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Technology Diffusion in Tax: An Examination of Tax Analytics and Automation Routinization

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Completed Research

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Abstract

This study examines the use of tax analytics and automation (TAA) technologies in corporate tax departments. We investigate the factors that influence the degree to which TAA technologies are used as an integral part of the tax department's processes. A survey of tax professionals from Fortune 1000 companies was conducted to gain an understanding of the level of TAA routinization that exists in their corporate tax departments. This study extends the research literature on assimilation of innovative technologies by using a unique sample in a tax department setting. We adapt a technology diffusion model from Zhu, Kraemer and Xu (2006) and predict that factors related to technological, organizational and environmental contexts are related to the degree of routinization of TAA technologies. Results indicate that the context factors of technology integration, managerial obstacles, and regulatory environment are all related to the level of TAA technology used by corporate tax departments.

Keywords

Tax technology, automation, routinization.

Introduction

As tax becomes more complicated, tax departments need to provide much more detailed disclosures concerning economic activities. The needed data is not always easy to obtain, so new technologies are required to free tax departments from time-consuming tasks (KPMG 2018). Consider that the corporate tax department is a microcosm of a company's overall financial operations and encounters many of the issues of the larger organization. It is responsible for the correct calculation of one of the largest items on a company's income statement in addition to being responsible for all of its tax filings. Given the complex and dynamic nature of taxation, process and procedure are extremely important to the day to day operations of a corporate tax department, and the relatively small size of the department provides the unique opportunity to evaluate the assimilation of analytics and automation technologies in this setting. Therefore, the focus of this research study is to examine the current state of assimilation of tax analytics and automation (TAA) technologies in Fortune 1000 companies.

The use of TAA technologies to handle rule-based, repeatable tasks allows tax accountants to focus on value-added tasks to share their insights to business process managers and, thus, to enrich their perceived value within the organization. However, the volume of 4IR technologies is overwhelming, and technologies have a huge impact on customer behavior, company sourcing decisions, and their interactions with service providers. As a result, accounting and tax professionals hold mixed feelings about the impact of the 4IR on their profession (SAIPA Accounting iNdaba 2019).

This research study draws on the theory of innovation assimilation (Zhu, Kraemer, and Xu, 2006) to adapt their model of technology diffusion to the tax setting. This study specifically examines the level of assimilation of TAA technologies that currently exist in large corporate tax departments. A survey of tax professionals from Fortune 1000 companies was conducted to gain an understanding of the level of technology usage within their tax departments. The results of the survey provide valuable insights to the accounting profession and academia about the extent of TAA technology assimilation in the stage of routinization.

Theory and Hypotheses Development

The Fourth Industrial Revolution (4IR) and Tax

Dr. Klaus Schwab of the World Economic Forum (WEF) describes the 4IR as the age of integrated technologies for creating innovative solutions across the physical, economical, social, and biological worlds (Schwab 2016). Examples of 4IR technologies include artificial intelligence, the Internet of Things (IoT), advanced data analytics, robotic process automation, blockchain, robotics, cloud computing, virtual and augmented reality, and drones. The volume of 4IR technologies is overwhelming – these technologies impact customer behavior, their sourcing decisions, and their interactions with service providers.

Harvard Business Review (2017) states that digital disruption has accelerated dramatically and is the main reason for business change. It cited a 2014 study from Constellation Research which showed that 52 percent of companies in the Fortune 500 have either gone bankrupt, been acquired, or ceased to exist as a result of digital disruption since 2000, and estimated that approximately three-quarters of today's S&P 500 companies will be replaced by 2027. The study concludes that "while disruption is immense, so is the opportunity". Successful companies must become innovative and customer-centric, embracing digital transformation and utilizing technology to grow.

4IR technologies facilitate real-time data gathering, analysis, and decision- and prediction- making capabilities. The South African Institute of Professional Accountants (2019) reports that accounting professionals hold mixed feelings about the impact of the 4IR on their profession. Some find they must start training immediately to remain employable in the future. Others consider 4IR technologies as not relevant because of their own business processes or bureaucratic restrictions on data management and use. Still, the majority of accounting professionals feel optimistic about applying advanced analytics and digital technologies to help them improve their business processes' quality and efficiency. More importantly, accounting professionals feel confident in equipping themselves with the skills required to continue serving their clients in a business advisory capacity when their clients' traditional workflow becomes automated. Accounting professionals can then better interact with stakeholders to influence how organizations create and preserve value.

