

‘If at First You Don't Succeed, Try, Try Again’ Might Not Always Make Sense: On the Influence of Past Technology Category Satisfaction on Technology Usage

Completed Research

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Abstract

In this paper, we draw from the Expectation Confirmation Theory to postulate that Past Technology Category Satisfaction, which we define as the degree of a person's past satisfaction with a technology category across manufacturers, indirectly influences the Behavioral Intention to Use a specific technological product of the same category today. After collecting 106 online questionnaires about voice assistants and applying a structural equation modeling approach, our findings indicate that people's satisfaction with technological categories in the past does indirectly influence their usage behavior of current specific technologies through Perceived Usefulness and Perceived Enjoyment.

Keywords

Technology Usage, Voice Assistants, Expectation Confirmation Theory.

Introduction

Technologies mature over time (e.g., O'Leary 2008). More specifically, whereas first-generation technologies are often unable to deliver on all dimensions that consumers might wish them to do, successors regularly add functionality, making technologies more capable with each iteration. But what if consumers' dissatisfaction with a half-baked first-generation technology carried over to more advanced future versions?

Traditional Expectation Confirmation Theory studies argue that dissatisfied consumers from the past will not repurchase the corresponding item in question at a later time (e.g., Bhattacharjee 2001b). A typical implication of these studies may be: 'If Microsoft's Xbox One did not satisfy you in 2013, you will not buy their Xbox One X in 2017'. Hence, the focus of such studies lay on specific products and services from a specific manufacturer. However, we believe that Expectation Confirmation Theory offers supplementary insights with regards to consumers' repurchase behavior of specific products from specific manufacturers. Indeed, we seek to extend this theory by using it to explain the influence of people's satisfaction with past technology categories on current specific products. More specifically, we believe that people might not use current specific technological products (such as the Xbox One X) because they were dissatisfied with the entire technology category in the past (video game consoles in general in the case of the Xbox One X). If true, this would mean that companies' current technological products might benefit/suffer from the successes/mistakes of the past — and not only their own, but also those of other manufacturers.

For this article, we empirically evaluated the indirect influence of Past Technology Category Satisfaction – which we describe as the degree of a person's past satisfaction¹ with a technology category across manufacturers (cf. Bhattacharjee 2001a) – on people's usage behavior of current specific technologies through Perceived Usefulness and Perceived Enjoyment. More specifically, we collected 112 completed German-language online questionnaires about one specific technology, the Google Assistant, as well as voice assistants in general and analyzed the data by applying a structural equation modeling approach. Our results suggest that people's satisfaction with technological categories in the past does in fact indirectly influence their current usage behavior of specific technologies.

In the following sections, we will discuss the role of Perceived Usefulness, Perceived Enjoyment, and the Behavioral Intention to Use on technology usage and we will introduce Expectation Confirmation Theory. Following this, we will present our research model and research design. We will then reveal and discuss our results before summarizing our findings, presenting their implications, and providing an outlook on further research.

Theoretical Background

The Role of Perceived Usefulness, Perceived Enjoyment and Behavioral Intention to Use on Technology Usage

Generally, technologies can be differentiated into utilitarian, hedonic and dual technologies (e.g., Ernst et al. 2013). Utilitarian technologies provide utilitarian benefits (e.g., text-processing programs), hedonic technologies provide hedonic benefits (e.g., classic video game consoles), and dual technologies provide both utilitarian and hedonic benefits (e.g., Social Network Sites) (Ernst et al. 2013). Various studies in a variety of contexts have consistently confirmed that Perceived Usefulness and Perceived Enjoyment are the main indirect antecedents of the usage of utilitarian, hedonic, and dual technologies, respectively (Davis 1989; Davis et al. 1989; Davis et al. 1992; Van der Heijden 2004).

Perceived Usefulness – i.e., “the degree to which a person believes that using a particular system would enhance his or her job [and task] performance” (Davis 1989, p. 320) – centers on the motivations and benefits that are external to the system-user interaction itself, also referred to as extrinsic motivations (Brief and Aldag 1977; Van der Heijden 2004). Perceived Enjoyment – i.e., “the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use” (Venkatesh 2000, p. 351) – reflects a hedonic system's intrinsic motivations, such as fun, enjoyment, and other positive experiences, which stem directly from the system-user interaction (Brief and Aldag 1977; Van der Heijden 2004; Venkatesh et al. 2012).

