



The Sustainability of Disruptive Technology in the Supermarket Industry in Singapore

Chen Wei^a, Ameen Talib^b, ^ahonors student, The School of Business, Singapore University of Social Sciences, ^bhead Applied Projects, The School of Business, Singapore University of Social Sciences,

This paper aims to investigate disruptive technology in the supermarket industry and its sustainability in Singapore. The extended Technology Acceptance Model 3 (TAM3) was used to test and analyse factors affecting consumer willingness to adopt the use of high-tech enabled (HTE) services in supermarkets. A sample of 50 survey respondents completed an online questionnaire. Pivot tables and multiple regression statistics were used to analyse survey responses. Perceived usefulness and perceived ease of use are two determining factors that contributed to adoption attitudes. Other moderating factors like unique demographics, psychographics, relative convenience and location accessibility also play big roles in adoption rates. While actual use of HTE services was found to be low, the intention to use was high.

Key words: *Disruptive Technology, Technology Acceptance, Supermarket, Smart Retail Technology.*

Introduction

With the advent of rapid technological overhaul in today's landscape, the use of smart devices and applications have gained momentum in many sectors of the economy (Jiang, Du, & Jin, 2019). "Disruptive technology", coined and popularised by Clayton Christensen and Joseph Bower (Bower and Christensen, 1995, Christensen, 2003, Christensen and Bower, 1996), greatly displaces many existing processes, products and value networks today.

Against this backdrop, disruptive innovation has also penetrated into one of the world's most traditional retail business. The traditional supermarket business structure that has long been a perennial blueprint in the realm of retail is now changing with disruptive technological transformations, resulting in an unceasing disappearance of traditional markets (Matalamas &

Ramos, 2009). In spite of the upheavals caused by such innovations, mobile applications are here to stay as they continually provide users with high quality services (Williams, 2012).

The only tech-enabled and multi-sensory supermarket in Singapore is *habitat by honestbee* (honestbee, n.d.). In this paper, *habitat by honestbee* will be referred to as a “high-tech supermarket”. The adoption of smart retail in Singapore supermarkets is still in its infancy. Coupled with unique demographic and geological conditions, digitalisation and automation seem to be the future of supermarkets in Singapore. *Do supermarket businesses stand to benefit from the investment and deployment of such complex infrastructure and technology, and will this change the future of the most traditional of retail shopping experiences for customers?*

The primary objective of this paper is to determine the factors affecting the acceptance of high-tech supermarket technology that are derived from the Technological Acceptance Model (TAM3). This paper seeks to understand Singaporeans’ attitudes towards technology adoption through constructs identified in TAM literatures, including other external moderating factors.

Literature Review

The speed at which technology is evolving and penetrating the retail industry has left many customers confused, and hence apprehensive, due to their unfamiliarity with using them (Kaushik & Rahman, 2015). As a result, supermarkets have developed a variety of ways to incorporate technology to serve existing consumer needs while revolutionising their businesses. Countries all over the world have been launching new high-tech-enabled (HTE) services in their local grocers. Amazon Go in the US and Alibaba’s Hema in China are just two of the most progressive high-tech supermarkets worldwide that pioneered the transformation (Fannin, 2018).

Recent studies by Cho and Fiorito (2010) have introduced disruptive technology as a supermarket attribute that customers in supermarkets value today, though they are limited to self-scan devices and/or checkout counters. Some indispensable qualities of supermarkets as identified by Nilsson, Gärling, Marell and Nordvall (2015) and Sharma, Lowalekar and Jain (2013) were functional qualities like store location, product pricing, etcetera, as well as psychological qualities like store aesthetics, friendliness of staff, and so on. Other studies conducted by Uusitalo (2001) and Carpenter and Moore (2006) found that product supply and variety were the most important attributes when choosing a supermarket to patronise. These supermarket attributes provide the basis of supermarket patronage, which will be useful for the study of including HTE services in supermarkets if these factors remain consistent.

Supermarket shopping behaviour might also impact the adoption of HTE services in supermarkets. Nilsson et al. (2015) highlight two main styles of customer shopping behaviours: major and fill-in shopping. Major shopping refers to when customers invest more time, effort