Lange (2018) reinforced that digital disruption impacts global tax systems in addition to businesses. Digital disruption blurs the line between physical tax jurisdictions and digital worlds, leading to significant challenges for tax policy, lawmakers, and business leaders. In the middle of the 4IR, a firm must become knowledgeable about all of the impacts of digital technology, including benefits, disruptions, and challenges.

Mezzio, Stein, and Stein (2019) highlight that the tax area is in the vanguard of the 4IR with the growth of robotic process automation (RPA). RPA enables the automation of routine and repeatable business processes that could otherwise be time-consuming, inefficient, and prone to error. They note that RPA is one of many tools within a suite of TAA technology tools that companies can use to align their tax practices with long-term business strategies. The authors cite many examples of tax-related RPA applications in public accounting firms that will streamline tax preparation, reduce rework, and boost their employee value proposition by focusing on interacting with their clients on strategic issues and planning. Also, they emphasize that "[I]n this disruptive and transformative context, RPA and emerging technologies can address organizations' business and tax objectives now and into the future."

Diffusion of Technology Innovations

Fuller and Swanson (1992) define innovation as "the first or early use of an idea by one of a set of organizations," noting that this definition focuses on interfirm innovation, or the diffusion of innovation throughout a range of prospective organizations. Diffusion of innovation is a multi-stage process, according to Cooper and Zmud (1990), involving the stages of initiation, adoption, adaptation, acceptance, routinization, and infusion.

Given the current state of digital disruption, companies firmly believe that adopting and using information technology can have significant effects on their own productivity (Oliveira and Martins (2011). Research on the diffusion of technology has shown that it is the application of innovative technology rather than its invention that creates business value. Zhu et al. (2006) highlighted that innovative technology must be "integrated or ingrained into the corporate value chain before it can generate significant business value." They considered the series of diffusion stages to start with initiation, or initial evaluation of the technology, going through formal adoption of the technology, and ending at postadoption full-scale deployment of the technology, or routinization.

Swanson (1994) proposed a typology of information system (IS) innovation, with three types of innovations. Type I innovations are technical process innovations related to the management and administrative support of IS work or the technical IS task itself (i.e., IS process innovation, such as software maintenance departments, chief information officers, or systems programming). Type II innovations are those that apply IS products/services to support administrative tasks of the business, such as payroll systems and automated accounting systems. Finally, Type III innovations integrate IS products/services with the core business technology, potentially impacting and benefitting the whole business. Examples of Type III innovations include airline reservation systems and computer integrated manufacturing (CIM).

Previous literature has examined the diffusion process using the technology-organization-environment (TOE) framework developed by Tornatzky and Fleischer (1990). This framework "identifies three aspects of a firm's context that influence the process by which it adopts and implements technological innovations: technological context, organizational context, and environmental context." (Zhu, Kramer, Xu, 2003). Technological context describes both internal and external technologies that are relevant for the firm. Organizational context refers to measures that describe the firm, such as size and scope, managerial structure, and resource availability. Environmental context focuses on the realm in which a firm operates, including industry, competition, suppliers, and governments.

The TOE framework has been used to understand technology adoptions in areas such as open systems (Chau and Tam, 1997), electronic data interchange (Kuan and Chau, 2001), business to business e-commerce (Teo et al., 2006), and e-commerce and web sites (Oliveira and Martins, 2008; Oliveira and Martins, 2009). Pan and Yang (2008) studied the factors within the TOE framework that affect the decision to adopt enterprise resource planning (ERP) systems. The authors viewed ERP systems as vital for companies that are facing "a rapidly changing business environment and an increasingly competitive marketplace."

Hoti (2015) noted that the TOE framework is well-established and was useful in investigating a wide range of innovations. The author reviewed the literature on information systems (IS) adoption in small and medium-sized enterprises during the period 2004-2015 and found the patterns of adoption of new technologies continued to fit under the framework. Yeh, Lee, and Pai (2015) investigated the influence of TOE factors on e-business information technology (IT) capabilities, finding positive associations with all three types of factors. They also found that e-business IT capabilities are positively associated with the implementation of IT strategies.

