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Refining Organizational Adoption

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EXTEND YOUR TOES – AN ORGANIZATIONAL APPROACH TO IT

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ABSTRACT
Organizational adoption of innovations is complex with a large theoretical literature. This complexity is often simplified in TOE (Technology, Organization, and Environment) models that usually explain or predict technology adoption by placing equal weight on these three groups of constructs. This study examined the theoretical constructs in TOE by assessing how technology, organization, and environment interacted to impact five different organizations and their adoption of open source software (OSS). While these factors were influential in the adoption of OSS TOE model factors could not explain significant organizational differences found among the five case sites. Further analysis supported the development of an additional construct, an organizational approach to IT. An organizational approach to IT mediated traditional adoption constructs, explaining the differences in organizational adoption among organizations with similar characteristics, and provided an explanation for the different adoption outcomes. Utilization of this new construct can assist practitioners when planning for the adoption of new technologies in organizations.

Keywords
Organizational adoption, adoption theory, open source software, multiple case studies

INTRODUCTION

Traditional organizational adoption theories and models, such as the Technology, Organization, and Environment (TOE) Model, propose that three main groups of constructs: technology characteristics, organizational factors, and environmental forces, push or pull organizations through a series of adoption stages (Tornatzky and Fleischer 1990, Fichman 2000). Prior studies in organizational adoption have validated these three constructs as influencing factors in organizational adoption (Chau and Tam 1997, Kuan and Chau 2001, Zhu, Kraemer, Gurbaxani, and Sean 2006). But theoretical gaps still exist because when TOE models are used, equal weight is given to the three groups of factors. Often TOE models are contextualized to a specific technology and organization. This contextualization to a specific technology within a specific organization limits the generalizability of how these three groups of factors interact to predict technology adoption outcomes (Chau and Tam 1997, Kuan and Chau 2001, Zhu, Kraemer, Gurbaxani, Sean 2006).

The current study incorporated common constructs from existing organizational adoption theories into a Technology, Organization, and Environment (TOE) model (Abrahamson 1991, Attewell 1992, Damanpour 1991, Katz and Shapiro 1986, Markus 1987, Nord and Tucker 1987, Swanson 1994, Rogers 1995, Zahara and George 2002, Tornatzky and Fleischer 1990, Fichman 2000, Grand, von Krogh, Leonard, and Swap 2004). TOE constructs were not contextualized to either the technology investigated or to a specific organization. This was thought to increase the generalizability of the investigation and allow for observation into the interactions among the identified constructs in TOE. This model is presented in Figure 1. Adoption was defined as a multi-dimensional construct that included stage (awareness, interest, adoption, routinization, and infusion), extent (single user, single area, multiple areas, single department, multiple department, and the entire organization), and level (end product, complementary asset, design choice, or business model) (Damanpour 1991, Rogers 1995, Grand et. Al 2004).

