A study on factors affecting Japanese consumer's behavior toward 5G smartphone purchase

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Abstract

Purpose – *The purpose of this study is to analyze the determinants influencing Japanese consumers' behavior toward the purchase of 5G smartphones.*

Design/methodology/approach – *Empirical data was collected through an online survey of 320 Japanese respondents from ages 20 to 59. Data was analyzed by exploratory factor analysis, confirmatory factor analysis and multiple regression analysis.*

Findings – *The results indicate that hedonic value, user interface and price value (PV) positively influence attitude toward 5G smartphone purchase, while utilitarian value does not. In addition, the mediation effect of social influence (SI) is found to increase those positive effects. Male and female consumers displayed differences in the determinants, showcasing the effect of gender on attitude and behavior.*

Originality/value – *To the best of the authors' knowledge, this study is the first research to analyze Japanese consumers' behaviors' toward 5G smartphone purchase. Past research for 3G/4G smartphones supported that usefulness positively influenced consumers' behavior toward smartphones, so usefulness of 5G (e.g. high speed) was expected to be a factor to influence consumer behaviors' toward 5G smartphones. However, this research reveals that a simple tagline emphasizing such usefulness may not be convincing enough to promote the 5G smartphones to Japanese consumers. Alternatively, the research indicates that introducing the concepts of joyfulness, improved HV and greater PV of the 5G smartphone could attract more consumers in Japan. In addition, SI could enhance the perception of the various benefits of 5G smartphones.*

Keywords *5G smartphone, Japan, Utilitarian value, Hedonic value, User interface, Price value, Social influence*

Paper type *Research paper*

1. Introduction

The need of extended mobile communication grew rapidly since several years ago in Japan. Smartphones became the most frequently used devices for the internet access in 2017 among Japanese consumers, by surpassing PCs (Ministry of Internal affairs and Communication, 2020). Ministry of Internal affairs and Communication (2020) reported that average daily uses of smartphones for Japanese users exceeded 70 min per day in 2018 and data traffic through mobile communication increased by 2.3 times from 2016 to 2019. 5G technologies have several advanced features. For example, 5 G mobile communication provides 20 times faster speed than 4G (Qualcomm, 2021). Continuous growth on mobile communication raises the need of 5 G technologies and 5 G technologies are expected to bring opportunities for Japan society to showcase our advanced ICT initiatives (Ministry of Internal affairs and Communication, 2020). Telecom operators in Japan positioned rapid growth on 5G markets as their key strategies. Japan's leading operator, NTT Docomo announced that NTT Docomo's 5G Open Partner program was launched in January, 2018 (NTT Docomo, 2018) to aim rapid

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growth immediately after 5G service launch. Softbank also announced to open their laboratory to partners for rapid 5 G market growth (Softbank, 2018).

Telecom operators in Japan launched 5G services in March 2020. However, 5G smartphone shipments in Japan were very low. 5 G subscribers only account for 2.9% of total mobile subscribers in Japan in 2020 (Ministry of Internal affairs and Communication, 2020). Nakajima and Tobe (2020) pointed out that only 19% of consumers in Japan have high interest in 5G smartphones, and 35% of consumers will delay 5G smartphone purchases until alternative services become unavailable. Consumers viewed 5G smartphones as too expensive (Sato, 2020; Takatsuki, 2020; Aiyama, 2020; Ishikawa, 2020). In addition, network availability was in limited areas only (Shiraishi, 2020; Nikkan Kogyo Shinbunsha, 2020; Aiyama, 2020), and at the same time, consumers felt that 4G was sufficient to meet their needs (Nakajima and Tobe, 2020). Therefore, it was not attractive enough as consumers equated 5G to only speed (Sato, 2020; Takatsuki, 2020; Shiraishi, 2020). Measures introduced by the Japanese government during the COVID-19 pandemic changed consumer behavior toward the smartphone market (Ishikawa, 2020; Yoshikawa, 2020). The implementation of a lockdown in cities from April 7, 2020, to May 31 [Japan Broadcasting Corporation (NHK), 2021] meant that most retail stores were closed, or customer visits severely limited. The majority of smartphone sales campaigns and promotions were canceled or suspended (Sano, 2020). In June 2020, sales of smartphones had dropped by 22.5% (NTT Docomo, 2021; KDDI, 2021; Softbank, 2021).

Operators and handset OEMs are struggling to find the appropriate promotion strategies to promote 5G smartphones. Yoshikawa (2020) reported that Mr. Makoto Takahashi, President of KDDI, expressed his concerns on the slow uptake of 5G. The low numbers of actual purchase in Japan highlights a need to explore the determinants that affect consumer perception and attitude toward 5G smartphones. This study examines Japanese consumers' perceptions and their intention to purchase 5G smartphones. Specifically, this paper explores the relationships between the drivers of smartphone purchase, such as utilitarian value (UV), price and user interface (UI) on attitude and purchase intention (PI). The mediating effect of social influence (SI) is also examined, and the effect of gender was also explored. Consumers in Japan previously preferred UV rather than Hedonic value (HV), price value (PV), SI for 3G/4G smartphone usage during 3G/4G era (Jeon *et al.*, 2010; Wardani and Warsono, 2012; Takada and Fujita, 2013). SI's influence toward 3G/4G smartphone usage was confirmed (Jeon *et al.*, 2010; Takada and Fujita, 2013), however Wardani and Warsono (2012) denied SI's influence toward satisfaction on smartphone usage among Japanese consumers. HV's influence toward 3 G/4G smartphones usage was confirmed (Wardani and Warsono, 2012; Ahmad and Methe, 2013), however Wardani and Warsono (2012) confirmed that HV's influence toward 3G/4G smartphones usage was less that UV's. It is because Japanese consumers did not frequently use smartphone for socializing with others and smartphones were used more frequently for functional purposes (Wardani and Warsono, 2012). The findings from comparison with previous research provide novel theoretical and managerial contributions for faster 5G smartphone market growth in Japan as, to the best of the authors' knowledge, it is the first to explore consumer attitude toward 5G smartphones in Japan.

