The Drivers for Acceptance of Tablet PCs by Faculty in a College of Business

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ABSTRACT

Utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT) model developed by Vankatesh, et al. (2003) this study extends our understanding of technology acceptance, provides insights into the use of UTAUT as a tool to increase our understanding of acceptance, and identifies areas that administrators should consider when proposing a new technology in a College of Business setting. UTAUT is a useful tool for managers to predict the likelihood of success for new technology introductions and helps managers understand the drivers of acceptance in order to proactively design interventions targeted at users that may be less inclined to adopt and use new systems. The Tablet PC is a new technology being introduced in various settings including faculty and student use in higher education. This study applies UTAUT prescriptively as a management tool to asses the user acceptance of Tablet PCs by the faculty of a College of Business at a large university in the United States. The results largely validate UTAUT, although the findings suggest that certain variables, namely performance expectancy and voluntariness, are the most salient drivers of acceptance when applied to business faculty in higher education.

Keywords: Unified Theory of Acceptance and Use of Technology, UTAUT, Technology Acceptance, Tablet PCs, Faculty

1. INTRODUCTION

According to Microsoft, the Tablet PC allows faculty to rethink the way they work. Microsoft posits that Tablet PCs will have a profound impact on educators which is evident in the following statement:

> "For years, the field of education has looked to technology to reach students more effectively, and, with the Tablet PC, educators have found a way to make classroom lectures more engaging and interactive." (Microsoft 2004A)

If Tablet PCs make this type of impact it would only seem reasonable that the acceptance of the technology by faculty would be a key issue to understand. This study explores this topic and examines the key acceptance issues from a faculty perspective.

2. LITERATURE REVIEW

The practitioner literature is full of positive references to Tablet PCs and their potential impact on education. With its connectivity, portability, and stylus based input, Tablets appear to be a natural extension of the spiral notebook and chalkboard.

> "The TabletPC is the perfect juxtaposition of the monolithic technology initiatives now dominating the eLearning landscape and the spontaneous, playful, social learning environments reminiscent of schoolyards and chalkboards."(Lomas, 2003)

Previously, others have documented the usage and abilities of the Tablet PC in education when they indicated that Tablet PCs would allow faculty to focus more on students (Lindsey, 2003). Others have predicted that Tablet PCs would become indispensable in all areas of faculty life (Barton, 2003). McCloskey (2002) posits that the Tablet PC is like no other computer introduced because it is "in tune" with how people work.

Even MIT has gotten involved with TabletPCs. MIT with its iCampus project intends to use technology as a means to enhance education (Microsoft, 2002). John Williams, Director of the Intelligent Engineering Systems Laboratory at MIT, said this about TabletPCs:

> "The Tablet PC is a 'killer' computer: powerful enough to complete the heavy number crunching, flexible enough to keep track of assignments and due dates, and compact enough to unobtrusively

take it to meetings or into classrooms and lectures." (Microsoft, 2002)

To sum up MIT's experience with the TablePCs, Williams commented: "People are just going to take to the Tablet PC like water." (Microsoft, 2002)

So with all these perceived benefits it is important to explore faculty members' acceptance of the technology. The faculty perspective has been an important component of previous MIS studies (Ruby 2005; Dwyer & Knapp 2004; Sterling & Brinthaupt 2003; Hill 1994; Vijayaraman, 1994) and is the central issue explored by this study. As with previous education oriented studies of technology acceptance (Dwyer & Knapp 2002; Gong, Xu, & Yu 2004; Meso & Liegle 2005), this study examines technology acceptance from the faculty perspective.

Previous studies have addressed the use of Tablet PCs by faculty members in the College of Business (Arnett, Schmidt, & Shim 2005; Schwager, Anderson, & Kerns 2005; Shim, Arnett, & Schmidt 2004; Shim, Arnett, & Schmidt 2003). This study goes beyond these initial exploratory studies by utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT) model developed by Vankatesh, et al. (2003). UTAUT promises to be a useful tool to help understand user acceptance.

In addressing the acceptance of Tablet PCs, Monica Garfield (Garfield 2005) utilized UTAUT in a qualitative study in a corporate environment. Garfield provides anecdotal evidence of how the model can be utilized to understand user acceptance as well as understanding positive and negative reactions to the technology.

While much of the literature on Tablet PCs is positive, as the number of units in the market increases skeptics are emerging. Several IT analysts (Evers 2005; Mackie 2005; Clendenin 2004) identify the important problems with Tablet PCs acceptance which include premium price, ease of use and the need for "killer" application. Furthermore, Mackie (2005) points out that Microsoft believes Tablet PCs are still a niche product, but as users figure out more ways to use them their use will increase.

This study builds on these previous studies by using UTAUT as a tool for understanding the acceptance of Tablet PC computing by College of Business faculty members. It extends our knowledge of technology acceptance as well as provides some useful insights into acceptance of technology by faculty members. While the study occurs in a College of Business the findings should be relevant to many academic disciplines.

3. RESEARCH QUESTIONS

The two overarching questions for this research were: What are the drivers of user acceptance of Tablet PCs by business faculty in higher education? And, do variables such as gender, age, experience, and voluntariness make a difference?

