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Consumer Experience and Augmented Reality: A Study of Food and Beverage Service

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ABSTRACT
The application of Augmented Reality (AR) technology in physical environments has been prevalent for years and has also been found that it has a significant impact on customer experience. This study aims to explore how the restaurant industry can improve customer experience by integrating AR systems from perspectives of sensory, psychological aspect, recognition, and control. This study also intends to understand how goodness of fit, interactivity, and ease of use can enhance the dining experience.

Keywords: *Augmented Reality, Process Virtualization Theory, Theme Restaurant, Virtual Menu, Dining Experience*

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I. INTRODUCTION

In recent years, the applications of Augmented Reality (AR) is experiencing rapid growth. Under AR technology, in which both virtual and real worlds are combined, users in the real world can interact with virtual objects in space through electronic devices. This immersive interactive experience not only enhances user engagement but also deepens the user experience (Poushneh & Vasquez, 2017).

In the restaurant industry, Augmented Reality Menu (ARM) offer customers a unique dining experience. By downloading an app and pointing a smartphone at a QR code or the object to be activated, the dining experience is made more enjoyable. For example, in Starbucks' AR Valentine's Day event, placing a smartphone over a Valentine's Day cup allows users to see 3D heart-shaped petals flying out of the cup, enabling customers to send and receive virtual Valentine's messages (Chiu et al., 2021).

When customers browse menus through AR glasses or smartphones, AR applications can also serve as aids. This includes constructing three-dimensional models of meals, video demonstrations, and nutritional information. Customers can interact with different dishes on the menu through the AR interface to get more detailed information and order with ease. This enhances the interactivity and educational aspect of the dining experience. Moreover, AR can transform the dining table into an interactive entertainment venue, allowing customers to enjoy games, puzzles, or virtual entertainment while waiting for their food, thereby providing a richer environment-enhanced experience (Margetis et al., 2013). Other examples include Dinner Party (creating animated objects on food placed on the table), Neon Racer (playing AR games on the tabletop), Food Media (creating text messages or design patterns using real edible food), and iEat (ordering system, decorating the tabletop, providing games).

II. LITERATURE REVIEW

As a new application, theories that can be used to study the AR use is scant. We found that Process Virtualization Theory (PVT) can help to explain the AR use. This section then sequentially discusses PVT, customer satisfaction, and three mediating factors: goodness of fit, interactivity, and ease of use. We then proposes a research framework for studying AR.

Process Virtualization Theory (PVT)

Process Virtualization Theory, proposed by Eric Overby in 2008, focuses on the virtualizability of a process (i.e., whether a process between people or people and objects can be suitably conducted without physical interaction). Key constructs in the theory include sensory requirements, physiological requirements,

and identification and control requirements. These constructs are believed to has negative impact to virtualizability, meaning that as these needs increase, the process becomes less suitable for virtualization.

However, the introduction of AR technology has a positive effect on sensory requirements, synchronicity requirements, and identification and control requirements - AR technology can meet sensory needs by providing visual and auditory enhancements, making the virtual process more realistic. For instance, AR can provide visual projections in a virtual environment, making the interaction feel more authentic to the user, thus enhancing the sensory experience of the virtual process (Radu & Schneider, 2023). This helps to mitigate the negative impact of sensory needs on virtualization. Additionally, AR technology also offers better capabilities to identify and control the virtual environment. It allows users to identify virtual objects more accurately through the AR interface and interact in real-time. This improves the user's perception and control in the virtual environment, reducing the dependency on these needs, making the virtual process easier to realize (Javornik et al., 2016).

Customer Satisfaction

Customer satisfaction is often viewed as the consumer's evaluation of the expected and actual performance of a product or service after purchase and use. This concept is widely applied in market research, including assessing the performance of products, services, brands, or companies. Over time, customer satisfaction has evolved into a multi-dimensional concept, encompassing not only the quality of products or services but also aspects of consumer experience, price, brand image, etc.

For example, in the marketing field, AR is considered a potentially disruptive technology that enriches consumer experiences and has successfully transformed marketing methods in the market. The application of AR in online shopping significantly impacts consumer satisfaction and purchase intentions, offering a rich and highly interactive shopping experience (Ho et al., 2023).

