MIS Quarterly

RESEARCH ARTICLE

AN INVESTIGATION OF INFORMATION SYSTEMS USE PATTERNS: TECHNOLOGICAL EVENTS AS TRIGGERS, THE EFFECT OF TIME, AND CONSEQUENCES FOR PERFORMANCE

Ana Ortiz de Guinea
HEC Montréal, 3000 chemin de la Côte Sainte-Catherine,
Montréal, Québec H3T 2A7 CANADA {ana.ortiz-de-guinea@hec.ca}

Jane Webster
Queen's School of Business, Queen's University, 143 Union Street,
Kingston, Ontario K7L 3N6 CANADA {jwebster@business.queensu.ca}

Appendix A

Experiment (Study 2) Results

Table A1. Manipulation Checks

	Description	Result	Explanation of the Test
Manpulation Check 1	Close-ended question about the perceived behavior of Microsoft Word during the task. The possible answers for this question resembled the conditions in the experiment: (1) Microsoft Word behaved properly [which should be associated with the control condition]. (2) Microsoft Word changed the format of my essay but it allowed me to change it back immediately [which should be associated with condition 2]. (3) Microsoft Word changed the format of my essay and it did not allow me to change it back immediately [which should be associated with condition 3].	χ^2 (4) = 128.44; p < .001	Chi-square test to determine whether the experimental conditions relate to the manipulation check as expected.

Manipulation Check 2	Perceptual 7-point scale measure of the participants' control over the interaction with the system adapted from Agarwal and Karahanna (2000) (Cronbach's alpha = .83): • While writing this essay in Microsoft Word, I felt in control of the interaction. • Microsoft Word allowed me to control my computer interaction. • I felt that I had no control over my interaction with Microsoft Word.	Overall Test: ANOVA: $F(2, 99) = 38.29$; $p < .001$; Welch: $F(2, 58.49) = 52.19$; $p < .001$; Brown-Forsythe: $F(2, 41.04) = 41.04$; $p < .001$ *Post Hoc* Analyses: • Significant differences in perceived control between conditions 1 and 2 (Bonferroni: $p < .01$; Games-Howell: $p < .05$), conditions 1 and 3 (Bonferroni: $p < .001$; Games-Howell: $p < .001$), and conditions 2 and 3 (Bonferroni: $p < .001$; Games-Howell: $p < .001$). • Means: condition 1: Mean: 5.56; S.D.: 1.18 condition 2: Mean: 4.70; S.D.: 1.45 condition 3: Mean: 2.68; S.D.: 1.02	ANOVA: • Type III sum of squares was used because it is invariant to cell frequencies and it can be used in unbalanced designs (Field 2005; Tabachnick and Fidell 2007). • For the overall test, Brown-Forsythe and the Welch procedures were used because unbalanced designs often lead to the violation of the assumption of homogeneity of variance (Field 2005). • For the *post hoc* test, the Games-Howell pairwise test procedure was used along with Bonferroni because Games-Howell is most powerful and accurate when variances and sample sizes are unequal (Field 2005).

Table A2. Checks for Potential Covariates

Potential Biases	Result	Explanation of the Test
Experimental administrator	Wilks' Lambda: $F(72, 462.81) = 1.02$; $p > .10$ Pillai's Trace: $F(72, 534) = 1.02$; $p > .10$	MANOVA of the effects of potential biasing variables on the variables of interest (i.e., the components of IS use patterns), emotions (affect and physiological arousal), cognitions (computer and non-computer-related thoughts), behaviors (exploitive and adaptive behaviors), and short-term performance: • Type III sum of squares was used to perform the tests because it is invariant to cell frequencies and it can be used in unbalanced designs (Field 2005; Tabachnick and Fidell 2007). • The Pillai's Trace criterion along with the Wilks' Lambda criterion were used for the omnibus tests because the Pillai's Trace criterion is said to be more robust than the Wilks' Lambda when the design is unbalanced (Tabachnick and Fidell 2007).
Day of the week (weekend vs. weekday)	Wilks' Lambda: $F(12, 89) = 1.20$; $p > .10$ Pillai's Trace: $F(12, 89) = 1.20$; $p > .10$	
Time of the day at which participants participated in the experiment (morning vs. afternoon)	Wilks' Lambda: $F(12,89) = 1.49$; $p > .10$ Pillai's Trace: $F(12, 89) = 1.49$; $p > .10$	

