Augmented Reality Shopping Services – Key Factors Affecting Customer Evaluation and Acceptance

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Augmented Reality (AR) will have the potential to alter strategies within digital marketing and especially mobile marketing in the next few years. We conducted a test of a prototypical purchasing process based on Microsoft HoloLens technology in a laboratory setting with a group of test persons and collected the impressions of the users through semi-structured interviews. In our research, we firstly identified numerous challenges in the interaction with AR shopping technology such as the correct execution of gestures for interaction with the technology. At the same time, however, we were able to show that the users perceived the clear advantages of this technology, for instance, the contextual presentation of products in a real-world setting. Finally, the enthusiasm and goodwill of the users are two unexpected and salient results that warrant future research.

Keywords: augmented reality, AR, head-mounted-display, HMD, digital marketing, e-commerce, innovation, technology

INTRODUCTION

Augmented Reality (AR) will have the potential to alter strategies within digital marketing and especially mobile marketing in the next few years (e.g., Shankar et al, 2016; Scholz & Smith, 2016; O'Mahony, 2015; El-Seoud & Taj-Eddin, 2019). Since 2017 a number of factors have contributed to a considerable increase in services and diffusion of AR usage in the customer market. Today, most common smartphones are AR-ready by default, i.e. from now on companies have the possibility to present their products by Mobile Augmented Reality (MAR) functionalities in an entirely new way without installing additional terminals such as smart or magic mirrors in stores, which was also the subject in several research fields in recent years (e.g., Poncin & Mimoun, 2014, Javornik et al, 2016). This new customer friendly built-in mobile feature is considered to be an essential key factor for the expected growth rates of AR during the next five years (Digi-Capital, 2018). At a further stage of development, AR headsets will reach the mass market. According to a forecast by the International Data Corporation (IDC), AR headsets will generate revenue of more than 30 billion US dollars in 2021 (IDC Research, 2017a). Moreover, IDC assumes, the worldwide shipments of AR devices like head mounted displays (HMDs) or smart glasses will gain by a compound annual growth rate (CAGR) of nearly 173%

within a five-year period until 2021 (IDC Research, 2017b). Confirming another IDC forecast, there will be around 27 million standalone and tethered AR devices shipped worldwide in 2022 (IDC Research, 2018). One reason for this prospected trend is the supposition that the ongoing development in HMDs (i.e. Microsoft HoloLens or Magic Leap) and smart glasses will increase significantly in the upcoming years and reach market maturity quickly. In addition to that, another analysis predicts that the whole AR market (hardware and software) could approach up to $90 billion in revenue in 2022 (Digi-Capital, 2018). Besides gaming and entertainment, the opportunities of product visualization in retail and e-commerce will become one of the biggest drivers for this development in the customer market (Tractica, 2015). It is therefore, only a matter of time until AR retail apps will conquer the App Stores to get a first-mover advantage in this sector. This will inevitably lead to a reshaping of shopping behavior, which will require new strategies in digital marketing to satisfy the upcoming consumer needs within their integrated shopping experience.

For these reasons, it is necessary to determine the requirements for a successful implementation of AR apps in retail. Despite the increasing consideration of this technology by large consumer brands such as IKEA, Audi, and Lego, the scientific literature is still at the beginning of the investigation of potentials and challenges (e.g. Poushneh, 2018; El-Seoud & Taj-Eddin, 2019; Borusiak & Pierański 2017; Grewal, Roggeveen & Nordfält, 2017; Rese et al, 2016). Besides interaction, the overall acceptance and consumer responses to AR are central factors (e.g. Yim, Chu & Sauer, 2017). According to Rese et al (2016, p.306) "the overall perception and acceptance of AR is important", so the purpose of this study is to get a general overview about these subjects within the new field of HMD-based AR apps. Furthermore, the study is focused on exploring which criteria should be fulfilled to ensure the customers invest in the additional effort needed to use AR for shopping (Teo & Lim, 2001; Cronin, Brady & Hult, 2000).

The main characteristic of this paper is that the research presented in this paper is based on a self-developed prototype for the Microsoft HoloLens that enables us to perform user tests. The explorative research design is a combination of semi-structured personal interviews conducted before and after the practical app test. The results of the data collection method show that the shopping experience, customer's perceived benefits and usability of HMD-based shopping apps will have the major impact on the acceptability of Augmented Reality Shopping (ARS) services. In conclusion, we discuss some challenges and potentials for adoption ARS in retail marketing.