2. Literature review

Smartphones like Apple's iPhone heralded a new era in communication, influencing people's lifestyles in a manner not seen before. Smartphones became one of the most important portable devices, providing multiple features, not limited to only voice calls, but also music, video and gaming (Park *et al.*, 2015). Although the needs of smartphone users were broad and diversified, research identified the scales which predicted consumer perception and PI (Ibrahim *et al.*, 2013; Ibrahim *et al.*, 2013) argued that consumer perception toward benefits from smartphones could lead to PI of smartphones.

Consumers perceive one of the core benefits of smartphones is usefulness which was examined extensively in mobile communication services, by adopting the technology acceptance model (Park *et al.*, 2015; Ibrahim *et al.*, 2013; Wu *et al.*, 2014; Mohsin and Ahmad, 2012; Satriawan and Setiawan, 2020; Liu and Yu, 2017). In addition, smartphones could provide entertainment services for fun such as music and gaming, so several research models added joyfulness and enjoyment as a means to analyze consumer perception toward smartphones (Xu *et al.*, 2012; Whitten *et al.*, 2014; Park *et al.*, 2015; Haroon *et al.*, 2017). As the use of smartphones was prevalent among a wide cross-section of the population, the current smartphones may not provide an appropriate UI to all the users, especially for nontechnology savvy people (Salman *et al.*, 2018). Therefore, UI was increasingly recognized as one of the most important scales to positively influence consumers' perception toward smartphone adoption. Next, price could not be ignored in any discussion about the acceptance of new technology (Park *et al.*, 2015). Finally, Park *et al.* (2015) stated that the effect of SI on smartphone users continued to be strong since the days of 3G services. Therefore, this research analyzed consumer preference toward 5G smartphones from the viewpoint of usefulness, joyfulness, UI, price and SI.

2.1 Utilitarian value (usefulness)

Practical and functional benefits have been discussed from the viewpoint of new technology acceptance. Davis (1989) stated that perceived usefulness was positively correlated to usage of new technologies. Davis (1989) defined practical benefits as the degree to which a person believed a particular system would enhance his/her job performance. Perceived usefulness was applied for other new technology acceptance analyses such as instant messaging (Lu *et al.*, 2009), internet banking (Nasri, 2011) and virtual reality hardware (Manis and Choi, 2019).

Perceived usefulness was evolved to UV as a factor to measure consumers' preference from the viewpoint of usefulness. Hoffman and Novak (1996) stated that UV was an assessment of consumers' perception of functional benefits. Childers *et al.* (2001) defined UV as the efficiency to access the desired information online. Sánchez-Fernández and Iniesta-Bonillo (2007) asserted that UV was instrumental in task-oriented, rational and cognitive benefits. Voss *et al.* (2003) measured UV using pairs of adjectives such as effective/ineffective, helpful/unhelpful, functional/nonfunctional, necessary/unnecessary and practical/impractical. UV was adopted in the latest research to analyze new technology acceptance for online shopping, mobile banking, online games, mobile wallets, premium smartwatches, mobile payment and AI assistants (Gong *et al.*, 2013; Deb and Agrawal, 2017; Sharma *et al.*, 2020; Xavier and Zakkariya, 2021; Saygılı and Yalçıntekin, 2021; Handarkho *et al.*, 2021; Yuan *et al.*, 2022).

5G service increased UV, such as larger data usage (Dano, 2019). The average monthly data usage of 5G smartphone users in Korea was 24 GB in June 2019, which was approx. 2.6 higher than the average of 4G smartphone users (9.1 GB) (Dano, 2019). 5G service increased functional benefits not only in terms of speed, but also capacity and low latency. Hence, 5G smartphones can bring lots of benefits from the viewpoint of usefulness (Qualcomm, 2021) and have a positive impact on attitude toward purchase. Therefore, it is hypothesized that:

H1. UV positively influences attitude toward 5G smartphone purchase.

2.2 Hedonic value (joyfulness)

Recently, the concepts of emotional and experiential benefits were added for new technology analysis and expanded applicability. Moon and Kim (2001) added perceived playfulness to their research for web context in Korea. Perceived playfulness was positively correlated to attitude toward using, and the behavioral intention to use of web context.

Perceived joyfulness was evolved to HV as a factor to measure consumer preference from the viewpoint of joyfulness. Overby and Lee (2006) referred to the fact that HV was instrumental in experiential benefits such as entertainment and escapism. Sánchez-Fernández and Iniesta-Bonillo (2007) asserted that HV was entertaining, emotional, affective and noninstrumental worth. Xu *et al.* (2012) stated that HV was experientially-valued for joy or fun. In terms of research applications of HV, Voss *et al.* (2003) measured HV with pairs of adjectives such as not fun/fun, dull/exciting, not delighting/delightful, not thrilling/thrilling and enjoyable/unenjoyable. HV was also adopted in the latest research together with UV to analyze new technology acceptance for online banking, online games, mobile wallets, premium smartwatches and AI assistants (Kaur and Arora, 2020; Sharma *et al.*, 2020; Xavier and Zakkariya, 2021; Saygılı and Yalçıntekin, 2021; Yuan *et al.*, 2022; Pandey *et al.*, 2022)

The surveys indicate that approximately 50% of Gen Z/millennials would increase hedonic uses of mobile phones such as video streaming/mobile games after the 5G launch (Westcott *et al.*, 2019), so 5G smartphones are expected to impact joyfulness that will positively influence purchase attitude. Therefore, it is hypothesized that:

H2. HV positively influences AT.