The influence of Perceived Usefulness and Perceived Enjoyment on technology usage is mediated by the Behavioral Intention to Use (cf. Fishbein and Ajzen 1975). Behavioral Intention to Use is indeed a commonly accepted mediator between people's beliefs and their actual behavior. It “capture[s] the motivational factors that influence a [person's] behavior; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior” (Ajzen 1991, p. 181).

In summary, a person can be expected to form the intention to use a technology if they believe that it fulfills their expectations with regards to its instrumental benefits, that is, to its Perceived Usefulness, and with regards to its hedonic benefits, that is, to its Perceived Enjoyment. This intention then drives their degree of actual technology usage.

¹ “*Satisfaction* is the consumer's fulfillment response. It is a judgement that a product/service feature, or the product or service itself, provided (or is providing) a *pleasurable* level of consumption-related fulfillment, including levels of under- or overfulfillment. Here, *pleasurable* implies that fulfillment gives or increases pleasure or reduces pain ... Moreover, fulfillment does not need to be constrained to the case of met needs. Overfulfillment can be satisfying if it provides additional unexpected pleasure; and underfulfillment can be satisfying if it gives greater pleasure than anticipated in a given situation ...” (Oliver 2015, p. 8).

Expectation Confirmation Theory

Expectation Confirmation Theory is a cognitive theory that can be used to explain consumers' post-purchase behavior (Bhattacharjee 2001b). It generally postulates that people's confirmation of beliefs after performing a certain behavior indirectly influences their intention to re-enact that behavior in the future (Oliver 1977; Oliver 1980). More specifically, "[f]irst, consumers form an initial *expectation* of a specific product or service prior to purchase. Second, they accept and use that product or service. Following a period of initial consumption, they form perceptions about its *performance*. Third, they assess its perceived performance vis-à-vis their original expectation and determine the extent to which their expectation is confirmed (*confirmation*). Fourth, they form a *satisfaction*, or affect, based on their confirmation level and expectation on which that confirmation was based. Finally, satisfied consumers form a *repurchase intention*, while dissatisfied users discontinue its subsequent use" (Bhattacharjee 2001b, p. 353).

Previous studies often used Expectation Confirmation Theory to analyze people's repurchase decisions regarding specific products, or people's system and service continuance (e.g., 'If Microsoft's Xbox One satisfied you in 2013, will you buy their Xbox One X in 2017') (e.g., Bhattacharjee 2001b). Another study used this theory to explain people's usage of complimentary products made by the same manufacturer (e.g., 'people will buy an Apple Watch today because Apple's iPhones, iPads, etc. satisfied them in the past') (Ernst and Ernst 2016). In summary, the focus of the Expectation Confirmation Theory studies lay on the products and services from specific manufacturers.

However, we believe that the Expectation Confirmation Theory might also serve as an explanation of people's usage of specific technologies based on their past satisfaction across manufacturers, i.e. their past satisfaction with a technology *category*, in contrast to satisfaction with a specific technology made by a specific manufacturer (e.g., 'people will not use Microsoft's Xbox One today because video game consoles in general did not satisfy them in the past').

Research Model

In the following section, we will outline our hypotheses and present our corresponding research model in Figure 1.

