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Habit in the Context of IS Continuance: Theory Extension and Scale Development

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Abstract
Defining "IS habit" as the extent to which using a particular IS has become automatic in response to certain situations, we developed a reliable and validated scale to measure the construct. The final scale was tested in the context of a theoretical model developed based on recent work on IS continuance. The central idea of this model is to consider habit as a moderator of the relationship between intention and continuous IS usage. The paper describes the scale development process and presents the resulting 6-item measurement instrument. Furthermore, it reports on the results of using the scale to test the "moderator-hypothesis".

Keywords

Habit, IS continuance, instrument development, post-adoption

1. Introduction

Based on the work by Fishbein and Ajzen (1975), Rogers (1983) and others, past IS research largely sought to explore how users come to *adopt* a particular IS. However, IS adoption is just the first step towards overall IS success: an IS that does not meet the user's needs may eventually be abandoned (discontinued) – regardless of its successful prior adoption. Realizing the need to better understand *continued* IS usage behavior, researchers have recently begun to study the subject in more detail (c.f., Karahanna, Straub & Chervany 1999, Bhattacherjee 2001, Venkatesh 2002).

Aside from focusing mainly on adoption, past IS research has also been conducted under the implicit assumption that IS usage is mainly determined by intentional (planned) behavior. While plausible in the case of IS adoption, this assumption may not be applicable to continued IS usage behavior as it ignores that frequently performed behaviors tend to become habitual, and thus automatic, over time (Ouelette & Wood 1998). Put differently, people's baseline response to many situations related to continued IS usage may not be predominantly determined by intentional behavior, but rather the result of habitual behavior.

The purpose of this paper is to develop a parsimonious measurement scale of IS habit which we tested with the help of a theoretical model that extends recent work on IS continuance. Here, habit was modeled as a moderator of the relationship between intentions and actual continued IS usage behavior.

Below, we provide a brief overview of the habit construct, introduce a definition of IS habit and describe the various phases of the scale development process. We further present and discuss the results of testing the explanatory power of habit as a moderator of the link between intentions and continued IS usage to provide evidence for the importance of habit in this context.

2. Habit – A Brief Overview of the Construct

While the concept of habit has found only little attention in IS literature (Limayem, Hirt & Chin 2001, Karahanna et al. 1999, Thompson, Higgins & Howell 1991), it has been extensively studied in social psychology (Aarts and Dijksterhuis 2000, Ouelette et al. 1998, Aarts, Verplanken & Van Knippenberg 1998, Triandis 1980); health sciences (Orbell, Blair, Sherlock & Conner 2001); food consumption (Saba & di Natale 2000) and organizational behavior (March & Simon 1958).

Habits are commonly understood as "learned sequences of acts that become automatic responses to specific situations which may be functional in obtaining certain goals or end states" (Verplanken, Aarts, Van Knippenberg & Moonen 1998, pp. 540). Habits require learning (Triandis 1980). In contrast to reflexes, habits are not innate, but represent an individual's learned responses to some kind of stimulus (Verplanken et al. 1998). They are performed automatically (Orbell et al. 2001, Triandis 1980, pp. 204) in the sense that their performance requires little (if any) conscious attention and only minimal mental effort (Ouelette et al. 1998). In contrast to intentional behavior, they neither require any planning for nor deliberate control of the activity in question.

2.1 Defining Habit

Adapted to IS usage, but in line with prior conceptualizations, we suggest to define *IS habit* as *the extent to which using a particular IS has become automatic in response to certain situations*. Defined this way, habit has relatively little conceptual overlap with intention and may thus provide additional explanatory power in explaining IS usage.

Several terms have been used synonymously with habit. Important examples are "frequency of behavior", "past behavior", and "individual experience". In the paragraphs below we differentiate habit from these constructs.

Frequency of behavior. While frequent repetition and practice are critical to habit formation, frequency of (past) behavior by itself only represents a necessary, but *not* a *sufficient* condition (Ouelette et al. 1998).

Past behavior. For ease of measurement, past behavior has often been equated with habit (Thompson et al. 1991) and/or was used as a substitute measure. However, Ajzen argues strongly against this practice: "Only when habit is defined *independently* of (past) behavior can it legitimately be added as an explanatory variable to the theory of planned behavior" (1991, pp. 203; emphasis added). The correlation between past and later behavior is nothing more than an indicator of the behavior's stability or reliability.