2.3 User interface

Shneiderman (1992) stated that user-friendliness was one of the priorities in the design of new products and technology development. Shneiderman (1992) emphasized that UI impacted several items from the viewpoint of users such as (1) time to learn, (2) speed of performance, (3) rate of errors by users, (4) retention over time and (5) subjective satisfaction. UI was discussed as the background which influences customer satisfaction (Calisir and Calisir, 2004). Liu *et al.* (2010) stated that a well-designed UI could help users operate the system more easily and reduce their cognitive load.

Moon and Kim (2001) were the first to suggest adding UI as an additional factor for their research of web context. Thong *et al.* (2002) and Huang *et al.* (2013) confirmed that UI was positively correlative not only to perceived ease of use, but also to perceived usefulness. Youm and Yu (2013) stated that UI was positively correlative to PI for smartphone purchase in Korea. Liu and Yu (2017) also confirmed that UI is positively correlative to usage behavior for smartphone usage in China. As the use of smartphones was prevalent among a wide cross-section of the population, the current smartphones may not provide an appropriate UI to all the users, especially for nontechnology savvy people (Salman *et al.*, 2018). Therefore, UI was increasingly recognized as one of the important scales to positively influence consumers' perception toward smartphone adoption.

The survey indicated that approximately 40% of Gen Z and millennials would expand the UI of mobile phones into areas such as augmented reality/virtual reality after the 5G launch (Westcott *et al.*, 2019), so 5G smartphones are expected to provide better UI and influence purchase attitude. Therefore, it is hypothesized that:

H3. UI positively influences AT.

2.4 Price value

Pricing was discussed for the new technology acceptance over decades. Pricing was adopted in market research analysis for PC marketing (Holbrook, 1998; Ibrahim *et al.*, 2013) and stated that pricing was composed of perceived quality and perceived sacrifice, and was positioned as a trigger to accelerate consumers' perception. Kaur and Soch (2018) confirmed that cost influenced the consumer behaviors significantly when switching the mobile services. Manis and Choi (2019) stated that price played a key role in consumers'

decision-making process. Nguyen and Nguyen (2020) stated that price acceptance was customers' cognitive responses to show appreciation of products.

Cost and pricing discussions for new technology acceptance evolved to PV, and applied for several research. Venkatesh *et al.* (2012) defined PV as a factor to assess the balance of cost burden for new technology acceptance. PV positively influenced behavioral intention for mobile internet use in HK (Venkatesh *et al.*, 2012). Furthermore, Manis and Choi (2019) argued that those who were willing to pay more for a virtual reality device had a higher perception of enjoyment from virtual reality. Haroon *et al.* (2017) also concluded that higher prices positively influenced PI for 3G smartphone research in Pakistan. PV's positive effect on consumer preference was also confirmed for online banking, mobile hotel booking, mobile wallet, bike-sharing services and electric vehicles (Kaur and Arora, 2020; Mohamad *et al.*, 2021; Xavier and Zakkariya, 2021; Lyu and Zhang, 2021; Vafaei-Zadeh *et al.*, 2022).

Consumers viewed 5G smartphones as too expensive (Sato, 2020; Takatsuki, 2020; Aiyama, 2020; Ishikawa, 2020; Westcott *et al.*, 2019) and asserted that consumers were concerned about high price on 5G smartphones, suggesting appropriate pricing for faster 5G uptake. Therefore, it is hypothesized that:

H4. PV positively influences AT.

2.5 Social influence (subjective norm)

Subjective norm was often analyzed as a factor for new technology acceptance analysis. Liang and Yeh (2009) stated that subjective norm was the social pressure toward individuals to perform or not to perform a particular behavior for mobile gaming in Taiwan. Shalender and Sharma (2020) argued that subjective norm has an influential impact in society, which encouraged consumers to accept a particular technology. Leong *et al.* (2013) stated that SI was equivalent to social norm, defined as positive effect from important others which influenced consumer's decision. Gupta *et al.* (2019) defined SI as the opinions and recommendations from influential people which may impact the adoption of new technologies through positive images.

In terms of the research applications of SI, Liang and Yeh (2009), in Taiwan, stated that subjective norm was positively correlative to intention if a user had no interest in playing mobile games. SI positively influenced the behavioral intention of mobile internet use (Venkatesh *et al.*, 2012). Hoonsopon and Puriwat (2016) stated that SI was more positively correlative to PI in highly value-added products (e.g. car, tablet and smartphone) than commoditized products (e.g. detergent and soda). SI's positive influence on consumer preference was confirmed for luxury fashion and online banking (Jain *et al.*, 2017; Kaur and Arora, 2020). Subjective norm was confirmed as a factor that positively influenced adaptation intention for electric vehicles in recent researches (Shalender and Sharma, 2020; Vafaei-Zadeh *et al.*, 2022).