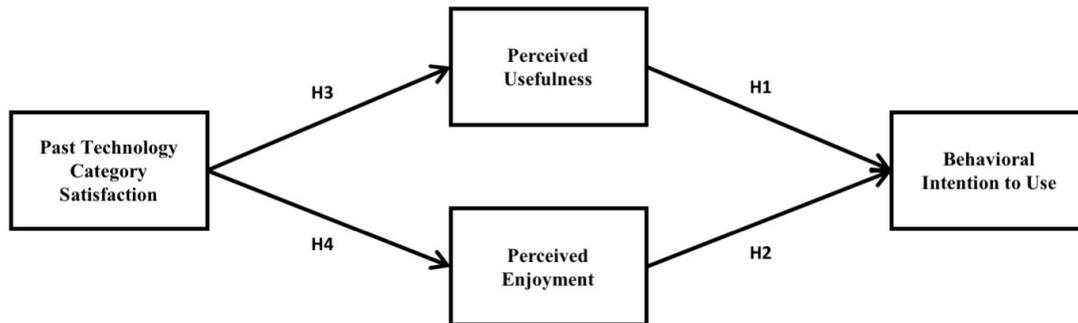


Figure 1. Research Model

As discussed above, Perceived Usefulness and Perceived Enjoyment are commonly accepted to be indirect antecedents of technology usage through the mediator Behavioral Intention to Use (Davis 1989; Davis et al. 1989; Davis et al. 1992; Van der Heijden 2004). We hypothesize that:

There is a positive influence of Perceived Usefulness on the Behavioral Intention to Use technologies (H1).

There is a positive influence of Perceived Enjoyment on the Behavioral Intention to Use technologies (H2).

Moreover, we believe that Past Technology Category Satisfaction positively influences a person's pre-use evaluation of specific technologies' characteristics today, i.e., their expectation regarding a technology's

utilitarian and hedonic benefits. More specifically, the expectations in the Expectation Confirmation Theory “refer to consumers’ beliefs about the potential utility [and enjoyment] that can be derived from a ... [product], which is akin to the notion of perceived usefulness [and perceived enjoyment]” (Bhattacharjee 2001a, p. 204). Past dissatisfied expectations regarding a product can actually change people’s future expectations (cf. Bhattacharjee 2001a; Oliver 1980). Indeed, expectations “may be adjusted higher ... if customers realize that their initial expectations were unrealistically low. Likewise, unreasonably high initial expectations ... may be lowered ... as some of those expectations are disconfirmed” (Bhattacharjee 2001a, p. 204). In other words, and adjusted to our context, if people were satisfied by a technology category in the past, their expectation regarding the usefulness and enjoyment of specific technologies of that category will be positively affected today. We hypothesize that:

There is a positive influence of Past Technology Category Satisfaction on the Perceived Usefulness of technologies (H3).

There is a positive influence of Past Technology Category Satisfaction on the Perceived Enjoyment of technologies (H4).

Research Design

Data Collection

To empirically evaluate our research model, we posted a call on the newsboards of one German university and promised a raffle of four 15 € gift certificate from Amazon for the participants. In this manner, 114 complete German-language online questionnaires about one specific technology, the *Google Assistant*, as well as voice assistants in general, were obtained. However, since 8 respondents stated that they had no prior experience with voice assistants, we dropped their datasets from our analyses. As a result, our final sample consisted of 106 datasets. 66 respondents were female (62 percent) and 40 were male (38 percent). The average age was 23.9 years (standard deviation: 3.46). 104 respondents were students (98 percent) and 2 were currently employed (2 percent).

At the beginning of the questionnaire, we provided a description of the general functionality of the Google Assistant, a voice assistant provided by Google for different devices including smartphones and smart speakers. Generally, voice assistants offer both utilitarian and hedonic benefits. For example, they can be employed for useful tasks, such as asking for directions, as well as for fun activities, such as asking for jokes, searching for Easter eggs and backchat or testing the artificial intelligence’s limits.

Measurement

We used existing scales in order to measure Behavioral Intention to Use, Perceived Usefulness, and Perceived Enjoyment. For Past Technology Category Satisfaction, we adapted items of Oliver’s satisfaction scale (1980) to our context. Table 1 presents the resulting items with their corresponding sources as well as the means and standard deviations in the collected sample. All items were measured using a seven-point Likert-type scale ranging from “strongly disagree” to “strongly agree.”

Results

We used the Partial-Least-Squares approach via SmartPLS 3.2.4 (Ringle et al. 2015). With 106 datasets, we met the suggested minimum sample size threshold of “ten times the largest number of structural paths directed at a particular latent construct in the structural model” (Hair et al. 2011, p. 144). To test for significance, we used the integrated Bootstrap routine with 5,000 samples (Hair et al. 2011).

