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Why Do Customers Use Smartphones for Shopping in Omnichannel Environments? Proposition and Testing the Factor Structure of Items for Customer–Smartphone Structural Equation Model (PLS-SEM)

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Abstract
The usage of smartphones is influencing more and more customers' behaviours and shopping processes. Customers use smartphones, for instance, to buy directly (so-called mobile shopping) or to prepare their shopping within bricks-and-mortar retail. They may search for product information, special offers or nearby retail stores. For these reasons, smartphones are also called shopping assistants or shopping companions. The smartphone becomes, in some ways, a technical but intimate partner and more than just a simple and passive device. It becomes an active partner: social networks can be consulted; mobile coupons can stimulate buying desire; and tracked individual physiological data can be the basis for purchase decisions. Numerous papers and studies focus on customers' acceptance of – and willingness to use – smartphones. But, why do some customers use their smartphones more often and more intensively while shopping within bricks-and-mortar retail than other customers? The purpose of this paper is to propose and test the factor structure of items for a structural equation model (PLS-SEM) including five constructs: (1) the intensity of smartphone usage; (2) the smartphone-extended self; (3) the smartphone-extended mind; (4) the smartphone as a supporter for the digital doppelgänger; and (5) the smartphone as shopping companion. To test the proposed factor structure and items, a small empirical study has been organised as pre-test. The study surveyed mainly students, who represent a highly relevant group of smartphone users.

Keywords: Smartphones, Customer Behaviour, Bricks-and-Mortar Retail.

JEL classification: M31

1. Introduction

Many customers use their smartphones often and manifold in everyday life. This could cause an increase in the use of smartphones while shopping within bricks-and-mortar retail. Customers may search for product information, special offers or prices. The impact of smartphones on the shopping process can be regarded as it acting as a shopping companion (Cliquet et al., 2014, p. 102). In this way, different marketing channels merge into one simultaneous, overall process (e.g., Brynjolfsson, Hu and Rahman, 2013; Piotrowicz and Cuthbertson, 2014; Rigby, 2011; Verhoef, Kannan and Inman, 2015). There are papers and studies examining customers' acceptance of smartphones (e.g., Agrebi, 2015; Bruner and Kumar, 2005; Jung, Hur and Kim, 2015) or willingness to use smartphones in bricks-and-mortar contexts (e.g., Deloitte Consulting LLP, 2012; Samat, 2014). However, one question is why some customers use their smartphones more often and intensively while shopping within bricks-and-mortar retail than other customers. Because of this issue, different conceptual frameworks and scientific descriptions of the influence of technology on humans are used to derive implications which are applied to customers who use smartphones within physical stores. Therefore, Section 2 of this paper uses three, as well as other, theoretical approaches – such as the extended self, the extended mind and the digital doppelgänger to develop a structural equation model and the associated items. Section 3 shows the results of a small empirical study which has been organised as a pre-test. The paper ends with a discussion and conclusion for further customer behaviour research (Section 4).

2. Theoretical framework

It could be argued that smartphones are just passive objects that are controlled by humans, and that the relevance of smartphones in everyday life is based on their increasing functional potentialities. The diversified usage behaviour could, in this case, be expressed by the intensity of smartphone usage (SU). However, it can be pointed out that humans are involved in smartphone interactions that go beyond functional and controlled tool-based use and beyond a simple means-to-end relation for problem-solving tasks. To do this, three active roles to the human–smartphone interaction are attributed: the smartphone-extended self (ES); the smartphone-extended mind (EM); and the smartphone as a supporter for the digital doppelgänger (DD). These three roles are suggested to have relations to the usage of the smartphone as a shopping companion (S).

The intensity of smartphone usage (SU)

The intensity of smartphone usage seems to very diversified. For example, Falaki et al. (2010) show that: "different users interact with their phones 10-200 times a day on average; the mean interaction length of different users is 10-250 seconds; and users receive 1-1000 MB of data per day, where 10-90% is received as part of active use" (p. 193–94). Therefore, the potential of the smartphone taking one of the aforementioned roles for the customers in everyday life could depend on the overall intensity of smartphone usage.

