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**Title: The Adoption of Augmented Reality Technologies in Hotels:
From the Managers' Perception**

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The Adoption of Augmented Reality Technologies in Hotels: From the Managers' Perception

ABSTRACT

Current studies indicated that Augmented Reality technology can enhance tourists' experience in museums and theme parks. Despite the potential benefits of creating a better stay for the customers, there are only a handful of hotels in the world have implemented the technology. This paper aims to explore senior management's perception to the potential adoption of AR technologies in their establishments. Qualitative interviews were conducted with four senior managers in Hong Kong, content analysis was adopted and four themes were derived. Senior management's knowledge and interest was found to be the most critical factor that influence the final decision of technology adoption. This research has broadened the interdisciplinary perspective for future research in AR developments in the hospitality literatures.

Keywords: AR technology, management perception, technology adoption, hotel

1.0 INTRODUCTION & OBJECTIVES

Technology is evolving extremely fast, from desktop computer to mobile phones; from information provider to an Ultra-Intelligent Electronic Agent. The invention of mobile phone, brings convenience and stay connected with people around the world. According to Tan, Lee, Lin & Ooi (2017), the creation of application of mobile phone enable consumers to access to a variety of services and resources, such as social networking, news and etc. (Tan, Lee, Lin, & Ooi, 2017) These technologies may bring not only convenience but to enhance the consumers' experience.

The concept of Virtual Reality (VR) was established in late 1980s, "*as a description of where computers might take us as a society, it was both radical and yet strangely attainable*" (Hunt, 2014, p. 98). The military and medical sectors heavily use this technology. It allows them to train, practice, and perform operations or operate unfamiliar environment without dangers. In the commercial section, such as Nintendo's WiiMote and Virtual Boy, as gaming devices for entrainment (Hunt, 2014). With the evolvement of VR, Argument Reality (AR) has bought the consumers more convenience by using their own mobile phone as a device.

Fox (2012) defines "*Argument Reality, an emerging type of digital content that combines real imagery with virtual 3D digital graphics and /or text, is likely to alter the IT industry*" (Kim & Hyun, 2016, p. 1). In other words, it provides a real-time and real-environment by addition virtual digital graphics to it. The difference between AR and VR is that AR presents the reality or real-world objects and VR is based on the imitation or man-made settings. Currently, it has been using by the education, healthcare, commerce, sports, and entrainment, design, and tourism industries. According to Alkhamisi & Monowar (2013), the AR technology has bought a total of US\$5.2 billion in 2017 (Kim & Hyun, 2016).

This AR application take the advance of using the installed camera lens in the smartphones as a device. The smartphone works with the location-based service or marker-based, such as GPS, to detect the device and user's location.

"The smartphone stores image-based data from the camera into a database, allowing it to recognize what the camera is looking at (i.e., visible markers placed on objects in the real environment). The AR systems pulls the digital data from web-based sources (e.g., Google, Twitter, Flickr, SNS applications) to overlay onto the markers that the camera is tracking. As a result, the user has more digitalized virtual information that reality provides"(Kim & Hyun, 2016, p. 1)

AR is also at large in the hospitality field, heritage sites and museums have adopted the technology, theme parks such as Universal Studio and Disney has been researching on adding VR/AR into their theme parks as they believed AR technologies can enhance their crafted attractions (Singletary, 2017). Lately, there are more and more examples of hotels adopting the latest technologies in their service delivery process, and Henna hotel in Tokyo has even "employed" more robots than human in their outlet, but up-to-date, there are comparatively fewer examples of hotels adopting AR technologies into their daily operations. On the other hand, Yovcheva (2013) suggested adopting AR does not automatically boost positive experience, therefore, the aim of this research is to have a better understanding how the hoteliers perceive the possibility of adopting AR technologies in hotel setting.

There are number of research that are foundational in the study of acceptance of latest and established technology. For instance, a large number of researchers have adopted the technology acceptance model (TAM) to identify the acceptance of technology innovations within their field of study (Tom Dieck, M., Jung, T., Kim, W., & Moon, Y. (2017). Researchers applied TAM to various industries, including hospitality (Kang et al., 2011; Kim et al., 2010; AyeH et al., 2013a; Parra-Lopez et al., 2011); however, those are mainly focus on user's perspective and there is a gap from the view of suppliers. To address these concerns, researchers will focus on internal factors from hotel management of apply augmented reality in property.

