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Is checkout- free store a flash in the pan? Factors influencing Hong Kong people's adoption intention of checkout-free stores

Research-in-Progress

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Abstract

Last year, two checkout-free flash stores made their debut in Hong Kong. After the initial try, several companies followed up, and opened their own checkout-free stores or exhibitions, e.g., Sinopec's easy joy, Watsons, and AlipayHK Futureland. The trial of these stores has aroused wide attentions and discussions on the possibility of new retailing format and experience in Hong Kong. From the consumers' perspective, this study aims to understand whether the concept of checkout-free store is welcomed by the local people, and what are the factors influencing Hongkongers' adoption intention toward checkout-free technologies and stores. To realize the above research objectives, we used theory of technology acceptance, UTAUT2, and their extension to build a theoretical model, and empirically tested it by focus groups. The qualitative study shows some initial results to address the research questions.

Keywords: Checkout-free stores, retailing, technology adoption intention, Hong Kong

1   INTRODUCTION

The checkout-free/unmanned store concept is rapidly gaining ground in China, but it was not until last year (2018) that Hong Kong got its first taste of this new format of retailing. Two new pop-up stores were opened in a month period with both snack retailer Okashi Land (supported by WeChat) and Alipay HK (Yuen, 2019). After several months, Sinopec, Watsons, and DBS also began to follow the trend. These new retailing format and experience have drawn Hong Kong people's interest and attention, however, most of such stores were flash or pop-up stores. Now, practitioners and researchers have to wonder, in a market that is notoriously hesitant about using self-checkout tills and mobile payments (Cai, et al., 2019), is checkout-free store a flash in the pan (like ofo bike)? And in the near future, will Hongkongers embrace the concept of checkout-free technologies in store?

Checkout-free/unmanned store is a new retailing concept where customers check-in with mobile apps., choose their goods, and leave the store without the help from cashiers or machines. In an ideal setting, it would be a complete automatic shopping experience for the time scarce consumers, and an effective way to save manpower cost for retailers (Soo, 2017). The idea of checkout-free stores first caught the world's attention in 2016 when the largest US online retailer Amazon announced its cashier-less Amazon Go store. They provided a complete new experience to customers - "Just Walk Out Shopping". Since then, a flurry of technology companies in China, US, and European countries have launched their own versions of checkout-free stores. The famous checkout-free stores in China include BingoBox, Tao café, and JDX, while the appealing ones in US and Europe are Zippin and Sainsbury glosory store (Trotter, 2018). All these stores have adopted the combination of various technologies, such as RFID, mobile payment systems, facial recognition, artificial intelligence technologies like machine learning, computer vision, and sensor technology to accurately recognize the movement of people and goods. By doing so, retailers can collect troves of data that give operators a better idea of consumer preferences and buying habits, which can then be used to optimise operations and make more efficient inventory decisions (Soo, 2017).

Though the idea of checkout-free stores is fancy, there are still many failure cases. In China, after the initial and quick expansion of unmanned stores/supermarkets in big cities, such as Beijing, Shanghai, and Hangzhou, two thirds of such stores were closed due to technical barriers, high technological cost, and poor operations, etc. (Murayama, 2019). As a special region of China, Hong Kong has its specialty. Unlike mainland Chinese, Hongkongers are hesitating to adopt new mobile payment methods due to the well-entrenched consumption habit (Cai, et al., 2019; Qi, 2018) and already reliable financial system. They also have a greater concern on information privacy and security (Cheng, et al., 2006), especially when it comes to facial recognition, personal credit, bank account linkage, and so on. All these made checkout-free technologies even harder to enter the Hong Kong market today.

Based on the above discussions, this study focuses on Hongkonger's adoption intention of the checkout-free stores. The research questions are summarized as below: (1) What are the internal and external factors that influence the Hongkongers' adoption intention of checkout-free technologies? (2) Do facilitating conditions play a significant moderating role in influencing checkout-free technology adoption? We borrow the theory of technology acceptance, UTAUT2, and technology anxiety theory to explore possible factors influencing Hongkongers' intention to adopt unmanned stores. The factors are divided into two categories: external belief toward technology adoption (perceived usefulness, perceived ease of use, perceived privacy and security), and internal belief toward themselves (perceived enjoyment, anxiety, and habit). We believe this research is timely from the perspective of theory and practice. Theoretically, first, the studies on checkout-free technology adoption are rather rare. The majority of studies described the adoption of traditional self-service technologies (ATM, self-service counter, etc.) (Mukerjee, et al., 2019), and mobile payments (Shankar and Datta, 2018). There is also a lack of empirical studies examining context-specific features of technology adoption (Dahlberg, et al., 2015). Second, as a core solution of checkout-free technology adoption is to reduce consumers' confusion (Johnson, et al., 2019), we investigated specifically the moderating role of facilitating conditions toward adoption intention. As to the practical contribution, this study helps the retailers who are about to enter the new retailing market to understand consumers' concerns toward checkout-free technologies, and give directions to win the future retailing.

