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Business and Information Technology Usage in Midwestern Veterinary Practices

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ABSTRACT

This study reports on the empirical investigation of computer and business technology use in Midwestern veterinary clinics. The purpose of this study is to assess veterinary practices regarding the success of information systems and to use this assessment to draw inferences regarding future IT investment in such practices. By measuring the end user satisfaction and using this as a surrogate measure of success, and then correlating this with specific aspects of technology use, we believe drawing inferences regarding IT practices is possible. This may provide current and future practitioners a rudimentary foundation for deciding not just whether to include computers in the practice, but what hardware and software combinations to choose. Results indicate the use of computer-related technology in veterinary practices is widespread and several characteristics of information systems correlate with end user satisfaction and by inference, system success. The study has also found information technology components such as email, Internet access, hardware and software training, and software designed specifically for the veterinary clinic in a networked office are well accepted in a majority of practices. From this we are able to make recommendations on essential components for the newly established practice and those established practices who desire to upgrade.

Keywords: *veterinary practice, end-user satisfaction, end-user computing, technology acceptance, technology, information systems*

I. INTRODUCTION

Starting in the late 1980's and early 1990's, an increasing number of firms began to offer software targeted for use in veterinary offices. These systems have ranged in scope from simple office and management tools to patient history and diagnosis systems to medical inventory control aids. While this marketplace has continued to expand and has affected nearly all veterinary practices [1], there have been indications from the general practitioner that much work remains to fully computerize the veterinary field [2] [3]. Academic research in this area confirms these indications. In an Australian study, MacGregor and Cocks [4] indicate lack of training, poor vendor assistance, and sparse documentation related to veterinary practitioner software all have significant impacts on user satisfaction and hence impact future computerization decisions. As in any application environment, for computer-related technologies to add value, a better understanding of the end user's needs, desires, and limitations must be obtained. Further, the veterinary practitioners of the future can learn from those of today who have implemented computer systems in their offices so that they can make more informed decisions regarding acquisition and use for computer tools aimed at this market.

For many years, a large and diverse body of information system (IS) literature has forwarded a variety of models offering explanations of why IS implementation may succeed or fail. Included among the many empirical studies which have investigated computer system success or failure [5] [6], DeLone and McLean [7] present an organized view of understanding IS success. Others have viewed success in terms of value and investment [8] [9]. For this reason, the ability to assess the success of computerized information systems has remained elusive. This presents a difficult problem to the small veterinary practice, which begins with deciding whether to automate certain functions in the practice, includes deciding on what functions to automate, and ends with deciding upon an optimal investment in IT. Clearly the veterinarian who has devoted his training and time to his medical practice and has little formal training in information technology is at a disadvantage when faced with these investment decisions. The decision is even tougher when there are no real metrics available for the practitioner to rely upon.

In spite of the lack of metrics and the ambiguity in those that are available, a widely accepted surrogate measure for IS success was developed by Doll and Torkzadeh [10], the End-User Computing Satisfaction (EUCS) instrument. The theory that led to the development of this instrument is simple—it states that if the end user is satisfied with the system he or she is using, then it is considered a success. Yet IS success is not a binary variable since the user may be satisfied with portions of the system and dissatisfied with others. The Doll & Torkzadeh [10] instrument allows for this and takes it one step further by categorizing IS success along several critical dimensions. These include ease of use, relevancy of content, accuracy, presentation format and timeliness. End users who complete this survey are able to evaluate the system they use in terms of each of these dimensions. When a group of users' responses are pooled and analyzed, an indication of the amount of

satisfaction then provides us with a surrogate measure of system success. Past research has demonstrated that this instrument is both reliable and valid [11] [12] [13] [14]. This has also been done in related areas such as health IT [15] [16] [17]. It has been applied to various settings where information technology is used in order to investigate those attributes of computerized applications that correlate with success. Although originally developed for measuring success factors in larger organizations, smaller organizations have also been studied, including small professional or rural organizations [18]. We have not yet seen this approach used in veterinary clinics.