Zhu, Kraemer, and Xu (2003), Zhu, Kraemer, Xu, and Dedrick (2004), and Zhu and Kraemer (2005) all used the TOE framework to examine the impact of technological, organizational, and environmental factors on different stages of a firm's assimilation of e-business. Zhu, Kraemer, and Xu (2003) specifically examined the adoption stage, Zhu, Kraemer, Xu, and Dedrick (2004) examined the value/performance stage, and Zhu and Kraemer (2005) examined usage. The authors surveyed businesses and consumers in European countries in the financial services and the retail industries. The three studies found that factors in all three contexts were significant adoption drivers and contributed to e-business value and use. One factor in the environmental context was a significant adoption inhibitor.

Zhu, Kraemer, and Xu (2006) extended the previous studies by examining how TOE factors influence three e-business diffusion stages: initiation, adoption, and routinization. The authors specifically found that seven factors in the technological context, organizational context, and environmental context factors had a significant effect on e-business initiation, adoption, and routinization, but the effects differed across stages.

These four related studies have used a range of factors to represent the TOE contexts. The technological context initially included technology competence or readiness. Zhu and Kraemer (2005) defined technology readiness as consisting of "technologies that enable Internet-related businesses" and "IT professionals possessing the knowledge and skills to implement Internet-related applications." Zhu et al. (2006) added a second technological context factor - technology integration. They distinguished technology readiness from technology integration by defining the latter as "the degree of interconnectivity among back-office information systems and databases inside the firm and those externally integrated with suppliers' enterprise systems and databases." In these studies, technology competence/readiness and technology integration both had a significant positive effect on e-business initiation, adoption, value, use, and routinization.

All four studies included firm size and firm (global) scope as factors representing the organizational context. Zhu et al. (2006) added a third variable of managerial obstacles (lack of skills) and found that firm size had a significant negative effect on initiation, adoption, and routinization of e-business, while the managerial obstacles factor only had a significant negative effect on initiation stage, and the global scope factor had a significant positive effect on the initiation stage.

Finally, all four studies included competition intensity or pressure as an environmental context factor, and the latter three studies added a regulatory environment/support factor. Competition intensity had a significant positive effect on adoption and use of e-business, while the regulatory environment had a positive effect on e-business value and use. Zhu et al. (2006) found for developed countries that the competition intensity factor had a significant positive effect on initiation and adoption of e-business, while the regulatory environment factor had a significant positive effect only on initiation of e-business.

This study adapts Zhu et al.'s (2006) integrative research model for assessing the diffusion of e-business at the firm level to analyze TAA technology innovation usage. Our study surveyed tax professionals from Fortune 1000 companies to gain an understanding of the level of technology usage that exists in their corporate tax departments. All of these companies have already gone through the initiation and adoption stages of technology innovation. Thus, the conceptual model as shown in Figure 1 integrates technological, organizational, and environmental contexts to the final stage of TAA routinization. Similar to Zhu et al. (2006), our technological context includes technology readiness and technology integration, our organizational context includes managerial obstacles, and our environmental context includes competition intensity and regulatory environment as factors. We eliminated firm size and global scope from consideration as organizational context variables, as our surveyed companies were all large with a global scope.

In the Zhu et al (2003, 2004, 2005, 2006) series of papers, the authors consider e-business to be a Type III innovation according to Swanson (1994), because it is usually embedded in a firm's core business processes, capable of extending basic business products/services, and able to streamline the integrations with suppliers and customers. One important distinction between our study and these studies is that TAA technology innovation may be considered a Type II IS innovation based on Swanson's theory, rather than a Type III IS innovation. Companies use TAA technology to support administrative tasks of their tax department. However, TAA technology initiation, the first stage of tax technology diffusion, includes evaluating the potential benefits of TAA technology to improve a firm's performance in value chain activities. The second stage of TAA technology diffusion, adoption, is a commitment to TAA, as it requires allocating resources and physically acquiring the technology. Adoption is a crucial step toward the widespread usage of technology because IT studies have shown significant differences between adopters and nonadopters in terms of internal resources and external environments (Zhu et al., 2006). Finally, the last stage of TAA technology diffusion, routinization, integrates TAA technology into a firm's value chain activities. As a result, there are aspects of Type III IS innovation in TAA technology, and we develop a series of hypotheses based on the Zhu et al. (2006) conceptual model.