(Individual) experience is another concept that has been confused with habit. Similarly to "frequency of behavior" experience should be considered a *precondition* to habit formation. Furthermore, as suggested by Karahanna et al. (1999), experience makes knowledge more accessible in memory which renders low probability events *more salient*, ensuring that they are accounted for in the *formation of intentions*. If we compare this with the "automatic" nature of habits, the mismatch becomes obvious.

3. Modeling Habit as a Moderating Variable

Defining habit so that it does not conceptually overlap with intentions, raises the question of how the two constructs interrelate. Intuitively, one may think that as a behavior becomes more habitual (and thus automatic), intentional behavior (conscious planning) decreases. Supporting this idea, Aarts et al. (1998, pp. 1364) found that habit strength attenuates the amount of information acquired and utilized before "deciding to do something". We therefore argue that if individuals are habitually performing a particular behavior, the predictive power of intention is diminished. In other words, we posit habit to exert a *moderating* effect on the relationship between intentions and IS usage.

Our search for a validated model that would allow us to include the habit construct as a moderating variable and test our measurement scale, led us to Bhattacherjee's (2001) recent work. Based on expectation-confirmation theory, a theory widely used in the consumer behavior literature to study consumer satisfaction, post-purchase behavior and the like, Bhattacherjee's (2001) "Post-acceptance model of IS continuance" seeks to explain an IS user's *intention to continue* using an IS. The model positively relates intentions to both satisfaction and perceived usefulness. Satisfaction and perceived usefulness are in turn positively related to the degree with which the user's expectations about the IS are met (confirmed).

As shown in Figure 1, we extended Bhattacherjee's (2001) model as follows: Intentions to continue using an IS are postulated to be positively related to continuance behavior. This relationship is moderated by the degree to which the behavior in question has become habitual.

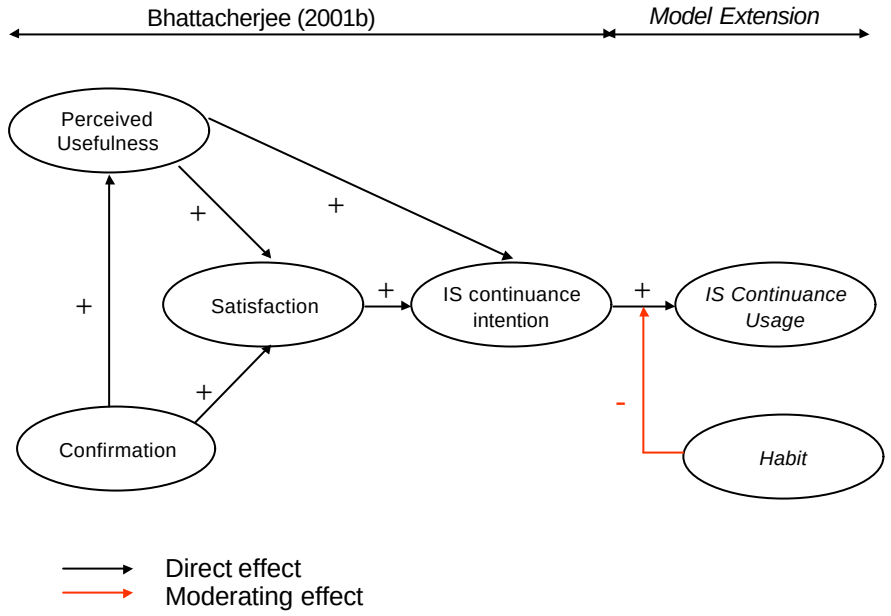

Figure 1: Extended research model, based on (Bhattacherjee 2001)

3.1 Instrument development

The main steps taken in developing the habit scale are based on Churchill's (1979) robust paradigm for developing better measures. This approach has been widely adopted by IS researchers and has worked well in producing measures with desirable psychometric properties. Figure 2 summarizes the steps of developing the habit scale.