The purpose of this study is to assess veterinary practices regarding the success of information systems and to use this assessment to draw inferences regarding future IT investment in such practices. By measuring the end user satisfaction of those veterinary clinics that are currently utilizing some form of automation, using this as a surrogate measure of success commensurate with past research, and correlating this success with specific aspects of computer use, we believe that drawing inferences regarding IT practices is possible. This may provide current and future practitioners a rudimentary foundation for deciding not just whether to include computers in the practice, but what hardware and software combinations to choose. We also collected a variety of demographic data for comparison, including practice size, computer uses, practice type, computer experience, and software used so that comparisons can be made along these lines.

II. METHODS

A questionnaire was developed and distributed randomly to veterinary practices throughout the Midwest. The target population for this study was veterinarians or individuals in a veterinarian clinic whose work-related activities required the use of information technology. The survey instrument was pre-tested using a sample of veterinarians known to have affiliation with academia. Following this, a final version of the survey was developed and printed on a single page (front and back) that was formatted as a tri-folded brochure so that respondents could easily complete the form and mail it back. Seven hundred survey packages were mailed. The packages contained a cover letter explaining the purpose of the study and a statement of guaranteed confidentiality to assure individual respondents that only summary statistics would be reported.

The questionnaire was composed of five parts. The first part consisted of five general demographic questions designed to elicit information about the respondent's practice. The second part asked questions to assess the respondent's computer usage and training [2]. The third part asked nine questions regarding attitudes toward computer use within the practice [19]. The fourth part gathered information about veterinary-specific software use [2]. The final section contained twelve items from the EUCS instrument [10], and included two additional items designed to elicit overall satisfaction and success in order to provide a statistical check on part 4 of the instrument. This portion asked respondents to consider only their office computer system.

III. RESULTS

A. General Demographics

The response rate was 27.2% (186 usable responses out of 685 questionnaires distributed). Fifteen surveys were returned unopened. Eighty percent of the respondents to the survey were the veterinarians themselves, 7% were veterinarian assistants and 14% were office assistants. Of those responding to the survey, 39% classified their practice as small animal exclusive, 37% as mixed animal, 10% as small animal predominant. 8% as large animal predominant, 2% as being a government practice, and 1% were academics. Seventy-eight percent of the respondents reported working in a private practice and 22% working in public practices. The majority of clinics reported 1 or 2 veterinarians; however, practice size varied from 1 to 9 veterinarians. This is shown in table 1.

Table 1: Practice Size

# Veterinarians in Practice	% of Respondents
1	48
2	29
3	14
4	2
5	2
6+	<1%

B. Computer Usage and Training

In order to better understand how technology is supporting veterinary practices in general, the questionnaire included a series of questions regarding whether information technology was used in the practice and if so, the type of system(s) in use. Eighty-four percent of the practices that responded indicated that they use a computer system in their practice. Of these, the systems were largely Windows based, either stand-alone workstations or small office networks, 71% of which were connected to the Internet. Despite this high percentage, only thirty-five percent reported using web browsers and 48% reported using e-mail. The reason for this may be that most offices reported that external connectivity was achieved using 56K dial-up modems. Of the software used, the overwhelming majority (79%) reported using word processing software of some sort. The next highest category (76%) was veterinary specific software. Many offices also relied on software for accounting, billing and record keeping. Table 2 tabulates the major software application areas in descending order.

Table 2: Applications in Vet Practices

Computer Application Area	% of Computerized Practices Reporting Use
Word Processing	79
Veterinary Specific	76
Financial / Accounting	61
Database Management	50
Spreadsheet	39
Literature Search	27
Desktop Publishing	25
Diagnostic Assistance	20
Other	13

Satisfaction with a computer system may be influenced by the amount of training that the end user receives. In order to control for the effects that training may have on end user satisfaction, several questions were asked regarding the type and extent of training received by the respondents. Fifty-six percent of the respondents reported having received training in vet-specific software while 39% reported having received training in general computer operations.