Goodness of Fit

The concept of goodness of fit reflects the degree to which Augmented Reality (AR) technology is integrated with physical stores, often enhancing sensory satisfaction. In mixed-reality environments, AR provides an enhanced visual and auditory experience, thereby improving the customer's sensory experience. Properly matching AR content with the environment or theme can provide a richer sensory experience (Tom & Jung, 2018).

When customers' sensory requirements in a restaurant or any service environment are fully met, their overall experience and evaluation of the service significantly improve. This positive experience, in turn, further strengthens their satisfaction and loyalty to the service provider (Bitner, 1992). Including environmental aesthetic design, comfort, functionality, and sensory elements, such as visual and auditory stimuli, restaurants through AR technology can create an immersive dining environment, which helps to meet customer sensory needs and enhance their overall evaluation of the restaurant. Therefore, the importance of sensory elements in service environment design should not be overlooked, as they are key factors in enhancing customer satisfaction and loyalty.

Interactivity

Interactivity is defined not just as the basic communication between the AR system and the user but emphasizes the quality and effectiveness of the interaction. Under this framework, a high level of interactivity can deeply satisfy customers' expectations in theme restaurants, providing an attractive experience, thereby significantly improving customers' psychological satisfaction and overall sense of fulfillment (Yim et al., 2017).

When customers' psychological requirements during the service process, such as a sense of identity, safety, and belonging, are fully met, their overall evaluation of the service tends to be more positive and proactive. This is because psychological needs play a crucial role in an individual's sense of well-being and satisfaction (Maslow, 1943). In customer experience-intensive businesses like theme restaurants, meeting these psychological needs is especially important. By creating a welcoming, inclusive, and safe environment through AR technology, service providers can help customers meet these psychological needs. When customers feel a sense of identity, safety, and belonging, their evaluation of the service naturally becomes more positive, which in turn increases their loyalty to the brand and the likelihood of revisiting.

Ease of Use

In this context, ease of use is defined as the simplicity and intuitiveness of operating the AR system. When the use of the AR system becomes intuitive and barrier-free, it can significantly enhance customers' understanding and mastery of the system environment. This intuitive operability helps to lower the learning and usage threshold and also strengthens the customer's sense of participation and control.

The ability of AR systems to seamlessly integrate with the real environment and provide high levels of identification and control is crucial for enhancing users' satisfaction with identification and control (Azuma, 1997). An intuitive operating experience can also enhance customer satisfaction, as customers will feel empowered by technology, rather than restricted by it. Therefore, the ease of use of AR technology is key to enhancing sensory satisfaction in physical establishments and meeting identification and control requirements.

III. RESEARCH QUESTIONS AND METHOD

Augmented Reality (AR) technology integrates virtual information into our real world. It can be a strategic tool to optimize the environment and enhance customer dining experiences in theme restaurants. Based on the importance of AR, this study proposes potential key factors that might affect the impact of AR characteristics on customer satisfaction, based on sensory requirements, physiological requirements, and identification and control requirements, guiding us in subsequent research.

This study aims to elucidate the importance of the following research questions through in-depth research exploration: (1) Key elements to consider when restaurants integrate AR systems. (2) How AR elements influence customer dining experiences. (3) How AR elements enhance customer satisfaction and intent to revisit.

Method

To determine the problem area, this study starts with a literature search. Initially, the keyword "ARM" (Augmented Reality Menu) is used to find relevant literature. To introduce a diversity of literature and broaden the research scope, the study also employs keywords like "Augmented Reality (Theme) Restaurant," "Augmented Reality Dining Table," "Augmented Reality Menu," and "Augmented Reality Food." These combinations help provide insights into the impact and extent of Augmented Reality catering applications on physical restaurants.

The study collected literature from recent years, setting the publication year range from 2019 to 2023, to maintain the timeliness of the literature review and reflect the latest developments in ARCA research. This will help researchers identify trends and findings in the ARCA field.

Findings

Applications of Augmented Reality (AR) in the catering industry cover various topics such as digital menus, the use of AR technology in restaurants, and the effects of AR retail applications in the food retail industry.