The smartphone-extended self (ES)

The smartphone appears more and more as a highly individualised, emotionalised and indispensable out item. The concept of the extended self (Belk, 1988, 2013) characterises such things as part of the extended self because Belk states that "knowingly or unknowingly, intentionally or unintentionally, we regard our possessions as parts of ourselves" (Belk, 1988, p. 1). According to James (1890), possessions are things that we call ours, and we are the sums of our possessions. In addition, Belk (1988) reasons that "the more we believe we possess or are possessed by an object, the more a part of self it becomes" (p. 3). The idea of self is transferred to products that are chosen to be part of our identity. This is why the extended self is one theoretical explanation clarifying the important role of smartphones in everyday life (Belk, 2014a; Clark, 2011; Clayton et al., 2015).

The smartphone-extended mind (EM)

Knowledge can be outsourced into the (mobile) internet, and always available if needed. Translations, calculations and reminders can be carried out in a two-way interaction between smartphones and customers. Clark and Chalmers (1998) advocate the idea of active externalism "based on the active role of the environment in driving cognitive processes" (p. 7). They argue that there is not only a process of problem-solving in human minds but external objects can also function as part of the mind. So, human mental states and beliefs may be partly realised "by structures and processes located outside the human head" (Clark, 2011, p. 76). Furthermore, a distinction between mind and environment is unreasonable because "the human organism is linked with an external entity in a two-way interaction, creating a coupled system that can be seen as a cognitive system in its own right" (Clark and Chalmers, 1998, p. 9). Following this approach, smartphones could, in some cases, be active drivers for customers' cognitive processes.

The smartphone as supporter for the digital doppelgänger (DD)

Bode and Kristensen (2016) describe quantified self-movement, in which members track their individual physiological data (e.g., heart-rate and weight), personal performance (e.g., running,

walking and sleeping) and mental state (e.g., happiness and creativity) in combination with situational and social conditions (e.g., date and weather) (p. 120). The tracking is mostly carried out by smartphones. The more data the device has collected, the more complete the overall picture of a person becomes: the device can provide many details about a person's body that the user themselves does not know. In this way, these created digital doppelgängers can then access data-based individual behaviour recommendations.

The smartphone as shopping companion (S)

Customers may use smartphones within bricks-and-mortar retail via different motivations. Voropanova (2015) conceptualises a model that suggests that "the use of a mobile device in shopping improves shopping productivity dimensions (time/effort savings, money savings, right purchase, and emotional benefits from shopping)" (p. 540). Research, in 2013, undertaken by the Google Shopper Marketing Council, has shown that customers use smartphones to "find product information", "find where specific products are sold" or "make life easier" (p. 21–25). As a conclusion, the following five dimensions could represent the usage of smartphones as a shopping companion: (1) getting information about products/services; (2) finding products/services; (3) saving money; (4) enjoying the act of shopping more; and (5) making the act of shopping more convenient.

Based on this suggested theoretical framework, the following hypotheses are assumed, which reflect the relationship between the five constructs:

H1: As the intensity of overall smartphone usage of customers grows, the smartphones become closely allied with customers' selves, their cognitive processes become incorporated with smartphones and, in turn, the use that smartphones have for tracking personal shopping-related data also grows.

H2: As smartphones become more closely allied with customers' selves, customers become more willing to use smartphones as shopping companions in bricks-and-mortar retail stores.

H3: As customers' cognitive processes become more incorporated with smartphones, customers are more willing to use smartphones as shopping companions in bricks-and-mortar retail stores.

H4: As customers increasingly use smartphones for tracking personal shopping-related data, customers are more willing to use smartphones as shopping companions in bricks-and-mortar retail stores.

3. Research methodology

To test the proposed factor structure and items, questionnaire research was conducted. The five latent variables were measured by 17 items, which are shown in Table 1.