The mediating effect of SI's has been studied in the recent years. The relationship between enjoyment (i.e. HV) and behavioral intention was mediated by subjective knowledge for online entertainment video in Germany (Schneider *et al.*, 2016). It was confirmed that HV did not influence behavioral intention directly, so HV influenced behavioral intentions only indirectly by fostering subjective knowledge for online entertainment in Germany. Subjective norm (i.e. SI) mediated the relationship between mobile usability (i.e. UI) and customer satisfaction for mobile payment for hotels in China (Sun *et al.*, 2020). For the research of mobile payment in China, the mediator relationship of subjective norm between mobile functionality (i.e. UV) and customer satisfaction was suggested, but not confirmed. Consumers exposed to positive price-related comments reported a significantly higher perceived price fairness compared with ones with negative price-related comments (Schneider and Huber, 2021). So, SI was analyzed as a mediator between UV, HV, UI, PV and AT in this study. The impact of SI may differ, depending on gender. A larger impact of

SI was reported in females rather than males (Venkatesh *et al.*, 2003; Ghalandari, 2012; Verma *et al.*, 2021) proved that SI had bigger influence for males than female. SI's impact was analyzed by segment in the present research. Therefore, it is hypothesized that:

H5a. UV positively influences SI.

H5b. HV positively influences SI.

H5c. UI positively influences SI.

H5d. PV positively influences SI.

H5e. SI mediates the relationship between independent variables and AT.

2.6 Attitude toward purchase

Manis and Choi (2019) stated that AT positively influenced PI for high technology consumer products. Therefore, it is hypothesized that:

H6. AT positively influences PI.

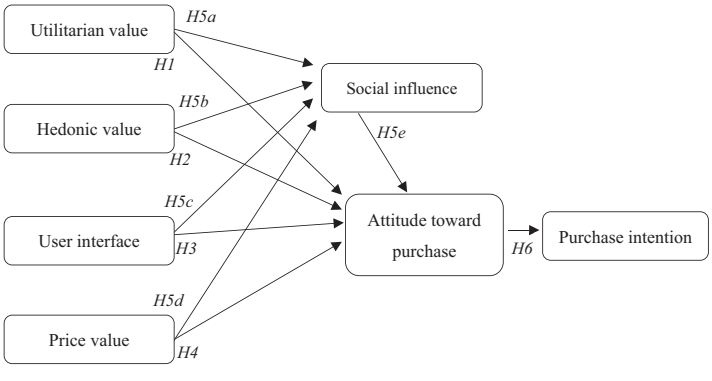
PI for 5G smartphones is analyzed with model as shown in Figure 1.

3. Methodology

3.1 Sampling and data analysis

Data was collected through an online survey panel from 400 respondents where respondents were recruited using the opt-in method through an online research company. The ages of respondents were from 20 to 59, and 100 responses were collected for 20s, 30s, 40s and 50s, respectively, to gather samples from broad ages equally. Also, 200 responses were collected from male and female, respectively. Eighty responses were dropped through the data cleaning processes, resulting in a final total of 320 respondents. A total of 320 valid responses were retained for data analysis. Regarding the demographics of respondents, male and female were 47.2% and 52.8%, respectively, as listed in Table 1. Respondents also answered the current uses of streaming services. Short video (e.g. YouTube and TikTok) was currently the most popular streaming service. Music, movie/drama and gaming. Data was analyzed using SPSS v. 27, SPSS Amos 27.0 and Hayes PROCESS-macro v3.5.

Figure 1 Research model



Source: Authors' own work

Table 1 Sample profile

Category	*Frequency*	*Distribution (%)*
Gender		
Male	151	47.2
Female	169	52.8
Age		
20–29	82	25.6
30–39	77	24.1
40–49	75	23.4
50–59	86	26.9
Occupation		
Businessman	164	51.3
Part timer	53	16.6
Housewife	35	10.9
Freelancer	30	9.4
No jobs	21	6.6
Student	11	3.4
Management/doctors and nurses	6	1.9
Current streaming service usage		
Short video	155	48.4
Music	94	29.4
Movie/drama	66	20.6
Gaming	60	18.8
News	50	15.6
Study/work	26	8.1
Not using streaming service	100	31.3

Source: Authors' own work

3.2 Measures

All the items used were validated in previous studies. UV and HV are measured using six items each from Voss *et al.* (2003). Seven items measuring UI were adopted from Oghuma *et al.* (2016), while seven items for PV was taken from Venkatesh *et al.* (2012). Six items for SI were adopted from Leong *et al.* (2013) and Park *et al.* (2015). Attitude toward purchase was measured using four items, while PI was measured using three items adopted from Manis and Choi (2019). The measurement items were widely used by various studies in different devices such as mobile devices and AI assistants (Whitten *et al.*, 2014; Yuan *et al.*, 2022) in various social and cultural contexts. Oghuma *et al.* (2016) and Xavier and Zakkariya (2021) demonstrated that the measurement items were robust and extensively validated. All items were measured on a six-point Likert scale, where "1" denoted "strongly disagree" and "6" denoted "strongly agree" (Table 2)

4. Data analysis

Skewness and kurtosis were checked as normality tests, and it was confirmed that both values were between the appropriate range (−1 and 1) for all the scales. Homoscedasticity was checked through scatterplots. The plots for all the independent variables showed as linear patterns with substantial R-square. Therefore, homoscedasticity was confirmed. Explanatory factor analysis was conducted to identify scales explaining consumers' preferences for smartphone purchase. Kaiser–Meyer–Olkin's measure of sampling adequacy was 0.892, exceeding 0.6 as the suggested value (Kaiser, 1974). Bartlett's test of sphericity was significant [x^2 (136) = 4391.44, $p < 0.000$], which suggested that explanatory factor analysis was an appropriate method. Variables with loading smaller than 0.50 on all common scales were deleted, and variables with loading larger than 0.50 on two or more scales were also deleted (Hair *et al.*, 2010). The mean of UI was highest (M = 4.330) and UV was following, while the mean of PV was lowest (M = 2.752) on Table 3.