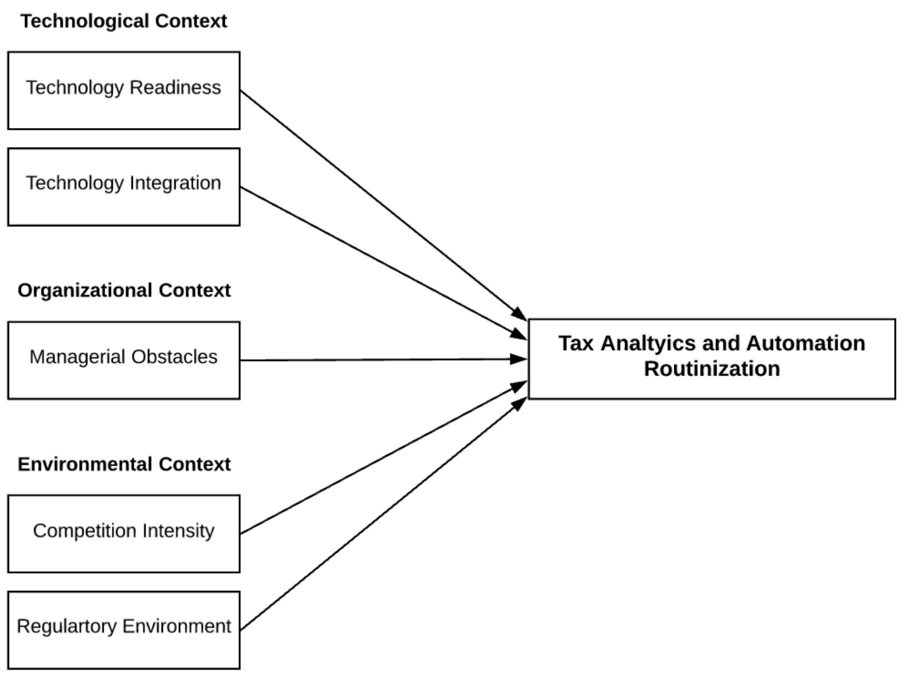

Figure 1. Research Model Adapted from Zhu, Kraemer and Xu (2006)

Technological Context – readiness and integration

The two factors of the technological context, technology readiness and technology integration, can impact technology diffusion. Zhu et al. (2006) point out that "firms with greater technology readiness are in a better position to initiate, adopt, and routinize e-business." Technology integration is a higher level than technology readiness, as technology integration increases the compatibility between systems and enhances system responsiveness. Both factors are important for all three stages of technology diffusion. As the companies involved in this study have already gone through the initiation and adoption stages of technology innovation, our hypotheses relate to the final stage of routinization.

Hypothesis 1: Technology readiness is positively related to TAA routinization.

Hypothesis 2: Technology integration is positively related to TAA routinization.

Organizational Context - firm size, global scope and obstacles

Zhu et al. (2006) studied three factors for the organizational context: firm size, global scope, and managerial obstacles. Given our sample of Fortune 1000 companies, we don't predict variation in companies for the first two organizational context factors. Zhu et al. (2006) did find that managerial obstacles had a negative effect for the initiation stage of technology diffusion, which may also apply to our study of TAA routinization.

Hypothesis 3: Managerial obstacles are negatively related to TAA routinization.

Environmental Context - competition and regulatory

Based on Zhu et al. (2006), two factors will be studied for the environment context: competition intensity and regulatory environment. Zhu et al. (2003), Zhu et al. (2004), Zhu and Kraemer (2005), and Zhu et al. (2006) all found that these two factors had a positive effect on the stages of technology diffusion studies.

Hypothesis 4: Competition intensity is positively related to TAA routinization.

