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ABSTRACT
The Internet of Things (IoT) represents a shift towards a digitally enriched environment connecting smart objects and users that promises to provide retailers with innovative ways to approach their customers. IoT technologies differ from previous innovations as they are ubiquitous, intelligent and autonomous. Research into the customer acceptance of IoT services in retailing is scarce and the relevance of technological autonomy has been neglected. Hence, the aim of this research was to assess the relevance of technological autonomy in the IoT service acceptance and to investigate factors influencing the willingness to accept. Based on the technology acceptance model (TAM) this research proposed a new model that consists of seven perceptional factors and degree of autonomy. In a between-subject experimental design, data from 167 supermarket customers was analysed using multiple (moderated) regression. First, degree of autonomy statistically significantly influences intention to accept IoT retail services. The results emphasize that the customer acceptance intention of IoT services decreases when technological autonomy grows. Further, support for the positive direct effects of perceived usefulness, compatibility, enjoyment, and technology trust in intention to accept was found. Ease of use, behavioural control and credibility did not play a significant role. Remarkably, support was found that enjoyment and technology trust gained relevance in situations when technological autonomy was high. These findings highlight that perceptions of relative advantage in enjoyment and trust are important, especially when technologies are highly autonomous. Finally, the insignificance of ease of use challenges the robustness and applicability of TAM in latest technologies. The findings encourage future research to consider degree of autonomy in other contexts of IoT technology acceptance.

Categories and Subject Descriptors
J.7 [**Computer Applications**]: Consumer products

General Terms
Design, Human Factors

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Keywords
Internet of Things; retail innovations; customer acceptance; technology acceptance model

1. INTRODUCTION
Advances in the Internet of Things (IoT) are a major strategic technology trend (High, 2015). The seamless integration of smart electronics into everyday physical objects will lead to new services and applications (Miorandi, Sicari, De Pellegrini, & Chlamtac, 2012). In this regard, the IoT will potentially be able to revolutionize the customer experience in retailing, allowing companies to introduce innovative consumer services. However, while IoT enabling technologies are readily available and retailers across the globe already augment the shopping experience with IoT services (Gregory, 2015), the expected vast adoption and diffusion has not taken place yet (Hwang, Kim, & Rho, 2015).

Even though advances in sensor and computing technology are expected to drastically change the retail shopping experience (Gregory, 2015), the individual acceptance of IoT services as pervasive applications in a holistic retail context has been neglected in current literature. Only one paper was found which considers technology acceptance in a retail context (Müller-Seitz, Dautzenberg, Creusen, & Stromereder, 2009). Therefore, this paper aims at extending current literature in consumer technology acceptance by assessing the factors influencing intention to accept IoT services in a grocery shopping environment.

Consumer hesitation to adopt IoT services may be explained by two essential technology characteristics that distinguish IoT solutions from previous innovations. First, IoT services build on autonomous and semi-intelligent technologies (Tan & Wang, 2010). As advances in these disciplines proceed, consumers may perceive increasing vulnerabilities (Jalbert, 1987) and loss of control over the technology. Therefore, as services increasingly rely on technological autonomy, it is crucial to learn if the actual transfer of control to the technology influences the consumers' perceptions and finally willingness to accept. This will strengthen the understanding of the relevance of technological autonomy as a factor influencing the acceptance of future shopping services. While prior research theoretically discusses the relevance of degree of autonomy (Beier, Spiekermann, & Rothensee, 2006; Röcker, 2010), no study was found that empirically assesses its impact on acceptance. Thus, this paper recognizes the autonomous and semi-intelligent nature of IoT services by assessing the relevance of degree of autonomy on intention to accept new IoT services in retailing.

