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Digital Video Presentation and Student Performance: A Task Technology Fit Perspective

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Digital Video Presentation and Student Performance:
A Task Technology Fit Perspective

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ABSTRACT

This paper reports the results of a confirmatory study of a Task Technology Fit (TTF) model. Three dimensions of fit: Task Match, Ease of Use, and Ease of Learning, are applied in the context of digital video tools use for oral presentation in a classroom environment. Students completed a digital video presentation that acted as a substitute for an in-class oral presentation. An existing survey instrument was adapted, and administered to the students to examine the impact on presentation skill and fit to task. Results confirm the adaptation of the TTF model and show significant relationships between variables. The model can be used in other task/technology combinations. Additional findings suggest that when there is a significant fit between digital video tools (technology) and improvement of oral presentation skills (task), student performance also improves. Digital video can be a useful alternative to in-class presentation when the goal is to improve presentation skill.

Keywords: *Communication, Digital Video, Ease of Learning, Ease of Use, Oral Presentation, Public Speaking, Task Match, Task Technology Fit*

INTRODUCTION

In their 2006 study, Park and Raven proposed an adaptation of the traditional task-technology fit (TTF) model (Goodhue, 1995; Goodhue & Thompson, 1995). Park and Raven noted that the TTF model, despite its promise, was not used much in IS research. Other models, such as the Technology Acceptance Model (Davis, Bagozzi, & Warshaw, 1992) are much more extensively used. They identified several reasons why that might be the case. The original model had 12 dimensions of fit, but many of these dimensions seemed to not to be reflective of the fit concept. They redesigned the model, with 3 dimensions of fit that were derived from the work by Eason (1988): (1) Task Match (TM), Ease of Use (EOU), and Ease of Learning (EOL). They updated the model by including well-tested measures for performance (measured as usefulness). Park and Raven tested the revised model in the context of knowledge management systems, and confirmed that their revisions worked well in that context. In their

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discussion of possible future research they noted the need for replication of the study in other contexts.

This study seeks to provide such a replication of the Park & Raven model, in a different context, with a different type of technology. Fit is examined between the task of creating a digital video presentation and the technological use of digital video tools. The use of a digital video (DV) presentation in a course management system (CMS) is examined for its impact on student presentation skill and fit to task. The level of fit is then compared to performance by students.

Task, Technology, Fit and Performance

Information systems success has been examined through a series of studies, and several theories have been developed (Park & Raven, 2006). The theory that is of particular relevance here is task technology fit theory (Goodhue, 1995; Goodhue & Thompson, 1995). One of the key concerns in Information Systems (IS) research is to more thoroughly understand the relationship between information systems and user performance. TTF theory indicates that when technology and task fit together well, performance will be higher (see Figure 1) (Goodhue, 1995; Goodhue & Thompson, 1995; Zigurs & Buckland, 1998).

Goodhue and Thompson (1995) measured task-technology fit with 8 factors: quality, locatability, authorization, compatibility, ease of use/training, production timeliness, systems reliability, and relationship with users. A survey containing between two and ten questions for each factor was used with responses on a seven point Likert scale, ranging from strongly disagree to strongly agree. Park and Raven (2006), in their research, re-conceptualized fit. They identified three aspects of fit: Task Match, Ease of Use, and Ease of Learning as shown in Figure 2. These dimensions were subsequently applied to digital video technology and student presentation task.

Digital Video Technology and Student Presentation Task

Oral presentation ability is one of the seven most important oral communication skills required by entry-level workers (Maes, Weldy, & Icenogle, 1997). Oral presentation is required by most undergraduate business courses for workplace and career preparation (Campbell, Mothersbaugh, Brammer, & Taylor, 2001). It is increasingly recognized as an essential element in technical disciplines like engineering, biology, and mathematics (Darling & Dannels, 2003). In a typical university setting, courses provide feedback on relatively few oral presentations because of time constraints and the pressures of larger class sizes (Campbell, et al., 2001). Technology may provide one solution for higher education to transform educational processes (Leidner & Jarvenpaa, 1995) and to better address the need for oral communication skills in a time-constrained environment (Ober,

Figure 1. The task-technology fit model adapted from Goodhue & Thompson (1995).

