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ABSTRACT

Past research recognizes the important influence of individual beliefs on technology acceptance and use. This line of research has also identified a variety of factors that drive the formation of these beliefs. One category of variables that has not received much attention in this research stream consists of individual preferences, in particular time-use preferences. In the current study we add to the literature on technology acceptance, and belief formation in particular, by introducing and empirically testing a new construct labeled computer polychronicity, which captures individuals' time-use preferences regarding IT. Computer polychronicity is positioned in this study as a key driver of perceived usefulness, mediating the effects of computer anxiety and computer playfulness. Overall, the results support the notion that preferences play important roles in the formation of technology-related beliefs.

KEYWORDS

Computer Polychronicity, Time-Use Preference, Perceived Usefulness, IT-Specific Traits

INTRODUCTION

Companies invest a great deal of resources toward enhancing the productivity of their knowledge workers with information technology (IT). However, the benefits reaped from IT investments depend largely on knowledge workers' actual use of these technologies. Past research recognizes the role of beliefs in IT acceptance (Davis 1989; Karahanna et al. 1999), and has attempted to identify important factors in the formation of these beliefs (i.e., Venkatesh et al. 1996). Two prominent categories of factors have emerged from this line of research; one focused on the characteristics of the target technology, and the other on users' holistic experiences with the target technology (Agarwal et al. 2000). While these categories account for several important factors in belief-formation about IT, opportunities exist to further identify salient drivers of IT-related beliefs.

One group of factors that has not received a great deal of attention in the IS literature consists of individuals' preferences. Preferences, which we define as *the most desired choices among bound sets of alternatives*, reflect the strategic portfolio of choices that individuals select in order to maximize their overall utility (McFadden 1980). One preference receiving considerable attention in the management and organizational behavior literature is time-use preference, or *polychronicity* (Hall 1959), which captures an individual's preference about how to organize activities over time to accomplish work (Conte et al. 2003).

In this study, we adapt the tenets of general polychronicity to the computing context and develop a new construct labeled *computer polychronicity,* which captures preference about organizing computer-related activities over time to accomplish work using technology. In the subsequent sections, we present the theoretical background of computer polychronicity, discuss the steps taken to develop and validate a measure of computer polychronicity following Churchill (1979), and empirically test a research model positioning computer polychronicity as a key influencing factor of beliefs about IT.

THEORETICAL BACKGROUND

Computer polychronicity is rooted conceptually in general polychronicity, originally applied as a cultural dimension (Hall 1959), and later adapted to the individual level (Conte et al. 2003; Kaufman et al. 1991) as an individual time-use-preference factor. Polychronicity reflects the notion that people respond to the time and role demands imposed by their environments, by strategically dividing up attention and activities over blocks of time and switching between activities while they work (Kaufman et al. 1991). Many alternative preferences for organizing activities exist on a continuum anchored by *monochronic* (organizing activities one event at a time) on one extreme and *polychronic* (organizing multiple activities simultaneously) on the other (Slocombe et al. 1999). Overall, the concept of polychronicity captures preference regarding time use, and belief about how to best organize activities (Conte et al. 2003).

While the term polychronicity has been used extensively to capture individuals' time-use preferences in different professional environments, past research suggests that individuals can exhibit different behaviors when interacting with technology than they do in other contexts (Milson et al. 2002). This notion has motivated the adaptation of several individual-level constructs from more general contexts, exclusively to the computing context to examine IT-related dispositions (Chua et al. 1999; Webster et al. 1992). Similar in spirit to these past works, we posit that past measures of individual-level polychronicity are too general to adequately account for the nuances of the computing context and thus, provide inadequate insight into time-use preferences in the computing context. In response to this inadequacy, we develop a measure that incorporates the tenets of polychronicity, tailored to the computing context.

CONSTRUCT DEVELOPMENT

In this study, we adapt the individual-level polychronicity definition provided by Conte et al. (2003) to the computing context and formally define computer polychronicity as *the extent to which a computer user 1) prefers to be engaged in two or more computer-related activities or applications at the same time when using a computer and 2) believes this is the best way to use a computer.* Consistent with past views of polychronicity, computer polychronicity is conceptualized as a trait-based preference for organizing activities; the primary distinguishing factor of this construct from past conceptualizations is its focus on the computing context.