Second, IoT services are ubiquitous and omnipresent in nature (Weiser, 1991). Technologies fade into the background, leading to

an intelligent network of less visible and touchable applications (Weiser, 1993). Consequently, connecting devices such as smartphones are the only comprehensible components of the IoT (Gubbi, Buyya, Marusic, & Palaniswami, 2013). It is therefore important to understand if these changing characteristics affect the consumer's intention to accept. Research is needed to assess if consumers readily accept ubiquitous technologies or if it rather discourages adoption. Therefore, this paper integrates perceptional factors that have been found to be significant predictors in the adoption of related technologies and assesses the relevance of these on intention to accept IoT services in grocery retailing.

Taken together, this leads to the following research questions:

1. What is the role of technological autonomy in the customer acceptance of IoT services in grocery retail?
2. What are the factors influencing consumer acceptance of IoT services in grocery retail?

This research is highly relevant to both researchers and practitioners. Based on the gaps identified, this research extents current literature in consumer acceptance with latest technology trends in semi-autonomous IoT services in a grocery retail environment. For practitioners, the study is relevant, because it provides insights into perceptional factors, which facilitate or prevent the acceptance of IoT services. This will allow retail marketers to adapt their new services accordingly in order to encourage consumer acceptance.

The paper is structured as follows: First, it provides a theoretical background and introduces the IoT service acceptance model. Second, the paper gives a short outline about the research methodology including data collection and measures used. Third, the results of the research are presented. Finally, the paper summarizes the results and discusses implications and limitations.

2. THEORETICAL FRAMEWORK

2.1) Internet of things in retailing

The Internet of Things (IoT) is a progression of the conventional internet towards a system of intelligent things and devices connecting the physical and digital world. The IoT describes the pervasive presence of objects which are able to interact with each other through wireless telecommunication (Atzori, Iera, & Morabito, 2010). By augmenting physical things and devices with abilities to sense, compute and communicate, these objects form a collective network (Guo et al., 2013). Building on Tan and Wang (2010), this paper continues with the IoT in retailing as a smart and supportive environment which is based on connecting objects and assortment items via sensitive, responsive and adaptive technologies with devices enabling the consumer to experience an augmented shopping experience in- and outside the physical store.

While technologies become increasingly ubiquitous and move to the background, touch screen technologies, apps and websites are the only comprehensible part which enables the user to actively interact with the smart environment (Gubbi et al., 2013). These components are the interfaces between service provider and user which enable retailers to augment the consumer shopping experience.

2.2) Technology Acceptance Model

Over the last decades a large spectrum of research models about the adoption of information technologies has developed. A dedicated stream of research focusses on the individual acceptance of technology by considering intention or usage as the dependent variable (Ajzen, 1985; Davis, 1989; Fishbein & Ajzen, 1975; Venkatesh & Davis, 2000). The Technology Acceptance Model (TAM) by Davis (1989) has become the leading theory in information system literature (Li, 2008). TAM argues that the intention to use a technology predicts the actual usage. Davis (1989) introduces two determinants influencing usage intention: (1) perceived usefulness (PU) as the degree to which an individual thinks that using the new technology will improve his own performance and (2) perceived ease of use (PEOU) as the degree to which an individual believes the new technology will be free from effort.

This research continues with TAM as it is a useful model to understand and explain consumer acceptance of information technologies (Legris, Ingham, & Collerette, 2003) and it has been found statistically reliable in different contexts (Davis, Bagozzi, & Warshaw, 1989; Legris et al., 2003). However, this study extends TAM by enriching it with relevant factors from prior studies in congeneric technologies.

2.3) Towards an IoT service acceptance model

While former research found intention to use to significantly predict actual usage behaviour (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003), this paper argues that this construct is not suitable in assessing consumer acceptance of IoT services. This is because of the ubiquitous and semi-autonomous nature and the rather subconscious processes of how consumers experience and sense these services. Hence, considering these technology characteristics, this paper instead continues with *intention to accept* as the willingness to accept pervasive and autonomous IoT services in the day-to-day shopping routine. Building on previous research, it is a reasonable approach to apply intention as the single dependent variable representing the willingness to accept IoT retail services.