Technologies improve efficiency and effectiveness only as they are accepted by employees and organizations. One of the most well researched areas in Information Systems literature is the area of user acceptance of IT. Several theoretical models attempt to explain use and acceptance of technology including: 1. Theory of Reasoned Action, (Fishbein and Ajzen 1975) 2. TAM (Davis et al. 1989, and Venkatesh and Davis 2000), 3. Motivational Model (Vallerand 1997, and Davis et al. 1992), 4. TPB (Ajzen 1991), 5. Combined TAM-TPB (Taylor and Todd 1995), 6. Model of PC Utilization (Thompson et al. 1991), 7. Innovation Diffusion Theory (Rogers 1995, Moore and Benbasat 1996), and 8. Social Cognitive Theory (Bandura 1986, and Compeau and Higgins 1995. Vankatesh, Morris, Davis, and Davis (2003) created a unified model of IT acceptance where they integrated the elements of these eight prominent models into a Unified Theory of Acceptance and Use of Technology (UTAUT). They found that UTAUT accounted for up to 70 percent of the variance (adjusted R^2) in usage intention. UTAUT is held up as "a definitive model that synthesizes what is known and provides a foundation to guide future research in this area (Vankatesh et al., 2003, p. 467)." From a practical perspective UTAUT "provides a useful tool for managers needing to assess the likelihood of success for new technology introductions and helps them understand the drivers of acceptance in order to proactively design interventions" increasing user acceptance. (Vankatesh et al., 2003, p. 426)

3.1 The UTAUT Model and our Hypotheses

In constructing UTAUT, Vankatesh et al. (2003) found that four constructs play a significant role as determinants of user acceptance and usage behavior: performance expectancy (UTPE), effort expectancy (UTEE), social influence (UTSI), and facilitating conditions (UTFC). The influences of four other variables (gender, age, voluntaries, and experience) were also measured as direct determinants and as moderators.

Performance expectancy is the degree to which an individual believes that using the system will help him or her increase job performance. Vankatesh et al. (2003) found performance expectancy to be the strongest predictor in UTAUT with an R^2 ranging from .46-.59, $p<.001$. Therefore, we predict a positive relationship between performance expectancy and tablet PC use.

H1: Performance Expectancy (UTPE) will positively affect Use of Tablet PC.

Effort expectancy is the degree of ease associated with the use of the system. Vankatesh et al. (2003) found effort expectancy to be weak predictor in UTAUT with an R^2 ranging from .08-.2, $p<.05$. We propose that effort expectancy may result in a positive relationship with tablet PC use.

H2: Effort Expectancy (UTEE) will positively affect Use of Tablet PC.

Social influence is the degree to which an individual perceives that important others believe he or she should use

the new system. Vankatesh et al. (2003) found that social influence had a low positive relationship in UTAUT. Therefore, we predict a positive relationship between social influence and tablet PC use.

H3: Social Influence (UTSI) will positively affect Use of Tablet PC.

Facilitating conditions are the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system. Vankatesh et al. (2003) found facilitating conditions was a significant predictor of usage behavior in UTAUT with an R^2 ranging from .05-.18, $p<.05$. Thus, we propose that facilitating conditions will positively affect tablet PC use.

H4: Facilitating Conditions (UTFC) will positively affect Use of Tablet PC.

Gender, age, experience, and voluntariness are variables Vankatesh et al. (2003) found as key modifiers. They measured the variables both as direct determinants and as modifiers. As direct determinants these variables were found to have a small influence on usage. As modifiers these variables had the following influences:

1. gender and age moderate the effect of performance expectancy, it was more important to younger workers, especially men.
2. gender, age, and experience moderate the effect of effort expectancy, it was more important to women, especially older women, and those with less experience.
3. gender, age, voluntariness and experience moderate the effect of social influence, it was more important in mandatory settings, and to women, especially older women.
4. age and experience moderate the influence of facilitating conditions, it was more important to older workers, and those with increasing experience with the technology.

Thus, in our particular case we predict that gender will have a positive influence for men and negative influence for women, age will have a negative influence, experience will have a positive influence, and voluntariness will have a positive influence on table PC usage.

H5: Examine the influence of additional variables.

- H5a: Gender will affect Use of Tablet PC (positively for men, negatively for women).
- H5b: Age will negatively affect Use of Tablet PC.
- H5c: Experience (Exp) will positively affect Use of Tablet PC.
- H5d: Voluntariness (Vol) will positively affect Use of Tablet PC.

3.2 Problem and Purpose

While there is anecdotal and some descriptive research in the IS literature concerning the use of Tablet PCs there has been little research of a theoretical nature. The purpose of this study is to provide a quantitative analysis of user acceptance of Tablet PCs by faculty in a College of Business by using the UTAUT model as a management tool to understand the drivers of acceptance so that proactive interventions can be designed to increase current user acceptance and facilitate new user acceptance of Tablet PCs by faculty. In this study we look 1) at the four direct determinants of UTAUT and then 2) add the four other variables. Figure 1 presents the research model.

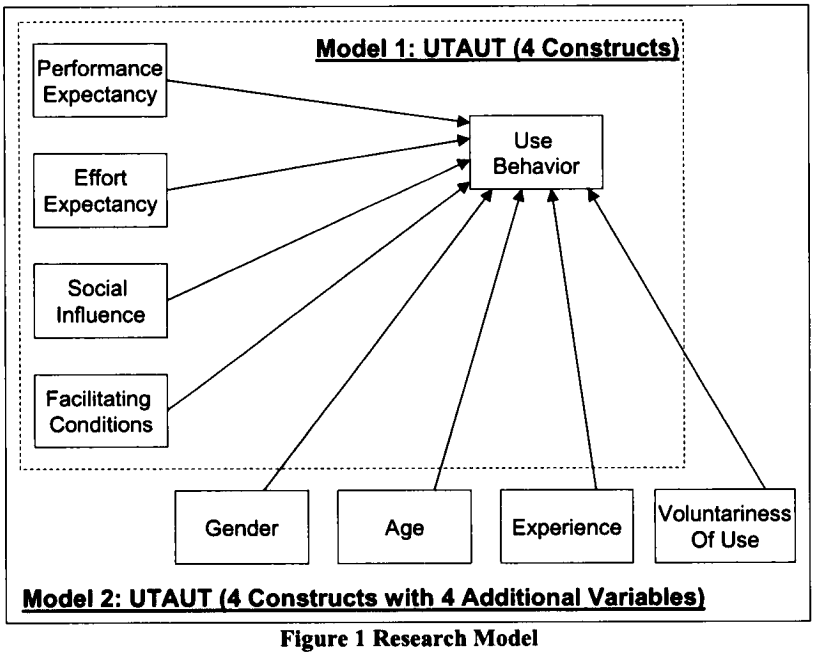

Figure 1 Research Model

4. RESEARCH METHODOLOGY

4.1 Subjects and procedure

As a part of a broader survey, the items used in estimating UTAUT (Vankatesh et al. 2003) were added to a web-based survey which was administered over the summer terms to allow faculty the opportunity to clearly think about their responses. A web-based methodology was chosen to encourage participation due to its ease of use as well as the availability of the technology to all participants. An e-mail was sent to solicit participation at the start of the first summer term and a reminder sent at the start of the second summer term asking for faculty participation.