In the following section, we will evaluate our measurement model. More specifically, we will examine the indicator reliability, the construct reliability, and the discriminant validity of our reflective constructs. Finally, we will present the results of our structural model.

Measurement Model

Tables 2 and 3 present the correlations between constructs as well as the *Average-Variance-Extracted* (AVE) and *Composite-Reliability* (CR), and our items’ factor loadings, respectively: AVE and CR were

higher than .70 and .87, respectively, meeting the suggested construct reliability thresholds of .50/.70 (Hair et al. 2009). All items loaded high (.789 and higher) and significant ($p < .001$) on their parent factor and, hence, met the suggested threshold of indicator reliability of .70 (Hair et al. 2011). Finally, the loadings from our indicators were highest for each parent factor and the square root of the AVE of each construct was larger than the absolute value of the construct's correlations with its counterparts, thus indicating discriminant validity (Fornell and Larcker 1981; Hair et al. 2011).

Construct	Items (Labels)	Mean	Std. Dev.	Adapted from
Behavioral Intention to Use	I intend to use the described voice assistant in the next 6 months. (BI1)	3.57	1.79	Hu et al. (2011)
	I predict that I will use the described voice assistant in the near future. (BI2)	3.60	1.77	
	In the future, I am very likely to use the described voice assistant. (BI3)	3.49	1.80	Venkatesh et al. (2003)
Perceived Usefulness	Using the described voice assistant enables me to accomplish tasks more quickly. (PU1)	3.86	1.30	Davis (1989)
	Using the described voice assistant makes it easier to accomplish my tasks. (PU2)	4.13	1.24	
	Using the described voice assistant increases my productivity. (PU3)	3.65	1.18	
Perceived Enjoyment	Using the described voice assistant is pleasant. (PE1)	4.31	1.22	Van der Heijden (2004)
	Using the described voice assistant is fun. (PE2)	4.24	1.37	
	Using the described voice assistant is exciting. (PE3)	4.30	1.44	
Past Technology Category Satisfaction	In the past, I have been satisfied with voice assistants. (PTCS1)	3.65	1.31	Oliver (1980)
	In the past, I have not been happy with voice assistants. (PTCS2) [reversed]	4.28	1.41	
	In the past, my experience with using voice assistants was very unsatisfactory. (PTCS3) [reversed]	4.21	1.40	

Table 1. Items of our Measurement Model

	BI	PU	PE	PTCS
Behavioral Intention to Use (BI)	.95 (.98)			
Perceived Usefulness (PU)	.50	.80 (.92)		
Perceived Enjoyment (PE)	.62	.58	.71 (.88)	
Past Technology Category Satisfaction (PTCS)	.40	.38	.46	.82 (.93)

Table 2. Correlations between Constructs [AVE (CR) on the Diagonal]

Structural Model

Figure 2 presents the path coefficients of the previously hypothesized relationships as well as the R²s of the endogenous variables (***) = $p < .001$, * = $p < .05$).

Perceived Usefulness was found to have a positive influence on Behavioral Intention to Use ($\beta = .212$, $p < .05$), confirming hypotheses 1. Also, Perceived Enjoyment was found to have a positive influence on Behavioral Intention to Use ($\beta = .498$, $p < .001$), confirming hypotheses 2. Past Technology Category Satisfaction was found to have a positive influence on both Perceived Usefulness ($\beta = .383$, $p < .001$) and Perceived Enjoyment ($\beta = .455$, $p < .001$), confirming hypotheses 3 and 4, respectively.