C. General Computing Attitudes Results

A series of questions were used to collect information regarding the respondents' attitudes toward computerization. These questions were first developed by Dye, et al. [19] in their study of computer use in private veterinary practice and were used to reveal perceptions about computer use within veterinary practice. Dye, et al. (p. 890) [19] reported that "overall veterinarians tended to hold generally positive attitudes toward the use of computers and seemed to be aware that computers hold potential for effective and productive management of their practices." As indicated by the data collected, our sample supports this finding and like most segments of society, veterinarians appear to be accepting of technology and the changes it has brought. Table 3 summarizes these statistics and compares the results with the Dye, et al. study [19].

Table 3: Computer Use Attitudes

Question Asked	Current Study	Dye, et. al. (1994)
Computers are an important part of any operation.	94.1% Agreed	50% to 67% Agreed
Better decisions are made with computers.	83.8% Agreed	50% to 67% Agreed
Communications in our operation are improved by having computers.	85.4% Agreed	50% to 67% Agreed
The human side of our operation is not diminished by having computers.	90.9% Agreed	50% to 67% Agreed
Computers are not threatening to employees.	78.4% Agreed	50% to 67% Agreed
Valuable information is not lost by using a computer.	85.0% Agreed	50% to 67% Agreed
The computer industry and vendors are overwhelming and pressuring us to automate our operation.	23.3% Agreed	Approximately 50% Agreed
Personnel look forward to the time when computers will be more widely used.	59.9% Agreed	Approximately 50% Agreed
Information is better obtained from a printed form than from a computer screen.	45.7% Agreed	Approximately 50% Agreed

D. Veterinary Software Results

As mentioned, 76% of reporting clinics expressed using some type of veterinary-specific software in their practice. Eighteen specific software packages were mentioned by name and two respondents reported using customized software developed specifically for their practice. The most popular package among those reporting was PSI (25), closely followed by AVIMARK (22), INDEXX (18), and AVS (17). Table 4 lists all packages and the number reporting use for each.

Table 4: Vet Software Usage

Software Package	Reported Users
PSI	25
AVIMARK	22
INDEXX (CORNERSTONE)	18
AVS	17
Impromed	12
DVMAX	5
VETECH	5
DVM	3
INTRAVET	3
AutoVet	2
DataVet	2
Vet Specific	2
M & J Software	1
PetWare	1
Sirius	1
VBOSS	1
VETCOM	1
VetMaster	1
VSS	1

In addition to packages, respondents were asked to list the category of software that they considered most important to their practice. As shown in Table 5, the vast majority believed that Veterinarian software packages were the most helpful. This software ranges in function from medical reference help to small office support with an emphasis on Veterinarian practices. Others reported that accounting/invoicing software was most important with fewer reporting inventory control or general office software.

Table 5: Most Important Software

Software Type	Reported Users
Vet Specific	80
Accounting / Invoicing	20
Inventory Control	3
General Office	2

E. Computing Satisfaction Results

As mentioned previously, the last part of the questionnaire included the End User Computing Satisfaction (EUCS) instrument as a surrogate measure for system success. We asked respondents to focus on the computer system that was used in the veterinary practice. Two of the fourteen questions asked the practitioner to directly assess their satisfaction with the system and whether they considered it successful so that the EUCS could be tested for both intermediate (satisfaction) and ultimate (success) criterion validity [20]. The questions can be found in Appendix I.

In past studies, generalizing EUCS and other attitudinal instruments to new application environments has been cautioned (p. 334) [21], (p. 270) [10]. If evidence supports psychometric stability in the new area, researchers can more confidently use the instrument's results in the investigation of competing tools, features, and technologies [13]. Yet, because the model has been tested for reliability and validity in other disciplines, the model we present here is "strictly confirmatory" and can be either accepted or rejected on that basis [22]. Using the EUCS instrument into an industry for which it was not designed requires a confirmatory factor analysis to assess the model fit. The model is considered to fit the data well if all of the items load on each dimension with approximately the same strength as similar studies in other industries and each of the dimensions load equivalently on the second order factor. Fit indices may be computed and must also fall within certain ranges. Factor loadings and fit indices were derived using Lisrel 8 [23], [24], [25], [26] and are shown in Appendix II along with the correlation matrix and other summary statistics. Reliability for this sample was measured using coefficient alpha and it is also presented in Appendix II [27].