Hypothesis 5: A supportive regulatory environment is positively related to TAA routinization.

Methodology

To test the research model in Figure 1 and the proposed hypotheses, an online questionnaire was designed to survey tax directors in Fortune 1000 U.S. firms. The survey questions are based on existing literature related to technology diffusion (Zhu et al. 2006) and, in particular, TAA technology diffusion in U.S. corporate tax departments. Each item on the questionnaire was reviewed for its content, scope, and purpose by a professional tax expert.

Survey Participants

Tax executives employed as of September 2019 were invited to participate in the online survey via a recruitment letter. Graduate assistants gathered the addresses for each Vice President of Tax (or similar title) at each Fortune 1000 company. Our survey invitation letters with the survey's weblink were sent to the vice president of the tax department using traditional mail. Letters were mailed in three waves with an initial invitation and two reminders mailed in one-month intervals to increase participation rates.

The survey period lasted approximately 3 months. Participation was voluntary and confidential and the data is analyzed in aggregate without disclosing confidential information. The participants were offered an option at the end of the survey to be contacted for further information (although not required if they wish to remain anonymous).

In total, 68 responses from 1,000 companies were returned with the response rate of 6.8%. Table 1 shows the sample characteristics of the survey participants.

Number of Employees			
	Less than 100	1	1%
	101-300	0	0%
	300-500	0	0%
	501-1000	3	4%
	1001-5000	10	15%
	more than 5000	46	68%
	Missing	8	12%
	Total	68	100%
Respondent Title			
	VP of Tax	21	31%
	Chief Tax Officer	3	4%
	Tax Director, Manager	32	47%
	Tax Technology VP, Director, Manager	7	10%
	Others	2	3%
	Missing	3	4%
	Total	68	100%

Table 1. Demographics of Response Sample

The distribution of firm size, measured by the number of employees, indicates that 93% of the respondents (56 out of 60, excluding missing observations) work in companies with at least 1000 employees (i.e., large companies). Survey respondents were vice presidents of tax, chief tax officers, Tax directors and managers. Several of them even have specific TAA relevant titles, including tax technology VP, director and manager as shown in Table 1. They appear to be the individuals in each firm best qualified to speak about the firm's overall tax analytics and automation activities. The positions of the respondents suggest the excellent quality of the data source.

Measures

Dependent Variable

The measurement items were adapted from Zhu et al. (2006) to conform to a tax setting. The dependent variable is TAA routinization or postadoption deployment and usage of TAA technology. TAA routinization was measured by four items designed to gauge the extent of TAA technologies used in all the tax department processes, including tax compliance, tax provision, tax planning and tax strategy. Participants responded to the question, "if your organization has used tax analytics and automation in your corporate tax department, please estimate how integrated the technology is in the following processes: 1) tax compliance, 2) tax provision, 3) tax planning, 4) tax strategy". A 5 point Likert scale anchored from "not at all integrated" to 'fully integrated" was used to capture the responses.

Independent Variables

The technological context variables in our model are technology readiness and technology integration. Technology readiness, measured by a count of the number of tax professionals with expertise in TAA technology, represents the human resource side to TAA technology use (Mata et al. 1995). Technology integration was measured by adapting the two-item scale used by Zhu (2006) to capture the backend integration of the company's information systems necessary for the functionality of the tax department's processes. Participants responded to the following questions on a 5 point Likert scale (not at all integrated to fully integrated): "please rate the extent to which 1) your tax systems are electronically integrated with your company's databases and information systems and 2) your company's databases and information systems are electronically integrated with those of your company's business partners.

The organizational context variable in our model is managerial obstacles. Managerial obstacles were measured by two items adapted from Zhu et al. (2006)[1] that capture the difficulty of making organizational changes and integrating technology. A five-point Likert scale (not significant to very significant) was used to respond to "please rate how significant the following obstacles are to your corporate tax department's ability to conduct tax analytics and automation 1) making needed organizational changes for tax analytics and automation implementation and 2) integrating tax analytics and automation into your overall tax strategy and business processes".