BACKGROUND TO THE RESEARCH

Important research foundations in the context of our project are the general work on marketing with AR and specific studies on the acceptance of AR Shopping.

Emerging Interest in AR Marketing

During the last ten years AR has been a trending topic among marketers (e.g., Clawson, 2009; Bulearca & Tamarjan, 2010; Alimamy, Deans & Gnoth, 2017; D'Angelo, 2018). Some even saw this technology as the savior of brick & mortar stores (e.g., Kramer, 2011; Narasimhan, 2017). Lighthouse projects such as the in-store installation "Digital Box" by Lego were long regarded as state of the art struggle against fast-growing e-commerce (Huang, Jiang, Liu & Wang, 2011, p.713; Peddie, 2017, p.77). However, the usability of early marker-based solutions as well as mobile AR browsers could not convince at this early stage of innovation. As a result, the initial interest faded somewhat after failed attempts. Thus, AR was caught in the trough of disillusionment for a long time.

In 2017, the leading providers of mobile operating systems introduced software development kits (SDKs) for deploying native MAR apps (Digi-Capital, 2017), thereby considerably lowering market barriers for AR service developers. This led to MAR to grow out of the gaming niche and was discovered by marketers. Poncin and Mimoun (2014) build on existing literature that shows the importance of store atmospherics to explain the rising interest in using digital technologies to enhance the store experience and especially AR. They compared two technologies and found a significantly positive impact on shopper affected reactions in both cases. Furthermore, Pantano and Servidio (2012) have already been able to

show in their research the perceived ease and digital interaction affecting consumer's satisfaction in retail stores. In addition, Dacko (2016) has analyzed the potential of MAR shopping apps in regard to adding value in retail and the possibility of changing users' shopping behaviors. According to that study, MAR shopping apps can affect customer's perceived benefit positively and lead to greater user evaluations of those providers who offer them. Potentials for retailers are "improving conversion rates" and "reducing return rates" by letting customers virtually try out the products before buying (Dacko, 2016, p.245). This means that by using AR, marketers may achieve competitive advantages over their conservative competitors (Shankar et al, 2010; Pantano, 2014). In summary, the infrastructure, development resources and interests of the major market players are now present for AR.

Acceptance of Using ARS Services

Once we have satisfactorily solved the technical challenges of AR systems, consumer acceptance will determine the success of AR. Therefore, it seems that gauging customer acceptance is of vital importance to determine which role AR can play in the retail market. In order to understand which factors, influence acceptance and use in a shopping scenario, we have used the Technology Acceptance Model (TAM) by Davis, Bagozzi & Warshaw (1989) in this paper. The model builds on two central self-reported indicators; the perceived usefulness as well as the perceived ease of use (ibid). Venkatesh and Bala (2008) define these as "the extent to which a person believes that using an IT will enhance his or her job performance" and as "the degree to which a person believes that using an IT will be free of effort". In this way, for example, Rese et al (2016) have investigated the acceptance of MAR apps based on a modified TAM and established the validity of the model as a theoretical framework for AR apps.

The implementation of AR will become self-evident for retailers over time. It can be assumed that the perceived benefits for customers will influence the acceptance of using ARS Services, which may, turn effect their purchase decisions. Up to now, the scholarly focus has mostly been on MAR app solutions (e.g. El-Seoud & Taj-Eddin, 2019; Scholz & Duffy, 2018), thus users' acceptability of HMD-based AR shopping apps seems to be the consistent continuation in research. With this paper, we are trying to go along this new path and highlight the potentials of HMD-based AR apps in retail.