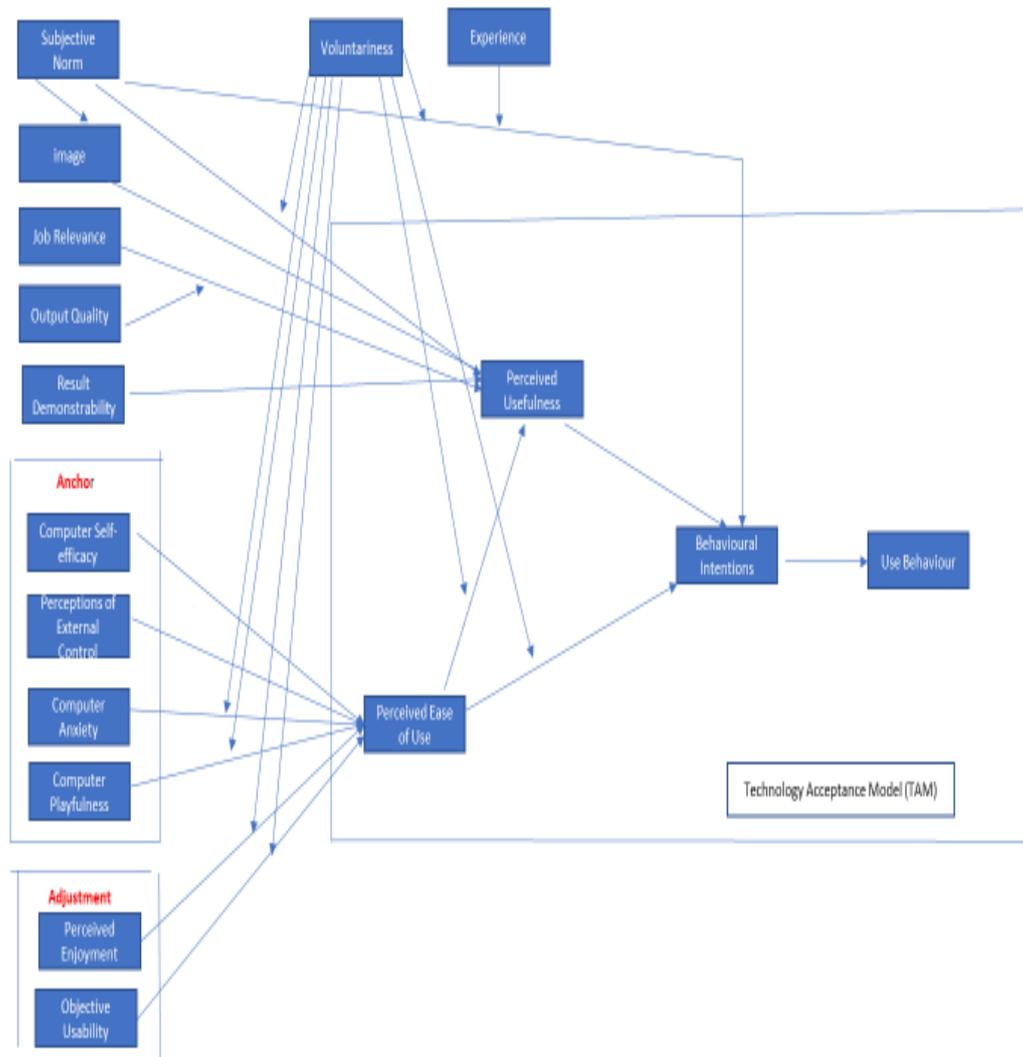
and money while shopping (Kollat and Willett, 1967; Kahn and Schmittlein, 1992; Walters and Jamil, 2003), while fill-in shopping demands more visits but less time and effort (Kollat and Willet, 1967; Kahn and Schmittlein, 1992).

Technology Acceptance Model (TAM)

Many technology adoption models that have been used and studied in existing literature are, but not limited to, the Theory of Diffusion of Innovations (DIT), the Theory of Reasonable Action (TRA), the Theory of Planned Behaviour (TPB), Decomposed Theory of Planned Behaviour, the Technology Acceptance Model (TAM), Technology Acceptance Model 2 (TAM2) and Technology Acceptance Model 3 (TAM3) (Lai, 2017).

The TAM in particular has been developed to project individual adoption and use of new information technology (Venkatesh & Bala, 2008). It is shown to be highly accurate in its ability to conjecture technology adoption and use (Davis, Bagozzi, & Warshaw, 1989; Adams, Nelson, & Todd, 1992; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000). The model asserts that *perceived usefulness (PU)* and *perceived ease of use (PEOU)* are constructs that govern an individual's intention to adopt any form of technology (Venkatesh & Bala, 2008). In the newest extension of the models, the TAM3 will present a holistic nomological network that includes three new theoretical extensions from TAM2, as well as the model of the determinants of PEOU (shown in Figure 1).

Figure 1. Technology Acceptance Model 3 (TAM3) (Venkatesh & Bala, 2008).



Considering the above, this study will adopt TAM3 to understand customer attitudes and usage behaviour in relation to new retail technology used in high-tech supermarkets. Two hypotheses will be tested in this research based on the theories suggested by the TAM:

H1: PU affects the willingness of consumers to adopt smart retail technology (HTE services).

H2: PEOU affects the willingness of consumers to adopt smart retail technology (HTE services).

The key determinants of both PU and PEOU from TAM3 will be used in this study that are relevant to HTE services in supermarkets. The definitions of these determinants are as below:



Extracted determinants of Perceived Usefulness (PU) from TAM3

Determinants	Definitions
Subjective Norm (SN)	The degree to which an individual perceived that most people who are important to him think he should or should not use the system (Fishbein & Ajzen 1975; Venkatesh & Davis, 2000)
Perceived Ease of Use (PEOU)	The degree to which a person believes that using IT will be free of effort (Davies et al. 1989)

Extracted determinants of Perceived Ease of Use (PEOU) from TAM3

Determinants	Definitions
Computer Self-Efficacy the (CSE)	The degree to which an individual believes that he or she has ability to perform a specific task/job using the computer.
Computer Playfulness (CPLAY)	“...the degree of cognitive spontaneity in microcomputer interactions” (Webster & Martocchio 1992 p. 204).
Computer Anxiety (CANX)	The degree of an individual’s apprehension, or even fear, when she/he is faced with the possibility of using computers.
Perceived Enjoyment (ENJ)	The extent to which “the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use” (Venkatesh 2000 p. 351).

Methodology

An online self-completion questionnaire was administered to a representative sample group of 50 participants, targeted at Singapore residents who are involved in supermarket shopping responsibilities in a household. The questionnaire was disseminated via a generic survey link by Google Forms, a survey administration application. Survey respondents were able to access the survey through smart devices i.e. smart phones, tablets, computers, etcetera. A web questionnaire method was chosen to expedite the data collection process and for the ease of data visualisation and analysis. The online survey algorithm ensured that all questions were

attempted before respondents were allowed to advance to the next, lowering quality rejects. The three sections in the survey questionnaire collate respondent demographic information, test TAM3 constructs in relation to high-tech enabled (HTE) supermarkets as well as understand respondent interaction with *habitat at honestbee* and other supermarkets, respectively. TAM3 constructs in the questionnaire were adapted from Venkatash & Bala (2008) and were measured using a 7-point Likert scale that ranges from 1 (Strongly Disagree) to 7 (Strongly Agree). A 7-point scale was used instead of a 5-point scale because it provides more variety of options which eliminates the dilemma of choice, thus improving the internal validity of survey responses (Joshi, Kale, Chandel & Pal, 2015).

