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Contingent dynamics of IS alignment in SMEs

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CONTINUANCE USAGE INTENTION IN MICROBLOGGING SERVICES: THE CASE OF TWITTER

Abstract

The emergence of Web 2.0 has brought with it a plethora of social networking technologies. Among these, microblogging has emerged as a new and popular tool for short, frequent communication via Web postings. The most popular microblogging service, Twitter, has established a large user base, in spite of numerous criticisms. This study aims to examine why this is the case. In particular, the study develops a model of microblogging use continuance based on theories of continuance, habit and critical mass. The model is then tested by means of a Web survey of Twitter users (n=131) and structural equation modelling using the partial least squares technique. The results suggest that continued use intention is strongly determined by perceived usefulness, satisfaction and habit ($R^2=0.454$) which together provide a strong explanation for Twitter user behaviour. Further, critical mass and frequency of prior behaviour, both influenced by social network size, are strong determinants of the habit construct. The paper rounds off with conclusions and implications for future research and practice in this very new area of inquiry.

Keywords: microblogging; microblogs; continuance; critical mass; habit; Twitter.

1 INTRODUCTION

Dramatic changes are afoot in how users interact using the World Wide Web. The concept of 'Web 2.0' or 'social software' has become used to describe revolution-like developments associated with Internet applications like wikis, weblogs and social networking software. Although the term 'Web 2.0' was first introduced around 2004, the development process has been a continual one, spawning ever new types of software. One of the newest developments in this area is that of 'microblogging'. As the technology is so new there are even several opinions about its name. In addition to 'microblogging' terms like 'microsharing' and 'activity streaming' are also typically used.

Notwithstanding the strong adoption of microblogging by private users and enterprises there is, as yet, very little academic research on the topic. Microblogging in general and the currently most popular microblogging service Twitter (www.twitter.com) in particular are presently among the most discussed Web 2.0 tools in the 'blogosphere' and in spite of substantial positive arguments many users complain about a lack of functionality or reliability issues. Considering the fact that Twitter use is nevertheless not declining but sharply rising there must be strong reasons why users continue using the service. Discovering an explanation for this finding could help us to understand the processes in microblogging platforms as well as to provide implications for the successful future implementation of microblogs in enterprise contexts.

The rising adoption of Twitter is a perfect setting for research in IS continuance theory. The purpose of our work is to understand the continued use of the microblogging service by its general users. The research question to be answered is "Why do users of the Twitter microblogging service continue to use the platform?" For this purpose we developed a research model using continuance theory (Bhattacharjee 2001) and related theories of habit (Limayem et al. 2007) and critical mass (Van Slyke et al. 2007). Data was collected via a Web survey of Twitter users. The data was then analysed using structural equation modelling via the partial least squares technique (Chin 1998).

The structure of the paper is as follows. In the next section we provide some background on the nature and growth of microblogs. In the following section we discuss the theoretical development of a research model of continuance in microblogging services. In the third section we describe the study's methodology before presenting the results of the analysis in section four. Finally we discuss the findings and their implications for research and practice in the conclusions.

2 BACKGROUND

Microblogs are a smaller version of weblogs combined with features for social networking and mobility. Users post short updates without a headline or additional information in their microblog. Other members can add them to their social network (i.e. 'follow' them). The messages from a member's social network appear in a chronologically ordered and combined view on their starting page. Most microblogging services limit the number of characters used in a posting to 140 or similar. The goal is to animate users to post short messages often in their microblogs. Access to microblogging services is also possible using mobile text messages, desktop clients or several third party applications.

The first and currently the most popular microblogging service is Twitter. Having earned an estimated US\$20 million of venture capital (Crunchbase 2008) the service has seen an exponential growth in its user base since launching in July 2006 to an estimated 3 million users in September 2008 (Twitter Facts 2008). Twitter shapes the understanding of microblogging by asking the user "what are you doing?". Around Twitter a whole ecosystem of third party applications have been developed and much of the microblogging vocabulary has its origins in this particular service, e.g. the verb "tweet" for the action of posting into a microblog. In the U.S. Twitter appears to have reached critical mass and is becoming common sense. For instance, President Barack Obama used Twitter massively in his