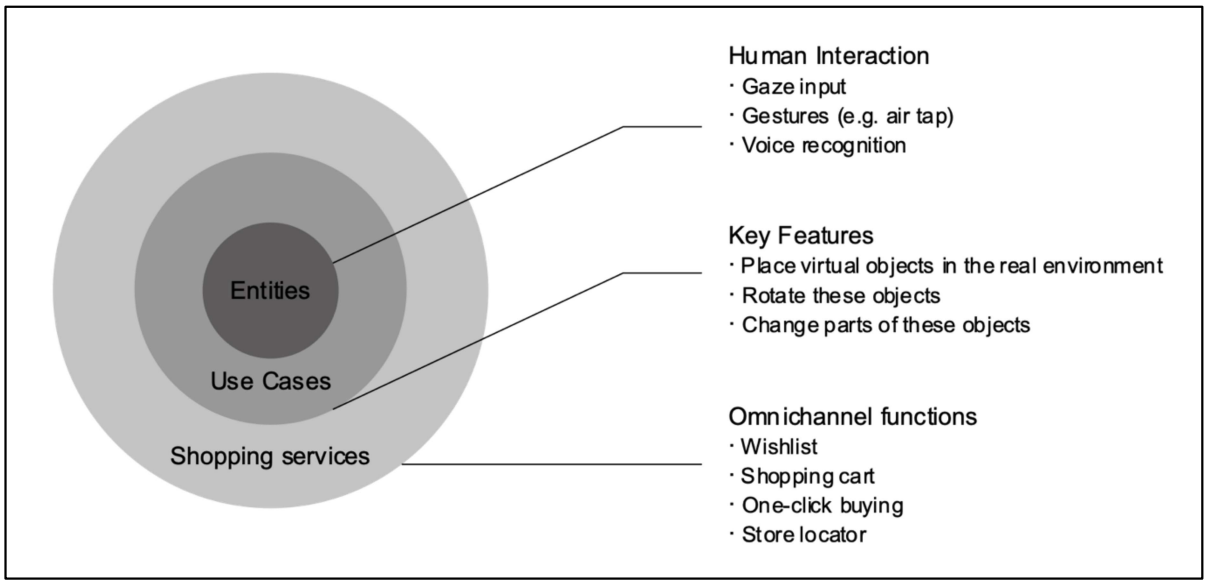
METHODOLOGY

Our research design is based on a prototypical implementation of an AR application based on Microsoft HoloLens. We use the prototype for a combination of user test, survey and observation.

Prototype

During the development of our prototype for the purpose of the test, the implementations of features as well as extended shopping services were at the center of our interest. Based on the "clean architecture" model by Martin (2017, pp.203 ff.), we categorize device specific functionalities and interaction possibilities as "Entities" (see Figure 1). According to this approach, we interpreted entities as the center of our software implementation, so that all further functions are built on them. These core functions represent the basis for enabling the test subjects to understand and use the technology. We have taken this into account, as the users have to apply themselves to the new operation of the Microsoft HoloLens at the beginning. For example, device-specific types of input such as the so-called "air tap", e.g. for selecting buttons, were anchored at the center of developing process.

FIGURE 1
ARCHITECTURE LAYERS OF THE PROTOTYPE, ONION VIEW



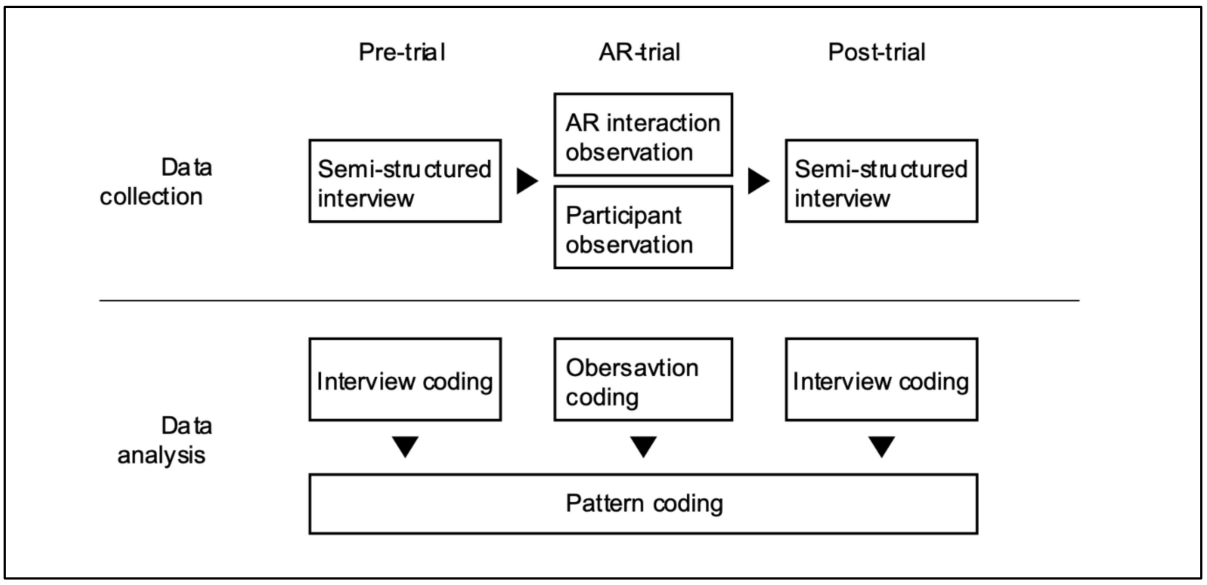
Further on, key functions such as placing, rotating and modifying virtual 3D objects in real space were implemented as "use cases" (ibid). By this, we understand extended services, that allows the test persons to interact with the prototype within a potential application scenario. For testing purposes, the selection of virtual objects has been limited to only two models of known chair designs, which are indicated by a simplified selection menu at the start of the app. After the object has been selected and placed in the room for the first time, the test persons are able to rotate the chair in its original size in the room, change the color of the seat shell and call up additional information about the product.