	BI	PU	PE	PTCS
BI1	.979 (190.4)	.492	.616	.413
BI2	.971 (96.0)	.505	.588	.354
BI3	.977 (151.4)	.461	.610	.411
PU1	.478	.918 (56.0)	.522	.379
PU2	.459	.917 (45.4)	.521	.348
PU3	.391	.841 (23.7)	.496	.292
PE1	.540	.485	.823 (21.8)	.403
PE2	.570	.466	.903 (45.4)	.385
PE3	.442	.504	.789 (14.6)	.357
PTCS1	.470	.432	.450	.872 (29.9)
PTCS2	.276	.280	.363	.924 (35.5)
PTCS3	.312	.298	.406	.920 (37.8)

Table 3. Reflective Items' Loadings (T-Values)

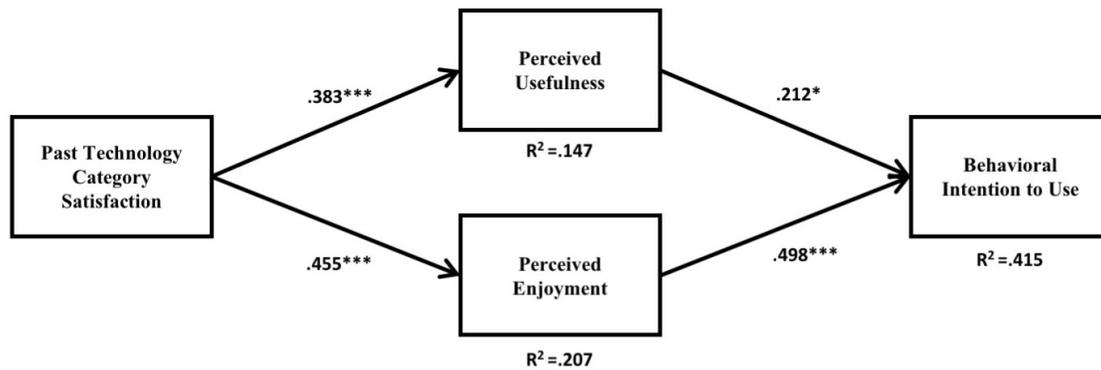


Figure 2. Findings

Overall, our research model included two predecessors of Behavioral Intention to Use (Perceived Usefulness, Perceived Enjoyment), and one predecessor of both Perceived Usefulness and Perceived Enjoyment (Past Technology Category Satisfaction). By taking this into account, the explanatory power of our structural model is good, since it explains 41.5 percent of the variances of Behavioral Intention to Use, 14.7 percent of the variances of Perceived Usefulness, and 20.7 percent of the variances of Perceived Enjoyment.

Still, our study has some limitations. First, the empirical findings are based on only a single specific technology/technology category: the Google assistant/voice assistants. Therefore, there might be differences between this particular voice assistant and others such as Apple's Siri. Differences can also be expected for different technology categories. Furthermore, we did not differentiate between different devices the voice assistant can run on. More specifically, there certainly will be differences between mobile devices such as smartphones and strictly home-based devices such as smart speakers. Moreover, since we mostly surveyed German-speaking students, our results might not hold true for non-German speaking people with other academic backgrounds and differences might also be found for other age groups.

Conclusions

In this article, we drew from the Expectation Confirmation Theory to evaluate the role of Past Technology Category Satisfaction on people's technology usage behavior. After collecting 106 complete online questionnaires and applying a structural equation modeling approach, our findings indicate that people's satisfaction with technological categories in the past indirectly influences their current usage behavior of

specific technologies through Perceived Usefulness and Perceived Enjoyment. As a result, our study contributes to the literature on technology usage by introducing an additional influence factor. Also, it contributes to the literature on Expectation Confirmation Theory by extending its focus from repurchase behavior regarding the specific products and services of a specific manufacturer to the influence of people's unspecific satisfaction regarding technology categories in the past on specific products today.

Moreover, our findings have important practical implications: They suggest that manufacturers should not rush half-done first-generation technologies to market because that may backfire in the future since consumers will not buy later iterations. Moreover, our results imply that manufacturers may need to be open and clear with regards to past failures in their communication when introducing a new and better version of a technology in order to further emphasize the dimensions in which the new incarnation supersedes its predecessor. This clear communication of new and better features is also important in the case where products of other manufacturers might have disappointed customers in the past — indeed, clear communication might counteract the fact that consumers' dissatisfaction carries over to other similar products.

As a next step, we plan to expand our research and address its limitations. More specifically, we want to roll out our survey to other countries and in particular survey people that are older and younger than those in our sample. Furthermore, we plan to take a look at other technology categories in order to enhance the external validity of our empirical findings.

