktop computers. 78.8% of the responses indicated an open source browser was in use on city computers.

4.3.2 Server Environment

Within the IT staff sample sub-set, 85.6% (394) indicated their city had servers in use. 54.5% of cities had less than 20 server machines in use. Table 18 in Appendix X lists the results for the number of server machines in use by cities.

The server operating systems was even more varied than desktop operating systems. Table 19 lists the results for server operating systems in use by cities in this study. As with desktop operating systems, Microsoft Windows represented the widest deployment. 96.5% or respondents indicated some version of Windows Server was in use, 40% indicated Linux, and 23.3% indicated various versions of Unix. Figure 6 lists the server operating systems in use by family. An interesting observation is the continued use of OpenVMS/DEC VMS and Novell Netware by some cities. VMS is a legacy operating system and Netware is a legacy network operating system.

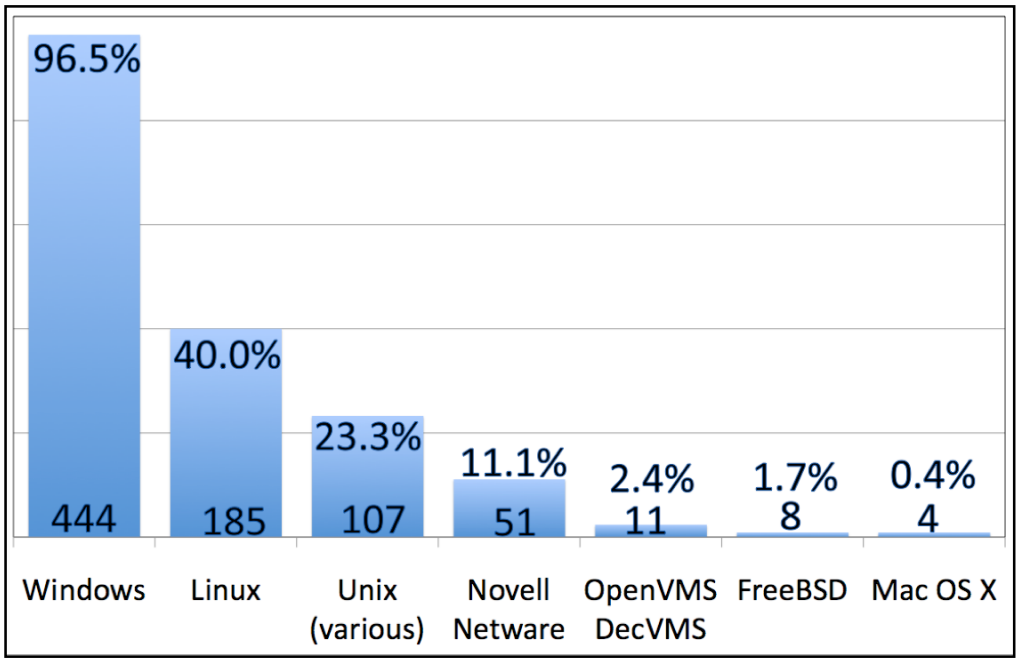

Figure 6. Server Operating Systems in Use by Family

93.0% (428) of IT managers and staff ranked Windows Server 1st as the most widely deployed server operating system. 4.1% of respondents indicated Linux as having the most server installations throughout their city. Novel Netware was in use by 2.8% (13) of the respondents' cities. For 2nd,3rd,4th,and 5th rankings of server Oss, Free BSD has the greatest number of installations. Table 21 through Table 25 in Appendix F list the server operating system rankings.

The web server software in use by cities is consistent with the previous results of desktop and server operating systems with Microsoft products having the largest usage. Microsoft IIS is used by 76.7% of the respondents' cities followed by Apache Tomcat (27.6%) and Apache httpd (22.8%). The high usage of Microsoft IIS would be expected given the installation numbers of Windows Server. However, Apache Tomcat and Apache httpd servers combined represent a 43.2% use rate by respondents' cities, some cities use both Tomcat and httpd. Table 26 lists the results for web server software usage.

Microsoft SQL Server is used by 90.7% of respondents' cities. Given the high number of responses indicating MS Windows Server was being used in the server environment, the high use of MS SQL Server can be expected. Open source databases are in use at 40.0% of the respondents' cities. Usage of MySQL and PostgresSQL, both opensource SQL databases, are 34.1% and 5.9%, respectively.

Table 27 lists the results for database software usage.

4.4 IT STRATEGY AND MANAGEMENT

This section presents results related to a city's discipline regarding IT management. The sample set used for analysis in this section includes 1404 cases with primary duties indicated as IT manager, IT staff, City leadership, and City management. These individuals were deemed to have sufficient knowledge to answer survey questions regarding their city's IT strategy and management.

Outsourcing IT support can indicate a level of discipline in the management of IT resources and support. It may be more cost effective for a city to outsource IT support rather than maintain a cadre of city IT staff. However, to consider comprehensive adoption and deployment of OSS solutions a city may need to have IT staff to implement the OSS strategy.

The survey results for outsourcing of IT support shows 28.1% (395) of respondents indicated their city outsourced IT support, 69.9% (982) indicated their city did not outsource IT support, and 1.9% (27) did not know.

Gauging the organizational discipline of a city with respect to IT management and acquisition is difficult. The survey design addressed this with two questions about IT acquisition strategy and practice. The strategy question was intended to reveal the city's intent with respect to purchasing, and the purchasing practice question was intended to reveal city behavior.

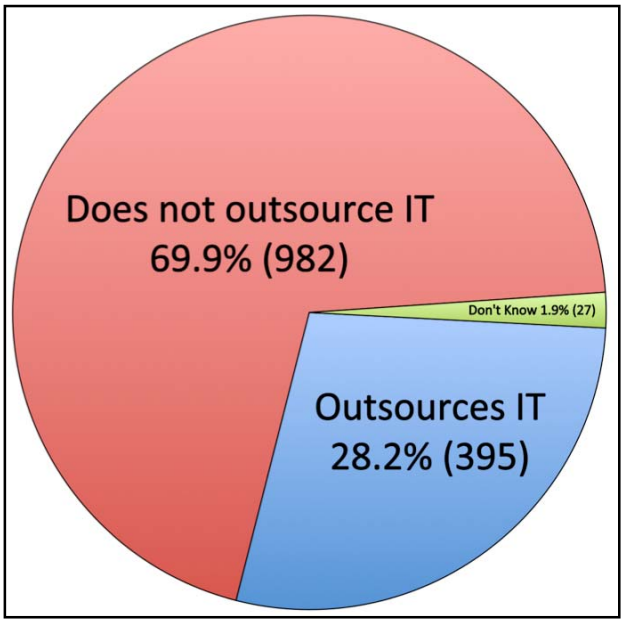

Figure 7. IT Outsourcing

Cities tended to favor total cost of ownership (TCO) in their purchasing strategy with 52.7% (600) of respondents indicating minimizing TCO was their city's strategy, 23.7% (333) indicated their city had no IT purchasing strategy, 16.9% (237) indicated their city seeks to minimize the acquisition cost, 16.7% did not know the purchasing strategy of their city.

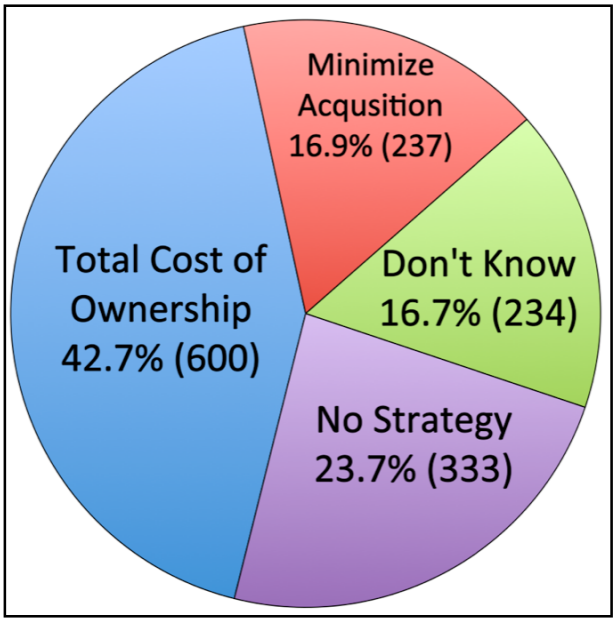

Figure 8. IT Purchasing Strategy

The survey data shows 62.8% (870) respondents indicate their city makes software purchases from an IT budget, 32.5% (457) make IT purchases on an ad hoc basis, and 5.5% (77) did not know.

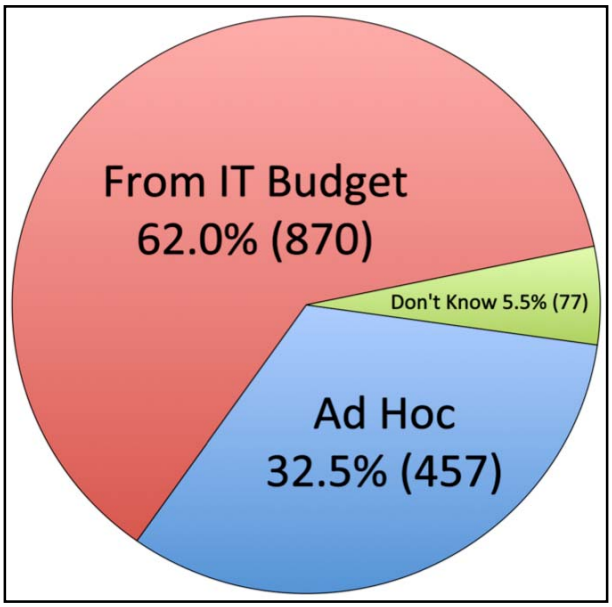

Figure 9. Software Acquisition Practice.

4.4.1 Leadership, Management and Staff OSS Awareness

The survey solicited the subject's perception of their city's leadership, management, and IT staff with respect to awareness and support of OSS. The intent was to discover the general level of awareness and understanding of OSS by city leadership and staff. A high level of awareness or OSS and understanding of advantages and disadvantages will reveal the level of organizational maturity with respect to IT management. Successful adoption and deployment of any technology requires, at least at some level, an understanding of the advantages and disadvantages of the technology. While those in leadership positions should not be expected to understand the details of a technology, they should have at least a basic understanding of the general strengths, weaknesses, advantages, and disadvantages with respect to their leadership or management position.

Generally, from the survey subjects' perspective, city leadership is unaware of OSS. 22.8% (320) of respondents indicate their city's leadership is aware of OSS, while 28.6% (401) indicate the leadership is unaware of OSS, 48.6% (681) were neutral or did not know.

The perception of city management's awareness of OSS was slightly higher with

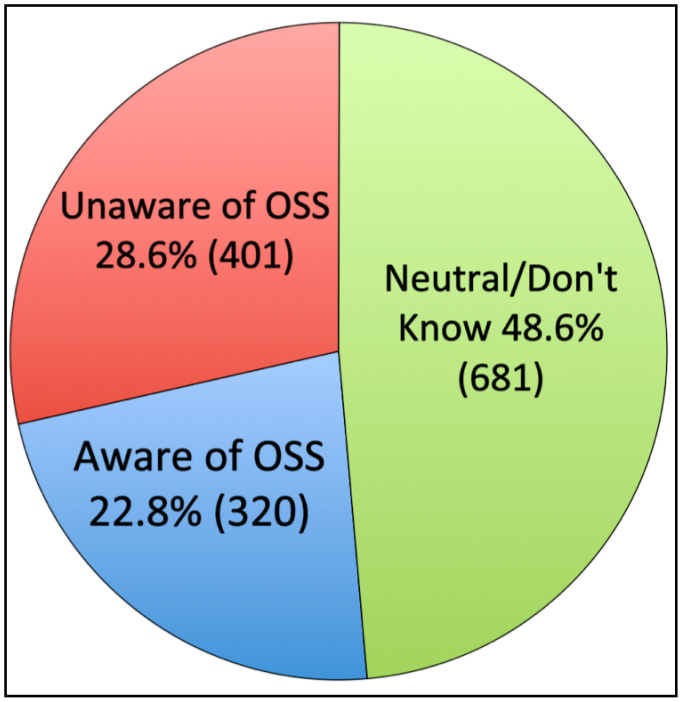

Figure 10. Perception of Leadership OSS Awareness

35.3% (495) indicating city management was aware of OSS, 15.0% (211) indicating the management was not aware of OSS, and 49.4% (649) were neutral or did not know. The perception city IT staff awareness of OSS was significantly higher with 50.9% (715) indicating the IT staff was aware of OSS, 5.9% (79) indicating the IT staff was unaware of OSS, 43.3% (608) were neutral or did not know.

4.4.2 Support of OSS Use

The survey data indicates the City leadership, management, and staff does not support the use of open of OSS, at least as perceived by the survey respondents. The large number of responses indicating a neutral position on, or did not know if, city leadership, management, or IT staff supported the use of open source software was an interesting finding. While OSS

is widely used in the private sector, these results may indicate a general unawareness or a potential aversion to the use of OSS by cities.