Our expanded interest concentrated on the acceptance of shopping services in the environment of HMD-based AR Apps. In an effort to test these, also known omnichannel functions were implemented as mock-ups in addition to the AR product presentation. The classic e-commerce method, in which the customer places or orders furniture directly on a wish list via a customer profile, options for fast checkout (Amazon, PayPal) have also been included. Furthermore, we offered the participants the option to submit their shopping cart to a local shop via a store locator or even, if desired, to arrange a consultation appointment. However, it should be noted that the modelling of a checkout process on the basis of a mock-up, concerning customer experience or e-atmosphere (see also Eroglu, Machleit & Davis, 2003), allows only limited insights. This should, nevertheless, enable us to show the test persons possible purchasing scenarios in this context and to make them more sensitive for the following interview.

Research Design

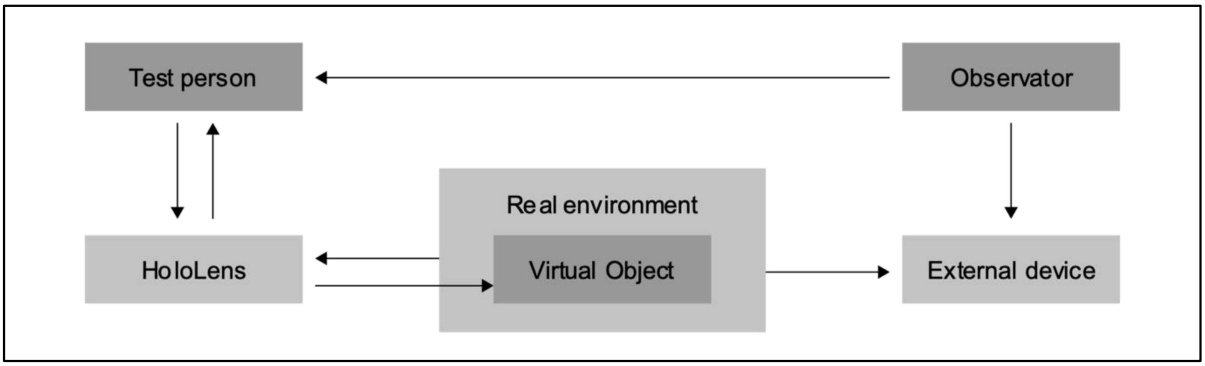
In our research, we used a multi-method approach to isolate existing user assumptions about AR from actual experience during use and subsequent evaluation. For this reason, we employ a three-step approach in order to obtain a more detailed level of insight into a technology that has not yet been used by most consumers today (see Figure 2).

FIGURE 2
RESEARCH DESIGN



For the pre-trial interview we used a semi-structured interview with all subjects. Our interview questions qualitatively assessed antecedents of the refined technology acceptance model 3 (Venkatesh & Bala, 2008) and uncovered pre-existing assumptions about AR. We discovered prior knowledge about AR and experience, self-efficacy or computer anxiety, and subjective norms. After the first interview we introduced the prototype to the test subjects and explained its usage well enough for an uninformed person to be able to use the unfamiliar technology. For this, each test person was inducted into how to use the Microsoft HoloLens before starting the actual test of the service. We wanted to observe the augmented view for the user and the overlays by the app along with the user interactions. That's why we observed the field-of-view of the HoloLens in real time and as a recording and coded it later. This setup enabled us to recognize all holographic projections in the room, which the test persons interacted with (see Figure 3). The stream was recorded for evaluation of users' behavior afterwards.