election campaign. As Twitter has become perceived as a standard many so-called Twitter-clones have emerged, in part due to the relative ease in imitating the software. Serious competitors such as Pownce, Plurk and Jaiku tried to differentiate from Twitter by offering wider functionality or slightly different approaches. Google's acquisition of Jaiku (in 2007) and Facebook's offer for Twitter worth US\$500 million in shares (in 2008) demonstrated the strategic importance of microblogs. Eventually, a first rationalisation of the market led to the closure of Pownce in December 2008. Notwithstanding, new competitors entered the market in 2008 with open source microblogging software like laconi.ca; different installations of this program communicate with each other and contribute towards building a big peer-to-peer microblogging network.

Gartner (2008) added microblogging to its hype cycle in 2008 and predicts that the technology will garner a sharp rise in popularity. This was also a consequence of the fast growing debate on using Twitter-like tools in professional contexts. While Twitter itself can be an interesting channel for companies to develop their brands and improve their customer service, many argue that due to privacy regulations there should be such a tool behind the company firewall. Major companies such as IBM, Oracle and SAP experimented with so-called enterprise microblogs and in the second half of 2008 special enterprise microblogging products like Communote, Presently and Yammer were launched.

3 THEORY AND RESEARCH MODEL

In this section we present prior research and concepts that have informed the development of the research model tested in the study. Three main strands of theory have contributed to theoretical development: continuance theory as the basic theory of our investigation complemented with concepts of habit and critical mass. Let us briefly discuss each of these areas in turn.

3.1 Continuance theory

Continuance theory within the discipline of information systems stems from initial research in marketing. Expectation-confirmation theory (ECT) emerged from the consumer behaviour and services marketing literature and has proven broadly robust in a number of service contexts (Dabholkar et al. 2000, Oliver 1993). The general thrust of ECT is the assessment of post-purchase intentions, as influenced by initial expectations about a product or service, subsequent adoption and use (consumption) and the formation of perceptions about performance as influenced by the confirmation or not of initial expectations, the latter determining the level of satisfaction with a purchase and subsequent repurchase or use discontinuance. Bhattacharjee (2001) was the first to fully formalize the theory into an ex-post framework that could be applied to the domain of information systems, adapting the theory to be applied post-acceptance and to encapsulate perceived usefulness (Davis et al. 1989, Davis 1993) as a replacement construct for expectations. Perceived usefulness has consistently proven to be an important construct in longitudinal adoption to post-adoption behaviour (Davis et al. 1989, Karahanna et al. 1999). Thus Bhattacharjee's (2001) model relates the constructs of perceived usefulness and satisfaction to the extent of confirmation of a user's expectations about an IS, whereby expectations that are fulfilled drive greater satisfaction and perceived usefulness. High levels of perceived usefulness are also posited to lead to greater satisfaction with a system. In turn, the outcome variable of continuance intention is determined by the level of satisfaction with an IS and the perceived usefulness of the system.

Bhattacharjee's model has been successfully applied to individual user contexts involving the Web, such as online banking, and the Internet more broadly (Bhattacharjee 2001, Limayem et al. 2007). Microblogging services are also distributed systems reliant on Internet technology, and the focus of this study is on individual users; Bhattacharjee's theory (which appears to have broader application and generalization in any case) is adopted as a suitable core for a model examining continuance behaviour in this context.

3.2 Habit

Habit refers to the extent to which behaviour has become automatic as a result of prior learning (Limayem et al. 2007). Previous research has found a strong relationship between habit and continuance behaviour. However, the use of habit in research models is more complex. Research has variously examined habit as a moderator between intention and actual behaviour, as a direct effect on actual behaviour, and as an indirect effect on behaviour that primarily determines intentions. Our focus in this research is on use intentions rather than actual behaviour, and so naturally we focus on the latter of these formulations. Our focus on intentions is in line with a core body of previous IS literature (Legris et al. 2003), whilst the focus on indirect habit effects is a view that is held in a number of previous studies that have examined the effects of habit (and the much used proxy construct of experience) on behavioural intentions (Bagozzi & Warshaw 1990, Legris et al. 2003).