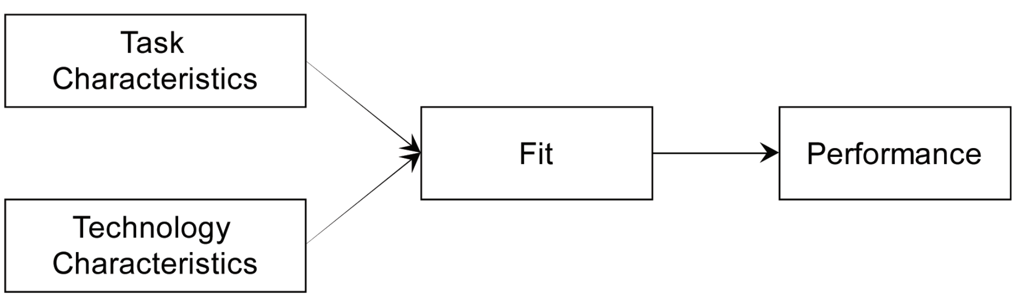
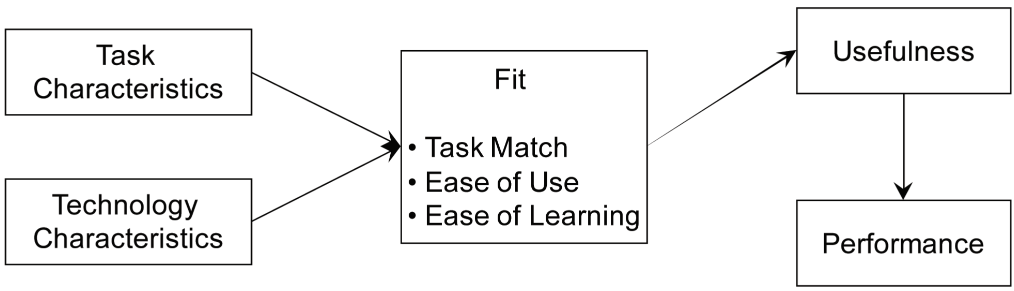


Figure 2. The Park & Raven (2006) re-configured task-technology fit model for Knowledge Management Systems



1987; Ober & Wunsch, 1983; Winsor, Curtis, & Stephens, 1997).

The use of technology by faculty and students has increased and placed growing importance on technology in the curriculum (Plutsky & Wilson, 2000). Technological developments in digital video technology are contributing to video-enhanced learning. Students are able to access a video as they were previously able to access a book. Video streaming to desktop computers and portable devices has made digital video access commonplace (Fill & Ottewill, 2006). While communication scholars have shown interest in the pedagogical benefits of video since 1970 (Hallmark, Hanson, Padwick, Abel, & Stewart, 1993), surprisingly few studies use video technology as part of an oral communication skills based approach (Leeds & Maurer, 2009). Assessment of oral communication skills in the academic environment is necessary (Campbell et al., 2001; Maes et al., 1997; Reinsch & Shelby, 1997). Recent literature suggests that oral communication is of significant importance to organizational success and is a critical factor in graduate placement decisions (Aly & Islam, 2005; Campbell et al., 2001; Darling & Dannels, 2003; Ruchala & Hill, 1994; Sorenson, Savage, & Orem, 1990; Wardrope & Bayless, 1994). However, environmental needs for large class enrollments (Campbell et al., 2001; Geske, 1992) place a strain on universities to adequately teach and assess oral presentation delivery skills.

As technology usage is increasing, classroom size continues to increase, and the importance of oral presentation delivery skills remains paramount, it is important to examine how video technology fits with student presentation and how it can affect performance. The use of DV in a CMS to record and deliver oral presentation may address these issues if the technology is suited to the task. Learning technologies are most successful when embedded into an existing learning context; blended with other components of the student learning experience (Fill & Ottewill, 2006). Digital video technology use in this study is embedded in WebCT VISTA, the course management system.

RESEARCH QUESTIONS

The researchers investigated the following research questions:

1. Will the Park & Raven task technology fit model and instrument work with other technology/task combinations?
2. Does a better fit between the presentation improvement task and digital video technology result in better performance?