To develop measurement items for the computing context, the scale developed by Conte et al. (2003) was referenced as a baseline. One distinct advantage of their individual-level measure is its rooting in Bluedorn et al.'s (1999) cultural-level measure, which rigorously established construct validity. Overall, seven items were constructed for the new measure.

General Polychronicity	Computer Polychronicity
I like to juggle several activities at once.	When working with a computer, I prefer to juggle several computer-related activities at the same time.
I prefer to do one thing at a time.	When I work with a computer, I prefer to work with one computer application at a time.
I believe people should try to do many things at once.	I believe the most effective way to use a computer is to work with many computer applications at the same time.
When I work by myself, I usually work on one task at a time.	When I work on a computer, I usually work with one computer application at a time.
I believe it is best to complete one task before beginning another.	When using a computer, I believe that it is best to complete one computer-related task before beginning another.
	When using a computer, I believe users do their best work when working with several computer applications at the same time.
	When using a computer, I am comfortable working with several computer programs at the same time.

Table 1: Computer Polychronicity Items

Subsequent to item development, Q-Sorting was conducted to assure conceptual convergence of the items. All items measuring general and computer polychronicity were pooled and randomized. Two MIS professors and four doctoral students were then provided definitions of the two constructs and asked to match each item with its intended construct. Results from the activity suggested the items are conceptually distinct, and each item converges on the appropriate construct.

Scale Purification

Further validation of the scale was established via a survey administered to students enrolled in an introductory IS course at a large state university in the southeastern United States. Overall, 108 students were invited to participate, with 105 accepting (response rate of .97). Three surveys were returned incomplete and dropped from the study, resulting in N=103. Coefficient alpha, a primary

measure for assessing instrument quality (Churchill 1979) was .79 for the seven items, above the recommended minimum of .70 (Nunnally 1978); however, exploratory factor analysis, which was conducted to identify suspect items, indicated two items did not converge with the others. Examination of the items revealed that they might be tapping individuals' beliefs about the how *others* should interact with technology, as opposed to beliefs about the best way for *the respondent* to use technology. Because we are primarily concerned with self-oriented preference in this study, we deemed it appropriate to remove these items from the scale rather than investigate the possibility of a higher order construct. Coefficient alpha was re-calculated on the remaining five items, resulting in a value of .85 and confirmatory factor analysis suggested that the items form a uni-dimensional construct.

	Factor 1	**Factor 2**
When working with a computer, I prefer to juggle several computer-related activities at the same time.	0.77	-0.23
When I work with a computer, I prefer to work with one computer application at a time.	0.79	-0.39
**** I believe the most effective way to use a computer is to work with many computer applications at the same time.***	0.32	0.61
When I work on a computer, I usually work with one computer application at a time.	0.84	-0.03
When using a computer, I believe that it is best to complete one computer-related task before beginning another.	0.72	0.03
**** When using a computer, I believe users do their best work when working with several computer applications at the same time.***	0.29	0.84
When using a computer, I am comfortable working with several computer programs at the same time.	0.79	0.06
****Removed from the computer polychronicity measure.***		

Table 2: Initial Factor Analysis Results and Dropped Items

A second round of data collection was conducted to further assess the reliability and validity of the new construct. The sampling frame for the second round comprised working professionals from various industries, participating in a statewide public health coalition in the southeastern United States, who also frequently use technology to accomplish their work. The survey was deployed to 112 professionals, with 95 participating (response rate of 85%). Thirteen surveys were returned incomplete and dropped from the sample, resulting in N=83. Results for the second round of data collection produced a coefficient alpha of .92, well above the recommended minimum value (Nunnally 1978), and factor analysis results again indicated uni-dimensionality of the items, explaining over 75% of the total variance. Overall, the results indicate strong test-retest reliability across heterogeneous samples.