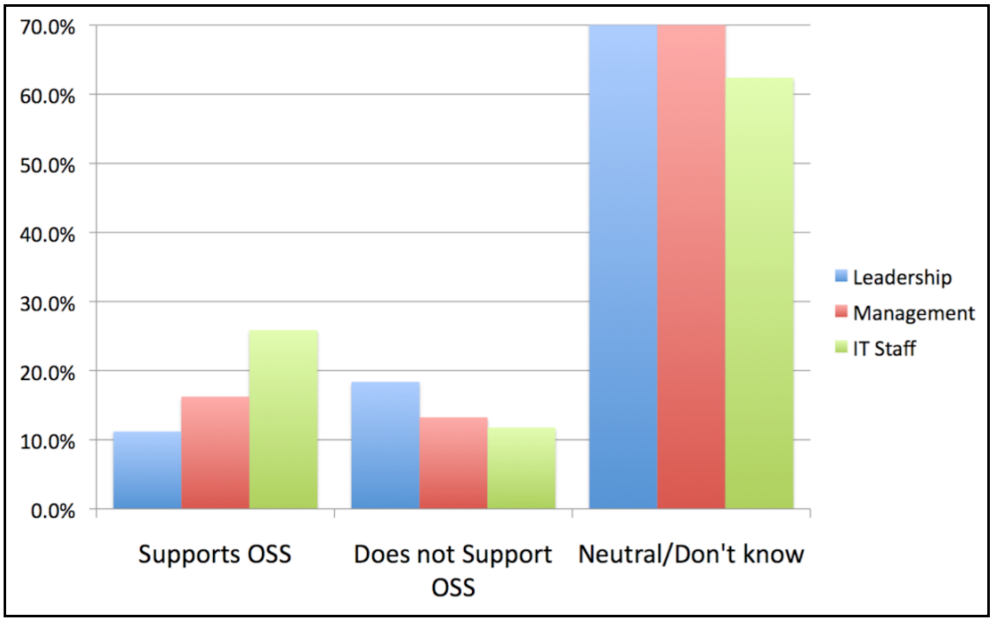

Figure 11. Subject Perception of Support of OSS

18.3% (258) of respondents indicated their city leadership did not support the use of OSS, 11.2% (157) indicated their city leadership supported OSS, 70.2% (986) were neutral or did not know. The lack of support for OSS by city leadership may be an artifact of lack of awareness.

The respondents perception of city management support of OSS was higher that the perception of city leadership support of OSS with 16.3% (228) respondent indicating city management supported the use of OSS, 13.3% (186) indicated management did not support the use of OSS, 70.2% (986) were neutral or did not know.

The perceptions of IT staff support of OSS use indicates that city IT staff generally are more supportive of OSS use that city management and Leadership. 25.8% (363) indicated their IT staff supported the use of OSS, 11.7% (165) did not support OSS use, 62.1% (872) were neutral or did not know.

The high frequency of respondents indicating a neutral position or had no knowledge of city leadership, management, and IT staff support of OSS use may be an indication of a lack of awareness or knowledge of OSS in general. The sample set includes only survey subjects who indicated their primary duty was city leadership, management, or IT staff.

4.4.3 Support of OSS to Save Money

As reported in the previous section, the perception of city leadership and management support of OSS was relatively low at 11.1% and 16.3% respectively. When asked if city leadership, management, and IT staff would support OSS to save money, the results were different with subject indicating a significantly higher level of support for OSS if it could save money. The perceived support of OSS by leadership, management, and IT Staff increase by 197%, 250%, and 139%, respectively. While the potential support for OSS support increased across all three categories, the significant increase in potential management support for OSS when it can save move may indicate that city management has greater interest in the budgetary impact of the adoption of new technology.

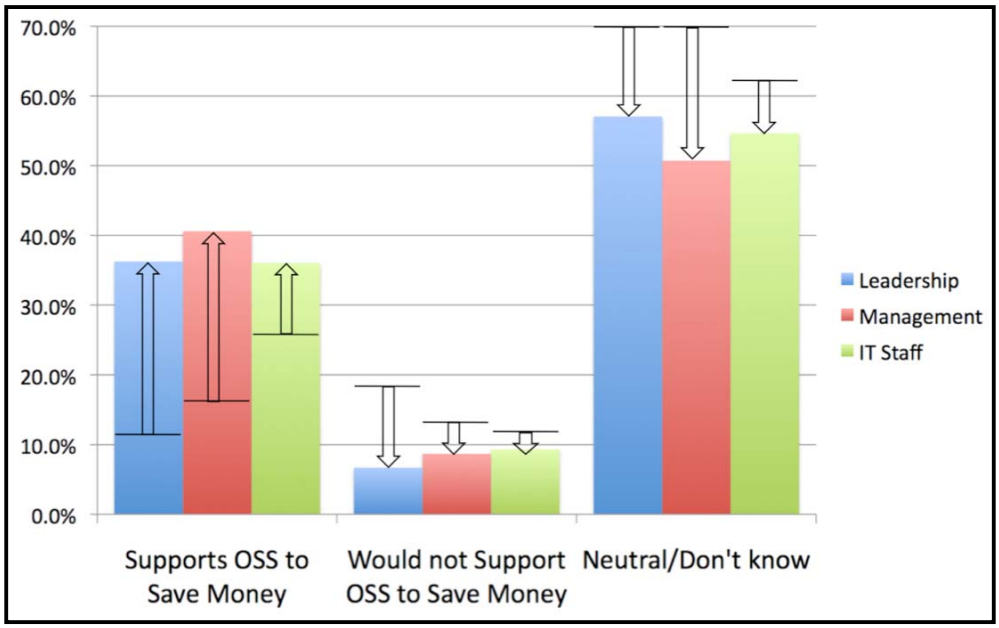

Figure 12. Subject Perception OSS Support If It Would Save Money

36.3% (509) of respondent indicate their city leadership would support OSS to save money, 6.7% (94) indicate the leadership would not support OSS to save money, 57.1% (801) were neutral or did not know.

40.6% (570) of respondents indicate their city management would support OSS to save money, 8.7% (122) indicate the leadership would not support OSS to save money, 50.7% (712) were neutral or did not know.

36.0% (506) of respondents indicate their city IT staff would support OSS to save money, 9.3% (131) indicate the IT staff would not support OSS to save money, 54.6% (767) were neutral or did not know.

Of note is the drop in frequency (from ~70% to ~50%) of respondents indicating a neutral position or those who did not know. The possibility of reducing the costs of information technology may be a significant influence on IT strategy and technology adoption. A potentially disturbing possibility is the willingness by city leadership and management to choose any alternative as long as it may reduce costs.

5.0 ANALYSIS

This chapter is presented in three parts. The first section presents interesting findings generated from this research. The second section addresses each research hypothesis. The third section presents findings that were revealed by the research but are generally orthogonal to the research objective.

5.1 INTERESTING FINDINGS

This section presents the interesting findings of this study.

5.1.1 Few Cities Have All Characteristics

Analysis of the survey data indicates few cities have all the characteristics that would enable successful adoption and deployment of OSS. Of the 1206 distinct cities in the sample set, just ten cities satisfied all characteristics within the three dimensions. Table 6 lists the characteristics used to select the cities from the sample set that have characteristics that may promote successful adoption of OSS.

Table 5. Cities Satisfying All Characteristic Criteria

City	State	Population
Balwin	Missouri	30,000
Northglen	Colorado	31,000
Houma	Louisiana	32,400
Ipswitch	Massachusetts	12,000
Largo	Florida	73,000
Layton	Utah	64,300
Redding	California	80,800
Santa Monica	California	87,200
Tomball	Texas	10,200
Ulysses	Kansas	5,600

Table 6. Selection Criteria

Dimension	Characteristic
Capability	Has an IT department
	IT support is handled in-house
	Currently uses OSS
Discipline	Has well defined IT strategy
	Has IT line item in budget
	IT is sufficiently funded
	Total cost of Ownership acquisition strategy
	Uses budget for software acquisition
Cultural Affinity	Leadership aware of OSS
	Leadership support use of OSS
	Leadership understands advantages of OSS
	Management aware of OSS
	Management support use of OSS
	Management understands advantages of OSS
	IT Staff aware of OSS
	IT Staff support use of OSS
	IT Staff understands advantages of OSS

5.1.2 Possible Aversion to OSS If Not Currently Using OSS

Of the 460 Municipal IT managers and staff in the sample set, 56.3% (259) indicated there city was not currently using OSS, 39.6% (182) indicated their city was using OSS, and 4.1% (19) did not know if their city was using OSS. Considering the widespread use of OSS in the commercial sector, the relatively high percentage of cities in this survey not currently using OSS required further investigation.

Of the Cities currently using OSS, 76.4% (139) are planning to use OSS in the future, 9.9% (18) have no plans, and 13.7% (25) did not know if OSS was planned to be used in the future. The high percentage of cities planning to use OSS in the future that currently use OSS can be expected. It is more likely an organization will continue to use a software product

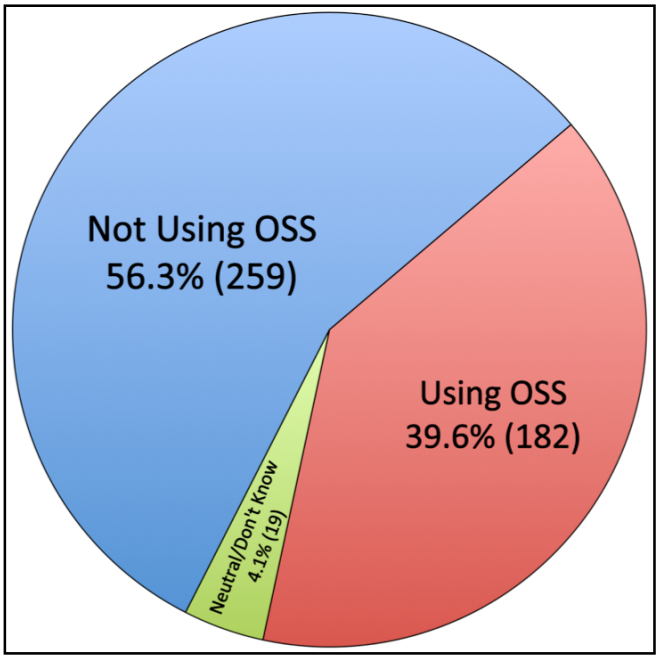

Figure 13. Cities Using OSS

once deployed and established than to abandon the product. The number cities currently using OSS that have no plans to use OSS in the future, 18 (13.7%), is surprising. The survey instrument did not include amplifying questions that might help explain this.

The cities currently not using OSS provide a more interesting observation. Of the 259 IT managers and staff indicating their city is currently not using OSS, 81.5% (211) indicated their city has no plans to use OSS in the future, 8.9% (23) indicated their city did plan to use OSS in the future, and 9.7% (25) did not know.

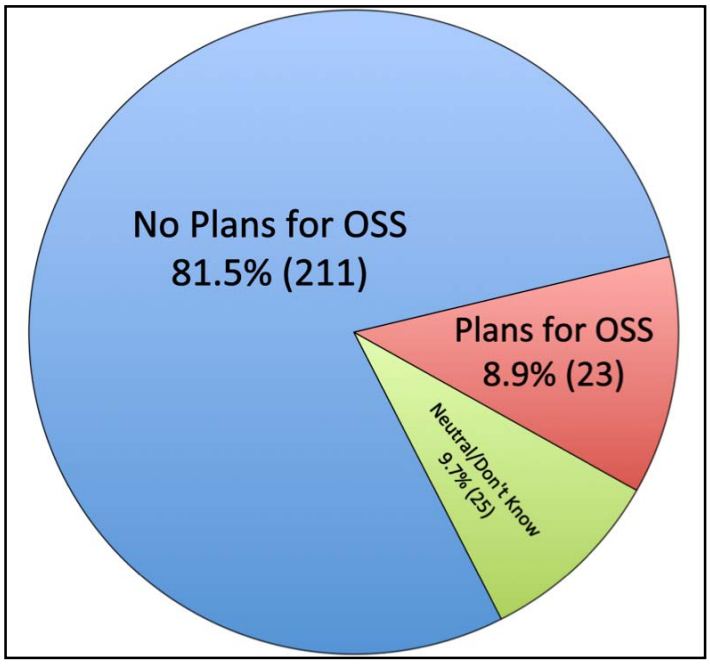

Figure 14. Plans for OSS at Cities Not Using OSS

The number of dedicated IT staff at the respondent cities may not be an influencing factor in decisions to use OSS in the future. While 73.9% (156) of the cities not planning to use OSS in the future have IT staff numbering 10 or less, 71% of cities currently using OSS also have 10 or less IT staff.

The organizational support for using OSS appears to be a significant influencing factor for a city's future plans for OSS use. The survey design included questions regarding the respondent's perception of the Leadership, Management, and IT staff views of OSS. The subjects were asked if the city leadership, management, and IT staff support the use of OSS. For the cities not planning to use OSS in the future only 5.7% (11) of the respondents indicated the city leadership supports the use of OSS, 7.6% (16) of respondents indicated city management supports the use of OSS, and 32.9% (59) indicated city IT staff support use of OSS. For cities currently using OSS the responses were 22% leadership, 33% management, and 71% IT staff.