In addition to the effect of habit on intention to continue using an IS, we also posit that habit is significantly influenced by satisfaction. Limayem et al. (2007) in their comprehensive definition, application and analysis of the habit construct in continuance theory find very strong support for the linkage between satisfaction and habit. Further, they find that frequency of prior usage and comprehensiveness of usage both have a positive associations with habit, both assertions that we also make for the purposes of model development.

The creation of habit requires a stable context conducive to its formation through repetition or practice (Orbell et al. 2001); we would hold that such a context exists when focusing on individuals' behaviour with respect to a single system such as a microblogging service. This position is in line with that of Limayem et al. (2007) in their study of habitual use of the Internet.

3.3 Critical Mass and Perceived Critical Mass

Critical mass in technology adoption has been discussed in the literature for many years (e.g. see Markus 1994; Rogers 1995). Some of the seminal work in this area was that of Rogers (1995) as part of his diffusion of innovation theory. Rogers (1995) defined critical mass in terms of a 'tipping point' whereby a certain minimum number of users have adopted an innovation which then feeds into rapid continued adoption of the new technology, at which juncture further adoption is self-sustaining. Further research into the application of critical mass theory to electronic communication media has demonstrated that universal access to a communication medium is major driver for critical mass; the decision to use a particular interactive media for routine communication relies on others in a communication network having adopted it and an overall social consensus (Markus 1994). Social context thus envelops individuals' choices and "As more and more individuals in a system adopt an interactive communication innovation, the innovation is perceived as increasingly beneficial to both previous and potential adopters" (Van Slyke et al. 2007, p 274). As a result, positive network externalities ensue as a result of technology use (Lou et al. 2000, Van Slyke et al. 2007).

Van Slyke et al. (2007) examined perceived critical mass within the context of instant messaging, which has similarities to microblogging. They applied diffusion of innovation theory and found direct effects on numerous variables, including social norms, perceived relative advantage, perceived compatibility, ease of use and behavioural intention. As part of continuance theory we focus on continuance intention; however, in our habit model we posit that the effects of critical mass will manifest themselves indirectly through automatic behaviour. Thus, based on Markus (1994), an individual will exhibit greater habitual behaviour and choose a technology for interactive communication if there is a greater perception of critical mass. Such a perception will be driven, at least in part, by the size of an individual's network – the extent of their personal communication network on the microblogging service. Further, the size of a network is posited to play a role in determining the frequency and comprehensiveness of an individual's behaviour: the greater the extent of the network, the greater possibilities there are for communication, coordination and cooperation, and the more activity that will take place.

3.4 Research Model and Hypotheses

A combination of all of the above theorisations into a single model results in Figure 1. Here we use Bhattacherjee's (2001) continuance theory as basic core of our research model (marked white in Figure 1). This leads to our first basic hypothesis:

H1: Bhattacherjee's continuance theory can be applied to explain Twitter usage.

Further, we extend the model with the construct of habit and the relationship from satisfaction (Limayem et al. 2007). In contrast to Limayem et al. (2007) however, we model it as a direct effect on continuance intention:

H2: Satisfaction has a direct effect on habit.

H3: Habit has a direct effect on continuance intention.

We accept the habit indicators of frequency of past behaviour and comprehensiveness of usage introduced by Limayem et al. (2007) and extend these constructs with perceived critical mass due to the property of Twitter as a communication tool.

H4: Habit in microblogging usage is driven by: (a) perceived critical mass; (b) frequency of past behaviour; and, (c) comprehensiveness of usage.

As a basic determinant for these three constructs we introduce social network size:

H5: The construct of social network size is a driver of: (a) perceived critical mass; (b) frequency of past behaviour; and, (c) comprehensiveness of usage.