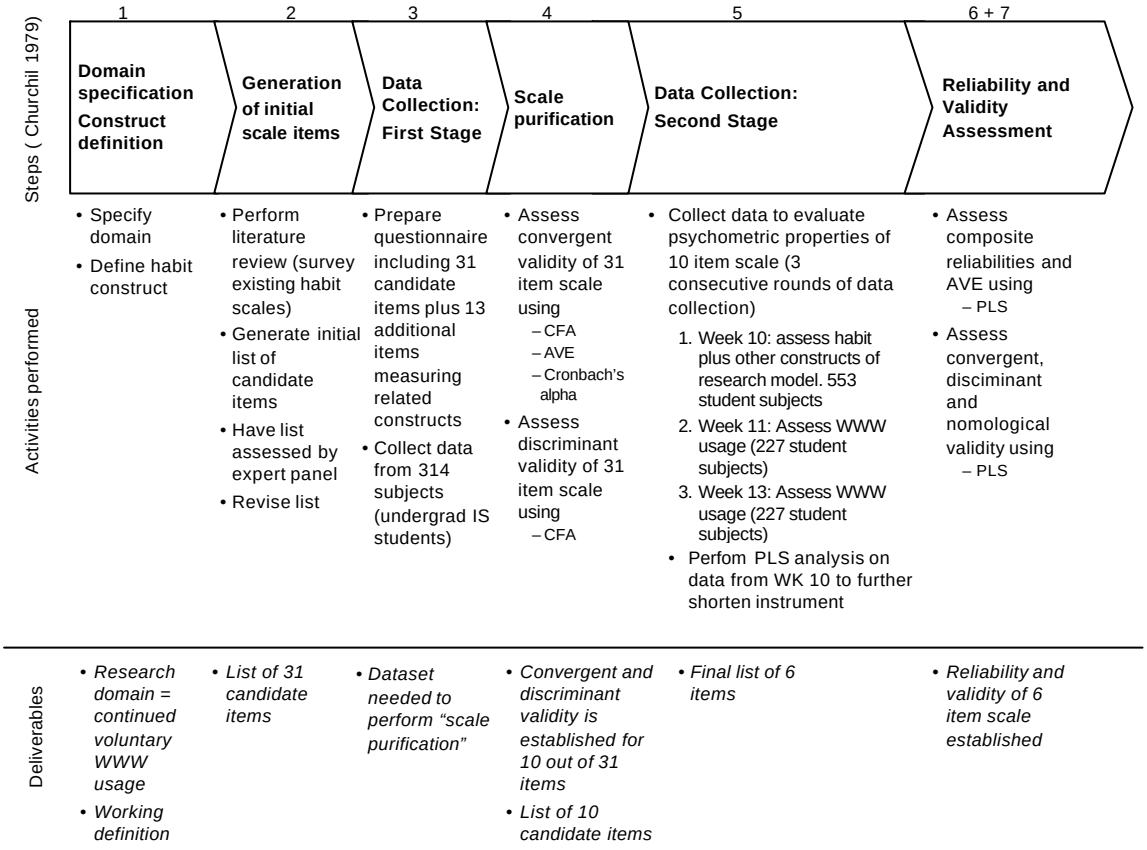

Figure 2: Overview of Scale Development Process employed

Step 1: Specification of the Domain and Definition of the Habit Construct

A major step in instrument development is to delineate its domain. Here, we study the habit of voluntary continued IS (WWW) usage at the individual level of analysis. No distinction was made between work-related and leisure-related usage, neither was www-usage limited to certain www-applications. We believe that despite being developed in the context of a particular IS (here: WWW), the final scale will easily be adaptable to study habitual behavior involving other IS technologies.

Step 2: Generation of Initial Scale Items

Churchill (1979) recommends the use of an extensive literature review and experts' opinions to form the initial list of scale items. Accordingly, we first conducted a thorough literature review to survey existing habit scales. We found most scales to be composed of only 1 or 2 items. Furthermore, many seemed to have been developed ad hoc, i.e., they are not the product of a rigorous instrument development and validation process (see Table 1). Following Mittal (1988) who notes that "a proper operationalization of habit should be based upon its key property; i.e., that it is an "automatic" process", we generated an initial list of 40 items and asked a panel of

experienced researchers for review and refinement. Based on their suggestions, we removed or rephrased problematic items. This process resulted in a list of 31 items.