Because the measure for computer polychronicity was primarily adapted from Conte et al.'s (2003) measure of individual-level general polychronicity, it was determined that this construct is most appropriate for use in determining discriminant validity of the new construct. Factor analysis was conducted on all the general and computer-related polychronicity measurement items, and the results indicated that these items appropriately reflect two distinct constructs.

RESEARCH MODEL TEST

After establishing reliability and validity of the computer polychronicity measure, a research model was developed that positions computer polychronicity in a nomological network of other IT-specific traits, as an influencing factor of perceived usefulness.

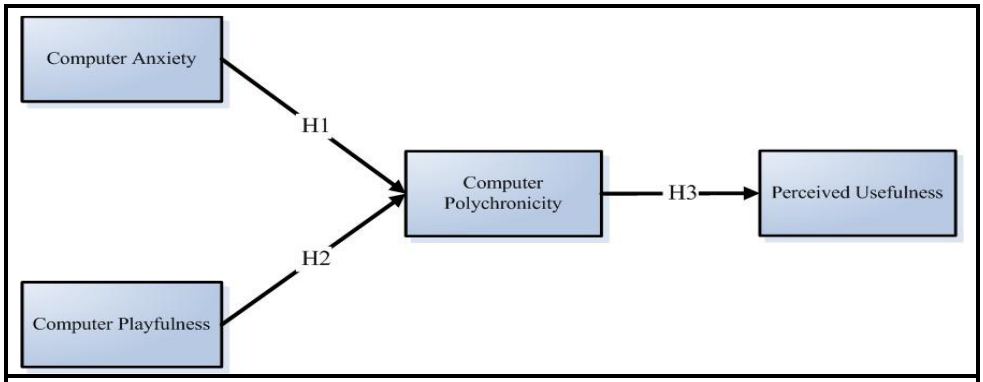


Figure 1. Research Model

Computer anxiety is commonly defined as *an emotional fear or apprehension when using a computer or when considering the possibility of computer use* (Chua et al. 1999). As a usage-preference variable, computer polychronicity is rooted in the idea of comfortably and capably using a computer. As a result, any negative disposition toward using a computer will likely inhibit a preference for juggling several different computer-related activities simultaneously. Thus, we hypothesize:

H1: Computer anxiety has a significant (negative) effect on computer polychronicity

Computer playfulness describes an individual's tendency to interact spontaneously, inventively, and imaginatively with computers (Webster et al. 1992). Inventive, playful interactions with technology can lead users to discover new, novel approaches to breaking up computer-related activities and working on them simultaneously. Discovery of efficient and effective approaches to dividing up and switching between computer-related activities can lead users to prefer polychronic computer behavior. This plausible link between playfulness and polychronic preferences leads us to also hypothesize:

H2: Computer Playfulness has a significant (positive) effect on computer polychronicity

Perceived usefulness is defined as *the degree to which a person believes that using a technology would enhance his or her job performance* (Davis 1989), and has been distinguished as "an important, if not the most important, factor" (Sun et al. 2006, p. 17) in determining technology usage. Highly computer-polychronic individuals are more likely to appreciate the general features of computing technology that enable flexible, multitasking behaviors and, as a result should perceive these technologies as being relatively more useful that their monochronic counterparts. Thus, we expect computer polychronicity to positively influence the perception of a technology's usefulness. Stated formally, we hypothesize:

H3: Computer polychronicity has a significant (positive) effect on perceived usefulness

Data Analysis

To measure computer anxiety and computer playfulness, we used the scales suggested by Hackbarth et al. (2003), while the scale we used for perceived usefulness was developed by Venkatesh et al. (2000). For computer polychronicity, we used the newly developed scale. Partial Least Squares (PLS) was used to evaluate the research model, which involves: (1) assessment of the measurement model and (2) assessment of the structural model.