RESEARCH MODEL

Task, Technology

Goodhue and Thompson (1995) defined tasks as "… the actions carried out by individuals in turning inputs into outputs" (p. 216). They defined technology as "computer systems (hardware, software, and data) and user support services (training, help lines, etc.) provided to assist users in their tasks" (Goodhue & Thompson, 1995, p. 216). Finally, task technology fit was defined as "the degree to which a technology assists an individual in performing his or her portfolio of tasks" (Goodhue & Thompson, 1995, p. 216). In this study, the task is to improve presentation skill. The technology is the combination of digital video equipment and software, and the course management system.

Conceptualization of Task Technology Fit

IS researchers have used user evaluations of systems as a surrogate for IS success. A user evaluation means an assessment is made by a user about certain qualities of information systems (Goodhue, 1995). It is based on the assumption that users can evaluate a system service by comparing what they obtain with what they require to do their job. Eason (1998) argued that this is a 'match' or 'fit' evaluation where functionality is matched against task requirements, and usability is matched against user characteristics.

Task match was defined as "the ability of system functionality to serve user task needs" (Eason, 1988, p. 191). Ease of use (EOU) was defined by Eason (1988) as "the usability of system operating procedures" (p. 191). Eason (1988) defined ease of learning (EOL) as "the adequacy of the user support methods provided for user learning" (p. 191). For each of the constructs, Task Match, Ease of Use and Ease of Learning, Park and Raven (2006) developed measures for the context of knowledge management systems. The items used in their study were adapted for the digital video context of this research. The appendix displays the items.

Performance was measured by Park and Raven (2006) as usefulness, a construct first operationalized by Rai et al. (2002). In this study, two self-reported measures of performance have also been added. Usefulness was found to be directly affected by fit (Park and Raven, 2006). As shown in Figure 2, usefulness is expected to influence (self-reported) performance, rather than the other way around. Furthermore, usefulness is expected to have a mediating effect on the relationship between fit and performance.

RESEARCH METHODS

Sample

The fit between the task of creating a digital video presentation and the technological use of digital video tools was tested through the use of a purposive sample of two intact classes taught by one of the authors. Purposive sampling is nonprobability sampling where the investigator selects a subpopulation that is thought to be representative of the typical population (Singleton & Straits, 2005). This study focused on a particular group of students at a static point in time. "These designs are often used when the experimental treatment is administered to intact groups, such as school classes, making random assignment of individual subjects impossible" (Singleton & Straits, 2005, p. 207). A sample of 62 students was drawn from a population of 560 second year undergraduate business information systems course at a large southeastern state university in the fall of 2006.

Digital Video Technology Presentation

The students in the sample completed a digital video presentation that acted as a substitute for an in-class oral presentation. Classroom lectures on oral presentation planning, preparation, and delivery were presented in class. Students were assigned related reading, discussion, and video file analysis as part of their course work. They were placed into teams and asked to complete a twelve minute video presentation. Teams were trained on DV quality characteristics and DV editing software. Groups received training on capturing footage and editing tape; handouts and instruction were provided. Film clip examples that demonstrated the adequate or inadequate use of lighting, the importance of a tripod for steady filming, and the problems associated with background noise interference were shown. The same mini-DV cameras, equipment, and editing software were used for each team. Apple Macintosh iMovie© digital video editing software was used for the creation of the DV files. QuickTime© player was required for viewing. Students identified an appropriate location and acquired the necessary equipment from the campus presentation technology department. They filmed the oral presentation in one continuous take. If students wished to re-tape, they were required to start again at the beginning of the presentation. Inserting or editing footage was not permitted. Students then compressed video files and uploaded them to their associated course using the WebCT Vista course management system.

Students viewed the presentation through the CMS while faculty and independent study assessors evaluated student performance based on presentation and video quality characteristics. A preliminary study conducted by the researchers focused an investigation into public speaking and communication education literature to identify a set of delivery skills that are associated with successful oral presentation delivery (Leeds, Raven, & Brawley, 2007). Five primary traits were identified: (1) eye contact and the absence of reading, (2) vocal variety, (3) credibility and confidence, (4) absence of nervous mannerisms, and (5) gestures and the purposeful use of the body. These traits incorporated elements of oral communication delivery skill found in successful interactions.