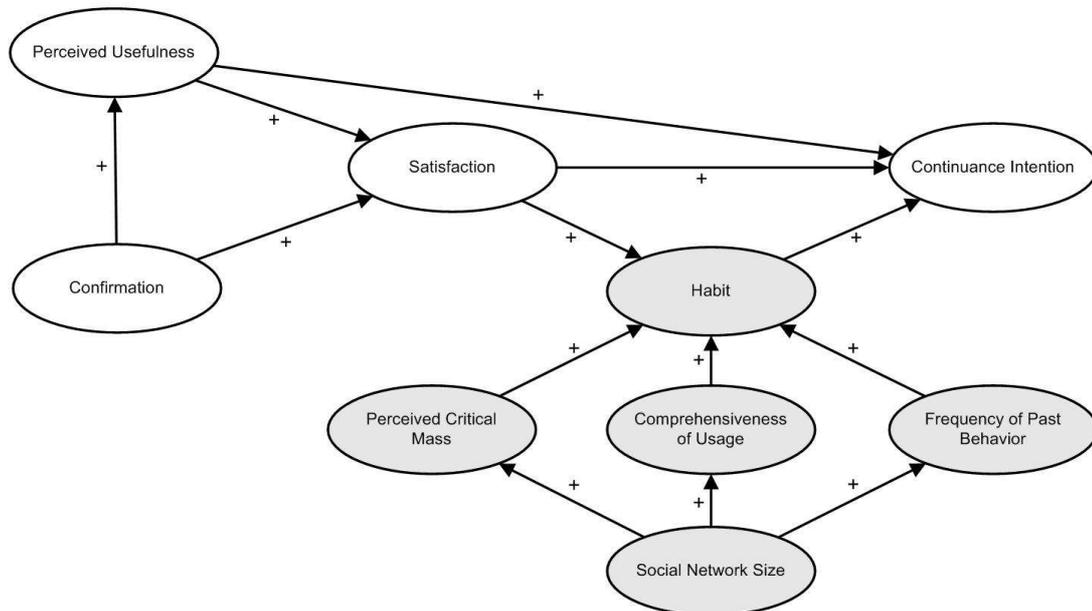


Figure 1. Research Model.

4 STUDY DESIGN AND METHOD

In this section we briefly outline the process of data collection, scale development and data analysis. Let us examine each of these in turn.

4.1 Data Collection

Twitter is clearly the best known microblogging service on the Web. This is one reason why we chose this platform as the basis for our investigation. Another point is that Twitter has had several downtime and reliability issues during 2008 and most recently additional, smaller competitors have emerged with broader functionality. Even in the face of this, Twitter's user base experienced exponential growth. It can be supposed that there are strong reasons why existing users continue to use Twitter and new users choose this service over the various alternatives. Finally, there was a practical reason for selecting Twitter. Twitter has an accessible Web API (application programming interface) which enabled us to retrieve data about users and thus gave us the opportunity to measure real behaviour for some constructs. For this reason survey participants were asked to give a valid Twitter user name.

Data was collected via the survey Web site, QuestionPro. Data collection was promoted mainly in Twitter with a few blog postings outside the platform. Promotion was initiated only from one of the author's Twitter accounts using this network as a starting point for viral marketing and 'hashtags' to reach completely different communities of users. Hashtags are usually short terms describing several topics, such as an event (i.e. #smclondon08 for Social Media Camp London 2008). People attending such an event and writing about it on Twitter use this tag in their postings. In searching for this term one is able to get related messages even from people who are not in one's network. These streams from Web-related events were used to post advertising for the survey. Overall, we received a total of 131 usable survey responses during the 13 days the survey was open (of the 138 originally collected, 7 were excluded due to incorrect user names or closed accounts which prevented us collecting usage data from the Twitter service). Based on the logfiles of QuestionPro, some 26.0% of the participants were from Germany, 18.3% from the US, 16.8% from the UK, 10.2% from the rest of Europe and 6.1% from the rest of the world (with 22.9% unknown). This shows a wide distribution of the survey. In addition, based on the API data, some 45% of the participants registered their specific username on Twitter in the year of the survey (2008) and 47% in the year before (2007). Only 6% were initial adopters in Twitter's first year of operation (2006).

4.2 Measurement

Scale development was largely based on a strong foundation of scale items from existing literature. The survey items selected and their provenance is demonstrated in Table 1. All but three constructs were measured using traditional 7-point Likert scales. Our constructs were extended with the new construct of social network size and two other constructs were measured in different ways to the existing literature. First, using Twitter's API it was possible to get data for both the frequency of past behaviour and social network size using a custom software programme developed by one of the authors. Frequency of past behaviour was defined as the two weeks prior to survey completion. Based on the date the survey was completed by each respondent we were able to measure this accurately based on the number of Twitter updates posted on the service. We used two weeks rather than the four weeks of Limayem et al. (2007) because we considered it more appropriate for the nature of this interactive medium. Social network size was based on the complete network of 'followers' and 'following' connections. Comprehensiveness of usage relied on a new conceptualisation of the variety of usages of Twitter based on a simple three-part categorisation into communication, coordination and cooperation, with each being activated as one-way and/or two-way (six uses in total).