Table 2 Measures

Construct	Items
Utilitarian values (Voss *et al.*, 2003)	I expect a 5G smartphone as "XXX", comparing with 4G smartphone • UV_1: effective • UV_2: functional • UV_3: beneficial • UV_4: useful • UV_5: efficient • UV_6: productive
Hedonic values (Voss *et al.*, 2003)	I expect a 5G smartphone as "XXX", comparing with 4G smartphone • HV_1: fun • HV_2: dull • HV_3: enjoyable • HV_4: pleasant • HV_5: playful • HV_6: amusing
User interface (Oghuma *et al.*, 2016)	• UI_1: I expect 5G smartphone increases the amount of information provided • UI_2: I expect 5G smartphone is easy to find information I need • UI_3: I expect 5G smartphone is quick for searching and checking information that I need • UI_4: I expect 5G smartphone has better display functions • UI_5: I would like to buy AR/VR once I purchase 5G smartphone • UI_6: I would like to buy headphones with high quality sound once I purchase 5G smartphone • UI_7: I would like to buy gamepads once I purchase 5G smartphone
Price value (Venkatesh *et al.*, 2012)	• PV_1: 5G smartphone is reasonably priced • PV_2: at the current price, 5G smartphone provides a good value • PV_3: how much would you pay for 5G smartphone (net after discount) • PV_4: 5G mobile communication fee is reasonably priced • PV_5: at the current price, 5G mobile communication provides a good value • PV_6: how much would you pay for 5G mobile communication fee (net after discount) • PV_7: I would wait and see until current price reduces further
Social influence (Leong *et al.*, 2013) (Park *et al.*, 2015)	• SI_1: friends and family members have influence on my decision to use 5G smartphone • SI_2: mass media and/or online media (e.g. YouTube, SNS ads, etc.) will influence my decision to purchase 5G smartphone • SI_3: it is the current trend to 5G smartphone • SI_4: people who are important to me would think that I should use 5G smartphone • SI_5: people who would influence my behavior would think that I should use 5G smartphone • SI_6: people who are close to me would think that I should use 5 G smartphone
Attitude toward purchase (Manis and Choi, 2019)	I think buying 5G smartphone is a "XXX" idea • AT_1: good–bad • AT_2: wise–foolish • AT_3: pleasant–unpleasant • AT_4: positive–negative
Purchase intention (Manis and Choi, 2019)	• PI_1: there is a high likely-hood that I will purchase 5G smartphone within the foreseeable future • PI_2: I intend to purchase 5G smartphone within foreseeable future • PI_3: purchasing 5G smartphone in foreseeable future is important to me

Source: Authors' own work

4.1 Model fit

Confirmatory factor analysis (CFA) was conducted using SPSS Amos 27.0 software to test the model's goodness-of-fit. The indices adopted included minimum discrepancy function by degrees of freedom divided (CMIN/df), the goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), Tucker–Lewis index (TLI) and root mean square error of approximation (RMSEA). The result of the GFIs is summarized in Table 4, showing that the measurement model met the requirements of model fit.

Table 3 Scales, means and SD

Scales	*Mean*	*SD*	*Q1*	*Median*	*Q3*
UV	4.188	1.341	3.500	4.500	5.000
HV	3.981	1.241	3.333	4.000	5.000
UI	4.330	1.197	3.667	4.333	5.333
PV	2.752	1.246	2.000	2.667	3.667
SI	3.461	1.177	3.000	3.500	4.000
AT	3.491	1.146	3.000	3.500	4.000
PI	3.225	1.390	2.000	3.000	4.000

Source: Authors' own work

Table 4 The result of the goodness of fit indices

Fit indices	*CMIN/df*	*GFI*	*AGFI*	*CFI*	*TLI*	*RMSEA*
Recommended values *	<3	>0.90	>0.80	>0.90	>0.90	<0.08
Actual values	2.016	0.931	0.892	0.977	0.968	0.056

Notes: *Recommended values were referred to Hair *et al.* (2010), Schermelleh-Enge *et al.* (2003), Bentler (1990) and Lattin *et al.* (2003)
Source: Authors' own work

The reliability and validity of the measurement model, as well as the internal consistency were evaluated, with the results listed in Table 5. Cronbach's alpha coefficient was larger than the recommended value, which was 0.58 (Taber, 2017), therefore, the internal consistency of each factor was acceptable. Standardized loading estimates should be 0.50

Table 5 Standardized factor loading estimates, internal consistencies, construct reliability and AVE

Scales	*Items*	*Estimate*	*Cronbach's alpha*	*CR*	*AVE*
UV	UV_1: I expect a 5G smartphone as "Effective", comparing with 4G smartphone	0.908	0.900	0.953	0.910
	UV_2: I expect a 5G smartphone as "Functional", comparing with 4G smartphone	0.901			
HV	HV_3: I expect a 5G smartphone as "Enjoyable", comparing with 4G smartphone	0.907	0.915	0.946	0.854
	HV_5: I expect a 5G smartphone as "Playful", comparing with 4 G smartphone	0.876			
	HV_6: I expect a 5G smartphone as "Amusing", comparing with 4G smartphone	0.871			
UI	UI_1: I expect 5G smartphone increases the amount of information provided	0.798	0.916	0.947	0.857
	UI_2: I expect 5G smartphone is easy to find information I need	0.930			
	UI_3: I expect 5G smartphone is quick for searching and checking information that I need	0.939			
PV	PV_1: 5G smartphone is reasonably priced	0.918	0.918	0.948	0.859
	PV_2: at the current price, 5G smartphone provides a good value	0.942			
	PV_4: 5 G mobile communication fee is reasonably priced	0.808			
SI	SI_1: friends and family members have influence on my decision to use 5G smartphone	0.522	0.640	0.847	0.734
	SI_3: it is the current trend to 5G smartphone	0.900			
AT	AT_1 I think buying 5G smartphone is a "Good-bad" idea	0.882	0.865	0.937	0.882
	AT_4: I think buying 5G smartphone is a "Positive-negative" idea	0.864			
PI	PI_1: there is a high likely-hood that I will purchase 5G smartphone within the foreseeable future	0.938	0.853	0.932	0.872
	PI_2: I intend to purchase 5G smartphone within foreseeable future	0.793			