The environmental context variables in our model are competition intensity and regulatory environment. Competition intensity was measured with three items that capture local, national and international markets (Zhu et al. 2006). The questions asked participants to "please rate the degree to which your company's business activities are affected by 1) competitors in your local area 2) competitors inside your country and 3) competitors from outside your country" anchored with "not affected at all" to "significantly affected". Lastly, to capture the legal environment surrounding the use of tax analytics and automation, a regulatory environment question was adapted from Zhu et al. (2006). The variable was measured by four items on a five-point Likert scale (don't agree to agree completely) to the following question: "please rate the degree to which you agree with the following statements 1) governments are utilizing tax analytics and automation 2) governments require the use of tax analytics and automation for tax compliance 3) tax laws support the use of tax analytics and automation 4) there is adequate legal protection for the use of tax analytics and automation information.

Results

We conducted a factor analysis using the principal components technique to determine the construct validity for each variable. For each variable, all the items loaded on a single factor and factor loadings were at or above the recommended cut-off value (>0.60) (Hair, Black, Babin and Anderson 2010) with the exception of one item for managerial obstacles as noted above. Next, composite reliability was assessed using Cronbach's alpha. The recommended cut-off value of 0.70 (Hair et al. 2010) is exceeded for the dependent variable of TAA routinization, and the independent variables of managerial obstacles and regulatory environment. The independent variables of technology integration and competition intensity fall just below the cut-off at 0.686 and 0.525, respectively. To create the composite variable for each construct, the average score for each participant for each variable was calculated. Descriptive statistics and scale reliability results are presented in Table 2, panels A and B. Mean scores for each variable indicate, in general, the survey participants responded to most questions above or slightly above the midpoint of the scale (i.e., 2.5). Integration was slightly below the midpoint indicating that back end integration, on average, is slightly below "somewhat integrated" for the companies that participated.

The hypotheses were tested using linear regression analysis in SPSS. The mean substitution option for missing data was implemented to address the limitation of missing data on the technology integration and

[1] Zhu et al. (2006) suggest three items; however due to low factor score loadings on one item (<.50) we retain two items.

regulatory environment variables given the small sample size. The regression equation is below, and results are presented in Table 3, showing a significant model (F=4.706, p=.001). The results for technological context show significance for the technology integration factor but no significance for the technology readiness factor. H1, predicting that technology readiness is positively related to TAA routinization, was operationalized by a count of tax professionals with TAA expertise and is not supported (t=.530, p=.299). However, H2, predicting that technology integration is positively related to TAA routinization, is supported (t=3.660, p<.001). The significant finding is an indicator of the importance of the backend integration of the company's information system with the tax department's systems in order to routinize (deploy and use) TAA activities in the tax department. The particular number of tax professionals with TAA expertise did not affect the ability of these companies to routinize TAA.

Panel A Descriptive Statistics[a]

	N	Range	Mean	SD
Dependent Variable:				
TAA Routinization	64	1-5	2.61	.828
Independent Variable:				
Tax Professionals with TAA	65	0-40	3.70	5.68
Technology Integration	56	1-4.5	2.30	.883
Managerial Obstacles	64	1-5	3.35	1.05
Competition Intensity	64	1-5	3.52	.935
Regulatory Environment	43	1-5	3.17	.980

Panel B Scale Reliability

Construct	Cronbach's α	Item	Factor Loading
TAA Routinization	.825	Routinization 1	.822
		Routinization 2	.701
		Routinization 3	.878
		Routinization 4	.837
Technology Integration	.686	Integration 1	.873
		Integration 2	.873
Managerial Obstacles	.708	Obstacles 1	.881
		Obstacles 2	.881
Competition Intensity	.525	Competition 1	.724
		Competition 1	.748
		Competition 1	.685
Regulatory Environment	.759	Regulatory 1	.745
		Regulatory 2	.873
		Regulatory 3	.798
		Regulatory 4	.616

[a] TAA Routinization, Technology Integration, Managerial Obstacles, Competition Intensity and Regulatory Environment are measured using the average of items contained in Panel B. Tax Professionals with TAA is measured using a count of tax professionals with tax analytics and automation expertise per organization.