RQ 1: Identify what are the perceptions towards adoption of AR technology in hotels.

RQ 2: Examine other external factors that may hinder managers' choice of AR technology in hotels

2.0 LITERATURE REVIEW

The AR application with the mobile technologies is to enhance the tourists' experience. According to Kounavis et al (2012), there were experimental research on the hindered VR/AR technology back in 1960s, however they did not go into the details of it (Tom Dieck & Jung, 2018). Many disciplines have research on VR/AR technologies including health, education, and retailing and consumer services. In Health disciplines, they are more focusing on VR which was used to simulate the experience in a controlled setting for clinical improvement of a treatment (Yung & Khoo-Lattimore, 2017). In terms of education, the studies are more focused on improving student's motivation and interaction and enjoyment of learning (Yung & Khoo-Lattimore, 2017). For retailing or consumer service sector, it is the geolocation and personalization and tailor-made marketing features for gaining business and higher intention to purchase their products/ services (Yung & Khoo-Lattimore, 2017).

2.1 AR in Tourism

Today, the tourism industries have used the development of AR, such as museums, historical sites and attractions. Destinations or buildings that are recognized by UNESCO World Heritage Sites have become one of the popular tourists' attractions. This urban heritage is known as subcategory of tourism (Tom Dieck & Jung, 2018). However, June and Han (2014), identified the negative use of space in these urban heritage destinations and suggested to use AR as an ideal solution. Garau (2014) commented that by providing the attraction information through three-dimension content available for tourists' convenience and knowledge learning (Tom Dieck & Jung, 2018). In near future, this dynamic and interactive experience will create a new type of cultural tourism. Using this attentiveness, it will bring tourists to explore the destinations or attractions in a new level of experience enhancement, as well as a way to educate tourists and appreciation of the historical culture.

Researchers, Fino, Marin-Gutierrez, Fernandex & Davara (2013), they introduced the implementation of Augmented Reality (AR) into a World Heritage city of San Cristobal de La Laguna, in Spain, as a tourist guide. Their design required to use the application of AR and QR Codes (also known as two-dimensional barcode) so the tourists can get access to both textual and

multimedia information (Fino, Martín-Gutiérrez, Fernández, & Davara, 2013). This has not only increase the knowledge but also bring the history to today's world.

The tourism industry has already adopted these VR/AR. Mesaros et al. (2016) discussed the AR experience which is delivered through smartphones for museums and attractions and Dieck et al. (2016) concerned on the acceptances of it (Yung & Khoo-Lattimore, 2017). Tung & Khoo (2017) have done an in-depth analysis of the VR and AR technology over the past decades. Among all the articles related to this topic, they have identified the challenges of technology awareness; usability; time requirement to learn; and the acceptance of it.

2.2 AR in Tourists' perspective

Anuar (2013) found that because of tourists' interaction with AR application, they are able to gain more knowledge of the destinations, hence this will bring more enjoyment from a new perspective. Some felt of excitement as like they got-away, even they were in familiar surroundings. The overlaid graphical annotations over reality facilitated tourism experience. Majority of the research articles mentioned how AR enhanced the tourists' experience, as well as the advantages and effectiveness of AR towards the destinations/ attractions. Chung, Han, & Joun (2015) rose that a user's readiness to accept new technology is an important, particularly in the usage of this state-of-art technology such as AR. One of the key elements of using AR is the esthetic response caused by the synthesis of its virtual objects in the real world. People use AR is necessarily to accept visual appeal as a stimulus factors influencing usefulness of the technology. In short, optimism and innovativeness are enablers of new technology use, whereas discomfort and insecurity are inhibitors (Parasuraman, 2000). People have both positive and negative perceptions about technology; the general belief continuum for a technology ranged from strongly positive to a strongly negative attitude toward technology (Lin et al., 2007). There were vast literatures on how AR can influence tourist experience, how tourist perceived AR and how technology impact of the development of tourism attraction, but there are limited research focusing on the understanding of the managers' perceptions of the adoption of such technologies in hotel and tourism industry, this study will focus on exploring the possibility of adopting AR in the hotel context.