Study	*Number of items in*	*Wording of items*
(Saba et al. 1998)	1	1. I consume skimmed milk out of habit
(Tourila and Pangborn 1988a)	1	1. I eat ice cream out of habit
(Trafimow 2000) - study 1	1	1. I habitually use (do not use) a condom when I have sex, p.386
(Wittenbraker et al. 1983)	1	1. How many times in the last two weeks when driving a car have you put on a seat belt by force of habit?
(Aarts and Dijksterhuis 2000)	2	1. To what extent do you use the bicycle (train) by force of habit? 2. How frequently did you use the bicycle (train) in the past two weeks?
(Orbell et al. 2001)	2	1. Taking ecstasy is something I do automatically 2. Taking ecstasy is something I do as a matter of habit
(Saba and di Natale 1998) (Saba and di Natale 1999)	2	1. I consume olive oil (seeds oil, butter) out of habit 2. How often do you consume olive oil (seed oil, butter)?
(Towler and Shepherd 1991-1992)	2	1. On average, how often do you eat chips out of force of habit? 2. I eat chips out of habit, p. 40
(Mittal 1988)	3	1. During the past 4 weeks, when I got into my car, I was not even aware and I put on my seat-belt ("use-habit") p. 1001 2. During the past 4 weeks, when I got into my car, I simply forgot to put on my seat-belt ("non-use" habit) I put on my seat-belt by force of habit
(Trafimow 2000) - study 2	3	1. I am in the habit (not in the habit) of making sure a condom gets used every time I have sexual intercourse 2. I am steadfast (not steadfast) about making sure a condom gets used every time I have sexual intercourse 3. I reliably (not reliably) make sure a condom gets used every time I

Table 1: Measures of habit used in previous studies (sorted by number of items in scale)

Step 3: Data Collection - First Stage

To purify the initial 31 items and to reduce our 31-item list to a manageable size prior to full-scale data collection, we prepared a questionnaire that included both our 31 items measuring habit and 13 items measuring four related constructs: attitude, subjective norm, perceived behavioral control, and behavioral intention. It is important to note that we included these constructs only for the purpose of assessing the discriminant validity of the new scale. We did not include them for theoretical development. We chose the four constructs after thoroughly reviewing the relevant literature on Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), and the Theory of Reasoned Action (TRA). All four constructs have validated measures. The questionnaire was completed by 314 undergraduate IS students.[1]

[1] According to DeVellis (1991), a sample size of 300 is adequate for this stage of scale development.

Step 4: Scale Purification

Following Steenkamp and Trijp (1991), we used confirmatory factor analysis (CFA) to assess the convergent validity and discriminant validity of the initial list of items.

4. Convergent Validity

Measuring convergent validity checks whether there is evidence of similarity between measures of theoretically related constructs (DeVellis 1991). Here, we examined convergent validity through a single factor model in a CFA using LISREL[2]. As shown in Table 2, 10 out of the 31 items had loadings equal to or higher than 0.60. The results illustrate a strong degree of convergent validity (Bagozzi & Yi 1988). Convergent validity of the measures was further ensured with a composite reliability of 0.92 and an average variance extracted of 0.53 (Hair, Anderson, Tatham & Black 1998). Cronbach alpha of the 10 items was also found to be 0.91, which is considerably higher than Nunnally's (1978) suggested acceptable value of 0.70.

Habit Items	Loadings
I normally use the WWW without explicitly planning to do so.	0.77
I use the WWW as a matter of habit.	0.72
I use the WWW automatically.	0.83
It is a habit of mine to use the WWW.	0.73
Starting the WWW is a habitual act.	0.70
Using the WWW has become a habit to me.	0.73
Using the WWW has become automatic to me	0.79
Using the WWW is natural to me.	0.67
When faced with a particular task, I habitually use the WWW.	0.70
When faced with a particular task, using the WWW is an obvious choice for me.	0.69
Composite Reliability = 0.92 Average Variance Extracted = 0.53 Cronbach alpha = 0.91	

Table 2: Convergent Validity of the Habit Scale

Discriminant Validity

Testing for discriminant validity checks whether the candidate scale items measure the construct in question or other (related) constructs. We performed a series of confirmatory factor analyses modeling habit to correlate with attitude, subjective norm, perceived behavioral control, and behavioral intention, respectively. We first ran each model imposing a correlation of 1 between the two constructs. Then we ran another model with a freely estimated correlation between the two constructs. According to Segars and Grover (1993) discriminant validity is demonstrated if

[2] The covariance matrix is not included in this paper due to the space limitation. It is available from the authors upon request.

	Discriminant validity tests for Habit paired with							
	Attitude		**Subjective Norm**		**Perceived behavioral control**		**Behavioral Intention**	
	d.f.	**Chi-square**	**d.f.**	**Chi-square**	**d.f.**	**Chi-square**	**d.f.**	**Chi-square**
Fixed	77	431.56	54	337.87	65	353.70	77	536.19
Free	76	409.08	53	249.85	64	339.24	76	405.66
Difference		22.48		88.02		14.46		130.53
Distinct Constructs?		Yes		Yes		Yes		Yes

Table 3: Discriminant Validity Tests for the Habit Scale

there is a significant difference of the chi-square statistics (i.e., Chi-square difference is greater than 3.84) between the constrained and unconstrained models. As reported in Table 3, all chi-square difference tests are statistically significant, permitting us to claim discriminant validity for the 10 remaining items of our initial list.