Doll and Torkzadeh [10] originally proposed a measurement model consisting of five independent but correlated factors. Subsequent research and additional analysis has provided evidence that the structural model consists of a single second-order construct [28], [29], [14], end user computing satisfaction, which is reflected in each of the five original dimensions. The model is depicted in figure 1 and is annotated with factor loadings and error parameters calculated from the data collected in this study. As can be seen in figure 1 and Appendix II, all loadings are significant, standard errors are in an acceptable range and the overall coefficient alpha is 0.96. Fit indices compare favorably to the results of prior studies [14], and are shown in table 6.

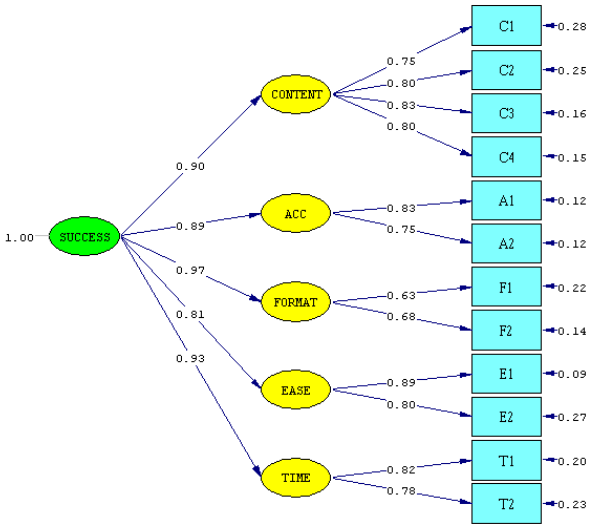

Figure 1: The EUCS Structural Model

Table 6: Goodness-of-Fit Indexes

	Current Study	Doll, Xia & Torkzadeh Study [14]
Chi-square (df)	113.51 (49)	185.81 (50)
Chi-square / df	2.32	3.72
Normed Fit Index (NFI)	0.93	0.94
Goodness of Fit Index (GFI)	0.89	0.93
Adjusted Goodness Fit Index (AGFI)	0.83	0.89
Root Mean Square Residual (RMSR)	0.035	0.035

Correlations between the average EUCS score and each of the two overall indicator variables (one for overall satisfaction and one for overall success) are very high as expected. This is shown in table 7. The overall measures of success and end user computer satisfaction are also highly correlated, indicating a strong association between them and providing support for the theory that EUCS can be used as a surrogate measure of system success. These correlations are shown in table 8.

Table 7: Characteristics Correlating with Success

Factor	Correlation
No Connectivity	-0.186*
Email	0.169*

No Networking Used	-0.165*
Access to Printer	0.184*
No Office Application Training	-0.214**
Using Computers for Decisions	0.293***
Communications with computers	0.213*
Storing information with computer	0.192*
Information on a printed report	0.300*

* p < 0.05, ** p < 0.01, *** p < 0.001

Table 8: Correlations between EUCS and Overall Measures of Satisfaction and Success

	Mean	STD Dev.	EUCS	Overall satisfac-tion	Overall success
EUCS	3.81	0.73	1		
Overall satis-faction	3.70	0.99	0.86	1	
Overall success	3.82	0.92	0.83	0.88	1

Based on these computations, the model is considered to have passed its confirmatory tests and closely approximates the original Doll & Torkzadeh [10] model. It is therefore deemed acceptable and can be used to make inferences for this study.