2.3 AR in Heritage, Museums, Theme Parks

According to Fritz, Susperregui & Linaza (2005), AR technologies are gaining importance in the virtual rebuilding of historical monuments, helping curators, archaeologists or historical reproduce on-site historical experiences. Casella and Coelho (2013) commented that AR mobile applications are the useful technologies for understanding the cultural tourism. Since it is getting popular, a variety of AR unitization examples in heritage can be found. Han, Jung & Gibson (2013) tried to understand urban heritage tourism AR user requirements such as accessing destination information, other's user reviews, design interfaces, multi-lingual aspects, and maps. Chung, Han & Joun (2015) investigated important factors for using AR at heritage destinations and how those factors influence visitors' beliefs, attitudes, AR usage intention and destination visit intention.

Since AR technologies are relatively new, most of the previous literatures are more focusing on the research heritages sites including scholars Chung et al. (2015), Fino et al. (2013); Tom

Dieck & Jung (2018). Furthermore, these scholars, Lu et al. (2005); Tan et al. (2017); Tom Dieck & Jung (2018) were using TAM (Technology Acceptance Model) and later these scholars used a modified version of TAM, known as TRA (Theory of Reasoned Action) to study about the acceptance of AR technologies. These TAM or TRA models are mostly used to identify the external factors (such as Information quality, System quality, Cost of use...); Perceptions (usefulness, ease of use...); Attitude (positive or negative); and Behavior (related intention to use or recommendation) (Kim & Hyun, 2016; Tom Dieck & Jung, 2018). There is limited research on AR particularly in hotels, therefore there is a potential area to explore. Furthermore, according to Le & Arcodia (2018) argues that “due to the tourism characteristics of high uncertainty and high financial and personal risks, risk perception and safety concerns have become a central issue in the complex travel decision-making process” (Le & Arcodia, 2018, p.106). Thus, this study aims to address the gap in AR adoption qualitatively focusing on the hoteliers’ perception.

2.4 AR in Hotel context

Augmented reality has emerged as an important concept within the hospitality industry in recent years, the technology backed augmented reality marketing in tourism and hospitality sector appear as a theme of a purposeful research. Literally, augmented reality is the forward step and variation of virtual reality, where consumers can experience real world with the support of graphical imposition and relevant applications (Azuma, 1997). Augmented reality is believed to be helping individuals or consumers to enjoy more freedom in searching, viewing, selecting and purchasing products or services. Thus technological infrastructures and its use in tourism and hospitality will aid in designing effective marketing strategies in the future (Daim, et al., 2012).

Johnson (2014) believes that expectedly AR technology is expanding in areas of AR contacts, eye tracking, education or even facial recognition. Augmented reality is a form of digital marketing while, augmented reality in marketing is featured as, ‘Augmented reality “augments” the viewer’s surroundings with new digital imagery and information. Augmented reality in and of itself usually isn’t the goal of any marketing campaign; the goal is to use AR in such a way that it creates an interactive experience, engaging the customer through a rich and rewarding experience’ (Vong, 2014).

The trends and impacts of AR have been increasing in associated areas of tourism and hospitality. Accordingly to Hotels.com's wacky, the 3D augmented reality virtualvacay.com project is regarded as a pioneering ARM initiative in tourism and hospitality. The traffic of Hotels.com soared to 26% with 36% increased booking, mainly due to launch of the Virtual Vacation micro-site and few related factors. In addition, the loyalty program registration also increased by 32% as a result of AR (USA Travel Today, 2014).

Best Western Hotels & Resorts has been a willing participant in the implementation of both augmented and virtual reality devices on both the guest facing side of the business as well as back of house. Dorothy Dowling, SVP and chief marketing officer at Best Western, said the company first partnered with Disney years ago to develop an augmented reality program for younger guests, and in 2015 came out with a new AR experience paired with the Disney Movie Experience (Hotel management, 2016).

Marcus Hotels & Resorts reported that its flagship property, The Pfister Hotel in Milwaukee, Wis. will be the first hotel in the U.S. to offer an augmented reality (AR) tour available to guests. According to a company release, to be launched during Milwaukee's Gallery Night, participants will be invited to download an AR application from their smartphone that will prompt them on a guided tour of the hotel's extensive art collection (Marcus Hotels & Resort, 2014).