Variable	Item	
Intensity of smartphone usage (SU)	SU1	I react quickly to impulses on my smartphone; when, for instance, it has news for me, I read them as soon as possible.
	SU2	When I wake up in the morning or fall asleep at night, the first thing or last thing I do is look at my smartphone.
	SU3	I use my smartphone every free minute.
Smartphone-extended self (ES)	ES1	My smartphone is very important to me, it plays an important role in my life.
	ES2	The idea of having to live without my smartphone makes me uneasy.
	ES3	My smartphone belongs to me. You could even say it's like a part of me.
Smartphone-extended mind (EM)	EM1	If I do not know something, I consult my smartphone.
	EM2	My smartphone helps me out in everyday life; for instance, when calculating, navigating or looking up words.
	EM3	You could say my smartphone is my personal assistant, with whom I organise my everyday life; it reminds me, for instance, of appointments or tasks.
Smartphone as supporter for the digital doppelgänger (DD)	DD1	When someone gets my smartphone in their hands, they can learn a lot about my personality.
	DD2	My smartphone has extensive knowledge about me and my behaviour.
	DD3	My smartphone gives me information about me (such as run steps, consumed calories, etc.) that I would not know without it.
Smartphone as shopping companion (S)	S1	I use my smartphone to get information about products/services during my shopping.
	S2	I use my smartphone to find products/services that are sold out or not offered at the store when I go shopping.
	S3	I use my smartphone to save money during my shopping.
	S4	I use my smartphone to experience more joy during my shopping.
	S5	I use my smartphone while shopping (for example with a shopping list-app), because it is more convenient.

Table 1. Factor structure and items

Source: Own table

A six-point evaluation scale was applied for the questionnaire. The total participant sample size of this research was 323. The survey was conducted in May, 2017. Respondents were all students and randomly chosen during lectures at Jade University of Applied Sciences (Germany), where they filled in the questionnaire. The gender was marked at 57% for males and 43% for females. Partial least squares structural equation modelling (PLS-SEM) methodology – using SmartPLS V.3.2.6 software (Ringle, Wende and Becker, 2015) – was used for the analysis. The path model was specified as reflective.

4. Research results

The evaluation of the reflective measurement model revealed that the two items, DD3 and S5, could not prove a required indicator reliability and the variable DD had questionable Cronbach's Alpha. After elimination of those two items, the composite reliability of both constructs DD and S increased and the Cronbach's Alpha of the variable DD became acceptable. After the elimination, internal consistency reliability, indicator reliability, convergent validity and discriminant validity were observed as reliable and valid. Table 2 shows that: Cronbach's Alpha and composite reliability values of all endogenous variables were above 0.7; all indicator loadings were above 0.708 and statistically significant; and averaged variance extracted (AVE) values of all endogenous variables were above 0.5.

Variable	Item	Convergent validity		Internal consistency reliability	
		Indicator reliability	Average variance extracted	Cronbach's alpha	Composite reliability
SU	SU1	.807*	.695	.782	.872
	SU2	.825*			
	SU3	.869*			
ES	ES1	.878*	.747	.831	.899
	ES2	.852*			
	ES3	.864*			
EM	EM1	.861*	.724	.809	.887
	EM2	.890*			
	EM3	.799*			
DD	DD1	.917*	.812	.770	.896
	DD2	.885*			
S	S1	.839*	.682	.845	.895
	S2	.871*			
	S3	.817*			
	S4	.773*			
*p < .000					

Table 2. Convergent validity and internal consistency reliability after item elimination

Source: Own table

To evaluate the discriminant validity, the heterotrait-monotrait ratio (HTMT) (Henseler et al., 2015) was assessed. None of the HTMT-values were above 0.85 and none of the confidence intervals contained the value 1. Therefore, there is no lack of discriminant validity.

The evaluation of the structural model showed that there is no lack of collinearity as all variables' variance inflation factor (VIF) were below 5. All path coefficients were significant, apart from the variables DD -> S with path coefficient that was non-significant (see Table 3).

Variables	Path Coefficient	P Value
DD -> S	.068	.271
EM -> S	.232	.001
ES -> S	.186	.003
SU -> DD	.425	.000
SU -> EM	.567	.000
SU -> ES	.673	.000

Table 3. Path coefficients

Source: Own table

The coefficient of determination (R^2) values were in a range of 0.16 and 0.45. Considering the aim and the problem of the research, the predictive power can be seen as not substantial, but acceptable.

The effect size (f^2) of SU -> DD, ES, EM is large, the effect size f^2 of EM, ES -> S is small and there is no effect of DD -> S.