Additionally, various studies argue that user beliefs have a significant causal relation with user acceptance (Pavlou, 2003; Wang, Lin, & Luarn, 2006). Hence, this study suggests that the constructs of PU, PEOU, perceived enjoyment, perceived behavioural control, perceived credibility, perceived technology trust and perceived compatibility positively predict the acceptance of IoT services in retailing. Users will accept innovations only if it provides them with a unique advantage compared to existing solutions (Rogers, 1995) indicating that perceived benefits in usefulness and enjoyment influence intention to accept. Furthermore, it is argued that the perceived difficulty of using a service prevents from service adoption (PEOU). As people fear the loss of control, perceptions of control over the technology may play a significant role in intention (behavioural control). As IoT services build on extensive data storage and evaluation, users may be apprehend of privacy and security concerns, indicating that credibility influences intention. Consequently, trust in the solution can minimize risks and lead to openness for acceptance. Services that are highly disruptive in changing current habits are expected to be considered as challenging and users may hesitate to accept such technologies (compatibility). (see table 1)

Considering technological advancements in intelligent and semi-autonomous behaviour, technological autonomy is the degree to which IoT retail services are able to make and execute decisions independently on their own without being actively controlled by the user. Positions in the literature about the impact of technological autonomy are diverse. For instance, one research stream connecting philosophy and technology argues that technological autonomy makes human beings vulnerable to

deleterious effects (Jalbert, 1987). Therefore, an increasing degree of autonomy may involve growing uncertainties and risks which in turn leads to a potential loss in control over the technology. Röcker (2010) argues that future technologies will significantly differ regarding the degree of autonomy. Degree of autonomy may play a focal part in the acceptance intention of IoT retail services. On the one hand, technological autonomy may directly influence acceptance intention. On the other hand, autonomy may be intuitively linked to the users' technology perceptions. Therefore, this research evaluates degree of autonomy both as an independent variable and as a moderating variable influencing the impact of consumer perceptions on intention. The significance of certain perceptions may grow as technological autonomy increases. In situations, in which autonomy is high and uncertainties increase, perceptions of relative advantages generated through PU or PE may gain significance. In this regard, the relative advantage may compensate the higher risks concerned. Simultaneously, users may be more sensitive towards control, trust and credibility issues in uncertain environments. Therefore, PBC, PTT and PCR may become increasingly significant when facing highly autonomous services. (see table 1)

Table 1: Variables of the IoT retail service acceptance model

Variable	Support from previous literature	Hypothesis
Usefulness	m-commerce (Agrebi & Jallais, 2015; Wang et al., 2006), IoT (Gao & Bai, 2014), retail (Müller-Seitz et al., 2009)	H1: The higher the PU, the higher the intention to accept IoT services in grocery retail.
Ease of use	m-commerce (Fong & Wong, 2015; Wang et al., 2006), RFID (Hossain & Prybutok, 2008), NFC (Dutot, 2015), IoT (Gao & Bai, 2014)	H2: The higher the PEOU, the higher the intention to accept IoT services in grocery retail.
Enjoyment	m-commerce (Agrebi & Jallais, 2015; Lu & Su, 2009; Venkatesh, Thong, & Xu, 2012), IoT (Gao & Bai, 2014)	H3: The higher the PE, the higher the intention to accept IoT services in grocery retail.
Behavioural control	consumer services (Hui & Bateson, 1991), self-service technologies (Lee & Allaway, 2002), IoT (Beier et al., 2006)	H4: The higher the PBC, the higher the intention to accept IoT services in grocery retail.
Credibility	m-commerce (Wang et al., 2006), RFID (Hossain & Prybutok, 2008), retail (Müller-Seitz et al., 2009)	H5: The higher the PCR, the higher the intention to accept IoT services in in grocery retail.
Technology trust	m-payment (Dahlberg, Mallat, & Öörni, 2003; Srivastava, Shalini, & Theng, 2010), IoT (Gao & Bai, 2014)	H6: The higher the PTT, the higher the intention to accept IoT services in grocery retail.
Compatibility	m-commerce (Mallat, Rossi, Tuunainen, & Oorni, 2009), NFC m- payments (Pham & Ho, 2015)	H7: The higher the PCO, the higher the intention to accept IoT services in grocery retail.
Degree of Autonomy	IoT (Beier et al., 2006; Röcker, 2010)	H8a: The higher the degree of autonomy, the lower the intention to accept IoT services in grocery retail. H8b: The impact of PU on the intention to accept IoT services in grocery retail positively increases when technological autonomy is high. H8c: The impact of PE on the intention to accept IoT services in grocery retail positively increases when technological autonomy is high. H8d-f: The impact of PBC/PTT/PCR on the intention to accept IoT services in grocery retail positively increases when technological autonomy is high.