3.0 METHOD

The application of AR in hotels is a relatively new concept in the hospitality literature, little is known on this topic, a qualitative approach was employed for data collection to generate deeper understanding of complicated behavior and also uncover the feelings and thoughts which may even beyond their awareness (Kwortnik, 2003) and to discover the not-so-obvious perspectives that are remote to academics (Walsh, 2003). Semi-structured in-depth interviews were conducted to accumulate useful insights from hotel managers (Guion et. al, 2001), researchers are believed to be able to learn about organizational culture from different interviewees' point of view by utilization the ethnographic method of questioning (Qu & Dumay, 2011).

The quality of the implementation of interview and data analysis will be affected by the quality of the interview guide, a well-developed guide will enhance the credibility of the study (Kallio et al., 2016), the interviews had included a set of predetermined open-ended questions and subsequent probing questions emerging from the dialogue between the interviewees and interviewers informed (DiCicco-Bloom & Crabtree, 2006; Walsh, 2003) by recent research on the implementation of technologies in hotels to guide the conversations.

Participants in this study were recruited by purposive sampling, which is useful when a random sample inadequate to access the relevant cases (Furunes & Mykletun, 2007) and is suggested to be suitable for studies where researchers are interested in informants who are experts in the phenomenon (Blanford, 2013).

Hong Kong Tourism Board (HKTB) has classified the hotels in Hong Kong into three categories according to their Tariff classification system: "High Tariff A", "High Tariff B" and "Medium Tariff". The hotels were classified based on their location, facilities, staff to room ratio, business mix and achieved room rate. Four hotels from four different hotel groups, covering all three types of Tariff categories, were contacted by email to explain the purpose of the research, two hotel general managers, one director of sales and a group managing director/ owner who are responsible for decision making process for their establishment agreed to be interviewed. Face-to-face interviews were conducted in their hotel offices with an average duration of 45 minutes to an hour each. The interviews conducted in Cantonese, were recorded, transcribed, and then translated to English.

Table 1. Summary of interviewees

Interviewee	Position	Hotel Size	Tariff
Respondent A	General Manager	559 rooms	High Tariff A
Respondent B	Director of Sales	453 rooms	High Tariff B
Respondent C	General Manager	524 rooms	High Tariff B
Respondent D	Managing Director/ Owner	48 rooms	Medium Tariff

Content analysis was used to reveal a collective understanding of buyers' perspective of the use of AR technologies on hotel sales and operations. The data analysis process involved two stages, in the first stage, two coders conducted data analysis independently and separately on the same set of information using an inductive approach, and different codebooks of themes were created and supported by narratives from the transcripts. To ensure the creditability of the data gathered, triangulation is used (Kvale, 1996), an independent researcher was assigned to verify are all the themes generated grounded in data and supported by sufficient evidence, all divergent opinions in coding were discussed and resolved to yield the final themes (Elo et al.,2014).

4.0 FINDINGS & DISCUSSION

Four themes were derived from the analyzing of data obtained from the interviews, the themes will be discussed in this section to explore and develop an understanding of the senior management's perception towards the adoption of AR in the hotel industry.

4.1 Senior Management's Influence

Knowledge and interest of the managers are found to be a critical issue to the decision of AR technology adoption in hotels. Failure to foresee the potential benefits of implementing AR technology, which may outweigh the possible problems and costs it may bring to the company was seen to be the sole reason for such decision. None of the respondents is aware of the current technologies that are using in other industries or other types of establishments in the hospitality field, such as museums and theme parks. All of them mentioned that they do not know much about the technology, do not know how can they make use of such technology and cannot estimate how AR technology can assist the advancement of their business, so they have never consider adding the new technology to their outlet. Personnel psychologists Morris and Ventakesh (2014) suggested older employees are less likely to have basic knowledge and skills of latest technological advancements due to associated psychological and sociological factors of ageing, which may further elevate their anxiety to technology adoption. Therefore, for senior managers who are generally older in age, may have a higher tendency of not adopting new technologies.