Source: Authors' own work

or higher, a construct reliability (CR) value was recommended to be greater than 0.70 to assert adequate convergence and the average variance extracted (AVE) value should be 0.50 or greater to suggest adequate convergent validity, (Bagozzi and Yi, 1988; Hair *et al.*, 2010). All the factor loading estimates were larger than 0.50, the CR for all the scales was larger than 0.70 and the AVE for all the scales was larger than 0.50. Thus, reliability and convergent validity requirements were satisfied.

The discriminant validity was tested based on whether the square root of every AVE marked on the diagonal axis correlation coefficients was bigger than the coefficients of the other constructs. The smallest square root of AVE (0.857) was bigger than the largest coefficient (0.765) as listed in Table 6. Thus, discriminant validity was satisfied.

4.2 Multiple regression analysis and mediator analysis

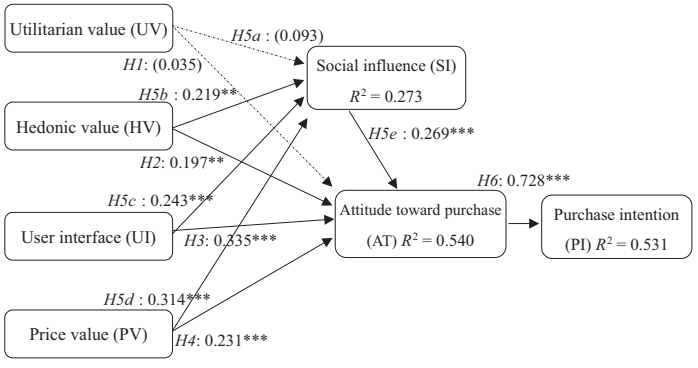
A multiple regression analysis was used to identify which scales made significant influences on attitude toward purchase of 5G smartphone and PI. The result of this analysis is summarized in Figure 2 and Table 7. HV, UI and PV were found to positively influence AT. In addition, SI was found to mediate relationships between HV toward AT, between UI toward AT and between PV toward AT. UV was not found to have any influence. UI's influence on AT was largest among HV, UI and PV (UI: $\beta = 0.335$, $p < 0.001$). R^2 of AT is 0.540, and R^2 of PI is 0.531. Considering the relatively high R^2 value, the research result is reliable in

Table 6 Correlation between latent variables for measurement of discriminant validity

	UV	*HV*	*UI*	*PV*	*SI*	*At*	*PI*
UV	*0.954*						
HV	0.821	*0.924*					
UI	0.691	0.610	*0.926*				
PV	0.258	0.284	0.266	*0.927*			
SI	0.448	0.537	0.536	0.475	*0.857*		
AT	0.561	0.603	0.632	0.498	0.765	*0.939*	
PI	0.421	0.409	0.442	0.464	0.515	0.825	*0.934*

Note: The square root of every AVE was highlighted
Source: Authors' own work

Figure 2 Results of regression analysis



Notes: Significant at * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$
Source: Authors' own work

Table 7 Hypothesis testing

Scales		*Hypothesis*	*β*	*Result*
Utilitarian value	*H1*	UV positively influences AT	(0.035)	Not supported
Hedonic value	*H2*	HV positively influences AT	0.197	Supported **
User interface	*H3*	UI positively influences AT	0.335	Supported ***
Price value	*H4*	PV positively influences AT	0.231	Supported ***
Social influence	*H5a*	UV positively influences SI	(0.093)	Not supported
	H5b	HV positively influences SI	0.219	Supported **
	H5c	UI positively influences SI	0.243	Supported ***
	H5d	PV positively influences SI	0.314	Supported ***
	H5e	SI mediates the relationship between independent variables and AT	0.269	Supported ***
Attitude toward purchase	*H6*	AT positively influences PI	0.728	Supported ***

Notes: $N = 320$. Significant at $^{*}p < 0.05$; $^{**}p < 0.01$ and $^{***}p < 0.001$
Source: Authors' own work

concluding that HV, UI, PV and SI are efficient scales to gather Japanese consumers' perceptions on 5G smartphone uptake.

Mediation effect was analyzed using PROCESS 3.5 and using 5,000 bootstrap samples at a 95% confidence interval to measure both the direct effect and the indirect effect between the scales (Hayes, 2012). The result of PROCESS is summarized in Table 8. Indirect effects were found for all scales, and the indirect effect between PV and AT was the largest (indirect effect: 0.16). The total effect between UI and AT was the largest (total effect: 0.56) among four scales (i.e. UV, HV, UI and PV), and HV followed.

Results of regression analysis and mediator analysis are compared by gender as shown in Tables 9 and 10. HV, UI and PV were found to positively influence AT for male, but HV was not supported for female. SI was confirmed to mediate relationships between HV toward AT, between UI toward AT and between PV toward AT for male. However, SI's mediation effect on HV toward AT was not supported for female. In addition, SI's influence toward AT was higher for male ($\beta = 0.330$, $p < 0.001$) than female ($\beta = 0.242$, $p < 0.001$). As a result, indirect effects for male were relatively higher (indirect effects: $0.17 \sim 0.27$) than female (indirect effects: $0.08 \sim 0.10$) as per Table 10.