Most studies have successfully proven that the use of AR technology in the catering industry can significantly improve customer experiences. For instance, tablet-based menus enhance customer enjoyment, increase adoption intentions, and encourage consumers to order more dishes in less time compared to traditional menus (Yim & Yoo, 2020). Enhancing sensory experiences and improving social interaction also positively affect customers' perceptions of restaurant experiences (Batat, 2021). Additionally, scholars have successfully developed a three-dimensional scale to measure customers' AR experiences in restaurant environments, showing good model fit and internal consistency for assessing consumer AR perceptions.

In literature related to "food" and "groceries," some scholars point out that success in retail food chains relies on the positive impact of system and information quality on user satisfaction, continued use intentions, and user benefits. Online food shopping studies also show similar results, indicating significant potential impacts of AR applications on enhancing consumer experiences and purchase intentions.

Issues with ARM Studies

Most ARM studies share several common challenges and limitations. Firstly, many studies' participants and samples are limited to specific groups, such as digital natives, university students, or residents of certain geographical locations. These samples may not fully represent all potential users, especially considering different cultural backgrounds, ages, genders, and digital familiarity. Secondly, many studies are conducted in controlled environments, like laboratories or isolated scenarios with specific technologies, which may not fully simulate real-world restaurant or retail settings. Additionally, although digital and AR technologies have shown potential in enhancing experiences, they are not necessarily suitable for all consumers. Some groups may have a conservative attitude towards new technologies, preferring traditional interaction methods. Lastly, particularly in the field of AR technology, the rapid development of technology means that current research findings may quickly become outdated, necessitating continuous updates to these findings to maintain their relevance.

In summary, past research conclusions are limited by the diversity of sample scope, research settings, and technology acceptance. Future studies need to consider a broader and more diverse sample and test these technologies in more realistic usage scenarios to more comprehensively understand their impact on consumer experiences.

IV. CONCLUSION

In this study, we propose to explore the factors influencing customer dining experiences and satisfaction from the perspective of internal and external needs in relation to AR characteristics. By collecting ARCA literature, we aim to summarize the findings of related research in a table to create a comprehensive understanding of current ARCA research concepts. Through this approach, we hope to understand how research in this field can develop and be applied in physical restaurant environments, thereby contributing to ARCA research.

Table 1: ARCA Research Findings

Author	Context	Variables	Subjects	Methodology	Findings
Ali (2022)	Consumer experiences The use of AR technology in restaurants	Utilitarian Hedonic Social	Assessing the measurement scale of consumer experiences in restaurant environments enhanced by AR.	● Conducting a qualitative phase for theme identification and item generation. ● Employing Exploratory Factor Analysis (EFA) for initial assessment. ● Utilizing Confirmatory Factor Analysis (CFA) for scale validation.	Successfully developed a three-dimensional scale to measure AR experiences. The scale showed good model fit and internal consistency, with Cronbach's alpha results ranging from 0.78 to 0.89.
Batat (2021)	Dining experience The use of AR technology in restaurants	Sensory Emotional Behavioral Social Intellectual	Exploring how AR technology is changing the restaurant industry and analyzing the impact of the case study "Le Petit Chef" on customer dining experiences.	● Conducting an exploratory analysis using a qualitative multi-method approach. ● Employing a case study method, specifically focusing on 'Le Petit Chef' AR dining experience.	AR technology can positively or negatively influence customers' perceptions of the restaurant experience. Sensory dimensions are enhanced or simulated through AR technology. Creating interactive and storytelling environments through AR also improves social interactions between customers and with restaurant staff (social dimension).
Chiu et al. (2021)	Consumer experiences The effects of AR retail applications in the food retail industry	System service quality Information quality User satisfaction User continued usage intention User benefits	Investigating how AR Retail Applications (ARRAs) act as a rapidly developing innovative and future trend technology in retail food chains to improve physical and online retail environments and customer experiences.	● Employing quantitative analysis methods, including Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). ● Collecting data through structured web-based surveys.	The study applied an updated version of the DeLone and McLean Information Systems Success Model (ISSM), validating that three types of quality positively impact user satisfaction, continued usage intentions, and user benefits.
Jeganathan & Szymkowiak (2023)	The effects of AR retail applications in the food retail industry	Simulated Physical Control (SPC) Environmental Embedding (EE) Quality of Mental Imagery (QMI) Ease of	Exploring the application of AR in online food shopping, aiming to explore how AR affects consumers' cognitive, emotional, and behavioral	● Using WebAR technology ● Collected data through an online questionnaire, where participants responded to statements on a 1-7 scale	The study found that both SPC and EE have a positive impact on EOE. QMI mediates between EE, EOE, and PL, and EOE and PL significantly influence PI.