The e-mails were sent to 50 College of Business faculty members who participated in the TabletPC program at a large university. Thirty seven faculty members responded to the survey, yielding a response rate of 74%. Faculty from all academic departments in the College responded.

4.2 Constructs

This study examines relationships among the 4 direct determinants of UTAUT and 4 additional variables with use behavior. The UTAUT constructs were measured with Vankatesh et al.'s (2003) original items and seven-point scale adapted to Tablet PCs (changing the wording from Vankatesh et al.'s "the system" to "Tablet PCs). The variable Use Behavior was measured with three questions asking for percent of time used (with a scale of 0-100%) Tablet PC overall, percent used of overall time used in Tablet Mode, and percent of teaching time used in Tablet Mode. Gender was coded as a dummy variable and age was coded as a continuous variable, consistent with Vankatesh et al. (2003). Experience was operationalized by three questions measuring years in a teaching position, months had Tablet PC, and self-rating of Information Technology literacy level (7 point scale). Voluntariness was measured by questions using the scale of Moore and Benbasat (1991), consistent with Venkatesh et al. (2003).

4.3 Construct Measurement and Validation

The Partial Least Squares (PLS, as implemented in PLS Graph (2005) and Smart PLS (2005)) methodology for the measurement of Structural Equation Models (SEM) was used to perform the analysis. SEM enables the simultaneous examination of both the path (structural) and factor (measurement) models in one model. PLS combines a factor analysis with linear regressions, and makes only minimal assumptions, with the goal of variance explanation (high R-square). Some advantages of PLS over other SEM tools are that it supports both exploratory and confirmatory research, is robust to deviations for multivariate normal distributions, and is good for small samples sizes. For many researchers PLS represents a pragmatic or practical alternative to confirmatory factor analysis based SEM (Rigdon, 1996). PLS has been widely used in Information Systems research including studies published in premier IS journals (Amoroso et al. 1991, Thompson et al. 1991, Gopal et al. 1992, Compeau et al. 1995a, Compeau et al. 1995b, Ravichandran et al. 2000, Chwelos et al. 2001, Wixom et al. 2001, Chin et al. 2003, Karimi et al. 2004, Dong-Gil et al. 2005). Chin (1995, 1997, & 1999) argues that the PLS approach is especially suitable for application studies because it provides a more general model, it is robust to assumptions, it is good for both small and large sample sizes, and is well suited for explaining large complex models.

We chose PLS because it is appropriate for smaller sample sizes and from a management perspective may "suggest where relationships might or might not exist and to suggest propositions for later testing."(Chin, 1997) We did not test the modifiers through interaction terms as suggested by Chin et al. (1996) because we did not have a sample size over 100. Rather, we decided to take a direct approach to see what influence the potential modifier variables had when added to the base four construct model.

5. RESULTS

To understand the data and the results we begin by presenting some descriptive statistics. After presenting some of the basics we then present the major components of the UTAUT model.

Table 1 presents some basic information about the respondents. From this information it appears that the respondents represent a variety of academic departments and age groups. Overall at least 50% of the faculty of each department who were issued a Tablet PC responded. Decision Sciences being the largest group followed by Accounting and Finance, Marketing, and then Management. The largest age group was 31-40 year old group with a range of 31-60+. It should be noted that 15 respondents were over 41 with 6 of those over 60 years old. The respondents also represent both genders, the majority being male. These statistics reflect the make-up of the college. Decision Sciences is the largest department in the College of Business and is comprised of faculty from the Management Information Systems, Operations Management, Management Science, and Statistics fields. There are also more male faculty than female in the college.

Faculty were asked about the number of years they have been teaching as well as the use of their TabletPC. Table 2 summarizes these questions.

From the information in Table 2 it is evident that the respondents are for the most part, seasoned academics who have invested quite a bit of time into their TabletPCs. There is a good mix of respondents with some having used their TabletPCs for two years and others just beginning to use the device. The skewness and kurtosis values show that the data is within the limits to be considered normal for statistical purposes.

Test of Model 1: UTAUT with 4 Main Constructs

A measurement model of the four main constructs of usage was estimated. All constructs were modeled using reflective indicators. Construct reliability was assessed using composite reliability and Nunnally's (1978) suggested 0.7 benchmark. All composite reliabilities (CR) for the constructs were greater than .70 with the exception of Social

Influence as seen in Table 4. Convergent validity was assessed using the average variance extracted (AVE) measure and Fornell and Larcker's (1981) suggested 0.5 benchmark. All average variance extracted (AVE) were above .50 with the exception Social Influence and Facilitating Conditions as seen in Table 4. To assess discriminant validity the AVE of the construct should be greater than the variance shared between the construct and the other model constructs (Chin 1998). Table 3 lists the correlation matrix with correlations among constructs and the square root of AVE on the diagonal. It may be seen that the diagonal elements are greater than the off-diagonal elements in the corresponding rows and columns except for Social Influence and Facilitating Conditions.

The structural model was tested using the loadings and significance of the path coefficients (indicate the strengths of relationships between dependent and independent variables), and the R^2 value (the amount of variance explained by the independent variables).

The results are presented in Table 4 and graphically in Figure 2. As expected, the model explained a moderate amount, 44.6% (R^2), of the variance in usage of Tablet PCs. This result is highly consistent with the results of previous research (specifically Vankatesh et al. (2003) which found R^2 ranges of 0.40-.042 in the direct effects model).