The rest of the paper is structured as below: first, we will describe the literature review of checkout-free technologies, technology adoption theories, and other key constructs in the research framework; second, we will introduce the theoretical model and hypotheses; last, the research methods and preliminary focus group data analysis results will be presented.

2   LITERATURE REVIEW

2.1   Self-service technology and checkout-free technology

Checkout-free technology has its root in self-service technology (SST). SSTs are technological interfaces that enable consumers to produce a service that is free from direct service employee involvement (Meuter et al., 2005). Since the concept was introduced in 1994, SSTs were widely applied in multiple contexts of customer touchpoints, and generated huge amount of service co-production and value co-creation (Hilton and Hughes, 2013). Meanwhile, there are two types of SSTs (Dabholkhar and Bagozzi, 2002): "off-site" options, such as telephone and online banking and internet shopping; and "on-site" options, such as ATM, hotel/air checkout, and in-store checkout of grocery store or supermarket. The on-site options of SSTs are the main subject of this study. Among all the advanced technologies in SSTs, checkout-free technology is one new key offering that revolutionizes service delivery (Mukerjee, et al., 2019). The checkout-free technology in a retail store is beyond the concept of traditional SST where shoppers need to line up and scan the barcode manually. It is a complete new "frictionless" shopping experience in the unmanned store (Motukuri, 2018). Typically and ideally, shoppers need to download a mobile application, scan the QR code or other personal identities (e.g., face, palm), enter the store, grab the items they wish to purchase, and leave the store directly without any interaction or assistance from the staff. The electronic bill will show up immediately and automatically on the mobile device. The core technologies today include RFID, mobile payment systems, facial and movement recognition, artificial intelligence technologies, and sensor technology (Soo, 2017). From the above discussions, we can see that checkout-free technology is one category and an extension of SSTs, which represents the most cutting-edge technologies for in-store retailing.

Many studies in IS and Marketing literature have investigated factors influencing consumer attitude, technology readiness, service quality, and satisfaction toward SST (e.g., Curran and Meuter, 2005). The research on checkout-free technologies is however rare. We found similar terms of "self-checkout" (Johnson, et al., 2019) and "smart in-store technologies" (Kim, et al., 2017) in the literature. Their main focus were on service quality, technology readiness and technology adoption intention. In terms of technology adoption, they used a series of technology adoption theories like technology acceptance model to build the theoretical frameworks.

2.2   Technology adoption theories

In IS literature, there is a series of technology adoption theories. Technology acceptance model (TAM) (Davis, et al., 1989) is the first model designed specifically for user acceptance of information systems. It advances a belief-attitude-intention-behaviour paradigm for explaining and predicting technology adoption among penitential users. According to TAM, perceived usefulness and ease of use are the main external variables affecting attitude and intention toward using a technology (Museli and Navimipour, 2018). For the intrinsic interest of adoption intention, perceived enjoyment and playfulness plays a role (Venkatesh and Bala, 2008). In this study, we are also going to introduce anxiety (Celik, 2016) as another affective and internal aspect of adoption intention. TAM related model is not able to comprehensively explain the specifics and contextual factors in consumers' technology adoption market (Dahlberg, et al., 2015). UTAUT (Venkatesh, et al, 2003) and UTAUT2 (Venkatesh, et al, 2012) were invented in consumer market context. In UTAUT2, hedonic motivation, price value and habit were introduced as an extension to the four existing factors from UTAUT (performance expectancy, effort expectancy, social influence, and facilitating conditions).

There are very few studies on checkout-free technology adoption. Kim et al. (2017) and Mukerjee et al. (2019) are among the first to study such a phenomenon. They used the TAM to explain intention or likelihood to adopt. Furthermore, Avici Yucel and Gulbahar (2013), stressed that it was the external belief variables (perceived ease of use and perceived usefulness) that predicted behavioural intention without the mediating role of attitude. We followed their approaches, and kept the external variables from TAM. Besides TAM, we also employed UTAUT2, especially the internal factors to reflect the impact of hedonic motivation, habitual behaviour, and anxiety of using checkout-free technologies.