Survey Instrument

Upon completion of the video presentation, surveys were distributed to students through WebCT Vista. Students received $10 in participant compensation and course bonus points equaling one-percent of their course grade for completing the survey. The survey instrument was adapted from items used in the Park and Raven (2006) study. Several items were dropped from the original instrument because they did not work in the digital video context, and most were rewritten to reflect the specific tasks and technologies of this study. The final survey consists of 4 demographic questions and 23 7-point Likert scale items (1 = very strongly disagree, 2 = strongly disagree, 3 = disagree, 4 = neutral, 5 = agree, 6 = strongly agree, 7 = very strongly agree). The specific constructs and measures in the survey questionnaire are listed in the appendix.

ANALYSIS AND RESULTS

Partial Least Squares Analysis

Partial Least Squares (PLS) analysis (with Smart PLS©) was used as the primary analysis tool in this study. PLS is an extension of the multiple linear regression model. It is also referred to as path analysis with composites, or soft modeling (Marcoulides & Saunders, 2006). PLS is a method for constructing predictive models versus causative models. It is an advanced statistical method that is based on the linear transition from a large number of descriptors to a smaller number of latent variables. PLS computes optimal linear relationships between latent variables in an attempt to account for as much of the manifest factor variation as possible (Tobias, 2007). It first estimates loadings of indicators on constructs and then iteratively estimates causal relationships among constructs (Fornell & Bookstein, 1982). In one analysis, an entire model such as the one shown in Figure 2 is analyzed.

PLS analysis was considered appropriate for this study because it places minimal demands on sample size and distributional assumptions (Chin, 1998; Fornell & Bookstein, 1982). PLS analysis is also appropriate for testing theoretical models in the early stages of development (Fornell & Bookstein, 1982). This study is a confirmatory study of an initial attempt to develop a theoretical model of task-technology fit in the KMS adoption context. It tests the same model in a blended technology context, using digital video tools and a course management system.

MEASUREMENT MODEL

Before testing the structural model, the measurement model was established by examining the psychometric properties of the measures.

Convergent Validity

Convergent validity was assessed through standardized loadings for each factor model. For convergent validity, the shared variance between each item and its associated construct should exceed the error variance. This translates into a loading of 0.707 or greater. Table 1 displays the loadings, which are all larger than the 0.707 threshold.

Three measures were used to assess internal consistency of each of the constructs: Cronbach's alpha, composite reliability, and average variance extracted (AVE). The Cronbach's alpha and composite reliability value are generally expected to be 0.7 or higher, indicating extensive evidence of reliability. Values of 0.80 or higher indicate exemplary evidence (Bearden, Netemeyer & Mobley, 1993; Yi & Davis, 2003). At the same time, a score between 0.60 and 0.70 may also be acceptable for exploratory research (Hair, Anderson et al., 1998; Nunally, 1967). Table 1 shows the Cronbach's alpha, composite reliability, and average variance extracted values for each construct. Four constructs have an alpha value of 0.8 or higher. Only Technology Characteristics has a low –but still acceptable - value at 0.671. Composite reliability values for all five constructs are .8 or higher, indicating exemplary composite reliability.

The third measure of construct reliability, average variance extracted, compares the amount of variance obtained from indicators with variance due to measurement error (Chin, 1998, p. 321; Fornell & Larcker, 1981). Acceptable levels for average variance extracted are 0.5 or higher (Chin, 1998). All constructs more than meet this criterion. Taken together, the three measures indicate that the constructs are very reliable.

Discriminant Validity

To test for discriminant validity we investigated each indicator's loading on its own construct, and its cross-loadings on all other constructs were calculated. The results, displayed in Table 2, show that each indicator has a higher loading with its intended construct than its cross-loading with any other construct. Each block of indicators loads higher for its intended construct than for indicators from other constructs, establishing discriminant validity.

Structural Model

Figure 3 shows the structural model as it was tested in our study. The relationships between constructs are measured through the path coefficients and their significance levels, and the explanatory power of the model is expressed as R^2 values. The path coefficients were computed, and bootstrapping with 500 re-samples was used to determine the t-values for each of the relationships. A t-value of 2.58 or greater indicates a significance level of 0.01. All four relationships were positive and significant at the 0.01 level. This further confirms the findings of Park and Raven (2006).