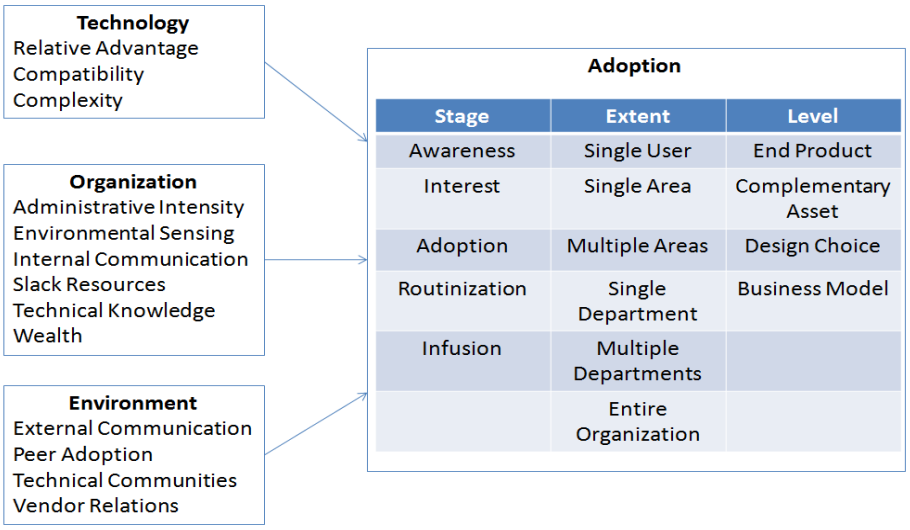

Figure 1. A Conceptual Framework for Organizational Adoption

I. Methodology

Five case studies were conducted to obtain data for the current study. This qualitative methodology was used because common quantitative approaches lack the ability to collect information on the unknown factors that may play a role in the adoption process. A semi-structured interview was developed based upon the constructs identified in Figure 1.

Twelve municipalities were invited to participate in the study. All case sites were in the same industry (municipal governments), in the same region (Florida), and were of similar size (populations greater than 75,000 people), and had an operating with a budget greater than $100 million distributed across more than fifteen municipal departments. These matching features increased the likelihood that sites would have similar technology adoption processes. Five municipalities (cities A-E) agreed to participate in the study. A review of the characteristics of the IT departments of cities A through E showed them to be similarly structured; departments were centralized and had similar IT department areas.

A total of sixty five (65) interviews were conducted. The participating IT departments identified individuals to be interviewed at the different levels within the organization. Participants were drawn from all levels within the IT department.

Data Analysis and Interpretation

Interviews were transcribed and coded according to the study's conceptual framework. Coding involved two coders, who were trained by the researcher to score interviews according to the study templates. The coders were able to agree on 98% of the total codes and demonstrated high inter coder reliability. The process of coding utilized strips or segments of interviews that mentioned study constructs. Because strips or segments could mention several topics, the same strip or segment could be coded for multiple constructs.

Results

Although all of the participating sites had adopted OSS in one or more areas within the IT department, it is important to highlight that each site had adopted OSS differently. These different adoptions were at different levels, stages, and extents which can be seen in Table 1. It was hoped that examination of the semi-structured interviews would provide an explanation for the differences in adoption. Perhaps different levels of technical, organizational, or environmental factors would explain why the organizations had adopted OSS in different ways. However examination of the semi-structured interviews revealed that each organization had similar instances of the adoption constructs. No noticeable differences were able to be found in the constructs through coding of the variables.

Departmental Area	City D	City A	City B	City E	City C
Security	Routinization End-Product Departmental	Routinization End-Product Departmental	Routinization End-Product Departmental	Routinization End-Product Departmental	Infusion Complementary Asset Departmental
Server	Interest	Awareness	Routinization	Routinization	Routinization

	End-Product Area	N/A N/A	End-Product Departmental	Complementary Asset Organizational	End-Product Organizational
Network	Awareness N/A N/A	Routinization Complementary Asset Area	Routinization End-Product Departmental	Routinization End-Product Departmental	Infusion Complementary Asset Organizational
End User Applications	Awareness N/A N/A	Awareness N/A N/A	Routinization End-Product Departmental	Routinization End-Product Departmental	Infusion Business Model Organizational
Database	Awareness N/A N/A	Awareness N/A N/A	Awareness N/A N/A	Routinization End-Product Departmental	Routinization Complementary Asset Organizational

Table 1 – Organizational Adoption of OSS

Table 2 highlights the instances of each construct found at the different case sites. This led to a review of the data because each instance was identified through semi-structured interviews, the interviews started with common questions but were allowed to differentiate based upon respondent answers. Subsequently, counts of the constructs found in the interview transcripts were not directly comparable which made it difficult to identify a single construct or group of factors that could explain the variation in OSS adoption.