FIGURE 3
TEST SETUP



We developed the AR app for the HoloLens to simulate an immersive AR shopping experience on a standalone device. This means that the test persons had the ability to change the color of a seat shell or enable/disable an ottoman, for example. Moreover, we asked all test subjects to use the app to choose one

or more products from the catalogue, place the products into a real environment and subsequently simulate buying one or more products in the AR environment to understand how people interact with an AR shopping app and what obstacles arise. We deliberately implemented multiple payment options in the purchasing process to make the interaction realistic and at the same time view the response to a more complex payment process in an AR environment. After the trial, we conducted a follow-up semi-structured interview with each participant. The main goal of this third phase was to name and rate the experiences, the perceived usefulness and ease of use of the technology. In this phase we also asked users about changes in their opinion about AR Shopping in the light of the previous test.

In October 2017, we conducted a total of 15 semi-structured interviews consisting of a pre-selected group of Master students in the digital economy. All participants had sufficient technical competence to operate the HMD smoothly after a short introduction. The participants were between 20 and 30 years old and all had purchased products online last year. On average, each participant tested the prototype for about ten minutes. In addition, all test subjects received help from the examiner as needed during the app trail.

FINDINGS

Our approach delivers results through pre-test interviews, observation during tests and based on post-test interviews. All interviews and observations were coded and summarized.

Pre-trial-interview

The ex-ante interview has shown that most participants already had passing knowledge of AR technology. It could be determined that all of them had heard of AR in general, while only some had a first experience in interaction. Mainly the mobile game Pokémon Go was mentioned in this context during the interview, whereas apps like IKEA Place were commonly unknown at this time. To our surprise, a considerable number of students confused AR technology with virtual reality (VR), i.e. a fully simulated virtual environment. They were not able to differentiate between actual AR features and VR specifications, so that both techniques were mostly the same in their perception and they used the terms interchangeably. However, after a short explanation all test subjects understood AR specific applications and the functionalities of the app to be tested. Following a short introduction into the features of the prototype all test persons could imagine using similar apps in the future, although they had not yet used AR or had previously confused it. To the question, if they could envision also using AR when shopping, all test persons showed a high degree of willingness. None of the interviewees addressed elements of reluctance or concerns about the technology.

AR-trial

Most subjects were able to use the basic interactions of the AR environment such as menu selection, navigation in space and interaction with objects after a seven-minute introduction. The analysis of the recorded point-of-view-videos from the trial showed that when participants experienced bad recognition of gestures (such as pinching fingers for selecting objects) by the HoloLens they reacted rather benevolently and repeated the gesture a few times. It was noticeable that problems of interaction arose at all stages of the buying process, starting from product selection, during product modification and also during the checkout process. During the short period of individual trial phase, there were no learning effects discernible. In the evaluation of the trials, we found that we had to intervene more often, for example, to explain gestures again. Moreover, we could recognize that the complexity of the app was challenging for most participants. The extent of implemented features had led to the effect that most subjects repeatedly asked the experimenter for further instructions at all stages of the buying process. Nevertheless, a small section of test subjects was able to explore all functionalities on their own and could go through the process without additional assistance.

Post-trial-interview

On reflection of the experience most of the students emphasized that it was their first time to interact with a native AR app on a standalone HMD. We found an unexpected degree of enthusiasm within the test group especially after the exposure to the technology. The majority of the test persons pointed out technical issues such as the awkward gesture recognition and the narrow field of view as disturbing factors. Surprisingly, these participants attributed the failure of interactions to themselves rather than to the technology. Regardless of these problems, the interviews show a considerable willingness of the participants to use the technology in future.

Even students who had problems using the technology during the test spontaneously suggested potential application scenarios for the technology, including in marketing and especially the possibility of overlaying additional product information onto users' field of view was considered a key benefit. For example, the opportunity to get a deeper grasp of how furniture will fit into the living room by color and scale was also referred to as very useful. The test subjects consistently saw technology as no substitute for a visit to a physical shop. Instead, they see the technology as a useful and complementary enhancement to retailing that they would like to use in addition.