The variance in the three dependent constructs; Fit, Usefulness, and Performance, was explained to varying degrees. The R^2 value of 0.33 for Fit means that 33% of the variance is explained by Task Characteristics and Technology Characteristics. For Usefulness,

Table 1. Construct analysis

Construct		Item	Standardized Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Fit	Ease of Learning	EOL1	0.862	0.947	0.954	0.657
		EOL2	0.871			
		EOL3	0.710			
		EOL4	0.674			
	Ease of Use	EOU1	0.873			
		EOU2	0.824			
		EOU3	0.845			
		EOU4	0.826			
		EOU5	0.756			
	Task Match	TM2	0.833			
		TM3	0.813			
Performance Characteristics		PERFORM1	0.910	0.751	0.889	0.800
		PERFORM2	0.879			
Technology (System) Characteristics		SC2	0.775	0.671	0.815	0.594
		SC3	0.776			
		SC7	0.762			
Task Characteristics		TC4	0.915	0.811	0.914	0.841
		TC5	0.919			
Usefulness		USEFUL1	0.797	0.899	0.926	0.713
		USEFUL2	0.812			
		USEFUL3	0.898			
		USEFUL4	0.887			
		USEFUL5	0.824			

29% of the variation is explained by Fit, and Usefulness in turn explains 30% of the variance in Performance. In the Park and Raven study, 48% of Fit was explained by Task Characteristics, Technology Characteristics, and Content Characteristics. The lower number in this study (33%) suggests that there may be additional constructs that would explain Fit.

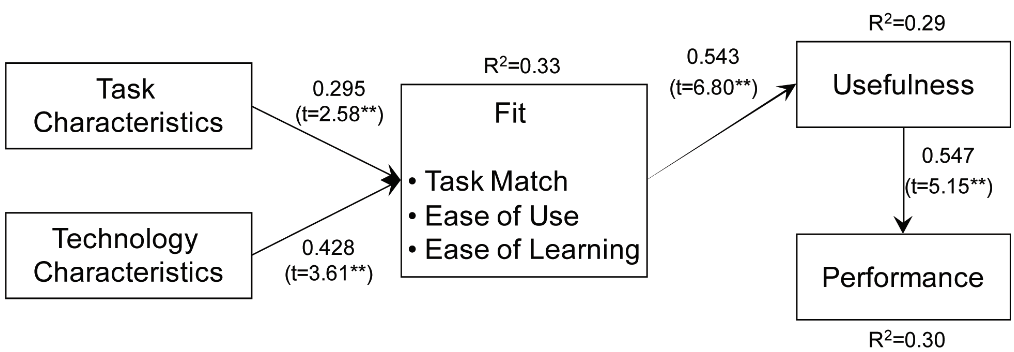
DISCUSSION AND IMPLICATIONS

The primary research question of this study asked if the TTF model would work with other technology/task combinations. The Park & Raven (2006) study suggested three new dimensions of fit to simplify the fit measurements.

Table 2. Construct loadings and cross loadings

Construct		Item	1	2	3	4	5
1. Fit	1-1. Ease of Learning (EOL)	EOL1 EOL2 EOL3	**0.862** **0.871** **0.710**	0.292 0.342 0.327	0.326 0.411 0.436	0.287 0.252 0.337	0.284 0.278 0.388
		EOL4	**0.674**	0.283	0.456	0.203	0.285
	1-2. Ease of Use (EOU)	EOU1 EOU2 EOU3 EOU4 EOU5	**0.873** **0.824** **0.845** **0.826** **0.756**	0.499 0.336 0.393 0.296 0.264	0.441 0.294 0.553 0.374 0.328	0.392 0.344 0.295 0.252 0.348	0.626 0.543 0.514 0.316 0.294
	1-3. Task Match (TM)	TM2 TM3	**0.833** **0.813**	0.344 0.309	0.432 0.330	0.381 0.373	0.603 0.449
2. Performance (PERFORM)		PERFORM1 PERFROM2	0.318 0.451	**0.910** **0.879**	0.299 0.339	0.560 0.466	0.521 0.454
3. Technology (System) Characteristics (SC)		SC2 SC3 SC7	0.278 0.368 0.461	0.071 0.123 0.515	**0.775** **0.776** **0.762**	0.020 0.024 0.412	0.142 0.156 0.592
4. Task Characteristics (TC)		TC1 TC2	0.361 0.368	0.457 0.598	0.252 0.187	**0.915** **0.919**	0.501 0.446
5. Usefulness (USEFUL)		USEFUL1 USEFUL2 USEFUL3 USEFUL4 USEFUL5	0.323 0.544 0.435 0.402 0.547	0.455 0.423 0.514 0.443 0.469	0.383 0.487 0.316 0.318 0.326	0.341 0.508 0.442 0.406 0.458	**0.797** **0.812** **0.898** **0.887** **0.824**