Table A3. Checks for Potential Covariates on Physiological Arousal (Heart Rate Data)		
Potential Biases	**Result**	**Explanation of the Test**
Age	Wilks' Lambda: F(16, 268.48) =.87; p >.10 Pillai's Trace: F(16, 364) =.88; p >.10	MANOVA of the effects of the potential biasing variables on physiological arousal (heart rate data): - Type III sum of squares was used to perform the tests because it is invariant to cell frequencies and it can be used in unbalanced designs (Field 2005; Tabachnick and Fidell 2007). - The Pillai's Trace criterion along with the Wilks' Lambda criterion were used for the omnibus tests because the Pillai's Trace criterion is said to be more robust than the Wilks' Lambda when the design is unbalanced (Tabachnick and Fidell 2007).
Gender	Wilks' Lambda: F(4, 91) =.72; p >.10 Pillai's Trace: F(4, 91) =.72; p >.10	
Time of the day	Wilks' Lambda: F(4, 91) =.69; p >.10 Pillai's Trace: F(4, 91) =.69; p >.10	
Smoking	Wilks' Lambda: F(4, 91) =1.35; p >.10 Pillai's Trace: F(4, 91) =1.35; p >.10	
Caffeine	Wilks' Lambda: F(4, 91) = 1.19; p >.10 Pillai's Trace: F(4, 91) = 1.19; p >.10	
Alcohol	Wilks' Lambda: F(4, 91) = .88; p >.10 Pillai's Trace: F(4, 91) = .88; p > .10	
Exercise	Wilks' Lambda: F(4, 91) = .56; p >.10 Pillai's Trace: F(4, 91)=.56; p>.10	

Table A4. Repeated-Measures ANOVAs

Variable			Results	Explanation of the Test
IS Use Pattern	Emotions	Affect	Time x Condition for Discrepant IT Event 1: $F(2,99) = 2.35$, $p < .05$	Because (1) affect measured before and after each discrepant IT event (thus, not continuously), and (2) the heart rate (measuring physiological arousal) was standardized for the 20 seconds before and after each discrepant IT event and not for the whole time, a series of repeated measures ANOVAs were performed to see how each event impacted affect and the heart rate data respectively. Since changes are expected after each discrepant event, the interaction between time and condition for each event should be significant.
			Time x Condition for Discrepant IT Event 2: $F(2,98) = .27$, $p > .10$ Time: $F(1,98) = .30$, $p > .10$	
			Time x Condition for Discrepant IT Event 3: $F(2,94) = 2.56$, $p < .05$	
		Physio-logical Arousal (Heart Rate)	Time x Condition for Discrepant IT Event 1: $F(2,96) = 20.42$, $p < .001$	
			Time x Condition for Discrepant IT Event 2: $F(2,96) = 3.32$, $p < .05$	
			Time x Condition for Discrepant IT Event 3: $F(2,93) = 1.46$, $p > .10$ Time: $F(1,93) = 7.34$; $p < .01$	
	Cognitions	Computer-Related Thoughts	Mauchly's test for sphericity assumption: χ^2 (299) = 1842.85; $p < .001$	Because the measures of computer-related thoughts, non-computer related thoughts, exploitive behaviors, and adaptive behaviors were measured continuously and coded for each minute of the experimental task, an overall trend analysis through repeated measures ANOVA was performed for each variable. Repeated measures ANOVA with more than 1 degree of freedom for the repeated measures, which is the case here, requires a check for sphericity. The sphericity assumption is "equality of variance of the differences between treatment levels" (Field 