3. RESEARCH METHODOLOGY

To answer the central research questions this paper builds on an experimental research design. While intention to accept was measured as the single dependent variable, PU, PEOU, PE, PBC, PCR, PTT and PCO were the independent variables. In addition, degree of autonomy was integrated both as independent variable and as interaction term. To assess the impact of the moderator, a between-subject design with two conditions was chosen.

3.1) Data collection: Setting and participants

For the study, customers of the grocery store at the University of Twente campus were selected via convenience sampling and asked to participate. Respondents were approached in a grocery shopping situation which is argued to increase the reliability of the results, because the data capture the shopping mood. Respondents were shortly briefed and were told that this survey is part of a master thesis in the acceptance of future retail services. The survey was provided via digital means using a laptop-pc and a tablet-pc. Respondents were randomly assigned to one of the two conditions (high vs. low degree of autonomy) and were introduced to the respective case with the help of a short 'Imagine…' description. After completion of the survey a few socio-demographic questions were asked. Afterwards respondents were thanked for their participation and debriefed. The data collection took place during three weeks in May 2016.

In total 171 respondents agreed to participate in the experiment. After a first review of the results, 4 responses were discarded either because the respondents did not complete the survey or did not own a smartphone. Smartphone ownership was considered as an essential requirement because as an IoT enabling gateway technology familiarity with the technology needed to be in place. This allowed further analysis of 167 samples (high degree of

autonomy case: N = 83; low degree of autonomy case: N = 84). 59.3% of the respondents were male. The mean age was 21.98 and the majority came from the Netherlands (55.7%). 59.9 % were bachelor students and 32.3% were master students.

3.2) Measures

The survey was comprised of 39 questions, mainly worded as statements. Items measuring the focal constructs were adopted from previous literature because they show high reliabilities in the respective contexts. Dutot's (2015) items were adopted to capture the intention to accept. Davis' (1989) scales were modified in order measure the constructs PU and PEOU. Gao and Bai (2013) provide the basic items to measure PE and PBC. PCR was measured by adopting Wang et al.'s (2003) scales. Pavlou (2003) provided the basis for the PTT construct. PCO scores were adapted from Mallat et al. (2009). The constructs were measured using a 7-point-Likert-type scale varying from 1 (strongly disagree) to 7 (strongly agree). Reliability of the constructs was confirmed by Cronbach's alpha. All constructs were found to have a solid reliability of 0.76 or higher (intention: $\alpha = .929$; PU: $\alpha = .763$; PEOU: $\alpha = .769$; PE: $\alpha = .862$; PBC: $\alpha = .842$: PCR: $\alpha = .888$; PTT: $\alpha = .841$; PCO: $\alpha = .839$).