4.3 Data Analysis

Data analysis was performed using a variance maximization approach to structural equation modelling (SEM) and associated statistics for validity and reliability. More specifically, we used the partial least squares (PLS) technique with reflective indicators in Smart-PLS 2.0 (Ringle et al. 2005). The PLS technique has become increasingly popular in information systems research, marketing and in

management research more generally in the last decade or so, influenced by its flexibility; indeed, PLS does not have the same distributional assumptions of normality for data and is able to handle small- to medium-sized samples (Chin 1998, Compeau & Higgins 1995).

Construct	Source
Perceived Usefulness	Limayem et al. (2007)
Confirmation	Bhattacharjee (2001)
Satisfaction	Bhattacharjee (2001)
Continuance Intention	Bhattacharjee (2001)
Habit	Limayem et al. (2007)
Perceived Critical Mass	Van Slyke et al. (2007)
Comprehensiveness of Usage	The general idea came from Limayem et al. (2007). However, this was implemented using 6 kinds of Twitter uses (communication, coordination and cooperation, with each being one-way and/or two-way)
Frequency of Past Behaviour	The number of Twitter postings during the preceding 14 days before survey participation
Social Network Size	The user's number of followers and number of friends ('following') in Twitter

Table 1. Sample Measures.

5 RESULTS

In this section we discuss the results of model testing, including scale validity and reliability and the results of our partial least squares path modelling analysis.

5.1 Tests for Validity and Reliability of the Measures

Table 2 demonstrates that the scale items exhibit high levels of convergent validity – the extent to which theoretical scale items are empirically related. The loadings of the measures on their respective constructs in the model range from 0.727 to 0.955, with all being significant at the 0.1% level.

Table 2 also demonstrates that all of the constructs fulfil the recommended levels with reference to composite reliability (CR) and average variance extracted (AVE). All items were higher than the cut-off of 0.50 recommended by Fornell and Larcker (1981), ranging from 0.695 to 0.891. Similarly, the values for composite reliability are very good, ranging from 0.842 to 0.942, well above the reliability values of 0.70 and 0.80 that are typically advised for building strong measurement constructs (Nunnally 1978, Straub & Carlson 1989).

Table 3 examines the extent to which question items measure the construct intended or other related constructs, otherwise known as discriminant validity. Fornell and Larcker's (1981) standard test for discriminant validity was used, whereby the square root of average variance extracted for each construct is compared with the correlations between it and other constructs; discriminant validity is demonstrated if the square root is higher than the correlations. Table 3 clearly indicates that each construct shares greater variance with its own measurement items than with other constructs with different measurement items, with a good margin of difference.

Table 4 provides an additional test for discriminant validity. Here we utilized the cross-loading method of Chin (1998). The method prescribes a requirement for measurement items to load higher on a construct than the scale items for other constructs and for no cross-loading to occur. Item loadings in the relevant construct columns were all higher than the loadings of items designed to measure other constructs; similarly, when glancing across the rows the item loadings are considerably higher for their corresponding constructs than for other constructs.

Overall, the results of testing for validity and reliability are very positive and provide us with a high degree of confidence in the scale items used in the study.