The statistical significance of each path was estimated using a PLS bootstrapping method utilizing 500 resamples to obtain standard error estimates and t-values (Chin 1998). All paths had positive effects. The statistical significance of the path coefficients allows us to see which hypotheses were supported:

Descrip -tion	**Response**	**N**	**Departments**	**N respon-dents**	**N respondents % of Sample**	**N sample**	**N sample % of Total**	**N Total Pop**	***Total Pop%***
Gender	Male	30	Accounting	8	72%	11	64%	17	*19%*
	Female	5	Decision Sciences (MIS, OM, MS, and Statistics)	14	82%	17	61%	28	*32%*
	No Response	2	Finance	6	100%	6	38%	16	*18%*
Age	20-30	0	Management	3	50%	6	40%	15	*17%*
	31-40	14	Marketing	5	56%	9	75%	12	*14%*
	41-50	6	No Response	1	NA				
	51-60	3	**Total**	**37**		**50**		**88**	
	60+	6							
	No Response	*3*							

Table 1: Description of Respondents

	Mean	**Mode**	**Standard Deviation**	**Skew-ness**	**z-score Skewness**	**Kurtosis**	**z-score Kurtosis**	**Min**	***Max***
Years teaching	13.54	20	6.8	.479	1.20	-.295	-.379	3	*31*
Percentage of time used as laptop	59.81	60	27.6	-.673	-1.71	-.481	-.626	0	*100*
Percentage of time used as tablet	42.55	40	26.6	.743	1.84	-.529	-.671	10	*100*
Percentage of overall computing time on this machine	36.39	10	22.4	.478	1.20	-.920	-1.12	5	*85*
Number of months using the TabletPC	*10.51*	*12*	*7.2*	*.580*	*1.46*	*-.820*	*-1.05*	*1*	*24*

Table 2: Years teaching and TabletPC usage

	UTPE	**UTEE**	**UTSI**	**UTFC**	**Use**
UTPE	0.719				
UTEE	0.607	0.806			
UTSI	0.439	0.518	0.604		
UTFC	0.537	0.799	0.667	0.638	
Use	0.634	0.546	0.385	0.489	0.759

Diagonal elements are the square root of Average Variance Extracted. The other values are the correlations between latent variables

Table 3. Composite Reliabilities for Model 1

- Performance Expectancy. H1 states that Performance Expectancy (UTPE) will positively affect Use of Tablet PC. The path coefficient was significant (β = 0.466, t = 2.6569, p < .01), thus supporting H1.
- Effort Expectancy. H2 states that Effort Expectancy (UTEE) will positively affect Use of Tablet PC. The path coefficient was not significant (β = 0.205, t = 1.1064, not significant), thus not supporting H2.
- Social Influence. H3 states that Social Influence (UTSI) will positively affect Use of Tablet PC. The path coefficient was not significant (β = 0.044, t = 0.1779, not significant), thus not supporting H3.
- Facilitating Conditions. H4 states that Facilitating Conditions (UTFC) will positively affect Use of Tablet PC. The path coefficient was not significant (β = 0.046, t = 0.2092, not significant), thus not supporting H4.

Test of Model 2: UTAUT with 4 Main Constructs and 4 Additional Variables

A measurement model of the four main constructs of usage and four additional variables was estimated. All constructs were modeled using reflective indicators. Construct reliability was assessed using composite reliability and Nunnally's (1978) suggested 0.7 benchmark. All composite reliabilities (CR) for the constructs were greater than .70 with the exception of Social Influence, Voluntariness, and Experience. Convergent validity was assessed using the average variance extracted (AVE) measure and Fornell and Larcker's (1981) suggested 0.5 benchmark. All average variance extracted (AVE) were above .50 with the exception Social Influence, Facilitating Conditions, Voluntariness, and Experience. To assess discriminant validity the AVE of the construct should be greater than the variance shared between the construct and the other model constructs (Chin 1998b).

	R^2	CR	AVE	Path Coef	Mean	SE	t
UTPE		0.800	0.517	0.466**	0.4726	0.1750	2.6569
UTEE		0.879	0.649	0.205	0.1803	0.1853	1.1064
UTSI		0.405	0.365	0.044	0.0355	0.2473	0.1779
UTFC		0.730	0.407	0.046	0.1590	0.2151	0.2092
Use	0.446	0.796	0.576				

Notes: N = 36, **p < .01, CR: Composite Reliability, AVE: Average variance extracted , Path Coef: Path Coefficients; Mean: Mean of subsamples, SE: Standard Error