The survey tests if the factors influencing adoption of smart technology in supermarkets align to that of the TAM3 model, considering other relevant factors such as convenience, accessibility, grocery variety and pricing as found in existing literature. It will disclose participants' attitudes towards technology disruption and adoption using appropriate determinants. It will also reveal participants' interaction with *honestbee's habitat* supermarket, e.g. willingness to visit, opinions of HTE, etcetera. A pilot test was conducted with five participants, aged 23, 25, 34, 57 and 58, before the dissemination of the survey. Minor adjustments were made to questions that needed more clarification based on feedback received.

Multiple regression was used to test the determinants of the TAM3, which would yield the strength of relationships (correlation) between the independent and dependent variables. For example, the extent to which both PU and PEOU will influence the behavioural intention (dependent variable) of respondents respectively.

Pivot tables were used to analyse the demographic segment of the survey results. Demographic information will allow the understanding of consumer behaviour relating to the willingness to accept HTE services. At the same time, it will aid in the formation of specific consumer profiles who behave in a similar fashion, to which businesses can target, due to these consumers' heightened receptiveness of adopting HTE services in supermarkets.

Results & Discussion

The demographics of survey respondents are summarised below. Of the 50 respondents, 32 percent were male and 68 percent were females - all of which were generally spread out amongst the five age categories. The majority were Singapore citizens (92%) who had university or post grad education levels (51%) and were married (66%). The majority of responses were valid for analyses purposes except in the categories "Age" and "Education Level", the numbers "48" and "49" in parentheses respectively represent the number of responses that were considered (out of 50), due to the omission of anomalies.

Summary of Respondent Demographics

Questions	No. of Respondents	% of Respondents
Gender	Males: 16	32%
	Females: 34	68%
Age (48)	18-24 yrs: 11	23%
	25-34 yrs: 3	6%
	35-44 yrs: 9	19%
	45-54 yrs: 11	23%
	55-64 yrs: 14	29%
Citizenship	Singapore Citizen: 46	92%
	Permanent Resident: 4	8%
Education Level (49)	Secondary: 12	24%
	Pre-U/Junior College: 4	8%
	Polytechnic: 8	16%
	University/Post Grad: 25	51%
Marital Status	Single: 15	30%
	Married: 33	66%
	Divorced/Separated: 2	4%
No. of Members in Household	<4 members: 16	32%
	4 members: 17	34%
	5 members: 10	20%
	>6 members: 7	14%
Ave. Household Monthly Income	<\$2500: 8	16%
	\$2500 - \$7000: 14	28%
	\$7001 - \$10,000: 9	18%
	>\$10,000: 19	38%

Table 1 summarises the behaviour, potential intentions and interaction that survey respondents have with *habitat by honestbee*. Only a small percentage (26%) had patronised the store. However, the majority of the same group were willing to patronise *habitat by honestbee* only. This was telling of their willingness to and preference of using HTE services during supermarket shopping. Respondents were also generally receptive to adopting HTE if their routine supermarkets started using them. A resounding 88 percent were willing to use them instead of looking for another traditional supermarket. From these statistics alone, it seems that respondents were willing to adopt new HTE services in supermarkets but were lacking the opportunity to do so.

Table 1: Respondent's supermarket shopping preferences/behavioural intentions

Questions	No. of Respondents	% of Respondents
Patronised <i>habitat by honestbee</i>	Yes: 13	26.0%
	No: 37	74.0%
Intention to patronise <i>habitat by honestbee</i> ONLY	Yes: 13	26.0%
	No: 37	74.0%
Patronise routine supermarkets if it changes entirely to HTE (instead of switching to other traditional supermarkets)	Yes: 44	88.0%
	No: 6	12.0%

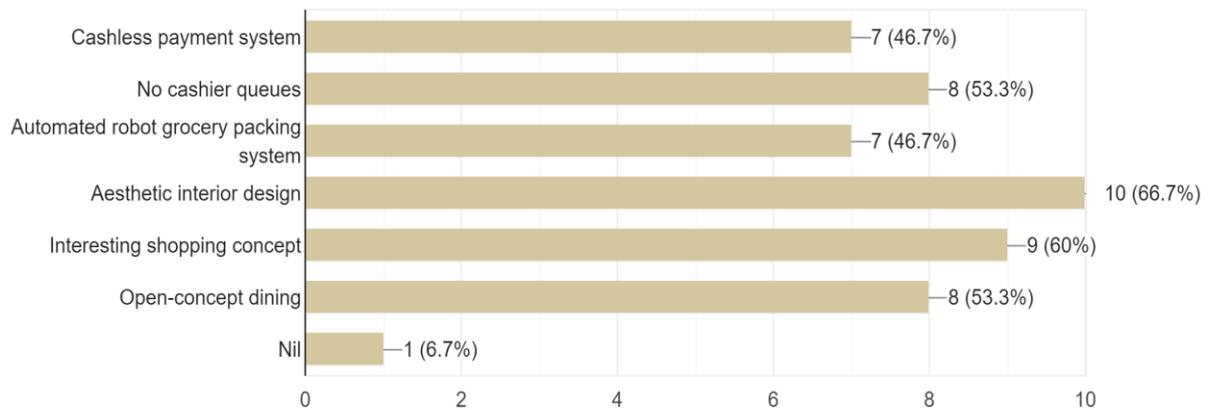
From the qualitative responses gathered, the majority (52%) of the respondents elaborated that *habitat by honestbee* “is too far”, “inconvenient”, “inaccessible location”, hence were not willing to travel further than their routine supermarket’s location to *habitat by honestbee*. Other top reasons related to the familiarity with traditional/conventional supermarkets, *habitat*’s higher price items and lack of variety and promotions. This further corroborates why very few have patronised *habitat by honestbee* but do have intentions to visit and explore HTE supermarket services. Inconvenience and inaccessibility issues aside, the 88 percent of respondents who were fond of adopting HTE services cited that the convenience the cashless system provides, the efficiency, and the novelty of a new shopping concept interested them.