Construct	Item	Loading	Mean	St. Error	t-value
<i>Confirmation (CONF)</i>					
CR = 0.872 AVE = 0.695	CONF1	0.862	5.71	0.103	20.444
	CONF2	0.904	5.63	0.113	51.131
	CONF3	0.724	5.14	0.123	9.636
<i>Critical Mass (CM)</i>					
CR = 0.842 AVE = 0.646	CM1	0.885	4.33	0.158	21.662
	CM2	0.618	5.28	0.101	6.992
	CM3	0.880	4.15	0.156	23.852
<i>Habit (HABIT)</i>					
CR = 0.919 AVE = 0.791	HABIT1	0.916	5.49	0.130	51.533
	HABIT2	0.930	5.50	0.127	70.021
	HABIT3	0.819	4.76	0.135	24.200
<i>IS Continuance Intention (CONT)</i>					
CR = 0.893 AVE = 0.737	CONT1	0.865	5.10	0.116	24.278
	CONT2	0.842	5.93	0.102	26.120
	CONT3	0.867	5.05	0.124	23.480
<i>Perceived Usefulness (PU)</i>					
CR = 0.935 AVE = 0.827	PU1	0.915	6.02	0.095	40.056
	PU2	0.890	5.92	0.096	21.853
	PU3	0.923	5.92	0.089	31.792
<i>Satisfaction (SATIS)</i>					
CR = 0.934 AVE = 0.780	SATIS1	0.918	5.87	0.092	41.291
	SATIS2	0.923	5.81	0.092	53.296
	SATIS3	0.842	5.53	0.103	18.985
	SATIS4	0.846	5.61	0.100	18.678
<i>Social Network Size (SNS)</i>					
CR = 0.942 AVE = 0.891	SNS1 (Followers)	0.933	217.86	24.677	25.364
	SNS2 (Following)	0.955	255.53	30.013	71.194

Note 1: CR = Composite Reliability; AVE = Average Variance Extracted

Note 2: Usage Comprehensiveness (mean=4.11, standard error=24.68) and Frequency of Past Behaviour (mean=121.58, standard error=14.33) are single-item constructs

Table 2. Psychometric Table of Measurements.

	CONF	CM	HABIT	CONT	PU	SATIS	SNS
Confirmation (CONF)	0.834						
Critical Mass (CM)	0.428	0.804					
Habit (HABIT)	0.624	0.562	0.890				
IS Continuance Intention (CONT)	0.575	0.420	0.556	0.858			
Perceived Usefulness (PU)	0.667	0.505	0.710	0.610	0.909		
Satisfaction (SATIS)	0.554	0.347	0.536	0.569	0.594	0.883	
Social Network Size (SNS)	0.219	0.286	0.282	0.021	0.288	0.251	0.944

Table 3. Correlations Between Constructs (Diagonal Elements are Square Roots of the Average Variance Extracted).

	CONF	CM	HABIT	CONT	PU	SATIS	SNS
CONF1	0.862	0.269	0.509	0.500	0.520	0.462	0.151
CONF2	0.904	0.418	0.631	0.455	0.671	0.495	0.184
CONF3	0.724	0.380	0.396	0.498	0.454	0.427	0.220
CM1	0.288	0.885	0.456	0.267	0.381	0.208	0.180
CM2	0.419	0.618	0.454	0.475	0.439	0.335	0.183
CM3	0.319	0.880	0.434	0.266	0.388	0.286	0.313
HABIT1	0.617	0.533	0.916	0.482	0.659	0.498	0.319
HABIT2	0.572	0.471	0.930	0.499	0.670	0.506	0.241
HABIT3	0.470	0.496	0.819	0.504	0.562	0.423	0.187
CONT1	0.435	0.420	0.443	0.865	0.488	0.510	-0.100
CONT2	0.579	0.345	0.544	0.842	0.640	0.533	0.174
CONT3	0.436	0.308	0.418	0.867	0.396	0.397	-0.065
PU1	0.660	0.470	0.673	0.556	0.915	0.583	0.279
PU2	0.516	0.453	0.630	0.531	0.890	0.516	0.256
PU3	0.634	0.456	0.633	0.577	0.923	0.518	0.249
SATIS1	0.549	0.403	0.565	0.555	0.583	0.918	0.246
SATIS2	0.517	0.318	0.530	0.503	0.581	0.923	0.267
SATIS3	0.386	0.197	0.341	0.449	0.412	0.842	0.131
SATIS4	0.481	0.277	0.420	0.494	0.496	0.846	0.224
SNS1	0.168	0.270	0.261	0.014	0.269	0.247	0.933
SNS2	0.239	0.270	0.271	0.025	0.275	0.230	0.955

Table 4. Loadings and Cross-Loadings for Reflective Measures.