Step 5: Data Collection – Second Stage

The purpose of this step was to collect data for further evaluation of the psychometric properties of the 10 remaining candidate items. The data collection involved three rounds. Round 1 (Week 10 of the academic semester) assessed the following constructs: perceived usefulness, confirmation, satisfaction, IS continuance intention, and habit. Rounds 2 and 3 (Week 11 and Week 13, respectively) assessed continued IS usage in a longitudinal setting.

Round 1

A self-administrated questionnaire was distributed to students of a local university. In order to be able to match the students' answers to this first questionnaire with those corresponding to the questionnaires to be distributed in rounds 2 and 3, we asked the students to identify their responses via the last four digits of their mobile phone number. A total of 553 valid answers were collected in round 1.

Round 1 data was analyzed using Partial Least Squares (PLS). As shown in Table 4, all items had loadings equal to or higher than 0.79. Convergent validity of the measures was ensured with composite reliability at 0.92 or above, average variance extracted at 0.69 or above, and Cronbach alpha at 0.88 or above. We selected the six items with the best psychometric properties to constitute our final scale (as highlighted in Table 4).

		Item-to-Total Correlation	ITEM LOADING
Perceived Usefulness (Davis, 1989)			
CA = 0.875	1. The WWW is of benefit to me.	0.903	0.903
CR = 0.923	2. The advantages of the WWW outweigh the disadvantages	0.884	0.879
AVE = 0.800	3. Overall, using the WWW is advantageous.	0.898	0.902
Habit (New scale)			
CA = 0.951	12. I use the WWW automatically.	0.807	0.806
CR = 0.957	13. When faced with a particular task, I habitually use the WWW.	0.795	0.797
AVE = 0.691	14. I use the WWW as a matter of habit.	0.864	0.860
	15. Using the WWW has become automatic to me.	0.867	0.860
	16. I normally use the WWW without explicitly planning to do so.	0.788	0.781
	17. Using the WWW is natural to me.	0.855	0.856
	18. When faced with a particular task, using the WWW is an obvious choice for me.	0.833	0.831
	19. Starting with WWW is a habitual act.	0.794	0.790
	20. Using the WWW has become a habit to me.	0.868	0.857
	21. It is a habit of mine to use the WWW.	0.867	0.871
IS Continuance Intention (Bhattacherjee, 2001)			
CA = 0.935	22. I intend to continue using the WWW rather than discontinue its use.	0.837	0.826
CR = 0.961	23. My intentions are to continue using the WWW than use any alternative technology.	0.796	0.791
AVE = 0.726	24. If I could, I would like to continue my use of WWW.	0.891	0.892
	25. I will continue to use the WWW in the future.	0.910	0.908
	26. All things considered, I expect to continue using the WWW in the future.	0.883	0.882
	27. All things considered, it is likely that I will continue to use the WWW in the future.	0.892	0.895
Confirmation Bhattacherjee (2001)			
CA = 0.881	28. My experience with using the WWW was better than what I expected.	0.892	0.884
CR = 0.927	29. The benefit provided by the WWW was better than what I expected.	0.916	0.920
AVE = 0.808	30. Overall, most of my expectations from using the WWW were confirmed.	0.889	0.893
Satisfaction Bhattacherjee (2001)			
CA = 0.891	31. How do you feel about your overall experience of the WWW use?		
CR = 0.924	a. Dissatisfied to Satisfied	0.821	0.854
AVE = 0.752	b. Displeased to Pleased	0.893	0.906
	c. Frustrated to Contented	0.892	0.868
	d. Terrible to Delighted	0.870	0.840
Note: CA = Cronbach Alpha, CR = Composite Reliability, AVE = Average Variance Extracted			

Table 4: Psychometric Properties of Measures of Round 1 Data (n=553)

Rounds 2 and 3

Rounds 2 and 3 were conducted in Week 11 and Week 13, respectively. Here we sought to assess the students' continued (voluntary) IS usage in a longitudinal setting. In both rounds, a questionnaire consisting of only two questions was distributed to the same group of students who had already answered our questionnaire in round 1. The questions assessed the students' perceived usage of the WWW with respect to frequency of access and usage time. Across the three rounds, we obtained a total of 227 valid and complete data sets.