2.3   Anxiety and perceived enjoyment

UTAUT2 first integrated the affect component (hedonic motivation) into a cognition and behaviour-based model, our study also includes another affective component – anxiety in explaining adoption intention. Anxiety, as a negative affective response of end users has received considerable attention in the technology adoption studies (Powell, 2013). It is extremely suitable to be studied in the present research context, since the use of checkout-free technologies is basically a self-behaviour in the (sometimes empty) store with no help from others. The situation shares all three types of computer

anxiety (Russell and Bradley, 1997), namely task anxiety, damage anxiety, and social anxiety. Task anxiety is the worry of completing a computer-related task (e.g., shopping task via mobile app.); damage anxiety refers to the possibility of damaging computer equipment or losing important information (e.g., accidently click buttons on the mobile device or break the sensor or camera); and social anxiety is the embarrassment due to the unexpected public exposure of computing incompetency (e.g., taking a longer time to enter and exit the unmanned store due to technology inefficiency) (Celik, 2016). Overall, consumers will refrain from checkout-free stores if they experience uneasiness during shopping tasks due to the above difficulties or embarrassments. Anxiety is the degree to which an individual temporally experiences fear, apprehension and aggression when considering use of, or actually using, checkout-free technologies (Celik, 2016). Anxiety has been empirically tested to negatively influence on the BI and SST usage (Meuter, et al., 2005) in particular. We therefore include anxiety as an important inner and affective factor toward adoption intention.

Another affective factor toward adoption intention is perceived enjoyment. Perceived enjoyment was included in UTAUT2 as one of the hedonic motivations toward technology use. Perceived enjoyment of checkout-free technologies refers to users' feeling of joy, pleasure and playfulness that is evoked when shopping in the unmanned store (Shang, et al., 2017). Since perceived enjoyment usually represents an intrinsic type of motivation, it is therefore treated as an internal factor affecting adoption intention.

2.4 Facilitating conditions

Facilitating conditions are the availability of the resources and support as perceived by individual consumers when using checkout-free technologies for in-store shopping (Venkatesh, et al., 2012). In particular, it represents both internal support (behavioural control, and self-efficacy on knowledge and resource) and external guidance available to consumers in overcoming technology difficulties. Venkatesh, et al. (2003) embodied facilitating conditions by three dimensional constructs: perceived behavioural control, compatibility, and facilitating conditions. In line with Venkatesh, et al. (2003), we believe facilitating conditions consisting of both internal and external supporting resources will not only directly influence behavioural intention (Limayem et al, 2007), but also moderate the relationships between the influencing factors (internal and external) and adoption intention. Specifically, due to the existence of facilitating conditions, perceived usefulness, ease of use, privacy and security, and enjoyment will be stronger; and anxiety and traditional consumption habit weaker. Facilitating conditions here include the clear text-based or video-based instructions at the entrance, guidance on the floor, corridor, and shelf, detailed instructions on payment methods, consumers' resources and knowledge on how to use checkout-free technologies in general, etc.

2.5 Traditional consumption habit

Habit was defined as the extent to which people tend to perform behaviors automatically because of learning (Limayem et al., 2007); it was developed over a certain period, and slow to change (Wood and Neal, 2009). Hong Kong people have well-entrenched consumption habit, the adoption of mobile payments has met significant barriers last year (Cai, et al., 2019), not to mention the checkout-free technologies today. Due to the well-established financial and technological infrastructure, Hong Kong people still prefer the traditional payment methods such as cash, credit card and contactless card payment system (Octopus card), and with the facilitation of staff (Qi, 2018). Consumers are more likely to repeat behaviors that are effortless and cognitively easier than other consumption behaviors (Lankton, et al., 2010). Habit was previously validated as a predictor of behavioural intentions (Venkatesh, et al., 2012) and continuous use of IS (Hsiao, et al., 2016), we therefore include traditional consumption habit as a negative driving force toward checkout-free technology adoption.

2.6 Perceived security and privacy

Perceived security is the degree to which a consumer believes that using a set of particular checkout-free technologies in store will be secure (Shin, 2009). Perceived privacy refers to the concern of the potential compromise of consumers' personal information when shopping in the unmanned store (Johnson, et al., 2018). There are many considerations of privacy and security when it comes to checkout-free technology usage. For example, Amazon Go uses AI to record every single trace of customers including identity, spend calendar, payment history and even how long and how many times one customer stays in a store or is standing in front of a shelf (Wang, 2018). The biometric information (e.g., face, finger print) and bank account information is exposed to the payment platform or the store via mobile applications, like Wechat Pay, Alipay, Amazon Go. People will have tremendous concerns on the information security and privacy, which significant hinder their intention to adopt checkout-free technologies. In the present study, perceived privacy and security will be treated as one construct to reflect the external factor influencing checkout-free technology adoption.