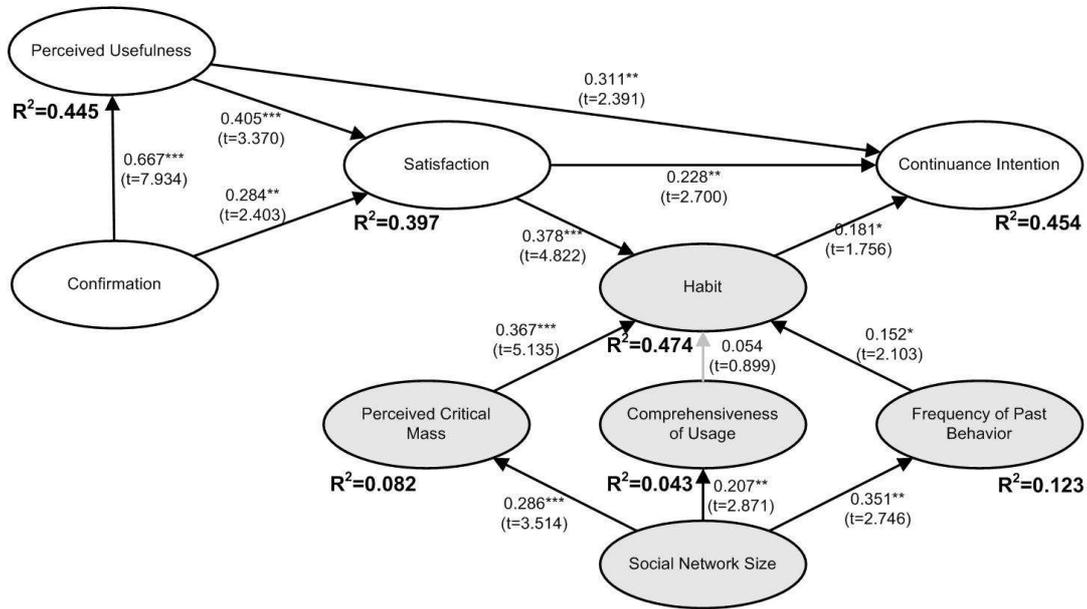
5.2 Test of the Research Model

The results of PLS path modelling are shown in Figure 2. For this analysis we utilised the software package, Smart-PLS (Ringle et al. 2005). The shaded items are those that have been added to Bhattacharjee's (2001) basic continuance model. A power analysis in G*Power 3.0 (Faul et al. 2007) shows that the sample size (n=131) has good power for explaining medium population effects ($f^2=0.15$; $\alpha=0.05$; $1-\beta=0.88$), and is thus suitable for the testing of the model under these conditions.

All relationships in Bhattacharjee's (2001) original model are strongly supported by the data (H1), with links from confirmation to perceived usefulness ($R^2=0.445$) and satisfaction at the 0.1% and 1% levels of significance respectively. Similarly, perceived usefulness is strong driver of satisfaction ($R^2=0.397$; $p<0.001$). Both perceived usefulness and satisfaction are strong drivers of Twitter users' continuance intentions at the 1% levels of significance. Together with habit, which provides a smaller but nevertheless significance influence (H3; $p<0.05$), some 45.4% of variance in Twitter use continuance intentions is explained by the model.

In line with the findings of Limayem et al. (2007), we find that satisfaction is a major determinant of the manifestation of automatic behaviour (H2; $p<0.001$). Along with strong linkages from the frequency of past behaviour (H4b; $p<0.05$) and perceived critical mass (H4a; $p<0.001$), these variables account for a considerable 47.4% of the variance of habit. We consider this to be a very strong explanation in statistical terms. The linkage between comprehensiveness of usage and habit is not supported. This finding corresponds with additional comments given by the survey participants suggesting that there is a wide range of possible usages but that one particular use can be enough to create value for a user. The comments included: "I use twitter as a learning tool", "We use Twitter to feed in blog posts from our blog network" and "I use Twitter mainly for entertainment purposes & social networking." Together these give an impression of different usage possibilities and a possible

explanation why comprehensiveness of usage may not be important in creating habit in the microblogging context.



Note: *** denotes $p < 0.001$; ** denotes $p < 0.01$ and * denotes $p < 0.05$.

Figure 2. Results of the PLS analysis.