5.1.3 Current OSS Support by Leadership, Management, and IT Staff

IT managers and staff report a significant difference in the perceived current support of OSS and the support of OSS if it would save money. 11.1% of IT managers and staff indicate they agree their city leadership currently supports the use of OSS. 36.2% of the IT managers and staff agree their city leadership would support OSS if it would save money.

The IT managers' and staff's perception of city management's current support of OSS is similar, if somewhat higher, to their perception of city leadership. 16.3% agree their city management currently supports OSS. 40.6% agree their city management would support OSS if it would save money.

The IT managers' and staff's perception of city IT staff's current support of OSS, that is their perception of themselves, was significantly higher than their perception of city leadership and management support of OSS with 25.8% agreeing the city IT staff supports the use of OSS. 43.8% indicated they thought the city IT staff understands the advantages of OSS. However, only 36.1% agreed the city IT staff would support OSS to save money.

5.1.4 Discrepancy of OSS awareness; Self, others

The survey data suggests a discrepancy between the subject's awareness of OSS and their perception of city leadership, management, and IT staff's awareness of OSS. Within the sample set 69.2% (971) of the respondents indicated they are aware of OSS. However, their responses regarding their city leadership, management, and IT staff's awareness of OSS show that most respondents perceive the leadership, management and IT staff as generally unaware of OSS. The high frequency of those individually aware of OSS could be attributed to the survey attracting individuals interested in OSS.

5.2 HYPOTHESIS SUPPORT

The research hypothesis stated, “Small to medium sized cities are able to use only OSS to deliver services and conduct business.”

The results indicate that cities in general do not exhibit characteristics that would promote the adoption of OSS at significant levels of deployment.

5.2.1 Results for Hypothesis 1.A - Capabilities

The sub-hypothesis addressing city IT capabilities stated, “Small to medium sized cities have the prerequisite IT capabilities to adopt OSS for the delivery of services and to conduct the city's business.”

The results show that some cities may have IT capabilities that would support comprehensive deployment of OSS solutions. Most cities have a dedicated IT staff. Most cities deploy MS Windows almost exclusively on the desktop and servers. We can conclude the IT staff at these cities will be very familiar with MS Windows system administration. The likelihood the IT staff at these cities have any significant experience with Open Source operating systems (i.e. Linux, FreeBSD) is fairly low.

Hypothesis 1.A is not supported by the results.

5.2.2 Results for Hypothesis 1.B - Discipline

The sub-hypothesis addressing city discipline stated, “Small to medium sized cities have the prerequisite discipline to adopt OSS for the delivery of services and to conduct the city's business.”

The survey data indicates that most cities perform some budgeting for IT. However, only 42.7% of IT managers and staff indicate their city’s purchasing strategy for IT is to minimize the total cost of ownership, 16.9% indicate the strategy is to minimize acquisition costs, and 23.7% indicate their city has no purchasing strategy.

Cities appear to lack discipline in the areas of IT acquisition practices and in purchasing strategies. While over all, 62% of respondents in the IT staff sample set indicate their city has an IT budget from which funds are used for software purchases, only 42.7% indicate minimization of the total cost of ownership was the primary IT purchasing strategy. For the purpose of this study minimizing the total cost of ownership for IT is an indicator of discipline for municipal organizations.

Of note regarding IT purchasing strategy, 23.7% of respondents indicated their city had no IT purchasing strategy and 32.5% indicated their city made software purchases on an Ad Hoc basis.

A large majority of respondents (79.8%) indicated their city has a line item for IT in the city budget. However, 24.0% of these respondents indicated their city's IT acquisition practice is on an Ad Hoc basis.

Hypothesis 1.B is not supported by the results.

5.2.3 Results for Hypothesis 1.C - Culture

The sub-hypothesis addressing city discipline stated, "Small to medium sized cities have the cultural affinity to adopt OSS for the delivery of services and to conduct the city's business."

Most cities do not exhibit cultural affinity for OSS. Based on respondent perception, city leadership, management, and IT staff does not support the use of OSS. The perceived awareness of OSS by leadership, management, and staff was low. City leadership, management, and staff do not understand the advantages and disadvantages of using OSS. Few respondents promote OSS at work. Less than half of respondents had a favorable view of OSS.

The survey data indicates that commercial operating systems and software have significant penetration in city IT infrastructure. Microsoft Windows family of operating systems ranks 1st, 2nd, and 3rd for desktop installations with 97.6% of IT managers and staff indicating MS Windows (98, 2000, XP, or Vista) is installed on the greatest number of machines throughout their city. Microsoft Windows dominates the server side with 81.7% of IT managers and staff ranking MS Windows Server 1st by total number of installations.

Hypothesis 1.C is not supported by the results.

6.0 CONCLUSION

The results indicate cities in general do not have the necessary characteristics to successfully adopt OSS to deliver services and conduct city business. The key indicators point to significant deficiencies in the three domains: capability, discipline, and cultural affinity.

While a majority of cities in the study show some characteristics that indicate the adoption of OSS is possible, and indeed on a trivial level (with a few notable exceptions) some cities are using OSS, still most lack key characteristics in the three domains to enable a successful comprehensive adoption of OSS.

Some cities represented in this survey may have the capabilities to support OSS adoption, or at least a cadre of IT staff. The wide use of the Windows operating system presents a significant IT support challenge to cities that might consider OSS solutions. With a small pool of municipal IT workers with OSS administration experience, cities may be reluctant to select OSS solutions. Vendor “lock-in” and the high cost of switching to OSS can explain the low adoption rate of OSS. However, the switching cost may also be preventing cities from moving from current commercial products and technologies to other commercial products.

The data suggest many cities may have an adequate level of discipline to support open source adoption with IT line items in the city budget and sufficient IT funding. However, a significant number of cities make software purchases on an ad hoc basis, indicating potential lack of organizational planning capability.

A city’s Culture, with respect to IT decision making, appears to be a significant barrier to open source adoption. City leadership and management of cities that do not support the use of OSS are generally unaware of OSS as an alternative to commercial software. Cities

currently using OSS are highly likely to continue to use OSS in the future while cities not presently using OSS have no future plans to use OSS.

Because the cities represented in this study in general do not exhibit the indicators in the three domains examined we conclude most cities do not have the capability, discipline, and cultural affinity to successfully adopt OSS on more than a trivia level.

7.0 RECOMMENDATIONS

This section provides recommendations that city leadership, management, and IT staff may wish to consider when exploring open source alternatives to commercial software. These recommendations may also be useful to OSS developers and vendors desiring inroads into municipal IT. Adopting OSS requires much more than simply addressing technical capability. Implementing any new technology requires consideration of its impact on all areas of an organization. A specific technology or product may improve IT operations and be viewed very favorably by IT staff, that product may disrupt the workflow of the end user with a devastating effect on productivity.

City's should consider the following as part of any OSS adoption plan:

- Open Source Vision Statement
- Establish and Open Source Software/Open Standards Policy
- Incorporate IT planning and procurement in budget process
- Educate key personnel (Leadership, Management)
- Improve IT Staff OSS knowledge

8.0 LIMITATIONS AND FUTURE STUDIES

8.1 LIMITATIONS

The capabilities of the cities could have been better characterized with additional questions in the survey instrument soliciting responses regarding the technical capability of the IT Staff with respect to open source and commercial software. While all but the smallest cities and towns had dedicated IT staff, the level of expertise could not be determined using the data from the survey instrument. Individually, the subjects' views and use of OSS were collected, but this data was superficial at best, providing only an impression of the subjects' opinion of OSS, and not their familiarity or experience using OSS.

The survey design included a question soliciting whether the subject's city had a well defined IT strategy, important to determining a city's level of discipline relating to IT management. Whether a city has a dedicated Chief Technical Officer (CTO) or Chief Information Officer (CIO) was not included in the survey design and would have been a good indicator of the level of organizational maturity with respect to IT management. Future research in this area should include this aspect in the survey design.

The skills and experience level of municipal IT Staff was not captured in the survey instrument. One measure IT Staff skills may be the certifications an individual holds.

8.2 FUTURE STUDIES

8.2.1 Expand Scope

The survey instrument was, to a degree, myopic with respect to the areas of interest. The goal was to keep the survey reasonably short so as not to loose the subject's attention. Unfortunately, some important topics were not investigated, topics that could have enhanced the results of this study. A follow-on study could expand upon the research presented in this thesis with increased breadth and depth.

8.2.2 IT Budget Influences

The survey contained no specific questions concerning city IT budgets, the process of developing IT budget, and organizational pressure influencing the IT budget. Understanding the influence/pressure of IT budgeting on IT technology decisions could shed additional light on the question of OSS adoption and deployment by municipal government.

8.2.3 Knowledge and Experience of IT Managers

CIOs may hold their positions but have relatively little or no knowledge of IT or IT management. The survey data shows that a small number of IT managers (8 of 318, less than 1%) had no knowledge of OSS. Though small, this statistic should not be ignored as it could be a subtle indicator of a more important issue for municipalities, which is attracting and retaining qualified CIOs and IT managers. A general assumption may be that municipal IT managers know their craft and are capable and experienced. With respect to OSS adoption competent, experience, well-informed IT managers may be more inclined to consider OSS as an alternative to commercial software. An investigation into IT manager knowledge and experience may provide some insight into the low OSS adoption rate indicated in the survey results. Additionally, such research may reveal an area of municipal management in which cities may wish to apply resources to improve.

8.2.4 Understand the Municipal IT Decision Process

An interesting research topic might be to understand what influences an IT manager's decision process in developing an IT strategy for their city. Do managers think outside of the box to look for novel solutions to address the IT needs of their city?

8.2.5 Investigate Inhibiting Factors

In 2004 at the Open Source Business Conference Ray Lane, a former Oracle executive, out lined six barriers to OSS adoption in enterprises; lack of formal support, velocity of change, lack of roadmap, functional gaps, licensing caveats, and independent software vendor endorsements. While this study did not examine the influence of or any connection between these barriers and OSS adoption by city government, these barriers identified by Lane may provide a partial explanation of the low adoption rate of OSS by city government observed in this study. A study identifying the inhibiting factors to OSS adoption and the level of influence to which those factors discourage municipal decision makers from choosing OSS solutions could prove very beneficial to city governments and the OSS industry.

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APPENDIX A
FINAL MUNICIPAL ANNOUNCEMENT REQUEST

Mr. <recipient name>,

I am a graduate student at California State University Monterey Bay in the Management and Information Technology program. I am currently conducting research in support of my masters thesis.

I am contacting you on the possibility the <municipal Association> can help me reach the widest possible audience for my survey.

My research investigates if it is possible for small to medium sized cities (population less than 500K) to use only open source software to conduct business and provide services. The results of this research may provide insight into how cities can reduce the annual costs of information technology by using open source software as an alternative to commercial software. My thesis advisor is Dr. Eric Tao (eric_tao@csumb.edu).

The survey can be accessed at http://etao.csumb.edu/softwaresurvey. The survey consists of 38 questions and can be completed in less than 10 minutes. Participants in this survey are entitled to receive a free (downloadable) copy of the final research report.

Would it be possible for you to forward my survey announcement to the members of <Association Abbreviation>?

Attached is an announcement email that I have been sending to city IT managers, IT staff, city managers, city officials and city staff. I've also attached a short announcement article the Florida City and County Management Association requested for their June newsletter.

More information about the research and survey is attached (below).

If you do forward the announcement please mention to the members to pass the announcement to their colleagues, IT managers and staff, city officials, and city staff.

If you have any questions please feel free to email me at David_Ward@csumb.edu or call me at 831-521-6531 or email my thesis advisor Dr. Tao at Eric_Tao@csmub.edu, tel: 831-582-4222.

Thank you,
David

David Ward
Graduate Student
David_Ward@csumb.edu
Management and Information Technology
California State University Monterey Bay
http://csumb.edu/

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The following organizations have announced this survey to their members:
Arizona City/County Management Association (ACMA)
City Managers Association of Oklahoma (CMAO)
Florida City and County Management Association (FCCMA)
Government Management Information Sciences (GMIS)

League of Arizona Cities & Towns
Maine Municipal Association (MMA)
Maryland Municipal Information Technology Association (MMITA)
Municipal Information System Association (MISA) California
Municipal Information Systems Association (MISA/ASIM) Canada (MISA/ASIM)
Nebraska City/County Management Association (NCMA)
New York State Local Government Information Technology Directors' Association (NYSLGITDA)
New Hampshire Municipal Management Association (NHMMA)
North Carolina Local Government Information System Association (NCLGISA)
Ohio City/County Information Technology Association (OCITA)
Southwest Illinois City Management Association (SWICMA)
Virginia Local Government Management Association (VLGMA)
Utah City Management Association (UCMA)
Washington City/County Management Association (WCMA)
Wyoming Association of Municipalities (WAM)
Wisconsin City/County Management Association (WCMA)

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Other places to find this survey announcement:
Next American City Magazine 1/2 page AD
http://americancity.org/

American City and County Magazine
http://americancityandcounty.com/
http://americancityandcounty.com/news/cau-student-open-source-0805/

==========
About the research:
This research investigates if it is possible for small to medium sized cities (population less than 500,000) to provide services and conduct business using only open source software. The results of this research may provide insight into how cities can reduce the annual costs of information technology management and support by using open source software as an alternative to commercial software.