Construct	City D	City A	City B	City E	City C	Total
Complexity	2	4	1	2	3	12
Compatibility	6	2	2	12	7	29
Relative Advantage	7	5	4	7	11	34
Internal Communication	77	64	111	62	148	462
Administrative Intensity	88	100	92	79	140	499
Environmental Sensing	13	23	12	7	19	74
Technical Knowledge	34	33	35	46	58	206
Wealth	3	12	4	17	7	43
Slack Resources	32	12	14	23	17	98
External Communication	18	20	12	15	19	84
Peer Adoption	1	2	1	2	4	10
Vendor Relations	34	23	22	31	17	127
Technical Community	20	12	26	11	7	76
Total	334	310	336	312	457	

Table 2 – Adoption Construct Instances

Although each construct was identified as influencing the adoption of OSS at each site, examination of the data looking at industry, size, and resources provided limited insights into OSS adoption. Difference in adoption could not be explained by looking at the model factors. This led to further analysis to identify reasons for differences in OSS adoption using each case separately. This interpretation sought to tie together how similar observations of the model constructs could lead to variations in organizational adoption.

Interpretation of the Case Sites

"*We are a 'best of breed' shop, meaning we only use leading industry-recognized software*." – Chief Information Officer City B.

"*Every so often we'll get somebody that comes in here and, you know, they're just determined that they want to have, you know, Excel or something. And we go through battles with them …we'll say "Give us the thing that you can't do in OpenOffice that you could do in Excel." And they'll start talking and …it comes down to, like, "Well its two clicks in Excel*

and three clicks in OpenOffice." And we're like "Okay, but we're not going to change our architecture because you have to say insert row from an extra click." You know?" – Chief Information Officer City A

"(The CIO) is very aware that (the IT department) doesn't want to be viewed as pushing on the user… (The CIO) is very people aware and politically in the city it's hard for us as an IT department because we are the support, then to tell everybody what they are going to do is bad…We want to be invisible, but at the same time help everybody achieve their job and do it as efficiently as possible." – Administrator of Enterprise Systems City C

As the quotes highlight, each IT department had a different approach towards IT. These approaches towards IT were linked to organizational goals, IT department goals, existing technical standards, IT project success rates, and organizational tolerance for IT change. The following highlight the different case sites.

City A – Hero Driven Change

City A's adoption of OSS was driven by individuals who were recognized as going above and beyond normal job duties thus 'hero driven'. Major technology decisions were made by end user departments. These external departments conducted searches for information systems with input from the IT department. In this environment, final decisions were made by end user departments who were unfamiliar with coordination issues surrounding the networking of applications. For example, the organization had decided to adopt three different Enterprise Resource Planning (ERP) solutions for different areas within the city. Coordination of these different applications was difficult and often simplified by adopting the most common technology denominator, namely proprietary software. OSS adoption depended on individuals who sought new ways to coordinate the infrastructure for these enterprise systems. Consequently the adoption of OSS was driven by individuals. These individuals were able to seamlessly infuse OSS within the overall culture of adopting proprietary software. Individuals who went beyond the call of using proprietary software were OSS 'heros'.

City B – IT Consolidation

City B's adoption of OSS was part of a larger effort to consolidate IT management of the entire organization within the IT department. Although the IT department was the only municipal IT resource, the city had recently consolidated all municipal IT departments underneath the umbrella of the centralized IT department. Consequently the IT department was consciously trying to build goodwill throughout the different municipal departments by successfully supporting existing applications, minimizing IT change, and successfully completing new projects. OSS was adopted by IT areas when it could highlight cost savings, be shielded from end users (reducing complexity or changes in technical standards) and provide adequate or superior functionality to proprietary alternatives. In this case, consolidation was reconfiguring how IT was adopted and functioned within the organization.