DISCUSSION

Our study shows a two-sided picture of the subjective perception of AR technology. On the one hand, all test persons pointed out the existing challenges, such as correct execution of the gestures during the learning phase. On the other hand, students mentioned, unanimously, the potential of this technology to increase their convenience in shopping. For instance, all test persons perceived the display's field of view as too narrow thus making the handling of the device a distraction in the shopping process. In addition, the students found the learning of the interaction and the interaction itself with the head-mounted technology to be complicated. Therefore, currently most participants would prefer to use a mobile augmented reality solution for shopping instead of HMD-based apps. The perceived ease of use is still, seemingly, a critical challenge in the acceptance of HMD-based AR for marketing.

Surprisingly and somewhat in contradiction to the stated shortcomings, the user experience did not lead to a negative overall assessment of HMD-based AR Apps but instead sparked enthusiasm and great interest in most test subjects. If our results can be generalized, there is reason to believe that the upsides of using glasses for AR features will have the potential to overlay initial difficulties in perceived usefulness respective customer experience at an early period.

In trying to explain why such clear problems nevertheless lead to an overall positive perception, we can only make assumptions that should be tested with further research. A reasonable explanation would be that our test subjects overlooked the technical difficulties, because from their point of view, the potential added value would outweigh the additional effort. One might assume, that not all technical problems will be solved by AR solution vendors in the next years, so that users will still have to learn how to best use this technology.

Here it must be taken into account that the placement of furniture is an application in which the contextual view in a room is extremely important and useful. In this respect, our experiment is by no means representative of all AR Shopping applications. Marketers should thus exploit the potential of AR in areas where the technology adds great value and not see it as an additional channel that can be used for communication in the same way as television and the Internet.

A second explanation, or a second component that explains the overall behavior of users, is the favorable perception of users. Since almost all people blamed themselves for errors in interaction with the technology, we seem to have found a special situation characterized by unanticipated user benevolence. To the best of our knowledge, this phenomenon is not or only rarely described in the existing literature.

In our analysis of the app testing as well the follow-up interviews, we found a remarkable level of enthusiasm by using HMD-based AR. In order to make use of this enthusiasm in other areas, marketers should design applications that require less effort and learning, e.g. by creating a seamless integration of

omnichannel touch points. In addition, the added value of AR applications for customers must be obvious, for example of placing and trying out furniture virtually in one's living room.

We see clear potentials for retailers to support customers during their purchase process with AR content to positively influence their satisfaction. As Spreer et al (2014) mentioned, retailers now have to face the challenge of implementing useful applications that offer actual benefits for the customers. Furthermore, Dacko (2016) found that AR shopping apps, in addition to providing an enhanced shopping experience, have to ensure that users end up buying the products they initially want. The application of ARS services can therefore be regarded "[…] as a way of improving the traditional points-of-sales in order to attract more customers and to increase sales" (Poncin & Mimoun, 2014, p.856). However, from a long-term perspective we see the potential of HMD-based apps in the convergence of brick & mortar and digital commerce, as the technology enables us to build virtual bridges to retail stores. It is conceivable, that customers comfortably search for new inspirations at home by using AR apps. As we have shown in our experiment, customers can enter the purchase decision process in their familiar environment and complete the purchase or, if necessary, find their way to a specialist retailer easily. This view can also be reversed at the same time. For example, we look into a flagship store in a metropolis, where it is not possible to exhibit all product variations due to limited shop space. Through this technology it becomes possible to experience the usual professional advice, the haptic quality of the products as well as the atmosphere of a flagship store and at the same time visualize countless variations of the products in the sense of a "virtual shelf". Another implication for marketers could be, that retail customers inform themselves about a product and then check at home whether the size of the product fits into the room before order it online via ARS services. This convergence of offline and online channels enhances the overall customer experience in an increasingly digital world.

The limited number of participants was sufficient for our project to show reaction patterns to AR Shopping technology. Nevertheless, the number of persons and the specific category of goods from our test limit the transferability of the results. Secondly, the group of participants consisted of students with an affinity for digital devices that presumably have easy access to AR. This is a bias that further limits transferability to the general public. It could therefore be instructive to work with a higher number of cases and heterogeneous groups. In the future, moreover, researchers might investigate the effects of acceptance of implemented HMD-based ARS services at stores directly and outside a laboratory setting.