Gaining an understanding of the factors that influence the adoption of open source software by municipal government is a key part of this study. Three areas have been determined to be of interest in this study; software availability, technical capability, and cultural affinity. From these three areas of interest the following research questions were developed:

1. Are there open source alternatives to commercial software currently used by city governments?

2. Do city governments have the technical capability to deploy and support open source software?

3. Does a city's organizational culture encourage the adoption of open source software?

Much research has been done into whether particular open source software products can be used as adequate alternatives to commercial software. While this research answers fundamental questions of usability about the target software, it has not addressed questions of what capabilities and characteristics an organization may require to successfully deploy and

support open source software. This study seeks to answer some of those questions.

====
About the survey:

This survey is being administered by David Ward in support of his Master's Thesis research under the guidance of Dr. Eric Tao at the California State University Monterey Bay.

- This survey is completely voluntary, there is no penalty for not completing it.

- This survey does not identify you through any personal identification and only collects data about you as it pertains to demographic information.

- Your answers will be kept strictly confidential and will not be released in any form that can be identified with you individually.

- This survey is only for individuals who are at least 18 years of age.

- This survey has been approved by the Committee for the Protection of Human Subjects at the California State University Monterey Bay (CPHS #08-072).

- Results of the survey may be published in aggregate form only, without identifying any individual or organization.

If you want to know more about this research project or have questions or concerns, please send email to David_Ward@csumb.edu or Eric_Tao@csumb.edu.

This research project has been reviewed and accepted by California State University, Monterey Bay. If you have questions about CSUMB’s rules for research, please call the Committee for Human Subjects Chair, Chip Lenno, CSUMB Technology Support Services, 100 Campus Center, Building. 43, Seaside CA 93955, 831.582.4799.

APPENDIX B
INDIVIDUAL EMAIL ANNOUNCEMENT

California State University Monterey Bay invites mayors, city council members, city managers, municipal information technology managers, technicians, support staff, and city employees to participate in an online survey of open source software use by municipal government.

The survey can be accessed at http://etao.csumb.edu/softwaresurvey . The survey consists of 38 questions and can be completed in less than 10 minutes. Participants in this survey are entitled to receive a free (downloadable) copy of the final research report.

This survey is part of my graduate research at the California State University Monterey Bay in support of my Masters Thesis under the guidance of Dr. Eric Tao. If you want to know more about this research project or have questions or concerns please send email to David_Ward@csumb.edu or call me at 831-521-6531. You may send email to Dr. Tao at Eric_Tao@csumb.edu, tel: 831-582-4222.

The results of this research may provide insight into how cities with populations less than 500,000 can reduce the annual costs of information technology management and support by using open source software as an alternative to commercial software.

This research project has been reviewed and accepted by California State University, Monterey Bay. If you have questions about CSUMBís rules for research, please call the Committee for Human Subjects Chair, Chip Lenno, CSUMB Technology Support Services, 100 Campus Center, Building. 43, Seaside CA 93955, 831.582.4799.

This survey has been announced in Next American City Magazine (1/2 page AD), American City and County Magazine (http://americancityandcounty.com/news/cau-student-open-source-0805/), and by several municipal associations (see below).

More information about the survey and research is provided below.

Please take the time today to complete the survey. Your input is important to my research.

Please pass this survey announcement to your colleagues, information technology managers and support staff, and city staff.

Thank you,
David

David Ward
Graduate Student
David_Ward@csumb.edu
Management and Information Technology
California State University Monterey Bay
http://csumb.edu/

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The following organizations have announced this survey to their members:
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Maine Municipal Association (MMA)
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Municipal Information Systems Association (MISA/ASIM) Canada
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New York State Local Government Information Technology Directorsí Association (NYSLGITDA)
New Hampshire Municipal Management Association (NHMMA)
North Carolina Local Government Information System Association (NCLGISA)
Ohio City/County Information Technology Association (OCITA)
Southwest Illinois City Management Association (SWICMA)
Virginia Local Government Management Association (VLGMA)
Utah City Management Association (UCMA)
Washington City/County Management Association (WCMA)
Wyoming Association of Municipalities (WAM)
Wisconsin City/County Management Association (WCMA)

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Other places to find this survey announcement:
Next American City Magazine 1/2 page AD
http://americancity.org/
-
American City and County Magazine
http://americancityandcounty.com/
http://americancityandcounty.com/news/cau-student-open-source-0805/
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==========
About the research:
This research investigates if it is possible for small to medium sized cities (population less than 500,000) to provide services and conduct business using only open source software. The results of this research may provide insight into how cities can reduce the annual costs of information technology management and support by using open source software as an alternative to commercial software.

Gaining an understanding of the factors that influence the adoption of open source software by municipal government is a key part of this study. Three areas have been determined to be of interest in this study; software availability, technical capability, and cultural affinity. From these three areas of interest the following research questions were developed:

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2. Do city governments have the technical capability to deploy and support open source software?

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Much research has been done into whether particular open source software products can be used as adequate alternatives to commercial software. While this research answers fundamental questions of usability about the target software, it has not addressed questions of what capabilities and

characteristics an organization may require to successfully deploy and support open source software. This study seeks to answer some of those questions.

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About the survey:
This survey is being administered by David Ward in support of his Master's Thesis research under the guidance of Dr. Eric Tao at the California State University Monterey Bay.

- This survey is completely voluntary, there is no penalty for not completing it.

- This survey does not identify you through any personal identification and only collects data about you as it pertains to demographic information.

- Your answers will be kept strictly confidential and will not be released in any form that can be identified with you individually.

- This survey is only for individuals who are at least 18 years of age.

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- Results of the survey may be published in aggregate form only, without identifying any individual or organization.

If you want to know more about this research project or have questions or concerns, please send email to David_Ward@csumb.edu or Eric_Tao@csumb.edu.

This research project has been reviewed and accepted by California State University, Monterey Bay. If you have questions about CSUMBís rules for research, please call the Committee for Human Subjects Chair, Chip Lenno, CSUMB Technology Support Services, 100 Campus Center, Building. 43, Seaside CA 93955, 831.582.4799.

APPENDIX C
MUNICIPAL ASSOCIATIONS

Municipal Association	Website URL
Alaska Municipal Management Association (AML)	http://www.akml.org/
Alaska Southeast Conference	http://www.seconference.org/
Southwest Alaska Municipal Conference (SWAMC)	http://www.swamc.org/
Alabama City/County Management Association (ACCMA)	http://www.accma-online.org/
Arkansas Municipal League	http://www.arml.org/
Arizona City/County Management Association	http://www.azmanagement.org/
League of Arizona Cities and Towns	http://www.azleague.org/
Association of Bay Area Governments	http://www.abag.ca.gov/
Association of Monterey Bay Area Governments	http://www.ambag.org/
CAL-ICMA	http://icma.org/cal-icma/
California Association of Councils of Governments	http://www.calcog.org/
League of California Cities	http://www.cacities.org/
Municipal Management Association of Northern California	http://www.mmanc.org/
Municipal Management Association of Southern California	http://www.mmasc.org/
Connecticut Conference of Municipalities	http://www.ccm-ct.org/
Connecticut Council of Small Towns (COST)	http://www.ctcost.org/
Colorado City/County Management Association	http://www.cml.org/resources/cccma.html
Colorado Municipal League	http://www.cml.org/
Delaware Association for Public Administration	http://www.ipa.udel.edu/dapa/
Delaware League of Local Governments	http://www.ipa.udel.edu/localgovt/dllg/
Florida City and County Management Association	http://www.fccma.org/
Florida Local Government Information Systems Association	http://www.flgisa.org/2002/
Carl Vinson Institute of Government	http://www.cviog.uga.edu/
Georgia City/County Management Association	http://www.gccma.com/
Iowa City/County Management Association	http://www.iaccmanagement.govoffice2.com/
Association of Idaho Cities	http://idcities.govoffice.com/
Downstate City/County Management Association	http://www.ilcma.org/downstate.htm
Illinois City/County Management Association	http://ilcma.org/
Illinois Municipal League	http://www.iml.org/
METRO Managers Association	http://www.ilcma.org/metro.htm
Southwest Illinois City Management Association	http://www.ilcma.org/swicma.htm
Township Officials of Illinois	http://www.toi.org/
Indiana Municipal Management Association	http://www.citiesandtowns.org/
Indiana Township Association (ITA)	http://indianatownshipassoc.org/
Kansas Association of City/County Management	http://www.kacm.us/
Kentucky City/County Management Association	http://www.kccma.org/
Kentucky League of Cities	http://www.klc.org/
Massachusetts Government Information Systems Association	http://www.mgisa.org/Pages/index
Massachusetts Municipal Management Association	http://www.mma.org/
Maryland City and County Management Association	http://www.mdmunicipal.org/

Municipal Association	Website URL
Maryland Municipal Information Technology Association (MMITA)	http://www.mdmunicipal.org/tech/mmita.cfm
Maine Municipal Association	http://www.memun.org/
Maine Municipal League (MML)	http://www.memun.org/
Maine Town and City Management Association (MTCMA)	http://www.mtcma.org/
Michigan Local Government Management Association	http://www.mlgma.org/
Michigan Municipal League	http://www.mml.org/
Michigan Townships Association	http://www.michigantownships.org/
Minnesota Association of Townships	http://www.mntownships.org/
Minnesota City/County Management Association	http://www.mncma.org/
St. Louis County Association of Townships	http://www.stlouiscountytownships.org/
Missouri City Management Association	http://www.momanagers.org/
Mississippi Municipal League	http://www.mmlonline.com/
North Carolina City/County Management Association	http://ncmanagers.org
North Carolina League of Municipalities	http://www.nclm.org/
North Carolina Local Government Information Systems Association	http://www.nclgisa.org/
North Dakota Township Officiers Association	http://www.ndtoa.com/
Nebraska City/County Management Association	http://www.nebraskacma.org/
New Hampshire Local Government Information Network	http://www.nhlogin.org/
New Hampshire Municipal Association	http://www.nhmunicipal.org/
New Hampshire Municipal Management Association	http://www.nhmanagers.org/
NHLoGIN Municipal Information Technology Committee	http://www.nhlogin.org/
New Jersey Municipal Management Association	http://www.njmma.org/
New Jersey State League of Municipalities	http://www.njslom.org/
Mid-Region Council of Governments of New Mexico	http://www.mrcog-nm.gov/
New Mexico Municipal League	http://nmml.org/
Local Government Managers Associaton of Nevada	http://www.nevadalogman.org/
Association of Towns of the State of New York	http://www.nytowns.org/
New York State City/County Management Association	http://www.nyscma.govoffice.com/
NYS Local Government IT Directors Association	http://www.nyslgitda.org/
Ohio City/County Information Technology Association	http://www.ocita.org/index.htm
Ohio City/County Management Association	http://www.ocmaohio.org/
Ohio Township Association	http://www.cpmra.muohio.edu/otaohio/
City Managers Association of Oklahoma	http://www.oml.org/dbs/CMAO/index.cfm
Oregon City/County Management Association	http://www.occma.org/
Association for Pennsylvania Municipal Management	http://apmm.govoffice.com/
Pennsylvania State Association of Township Supervisors	http://www.psats.org/
Rhode Island League of Cities and Towns	http://www.rileague.org/
Municipal Technology Association of SC	http://www.masc.sc/
South Carolina City and County Management Association	http://www.ipspr.sc.edu/scccma/
South Dakota Association of Towns and Townships	http://sdtownships.com/
South Dakota City Management Association	http://www.sdmunicipalleague.org/
Tennessee City Management Association	http://www.tncma.org/
Texas City Management Association	http://www.tcma.org/
Utah City Management Association	http://www.ucma-utah.org/
Virginia Local Government Management Association	http://www.vlgma.org/

Municipal Association	Website URL
Vermont League of Cities and Towns	http://www.vlct.org/
Association of Washington Cities	http://www.awcnet.org/
Washington City/County Management Association (WCCMA)	http://www.wccma.org/
League of Wisconsin Municipalities	http://www.lwm-info.org
Wisconsin City/County Management Association (WCMA)	http://www.wcma-wi.org/
Wisconsin Towns Association	http://www.wisctowns.com/
West Virginia Municipal League (WVML)	http://www.wvml.org/
Wyoming Association of Municipalities (WAM)	http://www.wyomuni.org/
Government Management Information Sciences (GMIS)	http://www.gmis.org/index.html
International City/County Management Association (ICMA)	http://www.icma.org/
National Association of Towns and Townships (NATaT)	http://www.natat.org/
National League of Cities (NLC)	http://www.nlc.org/
Canadian Municipal Associations	
Alberta Association of Municipal Districts and Counties	http://www.aamdc.com/
Association of Francophone Municipalities of Ontario	http://www.afmo.on.ca/
Association of Manitoba Municipalities	http://www.amm.mb.ca/
Association of Municipal Managers, Clerks and Treasurers of Ontario	http://www.amcto.com/
Association of Municipalities of Ontario	http://www.amo.on.ca/
Association of Yukon Communities	http://www.ayc.yk.ca/
Canadian Association of Municipal Administrators	http://www.camacam.ca/
Federation of Canadian Municipalities	http://www.fcm.ca/
Federation of Prince Edward Island Municipalities	http://www.fpeim.ca/
Fédération Québecoise des municipalités	http://www.fqm.ca/
Municipal Information Systems Association / Association des systèmes d'information municipale (MISA/ASIM) Canada	http://www.misa-asim.ca/
Municipalities Newfoundland & Labrador	http://www.nlfm.ca/
North Central Municipal Association	http://ncma.enorthernbc.com/
Northwest Territories Association of Communities	http://www.nwtac.com/
Ontario Municipal Administrators' Association	http://www.amo.on.ca/
Rural Ontario Municipal Association	http://www.amo.on.ca/
Saskatchewan Association of Rural Municipalities	http://www.sarm.ca/
Union of British Columbia Municipalities	http://www.civicnet.bc.ca/