Table 4. Basic Statistics for Model 1

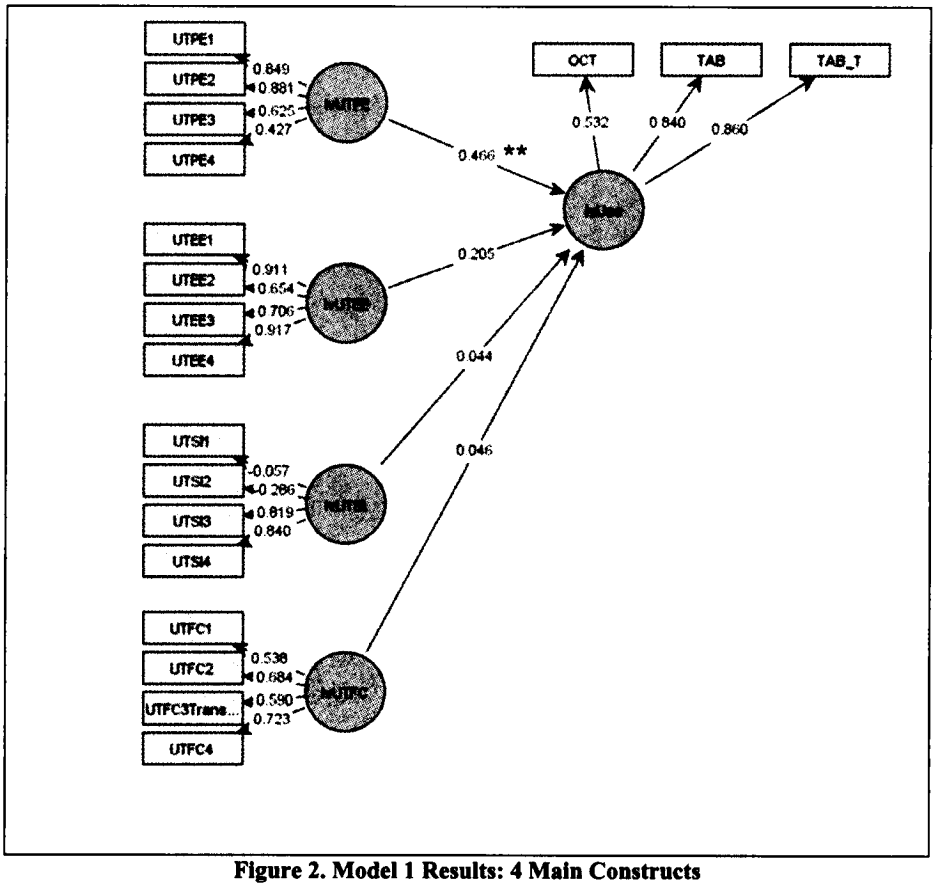

Figure 2. Model 1 Results: 4 Main Constructs

	UTPE	UTEE	UTSI	UTFC	Use	Vol	Exp	Age	Gender
UTPE	0.717								
UTEE	0.604	0.806							
UTSI	0.393	0.505	0.603						
UTFC	0.534	0.797	0.653	0.641					
Use	0.597	0.551	0.359	0.477	0.764				
Vol	0.155	0.308	0.197	0.192	0.572	0.588			
Exp	0.166	0.201	0.414	0.383	0.430	0.277	0.646		
Age	-0.369	-0.000	0.033	0.121	0.093	0.381	0.397	1.000	
Gender	-0.173	-0.257	0.107	-0.128	-0.257	0.147	-0.119	0.038	1.000

Diagonal elements are the square root of Average Variance Extracted. The other values are the correlations between latent variables

Table 5. Composite Reliabilities for Model 2

Table 5 lists the correlation matrix with correlations among constructs and the square root of AVE on the diagonal. It may be seen that the diagonal elements are greater than the off-diagonal elements in the corresponding rows and columns except for Social Influence and Facilitating Conditions.

The structural model was tested using the loadings and significance of the path coefficients (indicate the strengths of relationships between dependent and independent variables), and the R^2 value (the amount of variance explained by the independent variables).

The results are presented in Table 6 and graphically in Figure 3. As expected, the model explained a reasonable amount, 69.0% (R^2), of the variance in usage of Tablet PCs, a substantial improvement over the four construct only model. This result is highly consistent with the results of previous research (specifically Vankatesh et al. (2003) which found R^2 ranges of 0.50-.076 in the direct + interaction effects model).

The statistical significance of each path was estimated using a PLS bootstrapping method utilizing 500 resamples to obtain standard error estimates and t-values (Chin 1998a). The statistical significance of the path coefficients allows us to see which hypotheses were supported:

- Performance Expectancy. H1 states that Performance Expectancy (UTPE) will positively affect Use of Tablet PC. The path coefficient was significant (β = 0.412, t = 2.2984, p < .025), thus supporting H1.
- Effort Expectancy. H2 states that Effort Expectancy (UTEE) will positively affect Use of Tablet PC. The path coefficient was not significant (β = 0.017, t = 0.0164, not significant), thus not supporting H2.
- Social Influence. H3 states that Social Influence (UTSI) will positively affect Use of Tablet PC. The path coefficient was not significant (β = 0.015, t = 0.0850, not significant), thus not supporting H3.
- Facilitating Conditions. H4 states that Facilitating Conditions (UTFC) will positively affect Use of Tablet PC. The path coefficient was not significant (β = 0.045, t = 0.1782, not significant), thus not supporting H4.
- Additional Variables. H5 examines the influence of potential additional variables (as found in UTAUT Vanketesh 2003).
  - H5a: Gender will affect Use of Tablet PC. With only 5 female respondents we cannot test this hypothesis reliably. It is interesting from an exploratory perspective that the path coefficient was negative indicating a possible negative affect of the female gender.
  - H5b: Age will negatively affect Use of Tablet PC. The path coefficient was not significant (β = -0.005, t = 0.0315, not significant), thus not supporting H5b.
  - H5c: Experience (Exp) will impact the system outcome construct, Use of Tablet PC. The path coefficient was not significant (β = 0.177, t = 1.2693, not significant), thus not supporting H5c.

	R^2	CR	AVE	Path Coef	Mean	SE	t
UTPE		0.796	0.514	0.412**	0.3586	0.1793	2.2984
UTEE		0.879	0.650	0.017	0.0164	0.1904	0.0945
UTSI		0.288	0.364	0.015	-0.0225	0.1764	0.0850
UTFC		0.735	0.411	0.045	0.1343	0.2525	0.1782
Use	0.690	0.791	0.584				
Vol		0.526	0.346	0.478***	0.4564	0.1641	2.9133
Exp		0.511	0.417	0.177	0.2359	0.1395	1.2693
Age		1.000	1.000	-0.005	-0.0167	0.1588	0.0315
Gender		1.000	1.000	-0.225*	-0.1945	0.1217	1.8565

Notes: N = 36, *p < .05, **p < .025, ***p < .005, CR: Composite Reliability, AVE: Average variance extracted, Path Coef: Path Coefficients, Mean: Mean of subsamples, SE: Standard Error