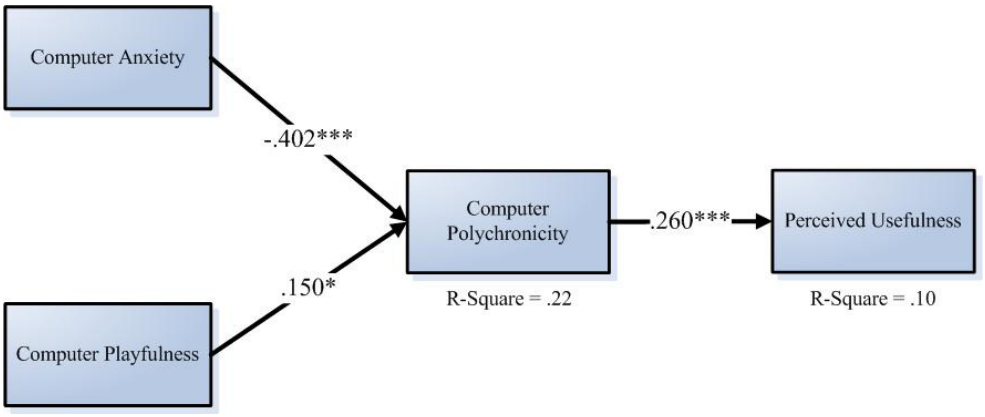
Measurement model assessment entails examining individual item loadings and internal consistency reliabilities to determine model reliability. Evaluation of the item loadings indicated that the measures of computer anxiety and computer playfulness had one item each with loadings below the general cutoff of .70 (Fornell et al. 1981). After removing these items, internal consistencies and item loadings indicated that the model demonstrates high reliability. To establish convergent and discriminant validity, items should load higher on their intended constructs than on any other latent factor, and the average variance extracted should be greater than that shared between the constructs themselves (Gefen et al. 2000). The overall results, summarized in table 4, indicate high reliability and validity of the measurement model.

	Reliability	Computer Anxiety	Computer Playfulness	Computer Polychronicity	Perceived Usefulness
Computer Anxiety	0.81	0.71			
Computer Playfulness	0.85	-0.26	0.79		
Computer Polychronicity	0.96	-0.44	0.26	0.93	
Perceived Usefulness	0.89	0.07	-0.06	0.26	0.79

Notes: Shaded numbers on the diagonal are the square root of the variance shared between the constructs and their measures. Off diagonal elements are correlations among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements.

Table 4. Reliabilities, Average Variances, and Construct Correlations

Assessment of the structural model is accomplished by examining standardized path coefficients, and the variance explained in the dependent constructs. As figure 2 illustrates, the results from the structural model assessment indicate support for all of the study's hypotheses.



Note: * significant at p < .10; ** significant at p < .05; *** significant at p < .01

Figure 2: Structural Model Test Results

DISCUSSION AND IMPLICATIONS

System usage has been described as the missing link in IT payoff research (Kohli et al. 2003) and individual beliefs have been described as important drivers of IT-usage behaviors (Davis, 1989). As a result, the role individual factors play in belief formation about technology is of practical and academic importance. While the literature has recognized the importance of system features and holistic experiences in belief formation about IT (Agarwal et al. 2000), the strategic choices that individuals make to maximize the utility from interacting with technology has not been thoroughly examined. This study adapts a time-use preference construct extensively studied in the management and organizational behavior literature to the IT context, and demonstrates that IT-specific preferences can play influencing roles in belief formation about technology.

The results suggest that IT managers interested in improving the perceived usefulness of a system should sell the system's features that encourage polychronic usage behaviors. Potential users who prefer to work with a wider variety of system features simultaneously and believe it to be the best way of working with IT should be receptive to these features, and perceive the system as relatively more useful. For researchers, the results add to our understanding of belief formation about technology by presenting *preferences* as antecedent factors of perceived usefulness. User preferences can emerge from a variety of beliefs, including how objective instrumental features of technology *and* holistic experiences impact overall utility. In this way, preferences provide a new, integrative category of constructs to examine as antecedents of IT acceptance and use.

Several directions for future research are possible. For one, the role that other preferences play in belief formation is a topic area for future research. Future research could also focus on the impact of computer polychronicity on other important perceptions such as perceived ease of use (Davis, 1989). Finally, future research could investigate other general and/or IT-related traits influencing computer polychronicity.

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