Of the 13 respondents who had patronised *habitat by honestbee*, most favoured its interior aesthetics, followed closely by its interesting shopping concept, no cashier queues, cashless payment system and the automated robot grocery-packing system (see Figure 2). These were unique features that were typically not found in traditional supermarkets.

Figure 2. Summary of respondents' favourite features in *habitat by honestbee*

4b. If yes, what did you like about *habitat by honestbee*? You may select more than one option.

15 responses



Role of Members in a Household

It was found that 66 percent of respondents were responsible for supermarket shopping in their households (see Figure 4). Of this group, a large majority (74%) indicated their interest toward adopting HTE services. Similarly, those who were not the supermarket shoppers of their household also indicated their willingness to adopt HTE services in supermarkets (89%). It can be concluded that most members of the household are generally inclined to use HTE services, despite what intra-family influencing determinants like SN (subjective norm) have on an individual, such as motivating or discouraging members of their family who are responsible for supermarket shopping to adopt or reject the usage of HTE supermarket services.

Respondents' supermarket shopping habits

Questions	No. of Respondents	% of Respondents
Supermarket Shopper of Household	Yes: 33	66.0%
	No: 17	34.0%
Frequency of Supermarket Shopping	Everyday: 1	2.0%
	Several times a week: 12	24.0%
	Once a week: 28	56.0%
	Once every two weeks: 3	6.0%
	Once a month: 6	12.0%

Testing TAM3 Determinants Using Multiple Regression

Multiple regression was used to predict the adoption of HTE services. Two main hypotheses were formed in the beginning of the research:

- H1:** PU affects the willingness of consumers to adopt smart retail technology (HTE services).
H2: PEOU affects the willingness of consumers to adopt smart retail technology (HTE services).

In testing the willingness of consumers to adopt HTE services, the determinant Behavioural Intention (BI) derived from the TAM3 model was used as the indicator of willingness to adopt (dependent variable). Since BI refers to an individual's subjective probability to perform a certain task, it will equate to the willingness of an individual to adopt HTE services. To test BI, both PU and PEOU functioned as independent variables. The primary determinants i.e. SN, PEOU, and CSE, CPLAY, CANX ENJ were also tested to uncover their relative influence on both PU and PEOU, respectively.

- H1:** PU affects the willingness of consumers to adopt smart retail technology (HTE services).

Perceived usefulness (PU) was identified to be influenced by both SN and PEOU. Table 2 presents regression statistics relating to this test. Both determinants were found to have the following relationship with PU:

$$PU = 0.63333 + (0.25254 * SN) + (0.68835 * PEOU)$$

Table 2: Summary of regression statistics of SN and PEOU on PU

<i>Regression Statistics</i>	
Multiple R	0.73907362
R Square	0.54622981
Adjusted R Square	0.52692044
Standard Error	0.93876495
Observations	50

PEOU's larger coefficient of 0.688 compared to SN's 0.252 indicates that it has a greater effect on PU. Generally, its multiple R value of 0.739 (see Table 2) illustrates a good positive linear relationship between the variables, indicating that both of these determinants do correlate well with PU. In summary, given the context of utilising HTE services during supermarket shopping, consumers will more likely be affected by subjective norms than perceived ease of use, e.g. opinions of their friends or family members that will either increase or decrease perception of HTE services' usefulness. This will rely heavily on people's sentiments of high technology usage in retail contexts which will activate a herd effect amongst individuals of the same ingroup. For example, parents' perceived usefulness of HTE services are high because they were influenced by their child's positive opinion of it. Such implications should benefit the sales and marketing strategies of businesses. Though the adjusted R Square of 0.526 indicates a mediocre fit, these determinants still demonstrate a correlation to perceived usefulness, just as Venkatesh and Bala (2008) empirically deduced.

Of the entire sample, 80 percent of respondents had a >4-point rating (out of 7 on the Likert scale) of the perceived usefulness of HTE services. This is indicative of a strong positive attitude towards HTE services. PU and BI share the following correlation:

$$BI = 2.51 + (0.522*PU)$$

Table 3: Summary of regression statistics of PU on BI

<i>Regression Statistics</i>	
Multiple R	0.6124
R Square	0.37504
Adjusted R Square	0.36202
Standard Error	0.92966
Observations	50

The multiple R value of 0.612 in Table 3 indicates a moderate positive linear relationship. The low R Squared value of 0.375, however, implies a weak correlation between PU and BI. Nonetheless, survey results also show that 80 percent of respondents had a >4-point rating of BI, indicating a high likelihood of and intention to use HTE services. This means that both PU and BI received equally high positive ratings but had a low correlation. This could be due to the interference of other moderating factors such as the lack of access, convenience,

unfamiliarity, etcetera, as found in existing literature as well as in the primary survey research. To elaborate, one could have a positive perception of usefulness of HTE services and a corresponding positive behavioural intention but not act on it due to the inconvenient location of the high-tech supermarket. However, the hypothesis that PU affects the willingness of consumers to adopt HTE services still holds true, but with limited effect due to the presence of external moderating factors.