The structural model revealed predictive relevance, because Q^2 values for latent variables were above zero. The q^2 effect size of EM -> S was 0.016 and q^2 of ES -> S was 0.030.

5. Discussion and conclusion

The analysis of the research results shows that the intensity of overall smartphone usage has a statistically significant relation to the three suggested roles of smartphones: the smartphone-extended self; the smartphone-extended mind; and the smartphone as a supporter for the digital doppelgänger. This supports H1 (see Figure 1).

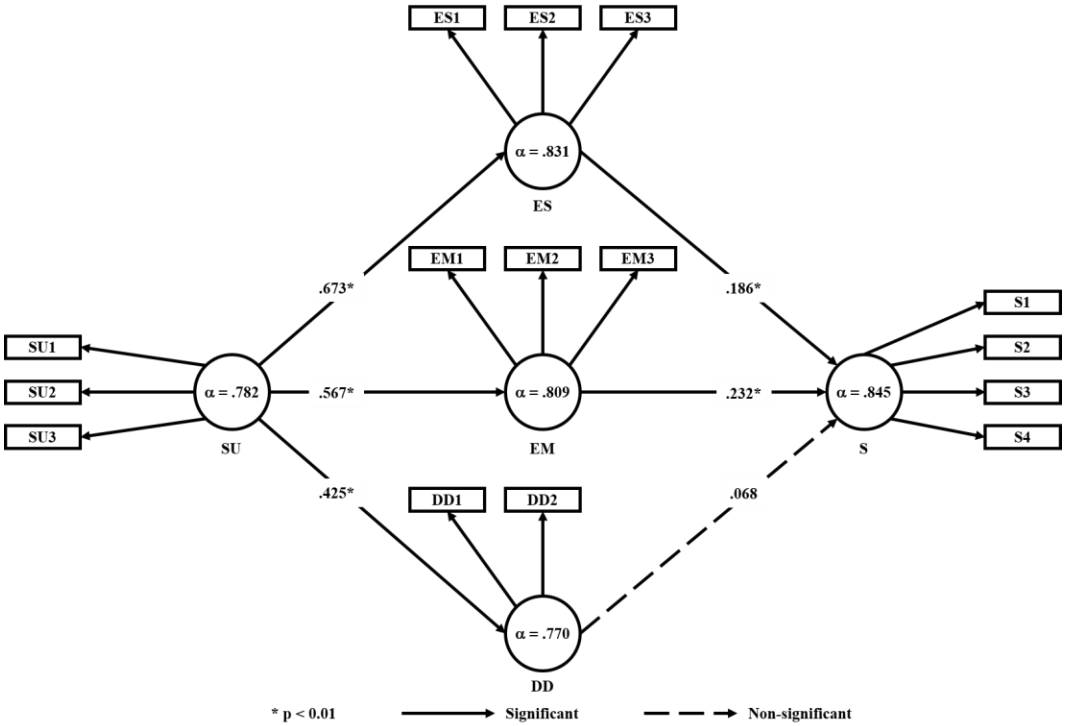

Figure 1. Estimated Structural Equation Model

Source: Own work

Two of the three suggested roles of smartphones, the smartphone-extended self and the smartphone-extended mind, also illustrate statistically significant relations to the usage of smartphones as a shopping companion within bricks-and-mortar retail (H2 and H3). However, the role the smartphone as a supporter for the digital doppelgänger seems not to have statistically significant relations to the usage of smartphones as a shopping companion (H4). Although, this could be a matter of the elimination of one of the three items that measured the construct. The matter of this paper was, amongst others, to pre-test of items. DD3 and S5 may have been unclearly phrased, because both gave examples and respondents may have only thought about those while answering. In sum, the suggested path model seems to work. Another pre-test should be done with substitution of the two problematical items.

Acknowledgments

I would like to express my very great appreciation to Professor Dr. Stephan Kull for the joint work done on the previous conceptual paper, which was the basis for this research paper. I would also like thank him for his valuable and constructive suggestions during the planning

and development of this research work. His willingness to give his time so generously has been very much appreciated. I also wish to thank the staff of Jade University of Applied Sciences for their help regarding the realisation of the importance of questionnaire research.

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