4.) RESULTS

4.1) Main effects

In order assess if there is a difference in mean acceptance intention between the two groups (high degree of autonomy vs. low degree of autonomy), an independent-samples t-test was run. The analysis reveals statistically significant difference in mean intention scores between the high degree of autonomy cases (M = 4.765; SD = 1.675) and the low degree of autonomy cases (M = 5.256; SD = 1.2036) t(165) = -2.176, p = 0.0155. Thus, statistical support was found that the mean intention among the respondents who were assigned to the high autonomy service is significantly lower than the mean intention among the respondents who were assigned to the low autonomy service.

In addition to that, a hierarchical multiple regression was run to predict intention to accept from PU, PEOU, PE, PBC, PC, PTT and PCO (see table 2). The full model of PU, PEOU, PE, PBC, PC, PTT and PCO (model 4) statistically significantly predicted intention to accept, R2 = 0.640, F(7, 159) = 40.318, p < .001, adj. R2 = .624. The basic TAM consisting of PU and PEOU (model 1) was statistically significant in determining acceptance intention, R2 = 0.459, F(2, 164) = 69.590, p < .001, adj. R2 = .452. The addition of PE to predict intention (model 2) led to a statistically significant increase in R2 of .087, F(1, 163) = 31.147, p < .001. The inclusion of PBC, PTT and PCR to the prediction of intention to accept (model 3) led to a statistically significant increase in R2 of 0.053 F(3, 160) = 7.107, p < .001. Finally, the addition of PCO to the prediction of intention to accept (model 4) led to a statistically significant growth in R2 of 0.040, F(1, 159) = 17.821, p < .00

Table 2: Hierarchical multiple regression predicting intention to accept from PU, PEOU, PE, PBC, PC, PTT and PCO

	Intention to accept							
	Model 1		**Model 2**		**Model 3**		**Model 4**	
Variable	**B**	**Beta**	**B**	**Beta**	**B**	**Beta**	**B**	**Beta**
Constant	-.344**		-.247*		-.165*		-.036	
Perceived usefulness	.889**	.586	.585**	.386	.563**	.371	.351*	.231
Perceived ease of use	.187*	.171	.060	.055	-.052	-.047	-.101	-.093
Perceived enjoyment			.407**	.401	.270**	.266	.183*	.180
Perceived behavioural control					.042	.047	.048	.053
Perceived credibility					.043	.049	.051	.051
Perceived technology trust					.206*	.265	.162*	.208
Perceived compatibility							.340**	.340
R Square	.459		.546		.599		.640	
F	69.590**		65.304**		39.875**		40.318**	
R Square Change	.459		.087		.053		.040	
F Change	69.590**		31.147**		7.107**		17.821*	
Note: N = 167; * p < , 05; ** p < .001; B = unstandardized regression coefficient; Beta = standardized coefficient								

4.2) Interaction effects

In order to assess the moderating effects of degree of autonomy between the predicting variables (PU, PE, PBC, PTT, PCR) and the dependent variable (intention to accept), five moderated regressions were run separately. Moderated regression supports the interaction effect of degree of autonomy between PE and PTT, respectively, and intention to accept.

No support was found that degree of autonomy moderated the effect of PU on intention. The 0.8% increase in total variation explained through the inclusion of the interaction term was not statistically significant F(1, 163) = 0.47, p = 1.773, p = 0.185.

Degree of autonomy moderated the effect of PE on intention to accept, as suggested by a statistically significant 1.9% growth in total variation explained, F(1, 163) = 4.478, p = 0.036. Simple slopes tests for both conditions indicate statistically significant positive linear relationship between intention to accept and PE. PE was more strongly related to intention to accept for high degree of autonomy (b = 0.896, SE = 0.149, $\beta = 0.725$, p < 0.001) compared to low degree of autonomy (b = 0.521, SE = 0.097, $\beta = 0.422$, p < 0.001).

In addition, no support was found that degree of autonomy moderated the effects of PBC or PCR. Both regressions reveal a statistically insignificant change in total variation explained

(PBC: F(1, 163) = 0.068, p = .795; PCR: F(1, 163) = 0.082, p = 0.775; PCO: F(1, 163) = 0.001, p = 0.978).