H2: PEOU affects the willingness of consumers to adopt smart retail technology (HTE services).

PEOU's determining factors include CSE, CPLAY, CANX and ENJ. Table 8 presents regression statistics of these variables on PEOU (dependent variable). These determinants were found to have the following relationship with PEOU:

$$PEOU = 1.0163 + (0.38171 * CSE) + (0.37743 * CPLAY) + (-0.078527 * CANX) + (0.12618 * ENJ)$$

Table 4: Summary of regression statistics of CSE, CPLAY, CANX and ENJ on PEOU

<i>Regression Statistics</i>	
Multiple R	0.834782336
R Square	0.696861548
Adjusted R Square	0.669915908
Standard Error	0.735217323
Observations	50

The coefficients of the determinants indicate that none of the variables alone affect PEOU significantly though all of which have a positive relationship with PEOU. The negative CANX coefficient is reflective of the negatively phrased survey questions, i.e. items where disagreement (values 1, 2 and 3 on a 7-point Likert scale) is considered a good answer. However, the multiple R value of 0.834 (see Table 4) reflects a strong positive linear relationship, indicating that the variables correlate strongly to PEOU in totality to a large extent. An adjusted R Square of 0.70 also implies a moderate fit. Therefore, these determinants largely influence PEOU, which is consistent with findings from the TAM3 model. Out of the four determinants, computer self-efficacy (CSE) seems to influence PEOU the most, given that it possesses the highest coefficient. It is followed closely behind by computer playfulness (CPLAY), which only marks a 0.01 difference. In response to these findings, managerial decision-making should take into consideration the role of CSE and CPLAY to in order to raise the perceived ease of use of HTE services among targeted audiences. For instance, CSE can be boosted through informational support that allows consumers to clearly understand the workings of a specific technology so that they are more confident of their ability to complete a task. Similarly, CPLAY can be encouraged through the conception of creative and fun

technology that consumers can interact with. This can also be supported by marketing efforts that will showcase the entertainment value of said technology.

Of respondents, 74 percent had >4-point rating of PEOU. This means that the majority perceive HTE services to be easy to use. It is also just as high as BI, which has 80 percent of respondents exceeding the >4-point rating. The following equation summarises the relationship between PEOU and BI:

$$BI=2.14 + (0.611*PEOU)$$

Table 5: Summary of regression statistics of PEOU on BI

<i>Regression Statistics</i>	
Multiple R	0.6724
R Square	0.45212
Adjusted R Square	0.4407
Standard Error	0.87045
Observations	50

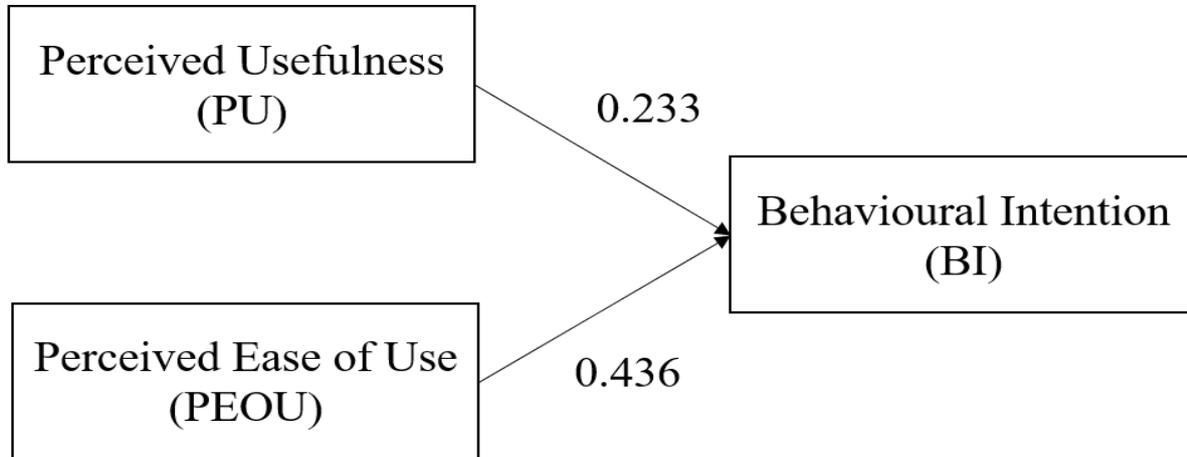
The multiple R value of 0.672 from Table 5 implies a moderate positive linear relationship between the two variables. The low R Squared value appears to be similar to that of PU's. Similarly, the identical reason involving the interference of external moderating factors would entail. A majority of the respondents who gave high ratings for both PEOU and BI would have been affected by inaccessibility or the inconvenience of the supermarket location, etcetera, which could account for the low correspondence. For example, one could perceive HTE services to be easy to use, as well as possess a strong intention to use, but be unmotivated because a traditional supermarket nearby is much more accessible. Although, this does not void the correlation between PEOU and BI. The positive relationship represented by the multiple R value indicates a clear causation that was also as exemplified in the TAM3. Hence, the hypothesis that PEOU affects the willingness of consumers to adopt HTE is not rejected, but accepted with the conclusion that external factors moderate the impact of PEOU on the intention to adopt HTE services in supermarkets.