Senior management have different concerns as well when making a decision for their outlets. Respondents A and B mentioned that their hotel group has set strict corporate culture that they have to follow. Therefore, regional general managers may not bother suggesting headquarters

to add any major implementations to the outlet themselves although the group have empowered them with certain authority to make decisions for their responsible outlets. Another concern for the regional general managers is the complexity of their corporate management structure, which may hinder the efficiency of penetration of new ideas to local branches. Hotels that are physically smaller in size have other concerns as well; respondent D claimed that they do not have actual space to implement such technologies with the installments of different equipment to support the ideal effect. Most importantly, they do not want to keep a crowd gathering around a certain point of interest and create chaos in their small lobby.

Last but not least, senior management tend to have their own perception of the needs of their customers, which may or may not reflect the real picture, as according to the first gap identified in the SERVQUAL model, there are differences between customers' actual expectations and the managers' perceptions of their customers' expectations, managers do not really know what level of service quality their customers desire (Luk and Layton, 2002). None of the respondents mentioned that they think that their customers will need such technologies when consuming their products and services, the assumptions made was not supported by actual data from conducting surveys or market research on the area, but was purely from their own perceptions.

4.2 Market Segmentation

Although AR technologies have been proved that it can enhance the experience of the tourist in a number of literatures, hotel managers may not see it the same way, due to the actual need of such technologies to their businesses. Different strategies will be employed for hotels targeting different market segments due to different needs of the customers.

For hotel D which mainly target budget customers, they may focus on minimizing operational costs by providing basic facilities so as to offer a competitive price for the customers. Therefore, adding AR technologies, on the contrary, will add on to the cost which will go against their corporate goals.

“We are targeting customers who values competitive prices with basic facilities that satisfy guests' needs instead of luxury seekers, so going after the latest technology trends is not our corporate goals” (Respondent D)

For hotels that are targeting business tourists, both respondents A and B believed that AR may not have any impact on increasing occupancy rate as most of the current room nights were sold and booked by corporate groups through a guaranteed contract rate, hotels being selected according to the corporate deals instead of personal wants. Besides, as AR technology at current is not too common in the business world, respondent A suggested business tourists favor other facilities more than AR technologies, such as Wi-Fi connection, convenience of having a working desk during their stay instead of the availability of AR technologies to enhance their experience in the hotel.

4.3 Profitability

Most respondents believed that AR technology able to help to make hotel environment more enjoyable to spend time in. The research finding support prior literature that Augmented information systems not only merely provide valuable and crucial information about a tourist attraction or destination but also maximize their experience in their travels and offer entertainment opportunities as well (Kounavis et al, 2012). Respondent B shared that

“integrated AR in different parts of the hotel may enrich guest experience in hotel. For example, some hotels created an AR hotel experiences and allow guest to point their smartphone and see realistic virtual depictions of the hotel’s celebrities. Some of the resort hotel integrated some famous cartoon character AR, allow guests see themselves together with characters. Some of the heritage hotel utilized AR to introduce the background and history about different sculptures which placed in both lobby and rooms to guests”.

All respondents agreed that the application of AR in Hong Kong property is very much depends on the costing, total investment and the ratio of return on investment; on top of enriched overall guest experience in hotel, if AR compatible with revenue generation, it will stimulate the initiative of hotel management’s investment decision of AR. Augmented reality is utilized in marketing and advertising sectors as a tool to enhance particular features of a product, which makes it more appealing to the customers and in return increases sales. (Sumesh & Azizul, 2016).

“Place AR room services menus in guest room, guests able to view all dishes in 3D via their phone instead of traditional in room menus. Guest may even able to order via the apps to entitle certain discount which may stimulate their consumption, and which also provided one of the important information of calculating the ROI ratio.

“We do not need these fancy technologies in our hotels as they will not add value to our outlets.” (Respondent B)

“AR may apply to hotel F&B, Spa or Banquets to stimulate sales... Currently, the customers may watch a video such as youtube, which is 2-D as marketing /pre-sell. Spa may use AR to demonstrate how the message may be done on the particular room/ environment. F&B may use AR to promote certain food items. For example, currently they have the ‘lobster bisque’ which they will cook the soup in front of the customer. This may present in the AR technology so that the restaurant staffs may sell to the customers during afternoon tea. This will lead to increment business for the lunch or dinners. (Respondent A)

4.4 Technology Flexibility

Some respondents believe AR can be used as a demo which take the ‘visualization one step ahead’. Currently, the customers may view photos or watch videos for the finalized products for pre-sell, which are two-dimension. AR may enhance the product expectation into a three-dimension visualization as a marketing tool. This was supported by scholars Sumesh & Azizul (2016), whom supposed AR technology is a powerful marketing tool. With the integration of

effective marketing communication and information through AR, it will lead to increase the consumer buying decisions (Sumesh & Azizul, 2016).