The inclusion of the moderator between PTT and intention leads to a statistically significant 4.7% increase in total variation explained, F(1, 163) = 10.294, p = 0.02. Simple slopes were tested for the two conditions. Both simple slopes tests indicate statistically significant positive linear relationship between PTT and intention to accept. Yet, PTT was more strongly related to intention to accept for high degree of autonomy (b = 0.743, SE = 0.110, β = 0.637, p < 0.001) compared to low degree of autonomy (b = 0.236, SE = 0.114, β = 0.203, p = 0.039

5.) CONCLUSION

First, degree of autonomy was found to play a significant role in acceptance intention of IoT retail services (H8a confirmed). In this regard, a high degree of technological autonomy discourages consumers from accepting new IoT services in retailing. This suggests, that highly autonomous services may increase perceptions of risks or uncertainties which prevents to accept IoT services. Thus, support was found that degree of autonomy is an important factor in consumer acceptance of IoT retail services.

Second, this study aimed at assessing the factors that influence the intention to accept IoT retail services. Based on literature, TAM was extended by adding perceived enjoyment, perceived behavioural control, perceived credibility, perceived technology trust and perceived compatibility to the basic model of perceived usefulness and perceived ease of use as predictors of acceptance intention. In addition, the study evaluated the moderating effect of degree of autonomy on the predicting variables and intention. The hierarchical regression indicates that the adoption of the model describes significantly more variance in the dependent variable compared to basic TAM. Perceived usefulness and enjoyment predict intention to accept IoT services (H1 and H3 confirmed). Thus, the relative advantage plays a key role in accepting those services. In addition, compatibility determines intention (H7 confirmed). This suggests that, if a service does not meet current inert shopping patterns, the user is rather hesitant to change the shopping behaviour. Furthermore, technology trust influences intention (H6 confirmed) indicating that the perceived trustworthiness of a service significantly influences the willingness to accept IoT services. Due to the ubiquitous and incomprehensible nature of IoT services, uncertainties exist about the underlying processes. Trust is key to reduce uncertainties and risks (Lin, 2011).

Other than in the basic TAM (model 1), in the full model, no support was found that ease of use predicts intention (H2 rejected). This is inconsistent with previous research, which found ease of use to be of leading importance for adoption (Dutot, 2015; Müller-Seitz et al., 2009). In addition, both, behavioural control and credibility were not found to significantly influence acceptance intention (H4 and H5 rejected). These findings may be explained by the disappearing nature of IoT hardware and the less conscious consumer experience (Weiser, 1991). Consequently, the cognisant interaction with the technology moves to the background (Beier et al., 2006). Therefore, perceived ease of actively accepting and using a technology becomes irrelevant. In addition, the consumer may not be able to estimate the extent to which such services intervene in privacy through data collection. The consumer may only comprehend the visible part of the IoT, but does not recognize the invisible data processes in the background. Further, he may think to keep the controllability over the underlying technology.

Technological autonomy was found to be a significant factor moderating the direct effect of enjoyment and technology trust on intention. These factors were found to have a positively stronger impact on intention to accept among services that are highly autonomous compared to services connected to lower levels of autonomy (H8c and H8f confirmed). Increasing technological autonomy goes hand in hand with growing vulnerabilities and uncertainties (Jalbert, 1987), because the user can barely recognize technological processes running in the background of applications. The results indicate that enjoyment is able to compensate for an increase in underlying uncertainties and risks. In this light, the consumer needs to experience a relative advantage that exceeds the drawback of accepting risks. In addition, trust effectively minimizes uncertainties connected to high autonomy. Considering the contrary, the consumer who is faced with low autonomy applications may not apprehend uncertainties, which make trust issues rather irrelevant.