To further corroborate that external factors were indeed influencing the willingness to adopt HTE services, the correlation between behavioural intention (BI) and actual use (USE) was calculated. A low R Squared value of 0.161 implying a poor fit was telling of the poor correlation. In addition, the average scores of BI was a 6-point rating while USE was a 4-point rating. The difference of 2 points was clearly indicative of external influences that could explain the discrepancy. The respondents cited "inconvenience" and "too far" as top reasons for not actually using HTE services despite their strong intentions to.

Finally, the effect of both PU and PEOU on behavioural intention (BI) is summarised in the

equation: $BI = 1.81 + (0.233 * PU) + (0.436 * PEOU)$

Figure 3. PU and PEOU's influence on BI



PEOU has a slightly greater influence on BI as compared to PU as variable coefficient values only differ by 0.203. Both PU and PEOU do influence the willingness to adopt HTE services in supermarkets, synonymous with conclusions established by the TAM3 model. The roles PU and PEOU play in managerial decisions is huge - both during pre-implementation and post-implementation. These determinants can aid in the creative designing process of HTE products during the initiation, adoption and adaptation phases, as well as serve as guidelines for the acceptance, routinisation and infusion phases (Cooper & Zmud, 1990). This also implies that the successful implementation and uptake of HTE services in supermarkets also depends on how sustainable it is. Results from this research proves that the willingness of adoption rates are largely positive, but only if changes were made to the current state of HTE services in retail outlets and supermarkets. Since BI scores were 80 percent positive, implying a strong inclination to use HTE services, managerial implications should primarily focus on the conceptualisation and development of HTE services that can be made accessible to the majority of the general public. PU and PEOU factors should also be considered to achieve sustainability, given their roles as significant catalysts in influencing the intention to use HTE services.

Target Market Analysis

Table 6 shows the demographic groups and their respective behavioural intention (BI) probabilities to adopt HTE services. Similar to the above analyses, the sample population was filtered using only respondents who had a >4-point rating (out of a 7-point Likert scale) of behavioural intention (BI). This was because a >4-point rating indicates an agreeable attitude hence willingness to adopt HTE services. Of the respondents, 80 percent fall in this category.

Table 6: Summary of demographic information and BI probability

Demographics	BI Probability
Total population with >4 ratings: 40/50	
Gender	
M: 14	0.765
F: 26	0.875
Age	
18-24 yrs: 11	0.636
25-34 yrs: 3	1.000
35-44 yrs: 9	0.667
45-54 yrs: 11	0.909
55-64 yrs: 14	1.000
Marital status	
Single: 15	0.667
Married: 33	0.848
Divorced/Separated: 2	1.000
Average h/h monthly income	
<\$2500: 8	0.750
\$2500 - \$7000: 14	0.786
\$7001 - \$10,000: 9	0.889
>\$10,000: 19	0.789
Education level	
Secondary: 12	1.000
Pre-U/Junior College: 4	1.000
Polytechnic: 8	0.750
University/Post Grad: 25	0.720
No. of occupants in h/h	
<4 members: 16	1.000
4 members: 17	0.765
5 members: 10	0.700
>6 members: 7	0.571
Have children	
0 children: 13	0.722
1 child: 12	1.000
2 children: 9	0.750
≥3 children: 6	0.750

The results in Table 6 show that both genders were generally inclined to adopt HTE, given the very high probability scores. The various age groups had moderate to high probabilities – in

particular the 25-34 and 55-64 age groups stood out, with a 1.00 probability, and the 45-54 age group followed closely at a 0.909 probability. A large proportion of respondents in these age groups are found to be responsible for supermarket shopping in their household - which explains their high involvement in the intention to use. The married and divorced/separated groups both have high probabilities of 0.848 and 1.00 respectively, which could be indicative of their responsibility for supermarket shopping for their households. All household income groups received high positive outcomes of ≥ 0.750 probabilities throughout. The secondary and pre-U/junior college groups revealed the highest receptivity, evidenced by a 1.00 probability. Diploma and university graduates also presented good BI probabilities of ≥ 0.720 . Generally, all demographic groups yielded high BI probabilities, which could be telling of the influences of subjective norm on their willingness to adopt HTE services. Besides that, there could be existing HTE products performing well in the market that favoured these responses. Of these results, certain consumer profiles stood out, which could be desirable target markets for (potential) businesses delving into the utilisation of HTE services in Singapore supermarkets. The two main groups are:

i. Individuals

Individuals (Singles) above the age of 25, irrespective of household income and education levels.

ii. Families

Families preferably with children, with household consisting of two to five occupants, irrespective of household income and education levels.

Implications for Habitat by Honestbee

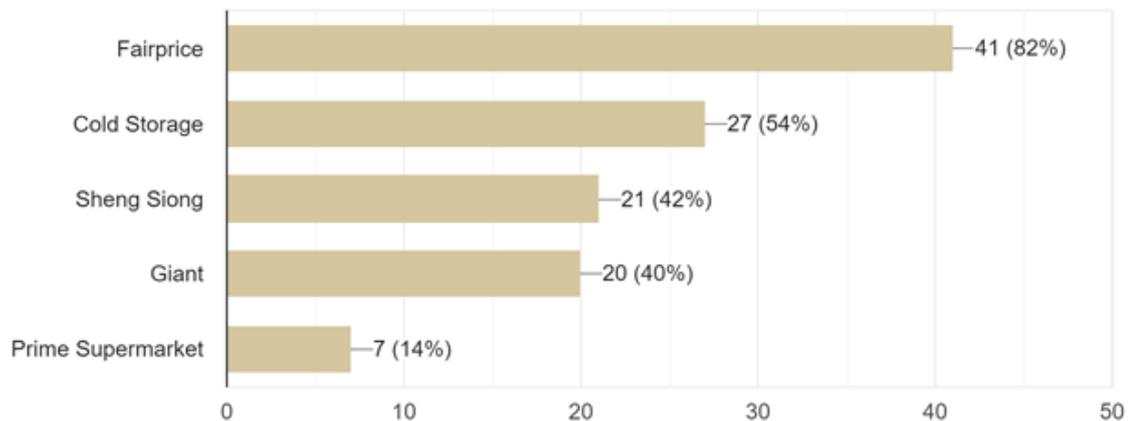
At this point of the research, Singapore's only HTE supermarket, *habitat by honestbee* was forced to close given the devastating effects of the COVID-19 pandemic. The supermarket had already been plagued by financial issues in recent years. The company had approximately S\$313 million in debt (Yap, 2020).