2005, p. 428); that is, "[a]ll pairs of levels of the within-subjects variable need to have equivalent correlations" (Tabachnick and Fidell 2007, p. 329). However, when time is a within-subjects independent variable, which is the case here, the assumption of homogeneity of covariances is likely to be violated (Tabachnick and Fidell 2007). In these cases, the use of significance tests that adjust for violations of the sphericity assumption provide a valid F-ratio, such as Greenhouse-Geisser or Hyundt-Feldt (Field 2005; Tabachnick and Fidell 2007). More specifically, Girden (1992) recommends the use of the Huynh-Feldt correction when estimates of sphericity (denoted as ε) are greater than .75, and the use of the Greenhouse-Geisser adjustment when sphericity estimates are less than .75. Consequently, this recommendation was followed. Since changes are expected after each event, the overall effect of time should be significant indicating changes in these variables over the whole period of time; and the specific interaction between time and condition after each discrepant IT event should be significant indicating changes in the variables between conditions as the discrepant IT events take place. These effects fade over time, eventually becoming insignificant, as can be seen in the figures of this appendix.
			Greenhouse-Geisser estimate of sphericity: $\varepsilon = .39$	
			Overall Test: Time: $F(18.46, 904.76) = 3.55$; $p < .001$	
			Contrasts: Time x Condition for Discrepant IT Event 1: $F(2, 98) = 110.62$; $p < .001$ Time x Condition for Discrepant IT Event 2: $F(2,98) = 24.77$; $p < .001$ Time x Condition for Discrepant IT Event 3: $F(2, 98) = 15.81$; $p < .001$	
		Non-Computer-Related Thoughts	Mauchly's test for sphericity assumption: χ^2 (299) = 959.71; $p < .001$	
			Greenhouse-Geisser estimate of sphericity: $\varepsilon = .48$	
			Overall Test: Time: $F(23.14, 1597.56) = 13.02$; $p < .001$	
			Contrasts: Time x Condition for Discrepant IT Event 1: $F(2, 98) = 34.40$; $p < .001$ Time x Condition for Discrepant IT Event 2: $F(2,98) = 12.13$; $p < .001$ Time x Condition for Discrepant IT Event 3: $F(2, 98) = 5.20$; $p < .05$	
	Behaviors	Adaptive Behaviors	Mauchly's test for sphericity assumption: χ^2 (299) = 901.17; $p<.001$	Same explanation as before.
			Greenhouse-Geisser estimate of sphericity: $\varepsilon = .55$	
			Overall Test: Time: $F(26.26, 1286.81) = 2.17$; $p < .05$	
			Contrasts: Time x Condition for Discrepant IT Event 1: $F(2, 98) = 38.48$; $p < .001$ Time x Condition for Discrepant IT Event 2: $F(2,98) = 16.88$; $p < .001$ Time x Condition for Discrepant IT Event 3: $F(2, 98) = 14.25$; $p < .001$	
		Exploitive Behaviors	Mauchly's test for sphericity assumption: χ^2 (299) = 625.87; $p < .001$	
			Greenhouse-Geisser estimate of sphericity: $\varepsilon = .59$	
			Overall Test: Time: $F(14.19, 1390.33) = 6.76$; $p < .001$	
			Contrasts: Time x Condition for Discrepant IT Event 1: $F(2, 98) = 13.32$; $p < .001$ Time x Condition for Discrepant IT Event 2: $F(2,98) = 7.96$; $p < .001$ Time x Condition for Discrepant IT Event 3: $F(2, 98) = 4.22$; $p < .05$	