Table 6. Basic Statistics for Model 2

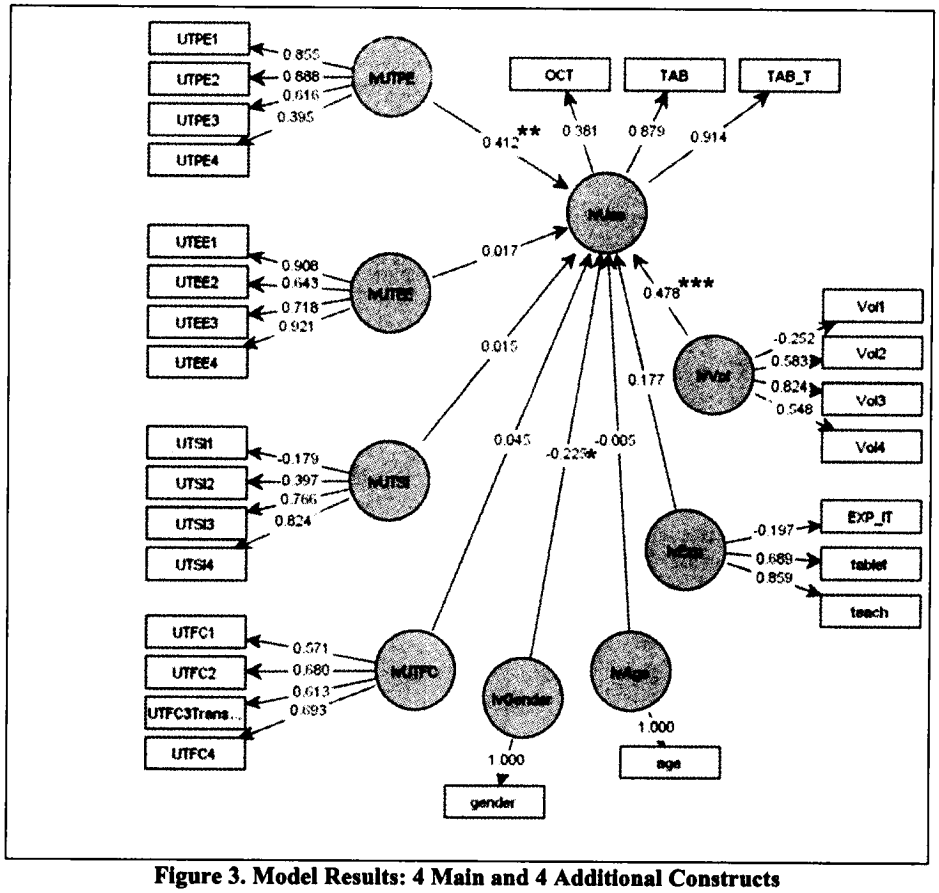

Figure 3. Model Results: 4 Main and 4 Additional Constructs

- H5d: Voluntariness (Vol) will positively affect Use of Tablet PC. The path coefficient was significant ($\beta = 0.478$, $t = 2.9133$, $p < .005$), thus supporting H5d.

Comparison of Model 1 and Model 2

To get an idea of the effect of adding the four new variables (Gender, Age, Experience, and Voluntariness) to Model 1 we compared Model 1 to Model 2. The addition of the four variables did have some influence on the path coefficients of the four main constructs:

- PE changed slightly from 0.466 to 0.412.
- EE changed considerably from 0.205 to 0.017.
- SI changed considerably from 0.044 to 0.015.
- FC remained mostly unchanged from 0.046 to 0.045.

The strength of the Voluntariness and Gender variables suggest that the changes appear to be primarily due to the effect of Voluntariness and Gender (with Experience as a possible other influence to be looked at) on Effort Expectancy and Social Influence. This is consistent with Vanketesh (2003) which found that Voluntariness moderated Social Influence, and Gender moderated Effort Expectancy, Social Influence, and Performance Expectancy.

6. DISCUSSION & LESSONS LEARNED

Our findings are consistent with the initial UTAUT study (Venkantesh et.al.2003). When comparing Model 1 to the initial direct effect UTAUT study, this study had an R^2 of .446 while the original UTAUT study the R^2 ranged from .4 to .42. When adding the additional variables, R2 is .69 in this study as compared to a range of .5 to .76 in the original study. Also, Performance Expectancy (UTPE) was statistically significant and the largest coefficient in both studies.

Realizing that Performance (UTPE) is the most important variable in user acceptance is of importance for academics and administrators looking to introduce new technologies to faculty in higher education, especially Tablet PCs. Successful introduction of new technologies for faculty requires great attention needs to be placed on UTPE. Focus on the benefits faculty will receive with the new technology. If faculty believe that a technology will be of use to them, they will use it.

Effort Expectancy (UTEE) was not significant in this new technology introduction. It appears that faculty are more results oriented and are willing to invest the time to learn a new technology if it will produce results. They are willing to sacrifices some ease of use for the perceived benefit.

Social Influence (UTSI) was not significant in this new technology introduction. This could be attributed to the fact that the technology was voluntary. This is consistent with the

initial UTAUT study which showed the UTSI was a factor when the technology was mandatory. We can see in Model 2 that voluntariness is a strong coefficient, so the more voluntary faculty believe the use of a technology to be, the more they use it.

Facilitating Conditions (UTFC) was not measurably significant in this new technology introduction. Yet this variable maintained its strength in both models 1 and 2, which could be an indication that it is a hygiene factor (Herzberg 1966). It could be indicative of the expectations faculty have, based on prior experience, that knowledgeable and supportive personnel will be present in any new technology introduction. However, due to the constraints of this study, this could not be tested.

Gender – with the small number of female respondents in our study we could not reliably test for the influence of gender on tablet PC usage. However, from an exploratory perspective the findings were consistent with the initial UTAUT study. This would indicate that female faculty members are less likely to adopt the new technology. Special attention shown by administration to female faculty members would be beneficial; especially training and support to promote ease of use of the new technology.

The authors believe the understanding of these dimensions can impact organizational ROI on several fronts. First, through teaching, use of the Tablet PC in the classroom should yield a more natural teaching method that is supported by technology. For instance replacing a black board with a Tablet PC allows the class interaction to be captured and disseminated at a later date. A Tablet PC can also enhance grading allowing feedback directly on a digital document. In regards to research, as a natural extension of the spiral notebook, researchers can become more efficient with their assembly of data and resources as all information can now be kept in one place that is portable and readily accessible. Finally in serve the Tablet PC can serve as a natural repository of information allowing the faculty member to be more productive in service responsibilities.