Further, we find that social network size exerts a strong influence over perceptions of critical mass for Twitter (H5a; $p < 0.001$), the frequency of previous usage of the service based on the last 14 days (H5b; $p < 0.01$), as well as comprehensiveness of usage in our model (H5c; $p < 0.01$), although the latter does not link further to habit.

6 DISCUSSION AND CONCLUSIONS

This paper has tested an extended research model of continuance behaviour in the context of the most popular microblogging service, Twitter. To our knowledge this is the first academic research paper that has examined use continuance behaviour with respect to this very new social networking tool. The results suggest that the continuance behaviour of Twitter users is strongly determined by their perceptions of value of using the service, satisfaction manifested in their usage of the tool and prior development of automatic behaviour or habit surrounding the use of the service (H1 and H3). Further, we find that social network size influences the development of past use behaviour and of perceptions of critical mass, as users see the value of interacting with a significant group of nodes in their network (H5). In turn, habit is driven by satisfaction (H2), past usage behaviour and the aforesaid perceptions of the significant size of the network via perceived critical mass (H4). However, one link is not supported – between comprehensiveness of usage and habit – which leads to the partial falsification of hypothesis 4 (H4c).

Although the findings are both original and significant, there are a number of limitations of note in the research. In using the Twitter API for retrieving data about the participants there is a clear advantage in collecting direct measurements. However, the obverse is that there could be the possibility of ‘missing’ use data. We used each user’s number of Twitter postings during the 14 days before survey participation as a measurement for past behaviour. Notwithstanding, there are Twitter usages such as

plain reading of other's postings or building a social network which are hidden from the API. Although posting updates on Twitter is seen as the primary usage it would be interesting to see further studies comparing individual perceived frequency of past behaviour with measured posting behaviour. In this way the importance of passive usage could be discovered.

Linked with this limitation is an issue that emerged during the study. We used six categories (communication, coordination and cooperation, each one-way and/or two-way) with real-world examples to capture comprehensiveness of Twitter usage. Nevertheless, a number of comments from respondents suggested introducing additional usage classifications such as work/personal, seminars/events or mobile/desktop. Clearly the development of a comprehensive, valid and reliable typology of Twitter usage is a matter for future research.

Another limitation of the study is the sample size. Although the sample has good explanatory power for medium-sized effects ($f^2=0.15$; $\alpha=0.05$; $1-\beta=0.88$), a larger sample could help to reveal smaller population effects, which may for example uncover missing relationships. A further limitation of our research model is the absence of demographic and other factors, such as age, gender, experience with Twitter, use intensity and so on. Since we may have a heterogeneous sample of a global nature; capturing and analyzing information on the sample may help to understand the behaviour of different groups of global consumers.

From a practical perspective, our research provides useful guidelines not only in terms of understanding public microblogging users, but in terms of other nascent applications of microblogging. Enterprise microblogging or "Twitter for the enterprise" is currently a very hot topic of discussion among Web 2.0 developers. Our research model provides practitioners with some advice regarding not only how to launch a microblogging service successfully but also how to make sure that users continue to use it. In addition to the core influences of perceived usefulness and satisfaction the strong relationship between habit and continuance intention could be an important starting point. Practitioners need to design high quality microblogging services that provide clear benefit and that provide a satisfying experience, but that also become permeated within users' daily routine activity to such an extent that usage becomes habitual. Incentives to build a core of users may be valuable in creating a self-sustaining body of users and in building perceptions of universal access. Clearly organisations will need to expend considerable effort in trying to create habit. It is not only important to find good initial use cases and incentives to create past behaviour but also to provide perceived critical mass. The corollary of this is interesting; this implies that there is actually no need to start a microblogging service within a whole organisation as long as there is perceived critical mass among the current set of users. A good starting point might be a single department or a single subsidiary. In our research, no relationship was detected between comprehensiveness of usage and habit, implying that there is no need for a wide range of uses of microblogging to build use continuance. One or two strong valuable use cases could be enough to create habit among users.

In conclusion, we perceive that microblogging is clearly becoming an established and much used interactive social medium. This study has shed light on a number of explanations for this phenomenon. We hope that this research paves the way for others to begin investigating aspects of user behaviour surrounding this very new and interesting social networking tool.

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