5. Discussion

5.1 Discussion of findings

The aim of this research is to explore consumer attitude toward 5G smartphones in Japan to accelerate 5G smartphone market growth in Japan. The research examines Japanese consumers' perceptions and their intention to purchase 5G smartphones from the viewpoint of UV, HV, UI, PV and SI.

Table 8 Direct, indirect and total effects on attitude toward purchase

	Total effect			*Direct effect*			*Indirect effect*	
Hypothesis	*Estimate*	*SE*	*LLCI – ULCI*	*Estimate*	*SE*	*LLCI – ULCI*	*Estimate*	*Boot LLCI – boot ULCI*
UV–AT	0.41***	0.042	0.324 – 0.490	0.29***	0.039	0.211 – 0.364	0.12	0.065 – 0.185
HV–AT	0.49***	0.042	0.405 – 0.578	0.35***	0.042	0.265 – 0.431	0.14	0.080 – 0.218
UI–AT	0.56***	0.044	0.474 – 0.645	0.42***	0.042	0.334 – 0.501	0.14	0.082 – 0.218
PV–AT	0.42***	0.046	0.334 – 0.514	0.26***	0.045	0.172 – 0.348	0.16	0.101 – 0.233

Notes: $N = 320$. All significance tests were conducting applying confidence intervals = 0.95, bootstrap = 5,000, model = 4; Significant at $^{*}p < 0.05$; $^{**}p < 0.01$ and $^{***}p < 0.001$
Source: Authors' own work

Table 9 Summary of regression analysis comparison by gender

Hypothesis		*Female (N = 169)* *β*	*Result*	*Male (N = 151)* *β*	*Result*
Utilitarian value	*H1*	(0.047)	Not supported	(0.066)	Not supported
Hedonic value	*H2*	0.109	Not supported	0.282	Supported **
User interface	*H3*	0.325	Supported ***	0.352	Supported ***
Price value	*H4*	0.315	Supported ***	0.169	Supported **
Social influence	*H5a*	(0.107)	Not supported	(0.075)	Not supported
	H5b	0.221	Supported *	0.232	Supported *
	H5c	0.191	Not supported	0.282	Supported **
	H5d	0.214	Supported **	0.387	Supported ***
	H5e	0.242	Supported ***	0.330	Supported ***
Attitude toward purchase	*H6*	0.676	Supported ***	0.786	Supported ***

Notes: Significant at * $p < 0.05$; ** $p < 0.01$ and *** $p < 0.001$
Source: Authors' own work

Table 10 Direct, indirect and total effects on attitude toward purchase by gender

	Total effect			*Direct effect*			*Indirect effect*	
Hypothesis	*Estimate*	*SE*	*LLCI – ULCI*	*Estimate*	*SE*	*LLCI – ULCI*	*Estimate*	*BootLLCI – BootULCI*
Female	*N* = 169							
UV–AT	0.34***	0.059	0.221 – 0.456	0.26***	0.056	0.149 – 0.371	0.08	0.021 – 0.157
HV–AT	0.39***	0.603	0.271 – 0.509	0.29***	0.059	0.174 – 0.409	0.10	0.036 – 0.184
UI–AT	0.45***	0.609	0.333 – 0.573	0.36***	0.594	0.245 – 0.479	0.09	0.031 – 0.174
PV–AT	0.43***	0.608	0.312 – 0.553	0.34***	0.059	0.223 – 0.457	0.09	0.033 – 0.163
Male	*N* = 151							
UV–AT	0.47***	0.060	0.348 – 0.584	0.29***	0.052	0.189 – 0.393	0.17	0.083 – 0.280
HV–AT	0.60***	0.063	0.472 – 0.720	0.39***	0.057	0.279 – 0.504	0.20	0.101 – 0.326
UI–AT	0.67***	0.061	0.548 – 0.790	0.46***	0.058	0.343 – 0.572	0.21	0.111 – 0.334
PV–AT	0.43***	0.688	0.294 – 0.565	0.16*	0.065	0.034 – 0.289	0.27	0.155 – 0.385

Notes: $N = 320$. All significance tests were conducting applying confidence intervals = 0.95, bootstrap = 5,000, model = 4; Significant at * $p < 0.05$; ** $p < 0.01$ and *** $p < 0.001$
Source: Authors' own work

The findings contradicted those of other studies where *H1* was rejected, although previous research results supported UV's positive effect toward consumer behaviors on smartphones (Jeon *et al.*, 2010; Xu *et al.*, 2012; Park *et al.*, 2015; Shakeel *et al.*, 2016; Liu and Yu, 2017). 5G service increased functional benefits not only in terms of speed, but also capacity, and low latency. So, 5G smartphones can bring lots of benefits from the viewpoint of usefulness (Qualcomm, 2021). However, as UV did not influence consumer attitude on 5G smartphones, we can postulate that smartphones are now seen through experiential and emotional perspectives by the consumer where today many feel a greater sense of attachment to their smartphones.

The results in this study for *H2, H3* and *H4* support previous findings. Previous researches confirmed that HV had a significant influence on consumer behaviors toward smartphone uses, and purchases (Xu *et al.*, 2012; Whitten *et al.*, 2014; Park *et al.*, 2015; Haroon *et al.*, 2017; Youm and Yu, 2013) stated that UI was positively correlative to PI for smartphone purchase in Korea. Previous research reported that PV had a significant influence on consumer behaviors toward smartphone uses and purchases (Manorek, 2016; Haroon *et al.*, 2017; Bringula *et al.*, 2018; Muljani and Koesworo, 2019; Satriawan and Setiawan, 2020). This research supports the result of the previous research, and confirms HV, UI and PV's influences toward AT.