Honestbee CEO admits that the one-outlet-only supermarket business was a "recipe for disaster", given the strong competition posed by other established local supermarket chains (Salim, 2020) As such, the tech supermarket's inability to reach out to the masses by means of convenience and accessibility was one of the firm's biggest failures. The tech components of the business model were not faulted, evidenced by its receptivity by local customers as well as from positive consumer sentiments found in this research. For example, restructuring efforts could take the form of partnerships with local supermarket chains that could primarily expand the reach of *habitat by honestbee*'s HTE services.

Figure 4. Supermarket patronage among survey respondents

3. Which supermarkets do you usually visit? You may select more than one option.

50 responses



Conclusions & Recommendations

HTE services do seem to have a promising future in Singapore's supermarket retail scene. Consumers were highly interested in the adoption and future of HTE services which further affirms the potential sustainability of disruptive technology in supermarkets. Although still in its infancy, HTE services are generally well-received by both users and potential users. The willingness to accept and adopt novel technology not only intrigues but also motivates some people to stay ahead of the times. Though IT might seem to be increasingly complex and expensive to acquire, retail businesses should embrace the benefits it will reap in the long term. It is imperative to grasp the workings of technology adoption by understanding the determinants posited by Venkatesh & Bala (2008) in the TAM3 model, to ensure the relevancy of the IT used while advancing towards a more effective and efficient future. The bigger players in the supermarket industry are traditional ones that have been serving households in many neighbourhoods for decades, while *habitat by honestbee* is a new entrant that relies heavily on unconventional shopping technology, and was located in an inaccessible location for many. Its failure should educate (future) retail business owners venturing into HTE services about the flaws of its business model, which has limited to no effect on the willingness of consumers to adopt new retail technology.

The findings from this study can support managerial decision making in several ways. First, businesses are able to identify and target consumers most likely to adopt and sustain usage of HTE services in supermarkets or relevant retail fields. Next, businesses are able to develop and explore upon the novelty and utility of the different types of HTE services consumers prefer to use during shopping. Ideally, the understanding of family psychographics will also help businesses target toward their different segments more accurately, depending on their desired



audiences. Ultimately, businesses looking to develop their own HTE service will greatly value the importance of the determinants of PU and PEOU. This will help with the prioritising of the generation, implementation and execution of their new service. For example, the comparison of both average scores of CSE (computer self-efficacy) and ENJ (perceived enjoyment), both determinants of PEOU, can help to expedite managerial decision-making. The higher average CSE score of 5.25 (out of seven) as compared to ENJ's 4.74 will mean that CSE assumes a higher importance to consumers than ENJ. Hence, any new HTE service implemented will have to serve its utility in a simple and easy-to-understand fashion than it should possess features of fun and novelty. Though there may be more determinants involved in the understanding of technology adoption that could be culturally and/or geographically specific, the current TAM3 model was more than comprehensive to bolster the breadth and depth of this study.

Limitations

There could be other factors affecting willingness to adopt unconventional HTE services in retail businesses between other close substitutes i.e. other HTE supermarkets. This could have produced more discussions about the competition between substitutes i.e. loyalty programmes, variety of groceries, price competition, delivery channels, etcetera, which would directly impact the sustainability and feasibility of HTE services in the supermarket industry in Singapore. This study is inadequate in providing recommendations for managerial decision-making relating to external competition between businesses that operate on very similar grounds. Suggested further research should cover these scopes where applicable. Additionally, the number of survey respondents (though $n > 30$) should be increased to generate more representative results. Logistic and probit regression models can also be explored for data analysis in future studies to achieve more accurate findings.