CONCLUSION

Our results point towards a high willingness to use AR shopping services in young technology-competent consumers. To tap into this potential, marketers will have to identify areas with clear added value based on AR features. Ultimately, successful implementation and the acceptance of HMD-based AR still depends on further technical development and improvement. This paper should be understood as tentative research based on early products in the life cycle of AR. With our research, we have primarily identified numerous challenges in the interaction with AR Shopping technology. Finally, the enthusiasm and goodwill of the users are two unexpected and salient results that need to be investigated in future research.

REFERENCES

Alimamy, S., Deans, K.R., & Gnoth, J. (2017). Augmented Reality: Uses and Future Considerations in Marketing. In R. Benlamri & M. Sparer (Eds.), *Leadership, Innovation and Entrepreneurship as Driving Forces of the Global Economy* (pp. 705–712). Cham: Springer Nature.

Borusiak, B., & Pierański, B. (2017). Augmented reality in retailing. In L. Loijens (Ed.), *Augmented reality for food marketers and consumers* (pp. 55-64).

Bulearca, M., & Tamarjan, D. (2010). Augmented Reality: A Sustainable Marketing Tool. *Global Business and Management Research: An International Journal*, *2*(2 & 3), 237-252.

Clawson, T. (2009). *Augmented reality: Don't believe the hype*. Retrieved August 20, 2018, from https://www.campaignlive.co.uk/article/augmented-reality-dont-believe-hype/975019
Cronin, J., Brady, M., & Hult, T. (2000). Assessing the effects of quality, value, and customer satisfaction on consumer behavioral intentions in service environments. *Journal of Retailing*, *76*(2), 193-218.
D'Angelo, M. (2018). *Augmented Reality Check: Why Businesses are Embracing AR in 2018*. Retrieved August 20, 2018, from https://www.businessnewsdaily.com/9245-augmented-reality-for-business.html
Dacko, S. (2016). Enabling smart retail settings via mobile augmented reality shopping apps. *Technological Forecasting & Social Change*, *124*, 243-256.
Davis, F., Bagozzi, R., & Warshaw, P. (1989). User Acceptance of computer Technology: A Comparison of Two Theoretical Models. *Management Science*, *35*(8), 982-1003.
Digi-Capital, LLC. (2017). *Apple and Facebook to drive mobile AR over 1B users and $60B by 2021*. Retrieved July 15, 2018, from https://www.digi-capital.com/news/2017/06/mobile-ar-to-top-a-billion-users-and-60-billion-by-2021
Digi-Capital, LLC. (2018). *Ubiquitous $90 billion AR to dominate focused $15 billion VR by 2022*. Retrieved July 17, 2018, from https://www.digi-capital.com/news/2018/01/ubiquitous-90-billion-ar-to-dominate-focused-15-billion-vr-by-2022
El-Seoud, S., & Taj-Eddin, I. (2019). An Android Augmented Reality Application for Retail Fashion Shopping. *International Journal of Interactive Mobile Technologies*, 13(1), 4-19.
Eroglu, S., Machleit, K., & Davis, L. (2003). Empirical testing of a model of online store atmospherics and shopper responses. *Psychology & Marketing*, *20*(2), 139–150.
Grewal, D., Roggeveen, A., & Nordfält, J. (2017). The future of retailing. *Journal of Retailing*, *93*(1), 1-6.
Huang, Y., Jiang, Z., Liu, Y., & Wang, Y. (2011). Augmented Reality in Exhibition and Entertainment for the Public. In B. Furht (Editor), *Handbook of Augmented Reality* (pp. 707–720). New York: Springer Science+Business Media.
IDC Research, Inc. (2017a). *Virtual Reality Headsets Expected to Drive Near-Term Growth, But Augmented Reality Headsets Are Forecast to Gain Momentum by 2020, According to IDC*. Retrieved October 24, 2018, from https://www.idc.com/getdoc.jsp?containerId=prUS43105017
IDC Research, Inc. (2017b). *Worldwide Shipments of Augmented Reality and Virtual Reality Headsets Expected to Grow at 58% CAGR with Low-Cost Smartphone VR Devices being Short-Term Catalyst, According to IDC*. Retrieved June 20, 2018, from https://www.idc.com/getdoc.jsp?containerId=prUS42807717
IDC Research, Inc. (2017c). *Worldwide Spending on Augmented and Virtual Reality Forecast to Reach $13.9 Billion in 2017, According to IDC*. Retrieved August 15, 2018, from https://www.idc.com/getdoc.jsp?containerId=prUS42331217
IDC Research, Inc. (2018). *Demand for Augmented Reality/Virtual Reality Headsets Expected to Rebound in 2018, Says IDC*. Retrieved July 18, 2018, from https://www.idc.com/getdoc.jsp?containerId=prUS43639318
Javornik, A., Rogers, Y., Moutinho, A., & Freeman, R. (2016). Revealing the Shopper Experience of Using a 'Magic Mirror' Augmented Reality Make-Up Application. In M. Foth, W. Ju, R. Schroeter, & S. Viller (Eds.), *DIS '16: Proceedings of the 2016 ACM Conference on Designing Interactive Systems* [*1*, 871-882].
Kramer, A. (2011). *The Virtual Fitting Room*. Retrieved from https://www.strategy-business.com/article/00073?gko=790d3
Martin, R. (2017). *Clean Architecture. A Craftsman's Guide to Software Structure and Design*. Prentice Hall, Upper Saddle River.
Narasimhan, A. (2017). *How Augmented Commerce Will Save the Brick-and-Mortar Store*. Retrieved July 18, 2018, from https://www.mytotalretail.com/article/how-augmented-commerce-will-save-the-brick-and-mortar-store
O'Mahony, S. (2015). A Proposed Model for the Approach to Augmented Reality Deployment in Marketing Communications. *Procedia – Social and Behavioral Science*s, *175*, 227-235.