Figure 3. The task-technology fit model showing the strength of relationship between constructs



Furthermore, they updated and developed measurements for all constructs of the TTF model. This study re-confirmed the Park & Raven study in the context of digital video tool use in the classroom. There were significant relationships between all four variables. The measurements used by Park and Raven were also shown to be applicable in this context.

The secondary research question asked if the fit between the presentation improvement task and digital video technology would lead to better student performance. When task and technology fit together, and when there is a significant fit between digital video tools (technology) and improvement of presentation skills (task), the student will perform better (improved presentation skills). The complexity of the task, and the reliability of the digital video tools are closely related to how well (1) the task matched the work, (2) how easy it was to learn how to use the DV tools, and (3) how easy it was to use the DV tools. These three in turn were closely related to the perceived improvement of presentation skills. Performance in the class does not only depend on how bright the student is, or how hard they work. If the technology and the task are not carefully matched then students won't learn. The implication is that digital video can be a useful alternative to in-class presentation when the goal is to improve presentation skills. The strong relationships between fit, usefulness and performance indicate that fit is indeed important for performance, and that the fit between the presentation improvement task and the digital video technology does lead to better student performance

Limitations and Future Research

Any research study has limitations that derive from the need to focus, availability of data, and analysis methods used. As our study builds on the work of Park and Raven (2006), so other research can extend the findings of the work presented here. As the R-square values show, the variation in fit, usefulness, and performance is only partly explained (at levels of 33%, 29%, and 30% respectively. Other factors will likely have impacted the variation in these constructs, and future research might identify for instance what else impacts student self-reported measures of performance. The findings in this study confirmed the validity of the Park and Raven (2006) model in the context of digital video technology and oral presentation improvement. This in turn raises the question if there are task/technology combination for which this model would not work. Because of the limitations in the sample size, it was not possible to look at the three constructs that together form fit. With more data, it would be possible to explore the individual relationships that task match, ease of learning and ease of use have with task, technology, and performance. This would give more detailed insights into fit.

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APPENDIX

Table 3. Constructs and measures

Construct	Item ID	Item
Ease of Learning	EOL1	Learning to use the digital video tools was easy for me.
	EOL2	It was easy for me to become skillful at using the digital video tools.
	EOL3	It was difficult to learn how to use the digital video tools for my assignment.
	EOL4	I took a long time to learn to use the digital video tools for my assignment.
Ease of Use	EOU1	The services provided by the digital video tools matched my requirements. I found it easy to get the digital video tools to do what I wanted them to do.
	EOU2	My interaction with the digital video tools was clear and understandable.
	EOU3	I found the digital video tools to be flexible to interact with.
	EOU4	I found the digital video tools easy to use.
	EOU5	The digital video tools were user friendly.
Task Match	TM2	The functionality of the digital video tools served my needs very well.
	TM3	The services provided by the digital video tools matched my requirements.
Performance Characteristics	PERFORM1	The quality of my work in the assignment has been excellent
	PERFORM2	My effectiveness in the assignment has been excellent
Systems Characteristics	SC2 (reversed)	The digital video tools were subject to unexpected or inconvenient down times which made it harder to do my assignment.
	SC3 (reversed)	The digital video tools were subject to frequent problems and crashes.
	SC7	I would rate the overall quality of the digital video tools to be excellent..
Task Characteristics	TC4 TC5	I had to collaborate with others in my assignment. My assignment required frequent coordination with the efforts of others.
Usefulness	USEFUL1	Using the digital video tools improved my performance in the assignment.
	USEFUL2	Using the digital video tools in my assignment increased my productivity.
	USEFUL3	Using the digital video tools enhanced my effectiveness in my assignment.
	USEFUL4	Using the digital video tools made it easier to do my assignment.
	USEFUL5	I found the digital video tools useful in my assignment.
Demographic Information	AGE	What is your age?
	GENDER	What is your gender
	RACE	Which best describes your race or ethnic group?

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