Table 2. Descriptive Statistics and Scale Reliability

Tax Analytics and Automation Routinization = a + b_1 Tax Professionals with TAA + b_2 Technology Integration + b_3 Managerial Obstacles + b_4 Competition Intensity + b_5 Regulatory Environment + e[b]

Independent Variables	Tax Professional with TAA	Technology Integration	Managerial Obstacles	Competition Intensity	Regulatory Environment	Overall Model
β	059	.403	-.233	.140	.253	R^2=.282,
t-statistic	.530	3.660	-1.972	1.233	2.236	F=4.706,
p-value	.299	**<.001**	**.027**	.112	**.015**	p=.001, n=65

[b] One-tailed *p*-values are reported

Table 3. Regression Analysis[b]

Results for the organizational context hypothesis are in the predicted direction and supported. H3, predicting that managerial obstacles are negatively related to TAA routinization, is significant and negative (t=-1.972, p=.027). The finding shows that companies who experience more difficulty in making organizational changes and integrating TAA technology into the overall strategy and business processes of their organizations have less TAA routinization than companies with less difficulty.

Results for environmental context show significance for the regulatory environment factor but not for the competition intensity factor. H4, predicting that competition intensity is positively related to TAA routinization, is not supported (t=1.233, p=.112). H5, predicting that a supportive regulatory environment is positively related to TAA routinization, is supported (t=2.236, p=.015). The degree of competition for these companies did not affect their level of TAA routinization. However, the regulatory environment did affect TAA routinization in that a more favorable regulatory environment is associated with a higher degree of routinization of TAA in tax processes.

Conclusion

TAA technologies are transforming the tax processes in corporate tax departments. The goal of this research study is to further our understanding of the current state of assimilation of TAA technologies in Fortune 1000 companies. To accomplish this purpose, we surveyed tax executives to gain an understanding of the factors that increase or challenge the degree to which TAA technologies are used as an integral part of the tax department's processes.

Using this unique data set from Fortune 1000 tax executives, we tested an adapted TOE model of factors affecting TAA routinization. Results for technology integration were supported and suggest that backend technology integration with the databases and information systems of the company and its business partners is important for integrating TAA into tax processes. We did not find that technology readiness, as operationalized by number of tax professionals with TAA expertise, to be a significant factor. Next, we find that our factor for organizational context, managerial obstacles, is significantly negatively related to TAA routinization as hypothesized. This finding suggests that if making organizational changes to integrate TAA into the strategy and business processes of the company is challenging, then it hinders the degree of TAA routinization that the tax department can achieve. Conversely, as suggested by Schmidt, Church, and Riley (forthcoming), if those managerial obstacles are not challenging then a higher degree of TAA routinization can be achieved. Finally, results are significant for the regulatory environment factor but not for the competition intensity factor. This finding indicates that when the regulatory environment is favorable to TAA, companies are more likely to be farther along in the routinization of TAA in their tax processes. The degree to which the company's business activities are affected by competition did not have an effect on TAA routinization.

Our study has important implications for research and practice. The TOE framework has been used to understand technology innovations in several areas, and this study adapted the framework to analyze technology innovation usage and value creation in the TAA field. In addition, even though TAA technology may be considered a Type II IS innovation, we show that technological, organizational, and environmental context factors have similar relations to TAA routinization as they do to Type III IS innovations in previous studies. Our study also provides support to the importance of involving tax department personnel in all major upgrades to a company's databases and information systems to ensure that tax processes are appropriately considered and integrated. The results can reassure senior tax management that, while it may be generally beneficial, developing TAA expertise in all its tax professionals is not necessary to achieve technology readiness. Our study supports the importance of company management providing flexibility in evaluating organizational changes that impact the integration of TAA into the strategy and business processes of the company. Finally, our study results inform senior tax management that the regulatory environment has a significant impact on the importance of developing strong TAA processes in their tax department.

Our study is subject to certain limitations, which are also areas for future research. We surveyed tax executives of Fortune 1000 firms and therefore cannot capture the TAA technology diffusion in firms that are smaller with fewer resources. Future research should consider the impact of TAA technology in firms with fewer resources. Also our survey response rate resulted in a small sample size which reduced the number of analyses techniques available to us. Nonetheless, we find significant results with our small and unique sample. Future research should examine larger data sets to further our understanding of TAA technology diffusion.

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