City C – OSS Network

City C's IT department was in a position of power within the city. This provided them oversight into IT operations within the city and the adoption of OSS in the late 90's. Furthermore, the IT department's independence provided the opportunity to invest heavily in personnel creating a learning environment where employees were encouraged to actively search for technology alternatives. The combination of these two factors, the ability of the IT department to actively influence IT adoption decisions and the IT department culture, collectively led to an environment where OSS was widely integrated into municipal operations. This linking of the IT department to other departments through the organizational chart allowed intra and inter departmental networking when it came to IT applications.

City D – Best of Breed

City D's adoption of OSS aligned with the municipality's approach of only using industry recognized leading solutions for municipal operations; namely purchase the best product in the marketplace. This approach resulted in the IT department being the only department that had adopted OSS applications. This policy, only using industry recognized applications for municipal operations, was a direct result of IT consolidation efforts within the city. This IT approach of consolidation minimized the IT department's influence in encouraging the adoption of OSS. The interviews highlight that IT consolidation was a political process within the city, and this decision, the adoption of industry recognized applications, was a critical factor in consolidating IT in the city. Thus the title of Best of Breed.

City E – Generation Divide

City E's adoption of OSS was highlighted by an employee generation divide. Interviews with the different members of the IT department highlighted an older and younger generation with different attitudes towards the technology. Younger employees were more comfortable with OSS and more readily identified projects or areas where the technology could be applied within the organization. Contrarily older generation employees were more familiar and comfortable with proprietary approaches. The end result of needing to work with both generations resulted in adoptions that were often limited in scope and shielded end users from complexity or changes in technical standards.

Discussion

While traditional theoretical factors from TOE influenced the adoption of OSS among the five case sites, the theoretical factors could not explain the observed differences adoption. The constructs were observed at similar levels in the organizations and there were no noticeable differences in the transcripts. This could not explain why the technologies were adopted in fundamentally different ways, as organizational scopes, adoption levels, and adoption stages varied. Interpretation of the case sites indicated that another factor, an organizational approach to IT, mediated the traditional adoption constructs identified in TOE. Furthermore the adoption decisions made by an organization's approach to IT had a recursive effect on the technology, organization, and environment constructs of that organization. Effects described by adaptive structuration theory; technology adoption appears to follow "evolution-in-use"; as a technology is adopted it influences technology, organizational, and environmental factors surrounding the adoption decision. Organizational goals, IT department goals, prior outcomes with IT, and how the organization made IT adoption decisions appear to be factors or measures that constitute an organizational approach to IT. These factors change as decisions are made and contribute to the evolving nature of technology adoption. When an organization's approach to IT was allowed to moderate traditional model factors in the adoption process variations in technology adoption were better explained. This new construct which is socio-technical in nature, meaning that it combines the sociological factors of an organization with the technical factors found in a technology's adoption, fills a critical theoretical gap in organizational adoption research by explaining how organizations with similar characteristics, in the same industry, can have different adoption outcomes.

Limitations and Future Research

As with most research studies, this work has limitations. Foremost is the context of the case sites. Municipal governments may not have the same organizational drivers as businesses and other organizations. Furthermore one must question whether Florida is a state that is representative of other municipal settings. This may decrease the generalizability of the research. Additionally as with all qualitative research, the researcher's biases may influence the interpretation of the different phenomenon at the case sites. With regard to future research, an opportunity exists to replicate this new construct within TOE models applied to other settings and other types of organizations. Furthermore, can the construct be quantified and used with quantitative approaches? It remains to be proven whether the new construct called socio-technical can have meaningful influence in real world applications of IT adoption. Can this construct assist practitioners to have a more user friendly approach when assisting organizations in their adoption of new technologies?

Conclusion

This research has added to the understanding of organizational adoption of technologies by expanding an existing model (TOE). The inclusion of an organizational construct ties together the different factors that affect organizational adoption. This new construct grounded in theory, identifies critical aspects of organizational culture that impacts decision-making related to IT adoption. Future work in the adoption field should incorporate a socio-technical construct to gain additional insight on the adoption process.

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