The support and training needed to enhance the acceptance of Tablet PCs by faculty are relatively easy to implement. However it might require additional organizational resources such as staff to support and enhance learning as well as access to the software applications such as Camtasia, OneNote and others that leverage the Tablet PC platform.

6.1 Limitations and Future Research

Due to the size and scope of this study there are several limitations. The study only addressed faculty and only limited number of faculty in one particular college of business at one university. Future studies should expand to different universities and should examine additional disciplines. This would increase the generalizability of the findings and might indicate differences between academic disciplines. In addition future studies should also address other populations as well.

Second, we must be careful in drawing conclusions based on gender because only 5 women participated in the study. While our findings were consistent with previous studies, future studies should address the unique needs of female faculty.

Third, in previous studies age has influenced use. In addition age has been shown to work with gender, specifically women. This study did not have a large variation in age, nor did it have a large sample of women. Therefore future studies should seek to more effectively address age and gender.

Fourth, we speculated that previous experience with knowledgeable and supportive technology personnel influence facilitating conditions. Future studies should attempt to establish a baseline of previous experience in this area.

Furthermore, future studies should also examine the funding models and specific resources that administrations use is support of technology acceptance. The addition of this data would enable administrators to better identify which resources specifically impact acceptance and provide the greatest ROI.

All these limitations and future research considerations can be addressed by extending the study to additional universities and disciplines.

7. CONCLUSIONS

This study utilized the UTAUT model to address Tablet PC usage in a college of business. The findings of this study are consistent with previous studies and are useful as administrators consider implementing new technology for faculty use. In addressing the faculty, administrators should focus on the following:

Faculty are mostly concerned with the end results of their technology use. Therefore, administrators can promote performance expectancy by selling the benefits. The message should be delivered regularly and in many different forms.

The more voluntary the faculty believe the technology's use, the more successful the program will be. Administrators need to insure that participation is voluntary.

Although this study did not contain enough responses to adequately address the female faculty perspective, it appears that special attention should be paid to them. Female faculty have unique needs and concerns relating to effort expectancy, so there needs to be some special emphasis on training for female faculty.

Faculty appear to expect that the needed knowledgeable and supportive support personnel will be available. Administrators should make sure that the support staff is in place to address this dimension.

Overall, this study confirms the use of UTAUT in a prescriptive manner and uses it to provide some useful insights into technology acceptance in an academic setting. It goes beyond the previous study which focused on anecdotal

and qualitative evidence by introducing a quantitative analysis.

8. REFERENCES

Amoroso, D.; and Cheney, P. (1991), "Testing a Causal Model of End-User Application Effectiveness." Journal of Management Information Systems, 8(1), pp. 63-90.

Arnett, K.P, Schmidt, M.B, and Shim, J.P. (2005), "Tablet PCs for Teaching Information Systems Courses." Proceedings of the Eleventh Americas Conference on Information Systems, Omaha, NE, August 2005, pp. 650-656

Ajzen, I. (1991), "The Theory of Planned Behavior." Organizational Behavior and Human Decision Processes (50:2), pp. 179-211

Bandura, A. (1986), Social Foundations of Thought and Action: A Social Cognitive Theory. Englewood Cliffs, NJ, Prentice Hall.

Barton, C., and Collura, K. (2003), "Catalyst for change." T.H.E. Journal, 31(4), pp. 39-41

Chin, W., and Todd, P. (1995), "On the use, usefulness, and ease of use of structural equation modeling in MIS research: A note of caution." MIS Quarterly, 9(2); pp.237-247.

Chin, W., Marcolin, B., and Newsed, P. (1996), "A partial least squares latent variable modeling approach for measuring interaction effects: results from a monte carlo simulation study and voice mail emotion/adoption study." Proceedings of the Seventh International Conference on Information Systems, pp. 21-41.

Chin, W. (1997), "Overview of the PLS Method." http://disc-nt.cba.uh.edu/chin/plsfaq/plsfaq.htm Accessed on Oct 10, 2005

Chin, W. (1998a), Issues and Opinion on Structural Equation Modeling. MIS Quarterly, (22) 1, pp. vii-xvi.

Chin, W. (1998b), "The Partial Least Squares Approach to Structural Equation Modeling." In G. A. Marcoulides (Ed.), Modern Methods for Business Research, London: Lawrence Erlbaum Associates, pp. 295-336.

Chin, W., and Newsted, P. (1999), "Structural Equation Modeling analysis with Small Samples Using Partial Least Squares." In Rick Hoyle (Ed.), Statistical Strategies for Small Sample Research, Thousand Oaks, CA: Sage Publications.

Chwelos, P.; Benbasat, I.; and Dexter, A. (2001), "Research Report: Empirical Test of an EDI AdoptionModel." Information Systems Research, 12(3), pp. 304-322.

Clendenin, M. (2004), "Tablet PC, so far, proves a bitter pill in sales." Electronic Engineering Times, 1324, p. 20

Compeau, D.; and Higgins, C. (1995a), "Computer self-efficacy: Development of a measure and initial test." MIS Quarterly, 19(2), pp. 189-212.

Compeau, D.; and Higgins, C. (1995b), "Application of Social Cognitive Theory to Training for Computer Skills." Information Systems Research, 6(2), pp. 118-144.

Davis, F., Bagozzi, R., and Warshaw, P. (1989), "User Acceptance of Computer Technology: a Comparison of Two Theoretical Models." Management Science, 35(8), pp. 982-1002.

Davis, F., Bagozzi, R., and Warshaw, P. (1992), "Extrinsic and Intrinsic Motivation to Use Computers in the Workplace," Journal of Applied Social Psychology 22(14), pp. 1111-1132.

Dong-Gil, K., Kirsch, L., and King, W. (2005) "Antecedents Of Knowledge Transfer From Consultants To Clients In Enterprise System Implementations." MIS Quarterly, 29(1), pp. 59-85.

Dwyer, C., and Knapp, C.A., (2004), "How Useful is IS 2002? A Case Study Applying the Model Curriculum." Journal of Information Systems Education, 15(4), pp. 409-417

Evers, J. (2005), "Tablets primed for masses." InfoWorld, 27(5), pp. 16

Fishbein, M., and Taylor, S., (1991), Belief, attitude, Intention and Behavior: An Introduction to Theory and Research. Reading, MA: Addison-Wesley.