APPENDIX D
SURVEY DESIGN

	#	Question	Rationale
Capability	1	What is your primary duty?	The primary duty of the subject will provide a means to classify the response. Only subject who duties include IT management, IT support, City leadership, and City management are relevant to the study. Responses from other respondents, while possibly interesting, do not fall within the parameters of the study.
	2	How many desktop machines do you have throughout your city offices?	The number of desktop computers used by a city is an indicator of the level of technical capability of a city. In conjunction with the number of dedicated IT employees, this question can support evaluation of city IT capability.
	3	Desktop operating systems in use in your organization (Select all that apply).	The types of desktop operating systems may indicate affinity to alternative IT solutions.
	4	Rank the desktop operating systems, 1st through 5th, by the number of installations.	Ranking the operating system by number of installations provides a view into the installation base of the OSes in use by cities.
	5	Indicate the number of years the above operating systems have been in use.	The number of years operating systems have been in use can indicate the ability and commitment cities have with respect to adopting alternative IT solutions.
	6	Desktop Office Suite Software used on your city computers (select all that apply)	The office suite software in use may indicate affinity to alternative IT solutions.
	7	Web browsers in use on your city desktop computers (select all that apply)	The web browsers in use by a city may indicate its affinity to alternative IT solutions.
	8	How many server machines are in use throughout your city government?	The number of server computers used by a city is an indicator of the level of technical capability of a city. In conjunction with the number of dedicated IT employees, this question can support evaluation of city IT capability.
	9	Server operating systems in use in your organization (Select all that apply).	The types of desktop operating systems may indicate affinity to

	#	Question	Rationale
			alternative IT solutions.
	10	Rank the server operating systems (1st to 5th) by the number of machines on which they are installed.	Ranking the operating system by number of installations provides a view into the installation base of the OSes in use by cities.
Capability	11	Indicate the number of years the above operating systems (in question 17) have been in use.	The number of years operating systems have been in use can indicate the ability and commitment cities have with respect to adopting alternative IT solutions.
	12	Web server software in use within your organization (select all that apply)	The types of web server software may indicate affinity to alternative IT solutions.
	13	Indicate the server-side database software in use within your organization (select all that apply)	The types of database software may indicate affinity to alternative IT solutions.
	14	Indicate the website content management approach/software used by your city government (inhouse/outsourced)	The approach a city uses for managing the city web site can be an indicator of a city's technical capability.
	15	If your city manages its website in house, indicate the software used for website management.	The type of software used can indicate the technical sophistication of the city.
	16	If your city is currently using OSS, indicate where the OSS is deployed. (desktop.server side, both, neither)	Where open source is currently deployed can indicate the current level of adoption of OSS
	17	My city outsources most of its information technology or computer support.	A city that outsources its IT support may be less likely to adopt OSS.
Discipline	18.1	Has a well-defined IT strategy.	Having an IT strategy is an indicator of organizational discipline with respect to IT management.
	18.2	Has an IT line item in its budget.	A line item for IT in the city budget is an indicator of organizational discipline with respect to IT management.
	18.3	Has an IT department.	An IT department demonstrates organizational discipline with respect to IT management with respect to IT management.
	18.4	Each department manages its own information technology/computers.	A city where each department manages its own IT resources does not demonstrate organizational discipline with respect to IT management.
Discipline	18.5	Leadership (elected officials) supports IT modernization efforts	Leadership support of IT is a key factor to adoption of new technologies.
	18.6	Information technology is sufficiently	Under funding of IT can impact

	#	Question	Rationale
		funded.	the IT capability of a city.
	18.7	Computers are upgraded or replaced when obsolete.	Indicates a city keep pace with technology advancements.
	18.8	Computers are in use long past useful life.	Indicates a city does not keep pace with technology advancements.
	19	Please indicate your city government's strategy/approach for purchasing information technology. (Minimize initial cost, Minimize total cost of ownership)	The purchasing strategy for a city is an indicator of organizational discipline with respect to IT acquisition.
	20	How many IT support staff are employed by your city government?	The number of IT staff
	21.1	Has no defined IT strategy.	This question is the inverse of question 18.1
	21.2	Does not budget for IT.	This question is the inverse of question 18.2
	21.3	Outsources IT support.	This question is the inverse of question 18.3
	21.4	City offices rely on an IT department for support.	This question is the inverse of question 18.4
	21.5	City leadership/management does not support IT modernization.	This question is the inverse of question 18.5
	21.6	IT is under funded.	This question is the inverse of question 18.6
	21.7	We have a computer upgrade plan.	This question is the inverse of question 18.7
	21.8	Computers are retired before obsolete.	This question is the inverse of question 18.8
Capability	22	From the following select the statement that best describes your city with respect to software acquisition practices. (Ad hoc, IT budget)	Indicates the organizational discipline with respect to IT acquisition.
	23	Computer support in my city government is handled mostly by city employees (i.e. computer technician).	Indicates the city may have internal capability to implement, deploy, and support OSS.
Cultural Affinity	24.1	The leadership is aware of OSS	The city leadership's perspective and opinion of OSS is an aspect of the city's cultural affinity to OSS adoption.
	24.2	The leadership supports the use of OSS	
	24.3	The leadership understands the advantages	
	24.4	The leadership understands the disadvantages	
	24.5	The leadership would support OSS to save money	
	24.6	The leadership would never support use of OSS	
	25.1	The management is aware of OSS	The city management's perspective and opinion of OSS is an aspect of a city's cultural affinity to OSS adoption.
	25.2	The management supports the use of OSS	
	25.3	The management understands the advantages	

	#	Question	Rationale
	25.4	The management understands the disadvantages	
	25.5	The management would support OSS to save money	
	25.6	The management would never support use of OSS	
	26.1	The IT staff is aware of OSS	The city IT staff's perspective and opinion of OSS is an aspect of a citiy's cultural affinity to OSS adoption.
	26.2	The IT staff supports the use of OSS	
	26.3	The IT staff understands the advantages	
	26.4	The IT staff understands the disadvantages	
	26.5	The IT staff would support OSS to save money	
	26.6	The IT staff would never support use of OSS	
	27	My city currently uses OSS to support service delivery or to conduct city business.	The current and possible future use of OSS indicates a city is
	28	My city is planning to use OSS in the near future to support service delivery or to conduct city business.	
	29	My city management views OSS as an opportunity to reduce IT costs.	Indicates the city management is open to alternative to commercial software
	30	I know what "open source software" is.	These questions solicit the subject's personal opinions, knowledge, and use of OSS source software
	31	Which of the following describes your view of OSS.	
	32.1	I promote OSS at work	
Cultural Affinity	32.2	I use OSS whenever possible	
	32.3	OSS is a good alternative to commercial Software	
	32.4	OSS is easy to install and manage	
	32.5	OSS is dangerous and should not be used	
	32.6	OSS is a poor alternative to commercial software	
	33	I can define what the term "open source software" means.	
Demographic	34	What is the population of your city?	Will be used for analysis of responses with respect to city size.
	35	Please indicate your country.	Country of subject to be used during analysis for classification of responses.
	36	Please provide the postal/ZIP code for your City Hall or city offices.	The postal code can be used to obtain additional demographic data about the subject's city.
	37	Would you like to receive a copy of the final research report?	Provide the subject an opportunity to obtain a free copy of the final research report as an incentive to complete the survey.
	38	Would you like to receive notification of future surveys related to information technology research relating to municipal government?	This questions serves two purposes; generation of a list of potential future subjects, and provide an impression of subjects

	#	Question	Rationale
			interested in the research.
	39	Where did you learn of this survey?	Results of this question will be used to determine the most effective announcement vehicle for future surveys.

APPENDIX E
SURVEY INSTRUMENT

Survey of Open Source Software Use by Municipal Government

1. Introduction

This survey is being conducted as part of graduate research investigating the use of software by municipal government. The intent of the research is to discover if small to medium cities (population less than 500,000) can conduct business and provide services using only open source software as an alternative to commercial software. The results of this research may provide insight that can help cities reduce the annual cost of information technology and software through the use of open source software.

This survey is being administered by David Ward in support of his Master's Thesis research under the guidance of Dr. Eric Tao at the California State University Monterey Bay.

You should be able to complete this survey in less than ten minutes.

- This survey is completely voluntary, there is no penalty for not completing it.
- This survey does not identify you through any personal identification and only collects data about you as it pertains to demographic information.
- Your answers will be kept strictly confidential and will not be released in any form that can be identified with you individually.
- This survey is only for individuals who are at least 18 years of age.
- This survey has been approved by the Committee for the Protection of Human Subjects at the California State University Monterey Bay (CPHS #08-072).
- Results of the survey may be published in aggregate form only, without identifying any individual or organization.
- It is important that you answer all questions honestly and accurately.

If you want to know more about this research project or have questions or concerns, please send email to David_Ward@csumb.edu or Eric_Tao@csumb.edu.

This research project has been reviewed and accepted by California State University, Monterey Bay. If you have questions about CSUMB's rules for research, please call the Committee for Human Subjects Chair, Chip Lenno, CSUMB Technology Support Services, 100 Campus Center, Building. 43, Seaside CA 93955, 831.582.4799.

Required questions are marked with an asterisk (*).

Thank you for your time!

*** This survey is intended to be taken by city employees, city management, elected city officials, information technology (IT) professionals such as a city's Chief Information Officer (CIO), Chief Technical Officer (CTO), network administrators, and IT support staff. So we know how to properly categorize your responses we need to know your position/duty within your city's administration.**

What is your primary duty?

- ◯ Information Technology Manager (i.e. CTO, CIO, IT Dept head, etc.)
- ◯ Information Technology Staff (i.e. computer technician, network manager, etc.)
- ◯ City Leadership (Elected office)
- ◯ City Management (i.e. City manager, Department head, etc.)
- ◯ City Employee
- ◯ Other (not any of the above)

Survey of Open Source Software Use by Municipal Government

2. Desktop Environment

The following questions inquire about the **desktop environment** (operating systems, and software) in use throughout your city's government offices. The list of all possible software would be far to long to include in this survey. Therefore, the software listed in this survey includes only the software deemed important to support this research study.

*** How many desktop machines do you have throughout your city offices?**

	0	1-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 or more	Don't know
Number of desktop machines.	○	○	○	○	○	○	○	○	○	○	○	○	○

*** Desktop operating systems in use in your organization (Select all that apply).**

- ☐ AlphaTao
- ☐ Free BSD
- ☐ HP-UX
- ☐ IBM AIX
- ☐ Linux Red Hat (any)
- ☐ Linux Novell Suse
- ☐ Linux Ubuntu
- ☐ Linux Centos
- ☐ Linux other
- ☐ Mac OS 8/9
- ☐ Max OS X (10)
- ☐ Sun Solaris (any)
- ☐ Windows 98
- ☐ Windows 2000
- ☐ Windows XP
- ☐ Windows Vista
- ☐ SCO Unixware
- ☐ Don't know
- ☐ Other (please specify)

Rank the desktop operating systems, 1st through 5th, by the number of installations.

	1st	2nd	3rd	4th	5th
Installation Ranking					

Indicate the number of years the above operating systems (from question 11) have been in use. This is the the number of years since the first deployment or first installation.

	1st	2nd	3rd	4th	5th
Years in use.					

Survey of Open Source Software Use by Municipal Government

*** Desktop Office Suite Software used on your city computers(select all that apply)**

- ☐ Ability Office
- ☐ Gnome Office
- ☐ iWork (Apple)
- ☐ KOffice
- ☐ Lotus SmartSuite
- ☐ Lotus Symphony
- ☐ MicroSoft Office
- ☐ NeoOffice
- ☐ Novell OpenOffice
- ☐ OpenOffice
- ☐ StarOffice
- ☐ ThinkFree Office
- ☐ WordPerfect Office
- ☐ WPS Office
- ☐ None
- ☐ Don't know
- ☐ Other (please specify)

*** Web browsers in use on your city desktop computers (select all that apply)**

- ☐ Firefox (Mozilla)
- ☐ Konqueror
- ☐ Netscape (any version)
- ☐ Internet Explorer (any version)
- ☐ Mozilla (any version)
- ☐ Opera
- ☐ Safari
- ☐ None
- ☐ Don't know
- ☐ Other (please specify)

3. Server Environment

The following questions inquire about the **server environment** (operating systems, and software) in use by your city government. The list of all possible software would be far to long to include in this survey. Therefore, the software listed in this survey includes only the software deemed important to support this study.