Satisfaction Score Correlations

Having determined that the data support the model and that the model is normally used as a surrogate measure of system success, we may now assess which characteristics of the information systems used in veterinary practices significantly correlate with the EUCS model. Table 8 summarizes these findings and indicates which of the EUCS items correlated significantly with the types of systems used and the attitudes toward them. The results indicated that practices without internal networks, Internet connectivity, or office application training experienced lower degrees of satisfaction. Practices using their computers for decision support, information storage, communication, and email were likely to have higher satisfaction scores. Further, we found that higher satisfaction scores correlate significantly with the following attitudes toward computer use: 1) that better decisions are made using computers, 2) that communication is improved, 3) that humans are unaffected and not threatened by computer systems, 4) that valuable information is preserved, 5) that there is very little pressure to automate from computer vendors, and 6) that the printed output is better than the computer screen.

Interestingly, having access to printers correlated significantly with the feelings that the system was successful and satisfying to end users, but offices were split evenly as to whether information obtained from a computer screen is better than from a printed form. These correlations are shown in table 9.

Table 9: Correlations between Computer Attitudes and EUCS

Item	EUCS
Important to operation	0.10 ns
Enable better decisions	0.27**
Improve communications	0.23**
Doesn't affect humans	0.22**
Doesn't threaten employees	0.20*
Valuable information not lost	0.19*
Pressure from industry	-0.30***
Look forward to wider use	0.13 ns
Like the printed screen better	-0.32***

* p < 0.05, ** p < 0.01, *** p < 0.001

IV. DISCUSSION

Our analysis of the results fall into two categories. First, we present an interpretation of what is used in veterinary offices currently with system success and user satisfaction. The purpose for this discussion is to provide information regarding which systems are successful and are not successful or are only marginally successful so that future decisions by veterinary practitioners can be made regarding acquisition, training and total investment in office systems. Second, we present a more detailed interpretation of attitudes toward computer usage in veterinary practices and the success and end user satisfaction of these systems. This is necessary because the correlations we report regarding computer attitudes and system success, although statistically significant, are only mild in their strength of association. Our statistical findings must therefore necessarily be tempered with a logical analysis.

The results of this study suggest that practicing veterinarians have recognized the value of information technology (IT) and have actively sought to utilize it to help improve their practices. Approximately 84% of the reporting veterinarians in this study utilize office computer systems to some in their practice. Most of these report utilizing software developed specifically for veterinary practices. Further investigation of the demographics has revealed that many of the veterinarians who reported no IT use operate their practices in the field, thus precluding most IT solutions. Even mobile solutions (e.g., PDAs and cellular technology) could only be used in a store-and-update-later mode since many of these veterinarians work in rural settings where connectivity is non-existent. We discuss mobile solutions further in the next section; here we turn our analysis to those veterinarian offices employing varying degrees of IT in a fixed office setting.

Most practicing veterinarians report that veterinary specific software is the most important application in their office, yet when further queried about its effectiveness, the results are mixed. Most of these types of

programs are perceived as being equally effective as not effective. One exception was AVIMARK, which was rated very favorably by most reporting offices. Most of those who rated it as unacceptable, however, reported that they had received no training to use it. Veterinarian software seems to be a volatile and highly competitive market, judging from the number of business failures and acquisitions and mergers that have taken place. In some cases, companies which produced vet-specific software were absorbed by larger companies whose focus is on research and development in pharmaceuticals, bodily function monitoring and those areas that are adjacent to but not core with office practitioner software. This might make the decision to acquire software a more difficult one for the veterinarian seeking to establish a practice or to upgrade an existing practice.