Step 6 & 7: Reliability and Validity Assessment

The purpose of these steps was to further evaluate the psychometric properties of the measures of our research model described in Figure 1. Most of the measures were borrowed from validated scales in prior research (for details see Table 4). Here, we also used PLS to assess the scale's convergent validity, discriminant validity, and nomological validity.

The constructs "perceived usefulness", "confirmation", "satisfaction", "habit", "IS Continuance Intention" were measured with reflective items, while the "IS continuance usage" was measured with formative items.

Convergent Validity

Table 5 presents information concerning the weights and loadings of the measures of our research model. The items in bold represent paths significant at the 0.01 level. Weights are relevant for the formative measures while loadings are relevant for the reflective ones. The two formative items in the model with weights at 0.72 (t-value = 9.12) and 0.44 (t-value = 4.49), demonstrated a substantive contribution to their corresponding construct. Additionally, all our reflective measures fulfill the recommended levels of the composite reliability and average variance extracted (see Table 5).

Overall, these results provide strong empirical support for the reliability and convergent validity of the scales of our research model.

Construct	Item	Weight	Loading	St. Error	t-value
Perceived Usefulness	Perceived Usefulness 1		0.929	0.032	30.070
CR= .932	Perceived Usefulness 2		0.880	0.015	59.790
AVE= .821	Perceived Usefulness 3		0.908	0.028	33.040
Confirmation	Confirmation 1		0.857	0.034	25.477
CR= .919	Confirmation 2		0.905	0.015	58.573
AVE=.791	Confirmation 3		0.906	0.016	57.241
Satisfaction	Satisfaction 1		0.811	0.031	26.566
CR=.908	Satisfaction 2		0.889	0.015	57.847
AVE=.712	Satisfaction 3		0.839	0.031	26.523
	Satisfaction 4		0.833	0.025	33.631
IS Continuance Intention	IS Continuance Intention 1		0.833	0.028	30.494
CR= .951	IS Continuance Intention 2		0.795	0.042	19.033
AVE= .764	IS Continuance Intention 3		0.909	0.015	63.049
	IS Continuance Intention 4		0.897	0.017	52.290
	IS Continuance Intention 5		0.906	0.015	59.080
	IS Continuance Intention 6		0.899	0.016	55.149
Habit	Habit 1		0.880	0.020	44.110
CR=.947	Habit 2		0.860	0.032	27.480
AVE=.749	Habit 3		0.845	0.027	31.430
	Habit 4		0.837	0.027	30.680
	Habit 5		0.882	0.021	40.930
	Habit 6		0.887	0.028	32.650
IS Continuance Usage	Usage 1	0.717		0.081	9.123
	Usage 2	0.436		0.097	4.485
Note: CR = Composite Reliabilty, AVE = Average Variance Extracted					

Table 5: Construct Weights and Loadings

Discriminant Validity

Discriminant validity was verified with the squared root of the average variance extracted for each construct higher than the correlations between it and all other constructs (Fornell & Larcker 1981). As shown in Table 6, each construct shares greater variance with its own block of measures than with the other constructs representing a different block of measures.

	Perceived Usefulness	Confirmation	Satisfaction	IS Continuance Intention	Habit
Perceived Usefulness	**0.906**				
Confirmation	0.599	**0.890**			
Satisfaction	0.427	0.492	**0.844**		
IS Continuance Intention	0.749	0.765	0.507	**0.874**	
Habit	0.650	0.755	0.443	0.490	**0.865**

Table 6: Correlations between Constructs (Diagonal elements are square roots of the average variance extracted)

Following Chin (1998), we further used the cross-loading method to assess discriminant validity of the scales employed in testing our research model. Table 7 reports the loading and cross-loading of all reflective measures in the model. Searching down the columns, one can see that the item loadings in their corresponding columns are all higher than the loadings of the other

items used to measure the other constructs. Furthermore, when searching across the rows, one finds the item loadings to be higher for their corresponding constructs than for others.