Pantano, E. (2014). Innovation drivers in retail industry. *International Journal of Information Management*, *34*(3), 344-350.
Pantano, E., & Servidio, R. (2012). Modeling innovative points of sales through virtual and immersive technologies. *Journal of Retailing and Consumer Services*, *19*(3), 279–286.
Peddie, J. (2017). *Augmented Reality. Where We Will All Live*. Cham: Springer International Publishing.
Poncin, I., & Mimoun, M. (2014). The impact of "e-atmospherics" on physical stores. *Journal of Retailing and Consumer Services*, *21*(5), 851-859.
Poushneh, A. (2018). Augmented reality in retail: A trade-off between user's control of access to personal information and augmentation quality. *Journal of Retailing and Consumer Services*, *41*, 169-176.
Rese, A., Baier, D., Geyer-Schulz, A., & Schreiber, S. (2016). How augmented reality apps are accepted by consumers: A comparative analysis using scales and opinions. *Technological Forecasting and Social Change*, *124*, 306–319.
Scholz, J., & Duffy, K. (2018). We ARe at home: how augmented reality reshapes mobile marketing and consumer-brand relationships. *Journal of Retailing and Consumer Services*, *44*, 11-23.
Scholz, J., & Smith, A. (2016). Augmented Reality: Designing Immersive Experiences That Maximize Consumer Engagement. *Business Horizons*, *59*(2), 149-161.
Shankar V., Kleijnen M., Ramanathan S., Rizley R., Holland S., & Morrissey S. (2016). Mobile shopper marketing: Key issues, current insights, and future research avenues. *Journal of Interactive Marketing*, *34*, 37-48.
Shankar, V., Venkatesh, A., Hofacker, C., & Naik, P. (2010). Mobile Marketing in the Retailing Environment: Current Insights and Future Research Avenues. *Journal of Interactive Marketing*, *24*, 111-120.
Spreer, P., Kallweit, K., Gutknecht, K., & Toporowski, W. (2012). Augmented Reality – Digital erweiterte Realität im stationären Handel. *Marketing Review St. Gallen*, *29*(5), 28-33.
Teo, T., & Lim, V. (2001). The effects of perceived justice on satisfaction and behavioral intentions: The case of computer purchase. *International Journal of Retail & Distribution Management*, *29*(2), 109-125.
Tractica, LLC. (2015). *Installed Base of Mobile Augmented Reality Apps to Reach 2.2 Billion by 2019*. Retrieved June 17, 2018, from https://www.tractica.com/newsroom/press-releases/installed-base-of-mobile-augmented-reality-apps-to-reach-2-2-billion-by-2019
Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273-315.
Yim, M.Y.C., Chu, S.C., & Sauer, P.L. (2017). Is Augmented Reality Technology an Effective Tool for E-commerce? An Interactivity and Vividness Perspective. *Journal of Interactive Marketing*, *39*, 89-103.