V. RECOMMENDATIONS

It appears that most veterinarians who operate practices in a fixed location believe that better decisions are made, communications are enhanced and the practice is improved with the aid of some set of information technology components. Our goal here is to aggregate the results and develop a set of solutions based on industry practice within animal medical science and best practices from varying types of other industries to assist the veterinarian who wishes to build or improve a practice by processing office and clinical information with computer technology. Generally speaking a small office network consisting of 2 to 10 machines is a relatively inexpensive way to enhance productivity. Practitioners must deal with a client base both in person and over the phone and keep records of visits, lab analyses, medications and treatments and must often share this information with several staff members within the office. Office software that allows file sharing is considered a must in most small businesses of this sort. Our results show that most vet offices are generally satisfied with networked solutions, both internal and external, and so connectivity should be viewed with a high level of priority. The veterinarian himself can bring a wealth of information available over the Internet directly into the office in real time and when needed to treat rarely encountered problems or to view new treatment options that are just emerging. Software made specifically for the veterinary office can be difficult to choose when so many vendors offer so much and those who must make acquisition decisions are not well trained in information technology. Because these products may not deliver precisely what the vet needs, we recommend a try before you buy policy. Many veterinarian software houses (e.g., Henry Schein, Veterinary Software Publishing, Inc. and others) allow potential customers to download trial or demo software for free for a specified period (usually 30 days). The vet can have the office staff research the needs of the practice and then locate one or two packages that seem to meet these needs, download them for free and use them for a short period of time to see if they can deliver on what they promise. Upon completion, the staff should review the EUCS items and rate each program under evaluation. The program with the highest score can then be selected (*ceteris paribus*). Some issues that such an evaluation might be concerned with are the following: 1) How easy is the program to learn? Is training available? If so, how much does it cost per person and how long will it take? Where can it be obtained? 2) How easy is the program to use once learned? 3) Is the program useful? Does it meet the needs of the veterinary practice and can it grow with the practice? The veterinarian or the staff might ask, "What does it allow me to do that I can't do now?" This may be evaluated in terms of either fewer unhealthy animals (better treatment opportunities) or in terms of business volume (the ability to treat more animals in the same period of time). These questions help the practitioner to focus on the optimal allocation of time information sharing and availability so that productivity is enhanced. 4) What does it cost? Do the benefits received from the software exceed its acquisition cost? (Acquisition cost includes the cost of training, installation and configuration.) Placing a value on benefits received from computer information systems is problematic and has been the focus of several past studies [8], [9] with no real concrete answers for the practitioner. However, by looking at what clinicians are using currently and determining whether these systems are successful may go a long way toward providing some guidance in this decision process. The results of this study are aimed at providing this information.

Are mobile solutions a viable additive to the veterinary practice? Mobile smart devices, personal digital assistants (PDAs) and small electronic voice recorders are relatively inexpensive and easy to handle for field operations. They can be programmed to accept data vital to the practice and transmit it back to the office server either remotely as through a cellular telephone connection or locally once the vet returns to the office. Whether they are a good investment for the veterinarian is unclear and was not the focus of this study, however, the same business question regarding other office technology can be asked to help make this decision as well. That is, the vet could ask, "What can it help me do that I couldn't do before, and how will this affect my productivity—will more animals be saved or in better health, or will I be able to treat more of them?"

Finally, we must not overlook the reason the veterinarian chose the animal health field in the first place—the love of animals and the desire to help them healthy. He or she did not enter the field to become an expert in information systems, yet as an entrepreneur, the more knowledge one has in this area, the better the decisions that are made. Our study seems to indicate that most veterinarians feel that office automation is necessary in the pursuit of this profession, but realize that it is only one tool in a set of tools that must be employed to accomplish the goal of helping animals and bringing peace of mind to their owners. To this end, the

veterinarian can delegate much of the functions involved with acquiring, installing and configuring the office information technology to his or her staff. Existing IT healthcare frameworks can be studied and adapted to meet differing needs [30]. Job announcements should include the requirement that applicants have aptitude in computer skills and the desire to work with and learn them. Veterinarians can also turn to consultants and to universities for assistance. Most business colleges have a small business development center of some sort that can provide information and sources of assistance. This sort of delegation can move the responsibility of the office and clinic systems to others involved in the practice, support the veterinarian's practice through information sharing, require less training and time commitments by the veterinarian to the system and allow the vet to do what he or she has intended to do all along—treat animals.