Fornell, C. and Larcker, D. (1981), "Evaluating structural equation models with unobservable variables and measurement error." Journal of Marketing Research, 18, pp. 89-98.

Garfield, M. (2005), "Acceptance of Ubiquitous Computing." Information Systems Management, 22(4), pp. 24-31.

Gopal, A.; Bostrom, R.; and Chin, W. (1992), "Applying Adaptive Structuring Theory to Investigate the Process of Group Support Systems Use." Journal of Management Information Systems, 9(3), pp. 45-70.

Gong, M., Xu, Y., and Yu, Y. (2004), "An Enhanced Technology Acceptance Model for Web-Based Learning." Journal of Information Systems Education, 15(4), pp. 365-375.

Herzberg, F. (1966), Work and Nature of Man. London: Harper Collins.

Hill, J., Scriven, J., and Wunsch, D.. (1994), "The effect of computers on faculty performance from a faculty perspective and department chair perspective." Journal of Computer Information Systems, pp. 79-83.

Karimi, J.; Somers, T.; and Gupta, Y. (2004), "Impact of Environmental Uncertainty and Task Characteristics on User Satisfaction with Data." Information Systems Research, 15(2), pp. 175-193.

Lindsey, S. D. (2003), "On-demand lectures create an effective distributed education experience." T.H.E. Journal. 31(4), pp. 16-20

Lomas, C., and Rauch, U. (2003), "Learning with TabletPCs: True learning tools or trendy devices." Syllabus, September 1.

Mackie, J. (2005), "Tablet PCs still needs a killer app." Computer Dealer News, 21(10), p. 4

McCloskey, P. (2002), "Tablet PCs Stake Out Higher Ed." Syllabus, December 1

Meso, P., and Liegle, J. (2005), "An Exploratory Assessment of the Pedagogical Effectiveness of a Systems Development Environment." Journal of Information Systems Education, 16(2); p. 157-167.

Microsoft, (2002), Massachusetts Institute of Technology Changes the Face of Education using Tablet PCs [Brochure]. Redmond, WA

Microsoft, (2004A), Business Case for Tablet PC [Brochure]. Redmond, WA

Microsoft, (2004B), Windows XP Tablet PC Edition 2005 Resources for Education [Brochure]. Redmond, WA

Moore, G., and Benbasat, I. (1991), "Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation." Information Systems Research, 2(3), pp. 192-222.

Moore, G., and Benbasat, I. (1996) "Integrating Diffusion of Innovations and Theory of Reasoned Action Models to Predict Utilization of Information Technology by End-Users," in K. Kautz and J. Pries-Hege (eds.), Diffusion and Adoption of Information Technology, London: Chapman and Hall.

Nunnally, J. (1978), Psychometric Theory (2nd ed.). New York, NY: McGraw-Hill.

PLS Graph (2005), Homepage of PLS Graph http://www.plsgraph.com/, Accessed November 9, 2005

Ravichandran, T.; and Rai, A. (2000), "Quality Management In Systems Development: An Organizational System Perspective." MIS Quarterly, 24(3), p381-415.

Rigdon, E. (1996), "Methodological Alternatives to SEM/CFA." http://www2.gsu.edu/~mkteer/relmeth.html, Accessed October 10, 2005

Rogers, E. (1995), Diffusion of Innovations, New York: Free Press.

Ruby, P., (2005), "Faculty Attitudes toward COBOL and its Place among Other Programming Languages in the AACSB Business College Curriculum within the United States, Journal of Information Systems Education, 16(2); pp. 217-230.

Schwager, P., Anderson, J. and Kerns, R (2005), "Faculty Perceptions of TabletPCs for Teaching, Research, & Service: A College of Business Perspective." Proceedings of the 2005 Southern Association of Information Systems Conference, February 2005, Savannah, GA, pp. 107-113

Shim, J., Arnett, K., and Schmidt, M. (2003), "Using Streaming Technology and Tablet PCs for Teaching Information Systems." Proceedings of the Ninth Americas Conference on Information Systems, August, 2003, Dallas, TX, pp. 3152-3153

Shim, J., Arnett, K., and Schmidt, M. (2004), "Video Streaming, HorizonLive, and tablet PCs for Teaching Information Systems Courses: Revisited." Proceedings of the Tenth Americas Conference on Information Systems, August 2004, New York, NY, pp. 55-57

Smart PLS (2005), "Smart PLS Community." http://www.smartpls.de/forum/, Accessed November 9, 2005.

Sterling, G., and Brinthaupt, T. (2003), "Faculty and Industry Conceptions of Successful Computer Programmers." Journal of Information Systems Education, 14(4), pp. 417-425.

Taylor, S., and Todd, P. (1995), "Understanding Information Technology Usage: A Test of Competing Models," Information Systems Research, 6(4), pp. 144-176.

Thompson, R.; and Higgins, C. (1991), "Personal computing: Toward a conceptual model of utilization." MIS Quarterly, 15(1), pp.125-144.

Vankatesh, V., and Davis, F. (2000), "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies." Management Science, 45(2), pp. 186-204.

Vankatesh, V., Morris, M., Davis, G., and Davis, F. (2003), "User Acceptance of Information Technology: Toward a Unified View." MIS Quarterly, 27(3), pp. 425-478.

Vellerand, R. (1997), "Toward a Hierarchical Model of Intrinsic and Extrinsic Motivation" In Zanna, M. (ed.), Advances in Experimental Social Psychology (29). New York, Academic Press.

Vijayaraman, B., Ramakrishna, H., and Quarstein, V. (1994), "MIS faculty's perspective on the structure and content of information technology courses in MBA programs." Journal of Computer Information Systems, pp.72-78.

Wixom, B.; and Watson, H. (2001), "An Empirical Investigation of The Factors Affecting Data Warehousing Success." MIS Quarterly, 25(1), pp.17-41.

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