*** How many server machines are in use throughout your city government? Count only those machines that are configured as a server (web server, file server, application server, etc.).**

- ◯ None
- ◯ 1-9
- ◯ 10-19
- ◯ 20-29
- ◯ 30-39
- ◯ 40-49
- ◯ 50 or more
- ◯ Don't know

Survey of Open Source Software Use by Municipal Government

*** Server operating systems in use in your organization (Select all that apply).**

- ☐ AlphaTao
- ☐ Free BSD
- ☐ HP UX
- ☐ IBM AIX
- ☐ Linux Red Hat (any)
- ☐ Linux Novell Suse
- ☐ Linux Ubuntu
- ☐ Linux Centos
- ☐ Linux other
- ☐ Mac OS Server
- ☐ Sun Solaris (any)
- ☐ Windows Server 2000
- ☐ Windows Server 2003
- ☐ Windows Server 2008
- ☐ Novell NetWare
- ☐ OpenVMS/DEC VMS
- ☐ SCO Open Server
- ☐ SCO Unixware
- ☐ None
- ☐ Don't know
- ☐ Other (please specify)

Rank the server operating systems (1st to 5th) by the number of machines on which they are installed.

	1st	2nd	3rd	4th	5th
Installation Ranking					

Indicate the number of years the above operating systems (in question 17) have been in use. This is the the number of years since the first deployment or first installation.

	1st	2nd	3rd	4th	5th
Year in use.					

*** Web server software in use within your organization (select all that apply)**

- ☐ Apache HTTPD
- ☐ Apache Tomcat
- ☐ HP-UX NSA
- ☐ IBM HTTP Server
- ☐ lighttpd
- ☐ Microsoft IIS
- ☐ Sun
- ☐ WebLogic
- ☐ None
- ☐ Don't know
- ☐ Other (please specify)

*** Indicate the server-side database software in use within your organization (select all that apply)**

- ☐ DB2
- ☐ Ingres
- ☐ InterBase
- ☐ MicroSoft SQL Server
- ☐ MySQL
- ☐ Oracle
- ☐ PostgreSQL
- ☐ None
- ☐ Don't know
- ☐ Other (please specify)

Survey of Open Source Software Use by Municipal Government

*** Indicate the website content management approach/software used by your city government (select all that apply)**

- ◯ Web site management is outsourced
- ◯ City manages the web site in house
- ◯ Don't know

*** If your city manages its website in house, indicate the software used for website management (select all that apply).**

- ☐ Dreamweaver
- ☐ Joomla!/Mambo
- ☐ Microsoft Expression Web
- ☐ Microsoft Frontpage
- ☐ Microsoft Sharepoint Designer
- ☐ PHP-Nuke
- ☐ Website is outsourced
- ☐ Don't know
- ☐ Other (please specify)

*** If your city is currently using open source software, indicate where the open source software is deployed:**

- ◯ Server side only
- ◯ Desktop only
- ◯ Both server side and desktop
- ◯ We do not use open source software
- ◯ Don't know

4. Information Technology Strategy and Management

The following questions are about your city's strategy regarding general information technology management. The purpose of these questions are to help us understand how cities currently approach information technology management.

*** My city outsources most of its information technology or computer support.**

- ◯ Yes
- ◯ No
- ◯ Don't know

Survey of Open Source Software Use by Municipal Government

*** Please rate the following statements regarding your city government:**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't know
Computers are upgraded or replaced when obsolete.	◯	◯	◯	◯	◯	◯
Computers are in use long past useful life.	◯	◯	◯	◯	◯	◯
Leadership (elected officials) supports information technology modernization efforts.	◯	◯	◯	◯	◯	◯
Has an information technology department.	◯	◯	◯	◯	◯	◯
Each department manages its own information technology/computers.	◯	◯	◯	◯	◯	◯
Has a well defined information technology strategy.	◯	◯	◯	◯	◯	◯
Information technology is sufficiently funded.	◯	◯	◯	◯	◯	◯
Has an information technology line item in its budget.	◯	◯	◯	◯	◯	◯

*** Please indicate your city government's strategy/approach for purchasing information technology (hardware or software):**

- ◯ Minimize the initial acquisition cost
- ◯ Minimize the total cost of ownership
- ◯ Does not have a purchasing strategy
- ◯ Don't know

*** How many information technology support staff are employed by your city government?**
Please count only those people whose primary duty is information technology support.

	0	1	2	3	4	5	6-10	11-20	21-30	31-40	41-50	Over 50	Don't know
Number of information technology support staff.	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

Survey of Open Source Software Use by Municipal Government

*** Please rate the following statements regarding your city government:**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't know
Has no defined information technology strategy.	◯	◯	◯	◯	◯	◯
City leadership/management does not support information technology modernization.	◯	◯	◯	◯	◯	◯
City offices rely on an information technology department for support.	◯	◯	◯	◯	◯	◯
We have a computer upgrade plan.	◯	◯	◯	◯	◯	◯
Does not budget for information technology.	◯	◯	◯	◯	◯	◯
Outsources information technology support.	◯	◯	◯	◯	◯	◯
Computers are retired before obsolete.	◯	◯	◯	◯	◯	◯
Information technology is under funded.	◯	◯	◯	◯	◯	◯

*** From the following select the statement that best describes your city with respect to software acquisition practices.**

◯ Usually allocates funds for purchasing on an ad hoc basis

◯ Has an information technology budget from which funds are used for purchases

◯ Don't know

*** Computer support in my city government is handled mostly by city employees (i.e. computer technician).**

◯ Yes

◯ No

◯ Don't know

5. Open Source Software and Your City

The following questions inquire about your level of knowledge and awareness of open source software and the extent open source software is used by your city. There are also questions regarding your perception of your city leadership's and city management's views of open source software as well as the city staff.

Survey of Open Source Software Use by Municipal Government

*** Regarding your city's leadership, rate the following statements with respect to Open Source Software. City leadership positions are generally elected positions such as city council, mayor, commissioner.**

Please understand these statements are not intended to question your city leadership's character, only to provide insight in its views and positions regarding Open Source Software.

Additionally, this survey collects no information that links your responses to you. Your responses are completely anonymous.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't know
The leadership is aware of open source software	◯	◯	◯	◯	◯	◯
The leadership supports the use of OSS	◯	◯	◯	◯	◯	◯
The leadership understands the advantages	◯	◯	◯	◯	◯	◯
The leadership understands the disadvantages	◯	◯	◯	◯	◯	◯
The leadership would never support use of OSS	◯	◯	◯	◯	◯	◯
The leadership would support OSS to save money	◯	◯	◯	◯	◯	◯

Survey of Open Source Software Use by Municipal Government

*** Regarding your *city's management*, rate the following statements with respect to Open Source Software. City management positions are generally appointed positions such as city manager, department heads, and oversight boards.**

Please understand these statements are not intended to question your city management's character, only to provide insight into its views and positions regarding Open Source Software.

Additionally, this survey collects no information that links your responses to you. Your responses are completely anonymous.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't know
The management supports the use of OSS	◯	◯	◯	◯	◯	◯
The management understands the disadvantages	◯	◯	◯	◯	◯	◯
The management would never support use of OSS	◯	◯	◯	◯	◯	◯
The management understands the advantages	◯	◯	◯	◯	◯	◯
The management is aware of open source software	◯	◯	◯	◯	◯	◯
The management would support OSS to save money	◯	◯	◯	◯	◯	◯

*** Regarding your *city's information technology staff*, rate the following statements with respect to Open Source Software. Information technology staff positions are computer technicians, system administrators, network administrators, and other technology workers.**

Please understand these statements are not intended to question the competency of city information technology workers, only to provide insight into the technical capabilities of city information technology staff.

Additionally, this survey collects no information that links your responses to you. Your responses are completely anonymous.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't know
The staff would support OSS to save money	◯	◯	◯	◯	◯	◯
The staff supports the use of OSS	◯	◯	◯	◯	◯	◯
The staff understands the advantages	◯	◯	◯	◯	◯	◯
The staff is aware of open source software	◯	◯	◯	◯	◯	◯
The staff would never support use of OSS	◯	◯	◯	◯	◯	◯
The staff understands the disadvantages	◯	◯	◯	◯	◯	◯

Survey of Open Source Software Use by Municipal Government

*** My city currently uses open source software to support service delivery or to conduct city business.**

- ◯ Yes
- ◯ No
- ◯ Don't know

*** My city is planning to use open source software in the near future to support service delivery or to conduct city business.**

- ◯ Yes
- ◯ No
- ◯ Don't Know

*** My city management views open source software as an opportunity to reduce information technology costs.**

- ◯ Yes
- ◯ No
- ◯ Don't know

6. Open Source Software and You

The following questions inquire about your level of knowledge and awareness of open source software.

*** I know what "*open source software*" is.**

- ◯ Yes
- ◯ No

*** Which of the following describes your view of open source software (select all that apply).**

- ☐ It is free
- ☐ Good alternative to commercial software
- ☐ Low quality
- ☐ Security Risk
- ☐ High maintenance
- ☐ Difficult to manage
- ☐ I can improve the program (edit source code)
- ☐ Don't know

Survey of Open Source Software Use by Municipal Government

*** Please rate the following statements about yourself with respect to Open Source Software.**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't know
I use OSS whenever possible	◯	◯	◯	◯	◯	◯
OSS is easy to install and manage	◯	◯	◯	◯	◯	◯
OSS is dangerous and should not be used	◯	◯	◯	◯	◯	◯
OSS is a poor alternative to commercial software	◯	◯	◯	◯	◯	◯
OSS is a good alternative to commercial Software	◯	◯	◯	◯	◯	◯
I promote OSS at work	◯	◯	◯	◯	◯	◯

*** I can define what the term "*open source software*" means.**

◯ Yes

◯ No

7. Demographic Information

The following questions collect information about your city that will be used to analyze the survey results.

*** What is the population of your city?**

◯ Less than 10,000
◯ 10,000-25,000
◯ 25,000-40,000
◯ 40,000-55,000
◯ 55,000-70,000
◯ 70,000-85,000
◯ 85,000-100,000
◯ 100,000-150,000
◯ 150,000-200,000
◯ 200,000-250,000
◯ 250,000-300,000
◯ 300,000-350,000
◯ 350,000-400,000
◯ 400,000-450,000
◯ 450,000-500,000
◯ 500,000-or more
◯ Don't know

*** Please indicate your country.**

◯ United States

◯ Canada

◯ Other

Please specify

Please provide the postal/ZIP code for your City Hall or city offices.

The postal/ZIP code will be used during analysis to associate Census Bureau data with your responses. Providing your city's postal/ZIP code will aid the researchers in analyzing the survey responses with respect to your city's demographics, an important aspect of this research. Providing the postal/ZIP code is optional.

Survey of Open Source Software Use by Municipal Government

8. Some final questions

The following questions provide you an opportunity to request a copy of the final research report and indicated whether you would like to be notified of future surveys.

Your email address will ONLY be used to notify you of the availability of the final research report or future surveys. Your email address will be kept confidential and not released to anyone. Your email address will not be connected to your survey answers.

*** Would you like to receive a copy of the final research report?**

Your email address will only be used to notify you of the availability of the final research report. Your email address will be kept confidential and not released to anyone. Your email address will not be connected to you survey answers.

◯ Yes

◯ No

Email address to receive research report:

*** Would you like to receive notification of future surveys related to information technology research relating to municipal government?**

Your email address will be used only to notify you of a new survey. Your email address will be kept confidential and not released to anyone. Your email address will not be connected to you survey answers.

◯ Yes

◯ No

Email address to receive future survey announcements:

Survey of Open Source Software Use by Municipal Government

*** Where did you learn of this survey?**

- ◯ Email from California State University Monterey Bay (David Ward)
- ◯ My Information Technology Association's website
- ◯ Email from my Information Technology Association
- ◯ My Municipal Association's website
- ◯ Email from my Municipal Association
- ◯ From a friend
- ◯ From a coworker
- ◯ Next American City Magazine (Print or website)
- ◯ American City and County Magazine (Print or website)
- ◯ Other

Please specify:

APPENDIX F
TABULATED SURVEY RESULTS

This appendix contains the results for the sample set of 1404 responses from City Leaders, Managers, IT managers and staff.