		Evaluation (EOE) Product Liking (PL) Purchase Intention (PI)	responses.		
Yim & Yoo (2020)	Digital menus The effects of AR retail applications in the food retail industry	Perceived interactivity Consumption visions Menu enjoyment Attitude towards the menu Menu adoption intention Ordering intention	Investigating the impact of interactive media on consumer responses in restaurant settings, focusing on comparing digital menus to traditional menus.	● Employing quantitative research methods for data analysis. ● Conducting experiments to compare responses to digital and traditional menus.	Compared to traditional menus, digital menus, especially tablet-based ones, were found to generate greater enjoyment, increase adoption intention, and encourage participants to order more dishes in less time.

References

[1]. Ali, F. (2022). Augmented reality enhanced experiences in restaurants: Scale development and validation. International Journal of Hospitality Management, 102, 103180.

[2]. Azuma, R. (1997). A Survey of Augmented Reality. Presence: Teleoperators and Virtual Environments.

[3]. Bitner, M. J. (1992). Servicescapes: The Impact of Physical Surroundings on Customers and Employees. Journal of Marketing, 56(2), 57-71.

[4]. Batat, W. (2021). How augmented reality (AR) is transforming the restaurant sector: Investigating the impact of "Le Petit Chef" on customers' dining experiences. Journal of Technological Forecasting & Social Change, 172, 121013.

[5]. Chiu, C. L., Ho, H.-C., Yu, T., Liu, Y., & Mo, Y. (2021). Exploring information technology success of augmented reality retail applications in retail food chain. Journal of Retailing and Consumer Services, 61, 102561.

[6]. Ho, J.-Y., Ju, G., Hong, S., An, J., & Lee, C.C. (2023). Factors influencing customer satisfaction with AR shopping assistant applications in e-commerce: an empirical analysis utilizing text-mining techniques. Aslib Journal of Information Management.

[7]. Javornik, A., Marder, B., Pizzetti, M., & Warlop, L. (2021). Augmented self - The effects of virtual face augmentation on consumers' self-concept. Journal of Business Research, 130, 170–187.

[8]. Jeganathan, K., & Szymkowiak, A. (2023). Playing with food – The effects of augmented reality on meal perceptions. Journal of Food Quality and Preference, 111, 104969.

[9]. Margetis, G., Grammenos, D., Zabulis, X., & Stephanidis, C. (2013). iEat: An Interactive Table for Restaurant Customers' Experience Enhancement. In Communications in Computer and Information Science (pp. 666-670).

[10]. Maslow, A. H. (1943). A theory of human motivation. Psychological Review, 50(4), 370–396.

[11]. Overby, E. (2008). Process Virtualization Theory and the Impact of Information Technology [Article]. Organization Science, 19(2), 277-291.

[12]. Poushneh, A., & Vasquez-Parraga, A.Z. (2017). Discernible impact of augmented reality on retail customer's experience, satisfaction and willingness to buy. Journal of Retailing and Consumer Services, 34, 229–234.

[13]. Radu, I., & Schneider, B. (2023). Designing augmented reality for makerspaces: Guidelines, lessons and mitigation strategies from 5+ years of AR educational projects. Computers & Education: X Reality.

[14]. tom Dieck, M. C., & Jung, T. (2018). Value of augmented reality at cultural heritage sites: A stakeholder approach. Journal of Destination Marketing & Management, 9, 14-24.

[15]. 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.

[16]. Yim, M. Y.-C., & Yoo, C. Y. (2020). Are digital menus really better than traditional menus? The mediating role of consumption visions and menu enjoyment. Journal of Interactive Marketing, 50, 65-80.