No evidence was found that degree of autonomy has an impact on the interaction between perceived usefulness, behavioural control or credibility and acceptance intention (H8b, H8d and H8e rejected). Independent of the degree of autonomy, usefulness significantly influences intention. Hence, perceptions of usefulness are equally important when facing different autonomy degrees. Apparently, usefulness cannot provide a relative advantage that has the potential to compensate for increasing vulnerabilities. Reconsidering the findings above, which show that enjoyment gains significance among highly autonomous services, suggests that the relevance of enjoyment may outweigh the relevance of usefulness in the acceptance of increasingly autonomous IoT services.

Control and credibility are insignificant predictors of intention, irrespective of the degree of autonomy. This supports the reasoning that due to the ubiquitous nature of the underlying technologies, the consumer may not fully comprehend the underlying processes and sacrifice of control. This suggests that control perceptions and actual state diverge. The user may think to have control over a service, while the high autonomy indicates a loss in actual controllability. This may be explained by humans' innate need to be able to control their environment (White, 1959). Again, the consumer may not be able to comprehend to what extent IoT services intervene in user privacy by data collection and processing. Taking these findings in a broader context and resuming that trust significantly influences acceptance intention, indicates that the consumer may not scrutinize the underlying processes and simply puts the emphasis on trust perceptions.

6.) IMPLICATIONS AND LIMITATIONS

The major theoretical contribution of this study is the realization that degree of autonomy is a key factor in the acceptance of IoT services. Derived from technological advancements in semi-intelligent and independent technologies, degree of autonomy is expected to play a decisive role in the acceptance of future technologies. This suggests that additional research is needed that considers degree of autonomy in the acceptance of future technologies.

Second, this paper extends the technology acceptance literature by transferring findings of previous literature to the context of IoT services in grocery retailing. This paper theorizes the

determinants of consumer acceptance by extending the basic TAM (Davis, 1989) with additional perceptional factors. In doing so, the integrated model creates a better understanding of the factors influencing the acceptance of IoT services in this context.

Albeit, the results indicate that TAM may not be the most appropriate model to assess acceptance of ubiquitous IoT technologies and services. While ease of use is a central construct in TAM (Davis, 1989), the study found that it does not significantly predict intention to accept IoT retail services. Thus, the results suggest to disconfirm the robustness of TAM in explicating the acceptance of IoT services in a retail environment. This may be primarily explained by the technology characteristics of IoT services. Ease of use appears to be an obsolete construct because human-technology interactions increasingly fade into the background (Röcker, 2010). Future IoT services are positioned in a digital environment full of ubiquitous and intelligent technologies that steadily support the user. This recommends that there are other factors rather than ease of use that should be considered in future research (e.g. social influence).

The results have important implications for retail marketers to adjust their IoT services. Practitioners should clearly communicate the relative advantages and the trustworthiness of the technology. Further, IoT retail services need to be compatible with existing customer habits suggesting that marketers need to design services that do not challenge the user to vastly change usage behaviour.

By nature, there are some limitations connected to this research. First, it was built on a survey with customers of a grocery store. Therefore, consumption is based on the satisfaction of rather functional needs by purchasing fast-moving consumer goods. Research in a more hedonic context such as fashion shopping may reveal different results. In addition, previous research in TAM is dominated by studies involving student populations (Legris et al., 2003). This study also relies on a sample conducted at the University of Twente campus supermarket. The results may not represent the average population with regards to personal characteristics. In this regard, the University of Twente is a technology-focused institution. Therefore, the respondents are expected to be more open towards new technologies and rather willing to experiment with it. Future research should concentrate on a broader population that does not only consist of a campus community. Finally, the results were based on a short "Imagine…" description. Thus, the future technologies were not experienceable, but respondents needed to envision the service based on a case description. Results may be more convincing if they were connected to a try-out of the service. However, prior literature, which used the same approach of showing a case, found similar results concerning ease of use (Beier et al., 2006), indicating that the results capture the underlying developments. Nevertheless, subsequent studies could use real-life simulations of IoT retail services.

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