Table 7 Q1 Primary Duty

Primary Duty	Frequency	Percent
IT Manager	318	22.6%
IT Staff	142	10.1%
City Leader	170	12.1%
City Management	774	55.1%
Total	1404	

Table 8 Q2 Number of Desktop Machines

Number of Desktop Machines	Frequency	Percent
1-9	3	0.7%
10-19	5	1.1%
20-29	6	1.3%
30-39	6	1.3%
40-49	9	2.0%
50-59	20	4.3%
60-69	12	2.6%
70-79	15	3.3%
80-89	8	1.7%
90-99	8	1.7%
>100	361	78.5%
Don't Know	7	1.5%
N=460, Margin of error ±4.5%		

Table 9 Q3 Desktop Operating Systems in Use by Version

Operating System	Frequency	Percent
Windows XP	456	99.1%
Windows 2000	211	45.8%
Windows Vista	174	37.8%
Mac OS X	59	12.8%
Linux Ubuntu	44	9.5%
Linux Red Hat	37	7.4%
Windows 98	30	6.5%
Linux Novell Suse	16	3.5%
Linux other	18	3.9%
IBM AIX	9	1.9%
Linux Centos	8	1.7%
Sun Solaris	8	1.7%
HP-UX	5	1.0%
Mac OS 8/9	4	0.7%
SCO Unixware	3	0.7%
Free BSD	2	0.4%
Dontknow	3	0.7%
N=460, Margin of error ±4.5%		

Table 10 Desktop Operating Systems in Use by Family

Operating System	Frequency	Percent
Windows	458	99.7%
Mac OS X	60	13.0%
Linux	92	20.0%
Unix (various)	22	4.9%
Free BSD	2	0.4%
N=460, Margin of error ±4.5%		

Table 11 Q4.1 Desktop Operating System Rankings 1st

Operating System	Frequency	Percent	Mean Years in Use
Windows XP	419	91.1%	4.3
Windows 2000	24	5.2%	6.3
Windows Vista	5	1.1%	1.4
Windows 98	1	0.2%	5
Linux Novell Suse	1	0.2%	10
N=460, Margin of error ±4.5%			

Table 12 Q4.2 Desktop Operating System Rankings 2nd

Operating System	Frequency	Percent	Mean Years in Use
Windows 2000	166	36.1%	6.5
Windows Vista	97	21.1%	1.1
Windows XP	33	7.2%	4.0
Linux Ubuntu	13	2.8%	1.1
Max OS X	12	2.6%	2.8
Linux Red Hat (any)	5	1.1%	2.7
Linux Novell Suse	3	0.7%	4.5
Linux Other	3	0.7%	4.0
Windows 98	2	0.4%	7.2
Linux Centos	1	0.2%	3.0
IBM-AIX	1	0.2%	10.0
HP-UX	1	0.2%	10.0
N=460, Margin of error ±4.5%			

Table 13 Q4.3 Desktop Operating System Rankings 3rd

Operating System	Frequency	Percent	Mean Years in Use
Windows Vista	59	12.8%	1.3
Max OS X	25	5.4%	2.3
Windows 2000	22	4.8%	6.5
Linux Ubuntu	19	4.1%	1.8
Windows 98	17	3.7%	8.2
Linux Red Hat (any)	14	3.0%	3.8
Windows XP	5	1.1%	3.4
Linux Novell Suse	7	1.5%	2.3
Linux Other	7	1.5%	5.6
Mac OS 8/9	3	0.7%	2.8
IBM-AIX	3	0.7%	5.8
Linux Centos	1	0.2%	2.0
HP-UX	1	0.2%	7.0
N=460, Margin of error ±4.5%			

Table 14 Q4.4 Desktop Operating System Rankings 4th

Operating System	Frequency	Percent	Mean Years in Use
Max OS X	14	3.0%	2.8
Windows 98	12	2.6%	8.8
Linux Ubuntu	8	1.7%	1.7
Linux Red Hat (any)	7	1.5%	3.0
Windows Vista	5	1.1%	1.0
Windows XP	4	0.9%	3.7
Windows 2000	3	0.7%	7.5
HP-UX	3	0.7%	6.7
Linux Novell Suse	2	0.4%	2.0
Linux Other	2	0.4%	7.0
Linux Centos	1	0.2%	1.0
Free BSD	1	0.2%	8.0
IBM-AIX	1	0.2%	5.0
Mac OS 8/9	1	0.2%	5.0
Sun Solaris	1	0.2%	10.0
N=460, Margin of error ±4.5%			

Table 15 Q4.5 Desktop Operating System Rankings 5th

Operating System	Frequency	Percent	Mean Years in Use
Max OS X	4	0.9%	1.5
Linux Ubuntu	3	0.7%	1.3
Windows XP	3	0.7%	3.5
Windows Vista	3	0.7%	1.0
Windows 2000	2	0.4%	7.5
Linux Centos	2	0.4%	3.5
Linux Other	2	0.4%	1.0
Linux Red Hat (any)	1	0.2%	4.0
Linux Novell Suse	1	0.2%	3.0
IBM-AIX	1	0.2%	6.0
N=460, Margin of error ±4.5%			

Table 16 Q6 Office Suite

Office Suite	Frequency	Percent
MicroSoft Office	448	97.4%
OpenOffice	111	24.1%
WordPerfect Office	73	15.9%
Lotus SmartSuite	12	2.6%
Novell OpenOffice	7	1.5%
StarOffice	7	1.5%
iWork (Apple)	6	1.3%
Lotus Symphony	3	0.7%
Gnome Office	2	0.4%
KOffice	2	0.4%
NeoOffice	2	0.4%
GoogleDocs	1	0.2%
None	1	0.2%
Don’t_Know	3	0.7%
N=460, Margin of error ±4.5%		

Table 17 Q7 Browsers Used

Browser	Frequency	Percent
Internet Explorer	454	98.7%
Firefox	281	61.1%
Safari	57	12.4%
Mozilla	44	9.6%
Netscape	33	7.2%
Opera	23	5.0%
Konqueror	15	3.3%
None	1	0.2%
Don’t Know	2	0.4%
N=460, Margin of error ±4.5%		

Table 18 Q8 Number of Server Machines

Number of Desktop Machines	Frequency	Percent
None	4	.9%
1-9	102	22.2%
10-19	113	24.6%
20-29	85	18.5%
30-39	49	10.7%
40-49	25	5.4%
>50	20	15.9%
Don't Know	9	2.0%
N=460, Margin of error ±4.5%		

Table 19 Q9 Server Operating Systems in Use by Version

Operating System	Frequency	Percent
Windows Server 2003	435	94.57%
Windows Server 2000	251	54.6%
Linux RedHat	110	23.9%
IBM_AIX	60	13.0%
Windows Server 2008	51	11.1%
Novell NetWare	51	11.1%
Linux Other	41	8.9%
HP-UX	31	6.7%
Linux NovellSuse	31	6.7%
Linux Ubuntu	30	6.5%
Sun Solaris	26	5.6%
Linux Centos	21	4.6%
OpenVMS / DEC VMS	11	2.4%
FreeBSD	8	1.7%
MacOS Server	4	0.9%
SCO Open Server	3	0.6%
SCO Unixware	1	0.2%
None	3	0.6%
Don’t know	11	2.4%
N=460, Margin of error ±4.5%		

Table 20 Server Operating Systems in Use by Family

Operating System	Frequency	Percent
Windows	444	96.5%
Linux	185	40.0%
Unix (various)	107	23.3%
Novell Netware	51	11.1%
OpenVMS / DEC VMS	11	2.4%
Free BSD	8	1.7%
Mac OS X	4	0.9%
N=460, Margin of error ±4.5%		

Table 21 Q10.1 Server Operating System Rankings 1st

Operating System	Frequency	Percent	Mean Years in Use
Windows Server 2003	319	69.3%	4.7
Windows Server 2000	52	11.3%	5.3
Novell Netware	13	2.8%	8.5
Linux Red Hat	7	1.5%	5.7
Windows Server 2008	5	1.1%	1.5
Linux Novell Suse	5	1.1%	7.8
Other	5	1.1%	8.2
Linux Other	5	1.1%	6.25
Linux Centos	2	0.4%	7.5
IBM AIX	1	0.2%	10
Sun Solaris	1	0.2%	7
No Reponse	31	6.7%	n/a
N=460, Margin of error ±4.5%			

Table 22 Q10.2 Server Operating System Rankings 2nd

Operating System	Frequency	Percent	Mean Years in Use
Free BSD	31	6.7%	4.4
Mac OS Server	21	4.6%	1.4
Windows Server 2000	16	3.5%	9.3
Linux Novell Suse	11	2.4%	4.6
Windows Server 2003	10	2.2%	8.6
IBM AIX	10	2.2%	1.9
Windows Server 2008	8	1.7%	3.9
HP UX	6	1.3%	3.0
Linux Red Hat	6	1.3%	2.0
Linux Other	2	0.4%	7.5
Sun Solaris	2	0.4%	3.0
N=460, Margin of error ±4.5%			

Table 23 Q10.3 Server Operating System Rankings 3rd

Operating System	Frequency	Percent	Mean Years in Use
Free BSD	42	9.1%	5.0
Windows Server 2003	28	6.1%	7.6
Linux Novell Suse	13	2.8%	3.3
Mac OS Server	13	2.8%	1.0
Windows Server 2000	12	2.6%	9.2
IBM AIX	10	2.2%	1.4
Linux Other	10	2.2%	7.0
HP UX	7	1.5%	3.6
Linux Red Hat	5	1.1%	2.6
Windows Server 2008	2	0.4%	2.0
N=460, Margin of error ±4.5%			

Table 24 Q10.4 Server Operating System Rankings 4th

Operating System	Frequency	Percent	Mean Years in Use
Free BSD	12	2.6%	3.0
Mac OS Server	9	2.0%	1.0
Linux Novell Suse	7	1.5%	3.7
Linux Other	7	1.5%	3.7
HP UX	7	1.5%	2.7
IBM AIX	6	1.3%	2.0
Windows Server 2000	5	1.1%	8.0
Windows Server 2003	5	1.1%	5.0
Linux Rad Hat	4	0.9%	1.7
N=460, Margin of error ±4.5%			

Table 25 Q10.5 Server Operating System Rankings 5th

Operating System	Frequency	Percent	Mean Years in Use
Free BSD	5	1.1%	4.6
Windows Server 2003	5	1.1%	4.2
Linux Other	3	0.7%	5.6
Windows Server 2000	2	0.4%	8.5
HP UX	2	0.4%	1.5
Mac OS Server	2	0.4%	1.0
Linux Novell Suse	1	0.2%	4.0
Linux Red Hat	1	0.2%	1.0
IBM AIX	1	0.2%	1.0
N=460, Margin of error ±4.5%			

Table 26 Q12 Web Server Software Usage

Web Server Software	Frequency	Percent
Microsoft IIS	353	76.7%
Apache Tomcat	127	27.6%
Apache httpd	105	22.8%
None	43	9.3%
IBM HTTP Server	31	6.7%
Don't Know	25	5.4%
Web Logic	13	2.8%
Sun	8	1.7%
HP-UX NSA	3	0.7%
lighttpd	1	0.2%
N=460, Margin of error ±4.5%		

Table 27 Q13 Database Software Usage

Database	Frequency	Percent
MS SQL Server	417	90.7%
MySQL	157	34.1%
Oracle	106	23.0%
DB2	64	13.9%
PostreSQL	27	5.9%
Informix	22	4.6%
Progress	13	2.8%
None	12	2.6%
Don't Know	12	2.6%
Interbase	8	1.7%
Pervasive	4	0.9%
Ingress	3	0.7%
Sybase	3	0.7%
Pick	3	0.7%
UniData	2	0.4%
N=460, Margin of error ±4.5%		

Table 28 Q14 Website Management Approach

Approach	Frequency	Percent
In house	359	78.0%
Outsourced	99	21.5%
Don’t Know	2	0.5%
N=460, Margin of error ±4.5%		

Table 29 Q15 Website Management Software Usage

Website Software	Frequency	Percent
Dreamweaver	165	35.9%
MS Frontpage	95	20.7%
Website Outsourced	77	16.7%
Don't Know	32	7.0%
MS Sharepoint Designer	31	6.7%
Joomla/Mambo	18	3.9%
MS Expression Web	17	3.7%
PHP-Nuke	17	3.7%
Manually Maintained	17	3.7%
Custom CMS	11	2.4%
MS Visual Studio	10	2.2%
Drupal	7	1.5%
DotNetNuke	7	1.5%
Ektron	6	1.3%
N=460, Margin of error ±4.5%		

Table 30 Q16 Current OSS Deployment

OSS Deployment	Frequency	Percent
Does not use OSS	168	36.5%
Server and Desktop	112	24.3%
Server side only	86	18.7%
Desktop Only	47	10.2%
Don't Know	47	10.2%
N=460, Margin of error ±4.5%		

Table 31 A17 IT Support Outsourced

Outsourced	Frequency	Percent
Yes	395	28.1%
No	982	69.9%
Don't Know	27	1.9%
N=1404, Margin of error ±2.6%		

Table 32 Q19 IT Purchasing Strategy

Strategy	Frequency	Percent
Minimize acquisition cost	237	16.9%
Minimize Total Cost of Ownership (TCO)	600	42.7%
Has No Strategy	333	23.7%
Don't Know	234	16.7%
N=1404, Margin of error ±2.6%		

Table 33 Q20 Number IT Personnel

Support Staff	Frequency	Percent
0	318	22.6%
1	239	17.0%
2	193	13.7%
3	111	7.9%
4	88	6.3%
5	74	5.3%
6-10	145	10.3%
11-20	104	7.4%
21-30	34	2.4%
31-40	17	1.2%
41-50	13	0.9%
>50	21	1.5%
Don’t Know	47	3.3%
N=1404, Margin of error ±2.6%		