3   THEORETICAL MODEL AND HYPOTHESES

The driving factors were divided into two categories: internal factors and external factors. Thirteen hypotheses were proposed (Figure 1), which include seven main effects and six moderating effects of facilitating conditions. The research hypotheses were summarized and listed in Table 1.

Hypotheses	
H1	Perceived usefulness is positively related with checkout-free technology adoption intention.
H2	Perceived ease of use is positively related with checkout-free technology adoption intention.
H3	Perceived security and privacy is positively related with checkout-free technology adoption intention.
H4	Perceived enjoyment is positively related with checkout-free technology adoption intention.
H5	Anxiety is negatively related with checkout-free technology adoption intention.
H6	Traditional conception habit is negatively related with checkout-free technology adoption intention.
H7	Facilitating conditions positively moderate the relationship between perceived usefulness and adoption intention.
H8	Facilitating conditions positively moderate the relationship between perceived ease of use and adoption intention.
H9	Facilitating conditions positively moderate the relationship between perceived security and privacy and adoption intention.
H10	Facilitating conditions positively moderate the relationship between perceived enjoyment and adoption intention.
H11	Facilitating conditions negatively moderate the relationship between anxiety and adoption intention.
H12	Facilitating conditions negatively moderate the relationship between traditional consumption habit and adoption intention.
H13	Facilitating conditions is positively related with checkout-free technology adoption intention

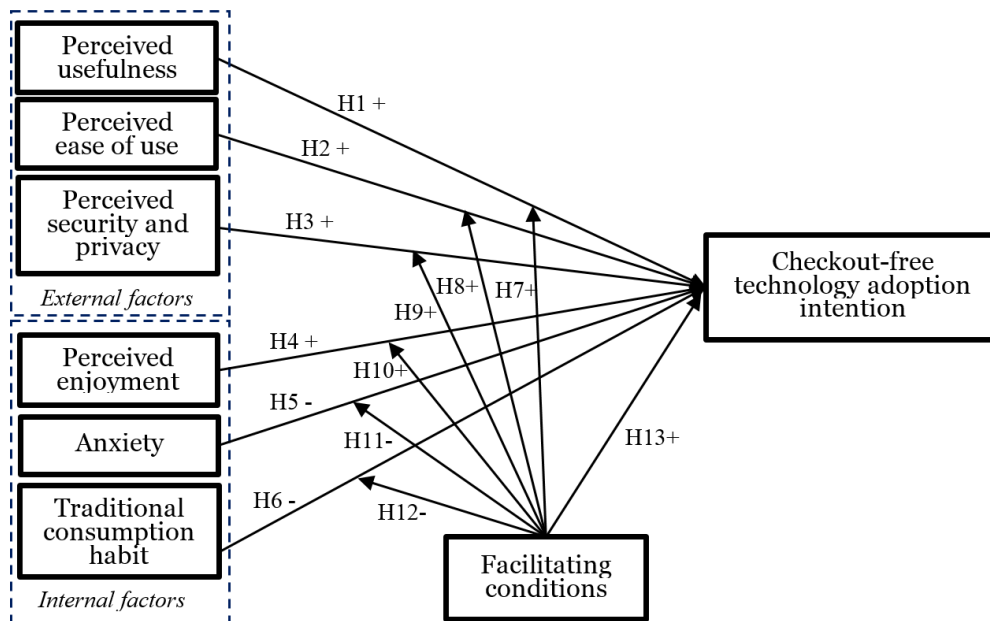*Table 1. Research Hypotheses*

Figure 1. Research Model

4   RESEARCH METHODS AND PRELIMINARY RESULTS

To test the model, we first employed qualitative study - focus group to get some preliminary ideas. Three focus groups studies were carried out. In each group, there are ten participants from different age groups (15-34, 35-54, 55 or above). The participants are Hong Kong local people who have never used checkout-free technologies before. The interview transcripts were prepared beforehand to address all relevant issues discussed above. Before the start of each interview, to explain checkout-free stores, we showed a

video to the participants, which demonstrated the purchasing procedure with checkout-free technologies. The raw data were collected and coded. The three groups though with different ages, have similar patterns in understanding checkout-free technologies. The data analysis results supported most propositions or hypotheses, except H11. The respondents reflected that the checkout-free technologies in-store are too advanced, and somehow complicated. In a closed store, even though necessary facilitations were provided, they still feel fear and panic if they don't know how to leave the store appropriately. Currently, we are preparing for a large scale survey to further test the causal relationships in the research model. We believe the studies on checkout-free technologies adoption are timely and interesting. For future studies, we would also consider specific types of checkout-free technologies, and culture issues when studying technology adoption.

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