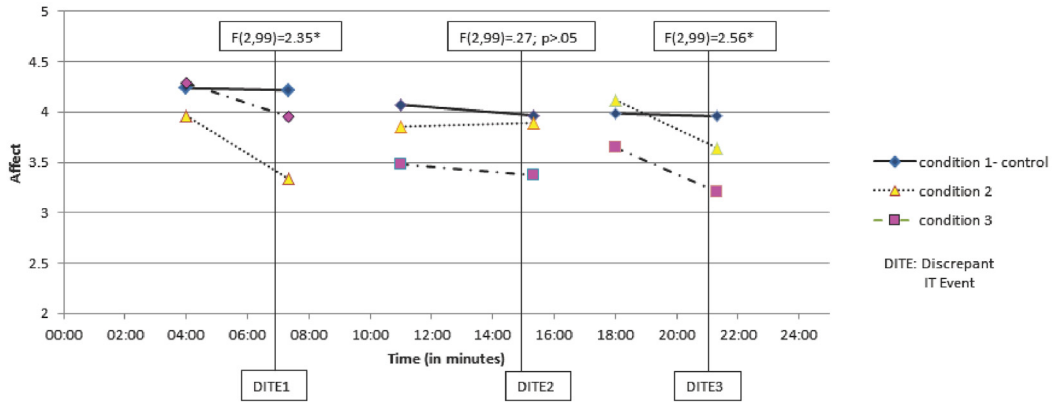

Figure A1. Affect over Time

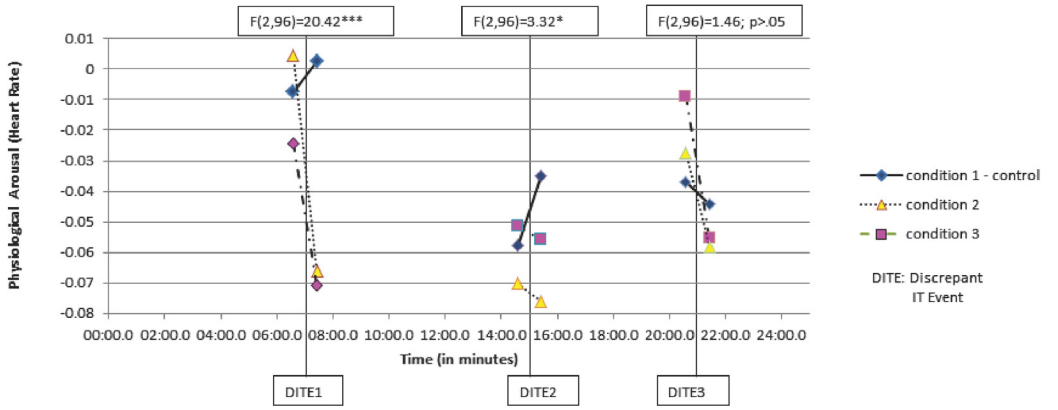

Figure A2. Physiological Arousal over Time

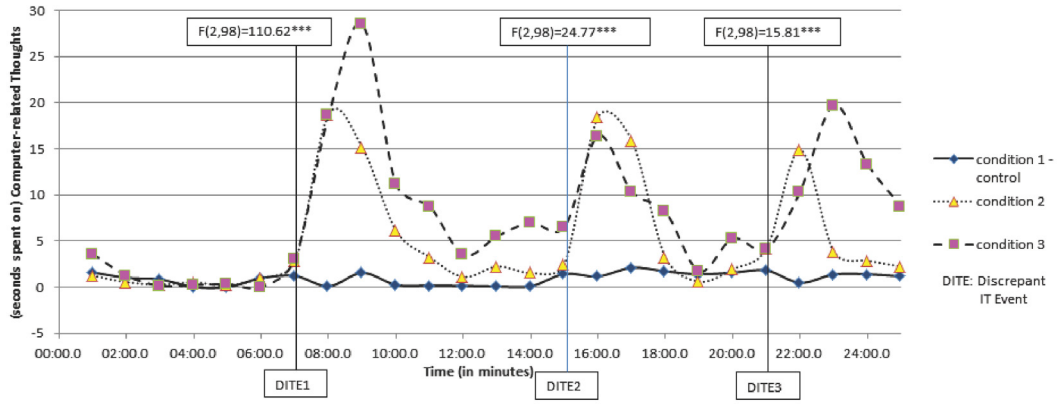

Figure A3. Computer-Related Thoughts over Time (Note: Non-Computer-Related Thoughts follow an opposite variation over time)

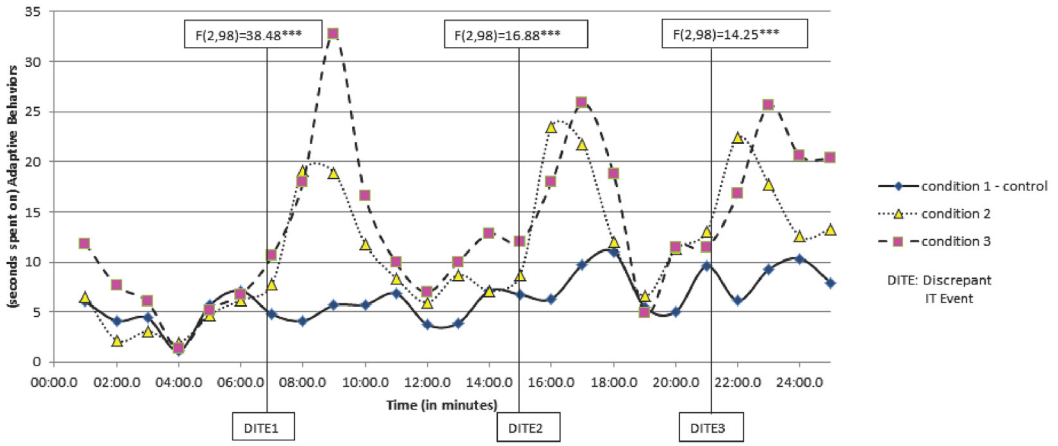

Table A4. Adaptive Behaviors over Time (Note: Exploitive Behaviors follow an opposite variation over time)

References

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