Table 7: Loadings and Cross-Loadings for Reflective Measures

	Perceived Usefulness	Confirmation	Satisfaction	IS Continuance Intention	Habit
Perceived Usefulness 1	0.630	0.498	0.277	0.543	0.465
Perceived Usefulness 2	0.642	0.609	0.403	0.602	0.605
Perceived Usefulness 3	0.667	0.415	0.214	0.484	0.446
Confirmation 1	0.312	0.665	0.232	0.446	0.419
Confirmation 2	0.364	0.657	0.240	0.488	0.490
Confirmation 3	0.418	0.641	0.237	0.527	0.518
Satisfaction 1	0.304	0.371	0.674	0.375	0.366
Satisfaction 2	0.214	0.341	0.594	0.296	0.246
Satisfaction 3	0.131	0.292	0.644	0.245	0.183
Satisfaction 4	0.185	0.357	0.595	0.289	0.235
IS Continuance Intention	0.364	0.413	0.490	0.569	0.540
IS Continuance Intention	0.453	0.498	0.238	0.629	0.525
IS Continuance Intention	0.460	0.531	0.260	0.659	0.566
IS Continuance Intention	0.430	0.531	0.280	0.648	0.532
IS Continuance Intention	0.467	0.535	0.291	0.634	0.516
IS Continuance Intention	0.431	0.534	0.251	0.625	0.522
Habit 1	0.400	0.455	0.234	0.538	0.599
Habit 2	0.355	0.478	0.207	0.529	0.602
Habit 3	0.409	0.498	0.240	0.557	0.625
Habit 4	0.364	0.488	0.216	0.472	0.585
Habit 5	0.357	0.484	0.244	0.534	0.608
Habit 6	0.409	0.511	0.262	0.541	0.625

5. Data Analysis & Results

The validated measures were subjected to PLS for further model testing. Modeling habit as a moderator, we expected it to exert a negative impact on the relationship between IS continuance intention and IS continuance usage.

In formulating and testing for interaction effects using PLS (as recommended by Chin, Marcolin & Newsted 1996), one needs to follow a hierarchical process similar to multiple regression where one compares the results of two models (i.e., one with and one without the interaction construct).

The standardized path estimate from habit to the intention-usage path indicates how a change in the level of the moderator construct Z (habit) would change the influence of the main construct X (intention) to the dependent construct Y (IS usage). Thus, if intention has an estimated beta effect of B on IS usage, a beta M for the interaction path can be interpreted as a beta change to

B+M for the estimated path from intention to usage when habit increases by one standard deviation from the baseline of zero (Chin et al. 1996).
One can also compare the R-square for this interaction model with the R-square for the "main effects" model, which excludes the interaction construct. The difference in R-squares is used to assess the overall effect size f^2 for the interaction where .02, 0.15, and 0.35 has been suggested as small, moderate, and large effects respectively (Cohen 1988). It is important to understand that a small f^2 does not necessarily imply an unimportant effect. If there is a likelihood of occurrence for the extreme moderating conditions and the resulting beta changes are meaningful, then it is important to take these situations into account.
The results of our analyses are shown in Figure 3 which reports standardized beta for habit and intention of 0.329 and 0.694, respectively, and an R-square of 0.214 for IS continuance usage. The inclusion of the interaction effects (see Figure 4) indicates an equally strong beta of –0.276 increasing the R-square for usage to 0.271.

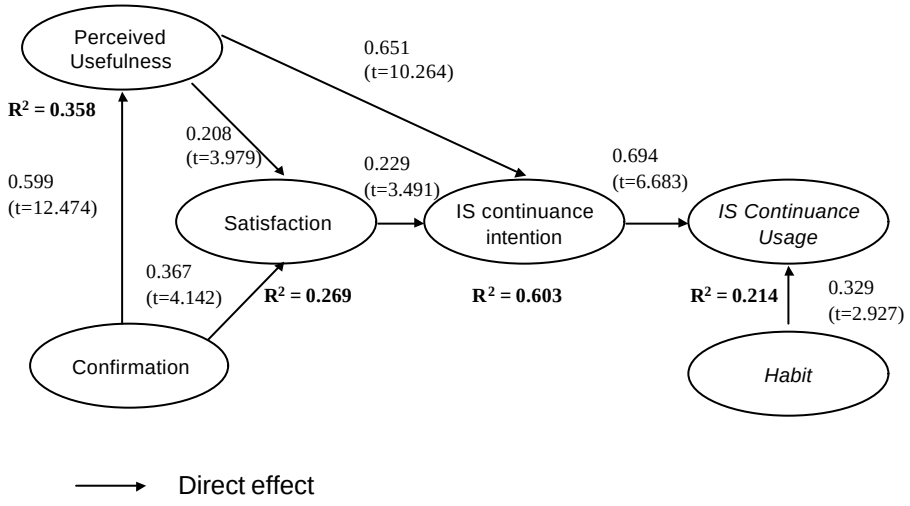

Figure 3: Research Model (without interaction effect)

These results imply that one standard deviation increase in habit will not only impact usage directly by 0.323, but will also *decrease* the impact of intention significantly from 0.551 to 0.275. Based on the hierarchical difference test, the interaction effect was found having effect size *f* of 0.08 which represents a medium effect (Chin et al. 1996).