REFERENCES

- Bower, J. L. and Christensen, C. M. (1995). Disruptive technologies: Catching the wave. *Harvard Business Review*, Vol. 73, No. 1, pp. 43–53.
- Carpenter, J. M. and Moore, M. (2006). Consumer demographics, store attributes, and retail format choice in the US grocery market. *International Journal of Retail & Distribution Management*, Vol. 34, No. 6, pp. 434-452. doi:<http://dx.doi.org/10.1108/09590550610667038>
- Cho, H. and Fiorito, S. S. (2010). Self-service technology in retailing the case of retail kiosks. *Symphony*, Vol. 1, No. 1, pp. 42-54. Retrieved from <https://search.proquest.com/docview/1018149840?accountid=196406>
- Christensen, C. M. and Bower, J. L. (1996) Customer power, strategic investment, and the failure of leading firms. *Strateg. Manag. J.*, Vol. 17, No. 3, pp. 197-218. doi: [https://doi.org/10.1002/\(SICI\)1097-0266\(199603\)17:3%3C197::AID-SMJ804%3E3.0.CO;2-U](https://doi.org/10.1002/(SICI)1097-0266(199603)17:3%3C197::AID-SMJ804%3E3.0.CO;2-U)
- Christensen, C. M. (2003). *The Innovator's Solution: Creating and Sustaining Successful Growth*. Boston, MA: Harvard Business School Press.
- Cooper, R. B. and Zmud, R. W. (1990). Information technology implementation research: A technological diffusion approach. *Management Science*, Vol. 36, No. 2. pp. 123-139.
- Fannin, R. (2018). *Alibaba beats amazon to new all-digital retail trend*. Forbes. Retrieved from <https://www.forbes.com/sites/rebeccafannin/2018/09/21/alibaba-beats-amazon-to-new-all-digital-retail-trend/#7eeb03346653>
- Honestbee, (2008). *Asia's leading marketplace for food experiences* [Press Release]. Retrieved from <https://assets.honestbee.com/web/files/press-kit.zip>
- Jiang, Y. D. X. and Jin, T. (2019). Using combined network information to predict mobile application usage. *Physica A: Statistical Mechanics and Its Applications*, Vol. 515, 430–439. doi: 10.1016/j.physa.2018.09.135
- Joshi, A. Kale, S. Chandel, S. and Pal, D. K. (2015). Likert Scale: Explored and Explained. *British Journal of Applied Science & Technology*. Vol. 7, No. 4, pp. 396-403. Doi: 10.9734/BJAST/2015/14975.
- Kahn, B. E. and Schmittlein, D. C. (1992). The relationship between purchases made on promotion and shopping trip behavior. *Journal of Retailing*, Vol. 68 No. 3 pp. 294. Retrieved from <https://search.proquest.com/docview/228619076?accountid=196406>



- Kaushik, A. and Rahman, Z. (2015). An alternative model of self-service retail technology adoption. *Journal of Services Marketing*, Vol. 29 No. 5, pp. 406-420. doi: <https://doi.org/10.1108/JSM-08-2014-0276>
- Koh, V. (2017). *Technology key to solving manpower crunch: Swee Say*. TODAY Online. Retrieved from <https://www.todayonline.com/singapore/technology-key-solving-manpower-crunch-swee-say>
- Kollat, D. T. and Willett, R. P. (1967). Customer impulse purchasing behavior. *JMR, Journal of Marketing Research*, Vol. 4, No. 000001, pp. 21-37. Retrieved from <https://search.proquest.com/docview/208747836?accountid=196406>
- Lai, P. C. (2017). The literature review of technology adoption models and theories for the novelty technology. *Journal of Information Systems and Technology Management*, Vol. 14 No. 1, pp. 21-38. doi: 10.4301/S1807-17752017000100002
- LaMorte, W. W. (2016). Central Limit Theorem. Boston University of Public Health. Retrieved from http://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_Probability/BS704_Probability12.html
- Matamalas, R. F. and Ramos, M. S. (2009). Marketing strategy of the supermarkets. [ICA MAXI, FORUM COOP, NETTO, LIDL]. 4-5. Retrieved from https://www.academia.edu/5761738/MARKETING_STRATEGY_OF_THE_SUPERMARKETS_ICA_MAXI_FORUM_COOP_NETTO_LIDL_Marketing_Strategy_of_the_supermarkets
- Nilsson, E. Gärling, T. Marell, A. and Anna-Carin Nordvall. (2015). Importance ratings of grocery store attributes. *International Journal of Retail & Distribution Management*, Vol. 43 No. 1, pp. 63-91. doi:<http://dx.doi.org/10.1108/IJRDM-12-2012-0112>
- Pillai, S. (2019). *honestbee CEO replaced, firm said to be sticking to habitat growth*. The Business Times. Retrieved from <https://www.businesstimes.com.sg/garage/honestbee-ceo-replaced-firm-said-to-be-sticking-to-habitat-growth>
- Salim, Z. (2020). EXCLUSIVE: Is There Still Hope For Honestbee? CEO Ong Lay Ann Shares Plans to Save The Firm. Vulcan Post. Retrieved from <https://vulcanpost.com/693573/honestbee-ceo-plans-to-save-the-firm/>
- Sharma, H. Lowalekar, V. and Jain, R. (2013). Buyers' perception of important retail store attributes in indian traditional grocery setting. *International Journal of Marketing & Business Communication*, Vol. 2 No. 2, pp. 44-52. Retrieved from <https://search.proquest.com/docview/1478016758?accountid=196406>



- Uusitalo, O. (2001). Consumer perceptions of grocery retail formats and brands. *International Journal of Retail & Distribution Management*, Vol. 29(5), 214. doi:<http://dx.doi.org/10.1108/09590550110390995>
- Venkatesh, V. and Bala, H. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions. *Decision Science*, Vol. 39 No. 2, pp. 273-312. doi:<https://doi.org/10.1111/j.1540-5915.2008.00192.x>
- Walters, R. G. and Jamil, M. (2003). Exploring the relationships between shopping trip type, purchases of products on promotion, and shopping basket profit. *Journal of Business Research*, Vol. 56 No. 1, pp. 17-29. Retrieved from <https://search.proquest.com/docview/196326215?accountid=196406>
- Williams, J. (2012). The value of mobile apps in healthcare. *Healthcare Financial Management*, Vol. 66 No. 6, pp. 96-201.
- Yap, J. (2020). *Too Little, Too Late: Why Honestbee's US\$7M Funding Can't Stop The Ship From Sinking*. Vulcan Post. Retrieved from <https://vulcanpost.com/688114/why-honestbee-us7m-funding-cant-stop-sinking-ship/>
- Yi, M. Y. and Hwang, Y. (2003). Predicting the use of web-based information systems: self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. *International Journal of Human-Computer Studies*, Vol. 59 No. 4, pp. 431–449.