VI. CONCLUSION

This study analyzed the use of information technology within a sample of representative veterinary offices throughout the Midwest in an effort to learn more about how such technology is being used and whether its use has met the needs of these practitioners. Our findings indicate that the vast majority of practitioners do rely on this technology to help them manage their practices and that they are largely satisfied with it. This translates into systems that we can deem as successful according to the theory posited by Doll and Torkzadeh [10]. From this data, we can get an idea of what is working in vet offices and make certain inferences. We can then translate these inferences into recommendations for vets who seek to automate a new office or for those who are considering changes in their current practice. Our recommendations are derived from success in this industry as well as what has been successful in related industries and standard business practices. For vets whose practice is mobile and not confined to an office, information technology may still make sense as the advancements in communications technology have been rapid and pervasive, but the decision to incorporate IT into a mobile practice still must depend on whether the cost of investment is exceeded by the benefits received. We have attempted to use the information gathered in this study to help the veterinarian formulate an IT investment strategy while still allowing him or her to concentrate on service to animal health.

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APPENDIX I: EUCS INSTRUMENT QUESTIONS

Item	Question
C1:	Does the system provide the precise information you need?
C2:	Does the information content meet your needs?
C3:	Does the system provide reports that seem to be just about exactly what you need?
C4:	Does the system provide sufficient information?
A1:	Is the system accurate?
A2:	Are you satisfied with the accuracy of the system?
F1:	Do you think output is presented in a useful format?
F2:	Is the output information clear?

E1: Is the system user friendly?
E2: Is the system easy to use?

T1: Do you get the information you need in time?
T2: Does the system provide up-to-date information?

(From: Doll and Torkzadeh, 1988)

APPENDIX II: EUCS INSTRUMENT RESULTS

a. Correlation Matrix (Coefficient alpha on the diagonals)

	Mean	s	A1	A2	C1	C2	C3	C4	E1	E2	F1	F2	T1	T2
A1	4.00	0.91	1.00											
A2	4.05	0.83	0.84	1.00										
C1	3.74	0.92	0.61	0.62	1.00									
C2	3.47	0.94	0.55	0.57	0.69	1.00								
C3	3.53	0.92	0.60	0.60	0.72	0.78	1.00							
C4	3.69	0.89	0.66	0.63	0.71	0.75	0.83	1.00						
E1	3.74	0.94	0.63	0.60	0.57	0.66	0.57	0.63	1.00					
E2	3.74	0.95	0.53	0.49	0.50	0.65	0.58	0.59	0.79	1.00				
F1	3.90	0.78	0.63	0.61	0.63	0.64	0.63	0.64	0.59	0.57	1.00			
F2	3.94	0.78	0.74	0.76	0.64	0.63	0.63	0.66	0.67	0.61	0.71	1.00		
T1	4.00	0.93	0.69	0.67	0.77	0.60	0.67	0.70	0.57	0.49	0.60	0.65	1.00	
T2	3.87	0.92	0.65	0.63	0.71	0.59	0.60	0.67	0.65	0.48	0.63	0.62	0.76	1.00

b. Subscale correlations

	CONTENT	ACC	FORMAT	EASE	TIME	SUCCESS
CONTENT	1.00					
ACC	0.80	1.00				
FORMAT	0.87	0.87	1.00			
EASE	0.73	0.73	0.79	1.00		
TIME	0.83	0.83	0.90	0.75	1.00	
SUCCESS	0.90	0.89	0.97	0.81	0.93	1.00

C. Factor loadings for the second order model:

	CONTENT	ACC	FORMAT	EASE	TIME
C1	0.75				
	(0.09)				
	8.70				
C2	0.80				
	(0.09)				
	8.94				
C3	0.83				
	(0.09)				
	9.31				
C4	0.80				
	(0.09)				
	9.32				
A1		0.83			
		(0.09)			
		8.88			

A2		0.75			
		(0.08)			
		8.92			
F1			0.63		
			(0.25)		
			2.52		
F2			0.68		
			(0.27)		
			2.50		
E1				0.89	
				(0.09)	
				10.17	
E2				0.80	
				(0.08)	
				10.43	
T1					0.82
					(0.14)
					5.65
T2					0.78
					(0.14)
					5.68

Standard errors shown below the loading; t-value shown below.