References

- Ajzen, I. 1991. "The Theory of Planned Behavior," *Organizational Behavior and Human Decision Processes* (50:2), pp. 179-211.
- Bhattacharjee, A. 2001a. "An Empirical Analysis of the Antecedents of Electronic Commerce Service Continuance," *Decision Support Systems* (32:2), pp. 201-214.
- Bhattacharjee, A. 2001b. "Understanding Information Systems Continuance: An Expectation-Confirmation Model," *MIS Quarterly* (25:3), pp. 351-370.
- Biddle, B. J. 1986. "Recent Developments in Role Theory," *Annual Review of Sociology* (12), pp. 67-92.
- Brief, A. P., and Aldag, R. J. 1977. "The Intrinsic-Extrinsic Dichotomy: Toward Conceptual Clarity," *Academy of Management Review* (2:3), pp. 496-500.
- Davis, F. D. 1989. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly* (13:2), pp. 319-340.
- Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. 1989. "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management Science* (35:8), pp. 982-1003.
- Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. 1992. "Extrinsic and Intrinsic Motivation to Use Computers in the Workplace," *Journal of Applied Social Psychology* (22:14), pp. 1111-1132.
- Ernst, C.-P. H., and Ernst, A. W. 2016. "Success Comes to Those Who Are Successful: The Influence of Past Product Expectation Confirmation on Smartwatch Usage," in *The Drivers of Wearable Device Usage: Practice and Perspectives*, C.-P. H. Ernst (ed.), Cham: Springer, pp. 49-58.
- Ernst, C.-P. H., Pfeiffer, J., and Rothlauf, F. 2013. "Hedonic and Utilitarian Motivations of Social Network Site Adoption." Johannes Gutenberg University Mainz: Working Papers in Information Systems and Business Administration.
- Fishbein, M., and Ajzen, I. 1975. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*, Reading, MA: Addison-Wesley.
- Fornell, C., and Larcker, D. F. 1981. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research* (18:1), pp. 39-50.
- Hair, J. F., Black, W. C., Babin, B. J., and Anderson, R. E. 2009. *Multivariate Data Analysis*, 7th ed., Upper Saddle River, NJ: Prentice Hall.
- Hair, J. F., Ringle, C. M., and Sarstedt, M. 2011. "PLS-SEM: Indeed a Silver Bullet," *Journal of Marketing Theory and Practice* (19:2), pp. 139-151.
- Hu, T., Poston, R. S., and Kettinger, W. J. 2011. "Nonadopters of Online Social Network Services: Is It Easy to Have Fun Yet?," *Communications of the Association for Information Systems* (29:1), pp. 441-458.
- O'Leary, D. E. 2008. "Gartner's Hype Cycle and Information System Research Issues," *International Journal of Accounting Information Systems* (9:4), pp. 240-252.

- Oliver, R. L. 1977. "Effect of Expectation and Disconfirmation on Postexposure Product Evaluations: An Alternative Interpretation," *Journal of Applied Psychology* (62:4), pp. 480-486.
- Oliver, R. L. 1980. "A Cognitive Model of the Antecedents and Consequences of Satisfaction Decisions," *Journal of Marketing Research* (17:4), pp. 460-469.
- Oliver, R. L. 2015. *Satisfaction - a Behavioral Perspective on the Consumer*, 2nd ed., Abingdon, UK: Routledge.
- Ringle, C. M., Wende, S., and Becker, J.-M. 2015. "SmartPLS 3." <http://www.smartpls.com>.
- Van der Heijden, H. 2004. "User Acceptance of Hedonic Information Systems," *MIS Quarterly* (28:4), pp. 695-704.
- Venkatesh, V. 2000. "Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model," *Information Systems Research* (11:4), pp. 342-365.
- Venkatesh, V., Morris, M. G., Davis, G. B., and Davis, F. D. 2003. "User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly* (27:3), pp. 425-478.
- Venkatesh, V., Thong, J. Y. L., and Xu, X. 2012. "Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology," *MIS Quarterly* (36:1), pp. 157-178.