To assess whether the interaction effect and main effects were significant, a jackknife resampling procedure was performed. The results of 227 resamples indicate that all paths were significant at the 0.01 level, and the proposed research model can explain 27% of variance in IS continuance usage (see Figure 4)

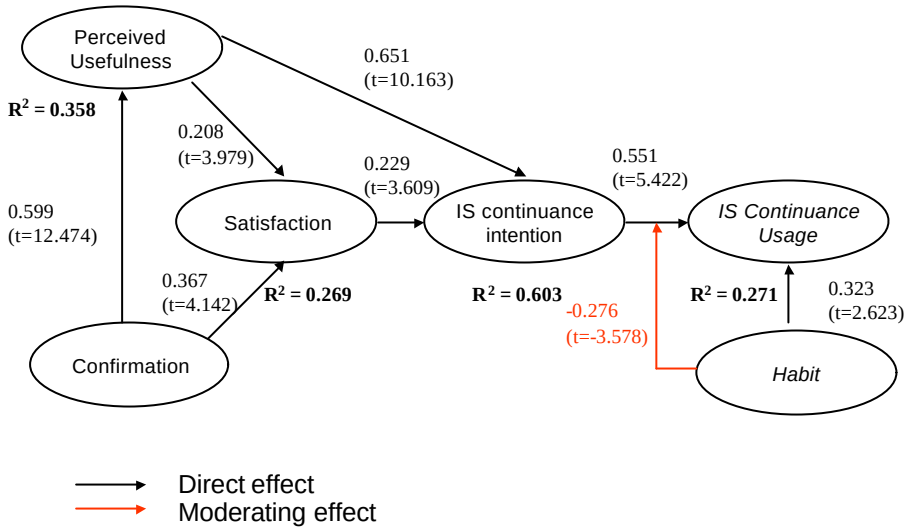

Figure 4: Research Model (With interaction effect)

6. Discussion and Conclusion

The purpose of this study was to define the habit construct, develop a reliable and validated scale and test its explanatory power regarding voluntary continued IS (here: WWW) usage behavior. As reported above, the new 6-item scale meets established validity and reliability requirements. Confirming the assumption that habit acts as a moderator of the relationship between intention and actual behavior, we also showed that the influence of intention on IS continuance varies depending on the strength of one's habit. This finding is compatible with Triandis' (1980) argument that as long as a behavior is new to a person, the person's intention to perform the behavior clearly influences his or her actual behavior. However, as the person gains more practice with the behavior we are likely to observe a shift in importance from intentional towards habitual behavior.

While this study contributes to research by refining existing work on IS continuance through theory extension and scale development, it is also relevant for practitioners. Both the introduction of new systems (e.g., e-business applications, CRM, ERP, new communication media) and the removal of old ones frequently raise questions about how to deal with lower than expected or declining usage rates, unwanted continued usage of out-dated systems, and so forth. Adding a parsimonious, yet reliable instrument to the decision maker's diagnostic tool box that helps assess the extent to which people *habitually use* a particular IS, can help decision makers select ways for improvement that adequately address their company's needs. If the results of such an assessment indicated, for example, that the successful introduction of a new system is hampered by the users continued (habitual) usage of the old system, it is unlikely that any managerial intervention trying to change the users' intentions will work. Instead, management may consider one of the following methods to remedy the problem:

Impeding performance of established usage behavior while facilitating evolution of new behaviors into habits (e.g. through (short-term) rewards).

Changing the environment to separate the individual from the stimulus that is prompting the habitual behavior (e.g., by substituting an old application for a new one).
Gradually introducing new systems, for example, by involving future users in their development or implementation early on — this may be particularly helpful if people fear the change associated with the introduction of the new system and thus would opt to resist it instead of embracing it.
Interrupting the employees' routines through unexpected, unusual, or novel events. Interruptions can trigger actors to review and revise their procedures or processes (Tyre & Orlikowski 1994).
In conclusion, this study constitutes a first step towards a better understanding of the determinants of IS usage continuance. By providing a parsimonious and rigorously validated measure of habit, we hope to have contributed to building a fruitful cumulative tradition in this important area of research. We also feel that this study paves the way to several other important questions to be explored. For instance, it would be interesting to explore how "IS habits" change over time and how their development relates to the establishment of organizational routines.

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