Table 34 Q18 and Q21

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't Know
Q18.1 Well defined IT strategy	15.3% 215	**32.7%** **459**	23.1% 324	19.9% 279	7.2% 101	1.9% 26
Q21.1 Has no IT strategy	4.9% 69	21.3% 299	18.5% 259	**31.3%** **439**	19.6% 275	4.1% 57
Q18.2 IT line item in budget	**42.0%** **590**	37.8% 531	5.0% 70	7.4% 104	4.6% 64	3.2% 45
Q21.2 inverse	1.9% 27	7.6% 107	8.5% 119	**43.7%** **614**	36.4% 511	1.5% 21
Q18.3 Has IT department	**45.0%** **632**	20.6% 289	4.7% 66	13.5% 189	15.5% 218	0.7% 10
Q21.3 Outsources IT	11.0% 155	22.7% 319	10.5% 148	**29.4%** **413**	23.9% 335	1.9% 27
Q18.4 Departments manage own computers	1.6% 23	13.7% 192	9.0% 127	34.4% 483	**39.5%** **554**	1.8% 25
Q21.4 Department rely on IT Dept.	**37.1%** **521**	33.0% 463	5.4% 76	13.4% 188	9.8% 137	0.9% 13
Q18.5 Leadership supports IT modernization	24.4% 343	**50.8%** **713**	17.0% 238	5.0% 70	1.7% 24	1.1% 16
Q21.5 Leadership doesnot support IT modernization	1.1% 16	**5.1%** **72**	14.2% 200	47.4% 655	31.1% 436	0.9% 13
Q18.6 IT sufficiently funded	9.8% 138	**37.7%** **529**	20.6% 289	22.9% 322	7.6% 107	1.4% 19
Q21.6 IT is under-funded	10.0% 141	**30.3%** **425**	22.8% 320	26.1% 367	7.8% 110	2.6% 37
Q18.7 Computers upgraded when obsolete	25.9% 363	**48.5%** **681**	13.0% 183	9.8% 138	1.9% 27	0.9% 12
Q21.7 No computer upgrade plan	4.0% 56	**15.5%** **217**	13.6% 191	39.1% 549	22.3% 313	5.0% 70
Q18.8 Computers in use past useful life	6.7% 94	21.8% 306	19.9% 280	**35.8%** **502**	14.2% 200	1.6% 22
Q21.8 Computers retired before obsolete	8.1% 114	**30.8%** **433**	16.2% 228	30.3% 426	12.0% 169	1.9% 27

Table 35 Q22 IT Acquisition Practice

IT Acquisition Practice	Frequency	Percent
Ad hoc	457	32.5%
From IT budget	870	62.0%
Don't Know	77	5.5%
N=1404, Margin of error ±2.6%		

Table 36 Q23 In House IT Support

In House IT Support	Frequency	Percent
Yes	1013	72.2%
No	376	26.8%
Don't Know	15	1.1%
N=1404, Margin of error ±2.6%		

Table 37. Q24 Perception of City Leadership

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't Know
Q24.1 Aware of OSS	3.7% 52	19.1% 268	17.9% 252	**19.7%** **277**	8.8% 124	30.7% 431
Q24.1 Supports the use of OSS	1.6% 23	9.5% 134	**32.7%** **459**	13.5% 190	4.8% 68	37.7% 530
Q24.2 Understand advantages	1.9% 27	11.8% 166	**24.3%** **340**	18.9% 265	6.9% 97	36.3% 509
Q24.3 Understand disadvantages	2.2% 31	10.0% 141	**25.2%** **354**	19.1% 268	6.7% 94	36.8% 516
Q24.4 Would support OSS to save money	5.4% 76	**30.8%** **433**	25.4% 357	5.3% 74	1.4% 20	31.6% 444
Q24.5 Would never support OSS	1.0% 14	3.5% 49	**27.9%** **392**	26.3% 369	5.4% 76	35.9% 504
N=1404, Margin of error ±2.6%						

Table 38. Q25 Perception of City Management

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't Know
Q25.1 Aware of OSS	4.0% 56	**31.3%** **439**	20.2% 284	11.4% 160	3.6% 51	29.5% 414
Q25.1 Supports the use of OSS	2.3% 32	14.0% 196	**36.5%** **513**	10.3% 144	3.0% 42	34.0% 477
Q25.2 Understand advantages	3.1% 43	22.1% 310	**24.1%** **339**	14.3% 201	4.1% 57	32.3% 454
Q25.3 Understand disadvantages	2.8% 39	20.3% 285	**24.9%** **349**	15.5% 218	3.7% 52	32.8% 461
Q25.4 Would support OSS to save money	5.1% 72	**35.5%** **498**	23.0% 323	6.9% 97	1.8% 25	27.7% 389
Q25.5 Would never support OSS	1.0% 14	4.1% 57	22.9% 321	**33.7%** **473**	7.5% 106	30.8% 433
N=1404, Margin of error ±2.6%						

Table 39. Q26 Perception of City IT Staff

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't Know
Q26.1 Aware of OSS	17.8% 250	**33.1%** **465**	13.4% 188	4.7% 66	0.9% 13	30.1% 422
Q26.2 Supports the use of OSS	6.6% 93	19.2% 270	**27.1%** **380**	9.1% 128	2.6% 37	35.3% 496
Q26.3 Understand advantages	11.3% 159	**32.5%** **456**	17.2% 241	6.4% 90	1.1% 16	31.5% 442
Q26.4 Understand disadvantages	11.6% 163	**32.9%** **462**	16.1% 226	6.3% 88	1.1% 16	32.0% 449
Q26.5 Would support OSS to save money	7.0% 98	**29.1%** **408**	22.6% 318	7.0% 98	2.4% 33	32.0% 449
Q26.6 Would never support OSS	1.9% 26	5.1% 71	21.7% 305`	**26.2%** **368**	11.7% 164	33.5% 470
N=1404, Margin of error ±2.6%						

Table 40 Q27 City Currently Uses OSS

City Currently Uses OSS	Frequency	Percent
Yes	294	20.9%
No	683	48.6%
Don't Know	427	30.4%
N=1404, Margin of error ±2.6%		

Table 41 Q28 City Plans to use OSS in near future

City plans to use OSS	Frequency	Percent
Yes	255	18.2%
No	528	37.6%
Don't Know	621	44.2%
N=1404, Margin of error ±2.6%		

Table 42 Q29 City management sees OOS as opportunity to save money

OSS as opportunity to reduce IT costs	Frequency	Percent
Yes	310	22.1%
No	340	24.2%
Don't Know	754	53.7%
N=1404, Margin of error ±2.6%		

Table 43 Q30 Knows what OSS is

Knows what OSS is	Frequency	Percent
Yes	971	69.2%
No	433	30.8%
N=1404, Margin of error ±2.6%		

Table 44 Q31 View of OSS

View of OSS	Frequency	Percent
Q31.1 It is free	598	42.6
Q31.2 Good alternative to commercial software	588	41.9
Q31.3 Low quality	104	7.4
Q31.4 Security risk	285	20.3
Q31.5 High maintenance	164	11.7
Q31.6 Difficult to manage	278	19.8
Q31.7 Can improve program	362	25.8
Q31.8 Don't know	441	31.4
N=1404, Margin of error ±2.6%		

Table 45 Q31 View of OSS (excluding Don’t know cases)

View of OSS *excluding the Don’t know cases*	Frequency	Percent
Q31.1 It is free	580	60.2%
Q31.2 Good alternative to commercial software	579	60.1%
Q31.3 Low quality	103	10.7%
Q31.4 Security risk	277	28.8%
Q31.5 High maintenance	162	16.8%
Q31.6 Difficult to manage	275	28.6%
Q31.7 Can improve program	358	37.2%
N=963, Margin of error ±3.2%		

Table 46 Q32 Self behavior & OSS

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't Know
Q32.1 Promotes OSS at work	5.6%	11.3%	28.9%	21.4%	8.5%	24.3%
Q32.2 Use OSS whenever possible	4.3%	10.5%	25.2%	25.4%	8.9%	25.6%
Q32.3 OOS good alternative to commercial software	6.0%	24.4%	29.0%	8.1%	1.6%	30.8%
Q32.4 Easy to install and manage	2.0%	14.4%	33.0%	12.6%	2.4%	35.6%
Q32.5 OSS is dangerous	0.9%	2.8%	24.1%	29.3%	12.9%	30.1%
Q32.6 Poor alternative to commercial software	1.1%	6.8%	27.0%	25.3%	8.9%	30.9%
N=1404, Margin of error ±2.6%						

Table 47 Q33 Can define OSS

Can define the term OSS	Frequency	Percent
Yes	916	65.2%
No	488	34.8%
N=1404, Margin of error ±2.6%		

Table 48 Q34 City Population

City population	Frequency	Percent
<10K	380	27.1%
10-25K	357	25.4%
25-40K	206	14.7%
40-55K	120	8.5%
55-70K	86	6.1%
70-85K	52	3.7%
85-100K	46	3.3%
100-150K	72	5.1%
150-200K	34	2.4%
200-250K	29	2.1%
250-300K	22	1.6%

Table 49 Q35 Country

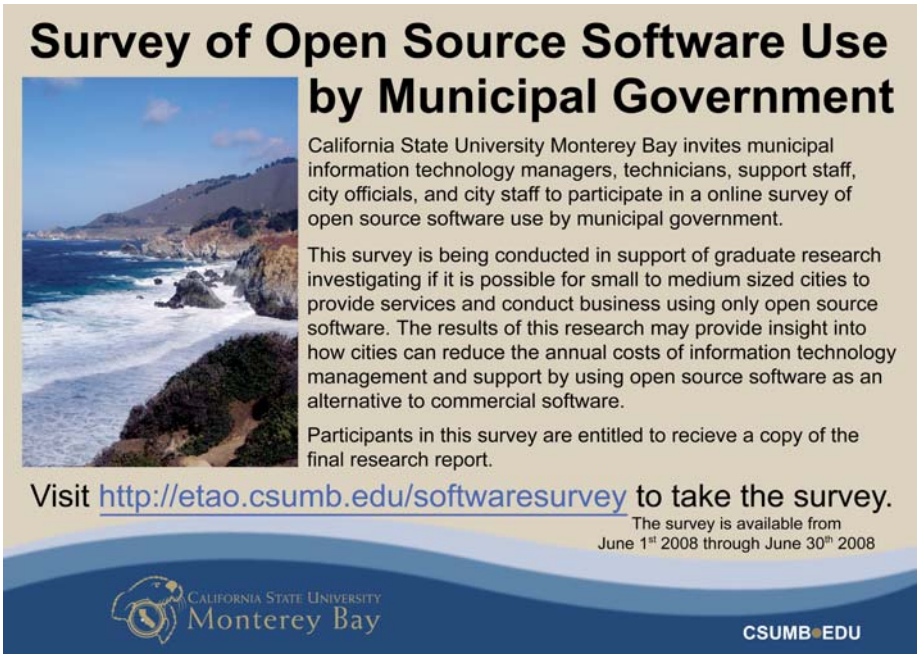
Country	Frequency	Percent
United States	1332	94.9%
Canada	72	5.1%
Total	1404	

Table 50 Q39 Where learned of survey

Where learned of survey	Frequency	Percent
Direct Email	1006	71.7%
IT Assoc Website	9	0.6%
IT Assoc Email	58	4.1%
Muni Assoc Website	14	1.0%
Muni Assoc Email	88	6.3%
From Friend	9	0.6%
From Coworker	171	12.2%
Next Am. City Mag	1	0.1%
Am City/Co Mag	14	1.0%
Other	34	2.4%

APPENDIX G
MAGAZINE ADVERTIZEMENTS

Next American City



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California State University student seeks input from locals on use of open source software

May 30, 2008 12:33 PM

A graduate student at California State University Monterey Bay is seeking input from municipal information technology managers, technicians, support staff, city officials and city staff in an online survey on the use of open source software by municipal governments. The project seeks to determine whether cities with populations under 500,000 can provide services and conduct business using only open source software.

The study, which is being conducted by David Ward for his Master's thesis, seeks to answer three main questions:

1. Are there open source alternatives to commercial software currently used by city governments?
2. Do city governments have the technical capability to deploy and support open source software?
3. Does a city's organizational culture encourage the adoption of open source software?

The survey, available at http://etao.csumb.edu/softwaresurvey, consists of 37 questions that can be answered in less than 10 minutes. Participants will be offered free copies of the final research report. For more information, contact Ward at David_Ward@csumb.edu or his professor, Dr. Eric Tao, at Eric_Tao@csumb.edu.

Find this article at:
http://www.americancityandcounty.com/news/cau-student-open-source-0805/index.html

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[X] I give permission to use my work by ITCD for research and educational purpose

- [X] with my name revealed
- [ ] without my name revealed

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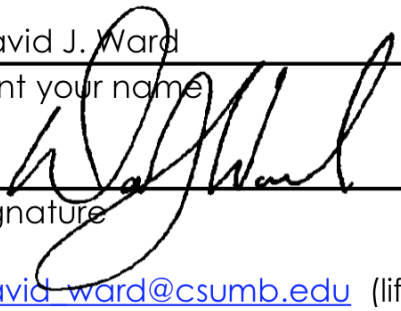
David J. Ward
Print your name



13 May 2009
Signature Date

david_ward@csumb.edu (lifetime Alumni Association member)
Permanent email address

Degree Goal (select one): [ ] MIST [X] MSMIT [ ] BS CSIT [ ] BS ITCD