Respondent A believed that this AR may be applicable to hotel F&B, Spa, and Banquet. This leads to the concerns of the maturity of this technology, other than the affordable cost and how it may gain profit. The hoteliers need to take consideration for a balance of how this technology may 'customize their needs', increase experience and user friendly. This relates to the marketing plan; including the lead time for the users' ability of tailor-made the videos and other activities before implementation. A marketing plan has the ability to bring business to success and outlining the tactics and marketing details by focusing on a specific period of time (Duermyer & 2017). If the technology is mature and at affordable prices, the turnaround of customize animation or images will be concerned, hence the flexibility of the new technology is critical. For instance, hotel restaurant requires constant updates in menus, does this technology give the hotel flexibility for constant update in this 'storyteller'? Lead time and planning need to be forecasted according to the business needs. Respondent A shared:

"... hotel needs planning, we normally plan for marketing and other campaigns a few months in advance. Let's say next quarter we are planning to have 'lobster promotion'. How flexible is this technology allowing us to create videos, or if we need to pay additional for this creation? Also, we need to know how much time for the creation and testing, so that it is ready and incorporate with the other marketing plans such as social media or other marketing activities..."

According to Li (2015), he has examined the relationship between new technology implementation, flexibility of new technology, and innovation performance. Resulting that the technology flexibility will improve a company's overall competitive advantage (Li, 2015). In summary, the developers need to ensure this AR technology do provide flexibility for the hotel managers to tailor-made their needs (ease-to-use) and training in order to hinder their decision in using AR technology in the hotel industry.

5.0 CONCLUSIONS & IMPLICATIONS

The development of technology and innovation in the hospitality and tourism industry is to enhance customers' experience, and hopefully leads to satisfaction and loyalty, resulting for positive revenue. Daim et. al (2012) believed the tourism and hospitality industry may take advantage of these technologies in designing effective marketing strategies. For the tourism industry, AR has been used for historical or heritage sites, and museums, as a tool to share knowledge of the destination and background stories. There are not too many articles examining the adoption of AR technologies in the hotel context. Furthermore, there is minimum researchers have investigated this AR technology in the users' perspectives, particularly the hotel industry. Hence, this study was focused on the hoteliers' perspective on how this AR technology may or may not bring benefits for the business. Thus, this discussion of the user's perspectives has the implications and insights for the suppliers (AR companies) to consider for further development for the hotel industry.

AR is still in a pre-mature stage as all the interviewees are not too familiar of this technology, or sometimes they are confused with VR. Most of them do not perceive any risk in

using the application of AR. One of the respondents commented that most hotel has the concern on data privacy which this technology do not contain any personal data. He further elaborated on the concern of 'mis-representation' from the video to the actual items. However, he does not believe it will be an issue. In summary, the decision of using this AR is associated with the senior management influence according to their knowledge and interest, the nature of business, such as the hotel size, location and segmentation of types and customers. Since AR is still not yet mature, mostly their concerns are related to the profitability, costing, and the flexibility of usage including the video creation and lead time for planning. In other words, supplier's knowledge is the most critical factor to hinder the manager's choice of AR technology of using at the hotel. The knowledge including the technical supports when producing the AR video at the hotel, the production time and costs.

This research has interviewed four key executive members in Hong Kong, including GM, hotel owners and Director of Sales. Due to different positions, each person has different interest and business concerns according to their specific job duties. Since the research was only conducted in Hong Kong with a small sample size, there are few limitations to the study. In order to resolve the above concerns, this research should be replicated in different locations with more different management roles being interviewed to verify its findings. Furthermore, this research provides a manifest of user's overview aspect, a latent analysis may require for more in-depth analysis on specifically AR technology's function and operation.

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