The mediating role of SI is confirmed in this study. The study supports all hypothesis (i.e. *H5b, H5c, H5d* and *H5)* except *H5a*. Therefore, this study confirms that SI's mediation effects are positive between dependent variables (i.e. HV, UI and PV) and AT except UV. The past

research of smartphone uses and PIs were conducted in APAC countries, and the results of the past research proved that SI had a significant influence on consumer behaviors toward smartphone uses and purchases (Jeon *et al.*, 2010; Ibrahim *et al.*, 2013; Park *et al.*, 2015). Therefore, the result for SI in this study is in line with past results.

5.2 Theoretical implications and contributions

To the best of the authors' knowledge, this study is the first research to find which scales have influences on Japanese consumers' behaviors' toward smartphone purchase in 5G era. The research offers novel findings. Previous studies proved that UV had the strong influence on consumer behaviors toward smartphone uses around the world (Jeon *et al.*, 2010; Xu *et al.*, 2012; Park *et al.*, 2015; Shakeel *et al.*, 2016; Liu and Yu, 2017). In addition, it was confirmed that Japanese consumers' UV had the larger influence than HV, PV, SI for 3 G/4G smartphone usage during 3 G/4G era (Jeon *et al.*, 2010; Wardani and Warsono, 2012; Takada and Fujita, 2013). However, UV no longer plays a vital role in smartphone purchase decisions in Japan as demonstrated in this research. The result in this study reveals that Japanese consumer attitude and behavior has changed in 5G smartphone markets, further contributing to the knowledge of consumer studies.

HV, UI and PV's influences toward AT is supported in this research, and there is an interesting finding on UI. This research confirms that UI has a significantly positive influence toward AT. Several research was conducted to test UV, HV and PV previously for smartphone uses and PIs, while relatively less numbers of previous research was conducted for UI. So, UI was not a prevailing scale, compared with UV, HV and PV. However, the result in this research indicates that UI has the largest influence toward AT ($\beta = 0.335$, $p < 0.001$) among UV, HV, UI and PV. The result in this study indicates another new sign of consumer behaviors in Japanese smartphone markets and expands the study of UI.

This research proves that SI has a positive influence toward AT for Japanese consumers, while previously SI's influence for Japanese 3 G/4G was unclear. For past research, SI's influence toward 3G/4G smartphone usage was confirmed (Jeon *et al.*, 2010; Takada and Fujita, 2013), however Wardani and Warsono (2012) asserted that SI did not have influence toward satisfaction on smartphone usage among Japanese consumers. So, this research result indicates the significant change of consumer behaviors in Japan from the viewpoint of SI. One of the possible reasons of such change is SNS community growth in Japan. Japanese consumers did not frequently use smartphone for socializing with others and smartphones were used more frequently for functional purposes (Wardani and Warsono, 2012). However, it was reported that Japanese mobile phone users spend time for SNS more than any other usages (e.g. mobile gaming, streaming, internet and e-mails) (Ministry of Internal affairs and Communication, 2020). Therefore, SNS becomes much more prevalent in Japan than before, and such life style change can be one of the factors to lead to a different result. This study assesses SI's mediation effects for four independent variables in Japan, and successfully confirms that the mediation on the relationship between UI and AT has the largest total effect casting a new angle on SI and UI.

5.3 Practical implications

The result of this results provides lots of insights for 5G smartphone market players in Japan. UV is not found to be positively effective toward AT in this study, while technical benefits from 5G are emphasized in the markets. So, this research reveals that simple messages such as 5G's high speed would not be attractive enough to convince Japanese consumers for 5G smartphone purchase. One of possible reasons is 4G high quality service in Japan. Horikoshi (2022) mentioned that quality of current 4G service is so high in Japan that 5G service can achieve only 1.5× faster mobile speed. Operators in Europe provides relatively poor 4G services, so 5G service can contribute 5× faster access than 4G. So,

difference between 4G access speed and 5G is relatively smaller in Japan than Europe. Such technical background in Japan may trigger difficulty to appeal 5G's high speed mobile communication in Japan.

The research result reconfirms that UI has a strong positive influence in Japanese smartphone markets. JGov (2023) revealed that the smartphones usages in Japan were expanding widely especially for entertainments and social networking (e.g. SNS, watching short movies), even before Pandemic in Japan. The most popular usage was SNS which was 1.5× times longer than checking e-mails, and watching on-demand streaming services was also ranked as third in 2019 before pandemic. Therefore, it was obvious that the smartphones were widely used not only for work and study, but also for fun and social networking before pandemic. In addition, the increase of various smartphone usages (e.g. SNS, watching short movies, on-demand steaming services, etc.) continue to expand in 2021 and 2022. Such new trends may require the reinforced UI. Recent smartphone users have been interested in UI expansion after the 5G launch (Westcott *et al.*, 2019). World most selling foldable smart phones, such as Galaxy Z Flip3 and Z Fold3 from Samsung Electronics got CES 2022 INNOVATION Awards (Yoo, 2021). Several global smartphone OEMs started to release the new foldable smartphones such as Motorola, Microsoft, Xiaomi, Oppo, Vivo, TCL, Google (Vasan, 2022; Google Japan, 2023). Furthermore, Samsung's foldable new smartphones (e.g. Galaxy Z flip5/fold5) doubles preorders because their new UI for standalone photo/video feature without tripod is very welcomed in Japan market (Takeno, 2023). Those fordable phones are expected to grow much faster than other smartphones and become mainstream in smartphone market (Tung, 2022). In addition, low latency on smartphones is one of critical features recently from the viewpoint of UI especially for people who play games with their smartphones (IMPRESS KK, 2023). Sony and KDDI announced that they proved that latest 5G technologies are capable to provide the smoother services including mobile gaming with 5G's low latency (Sony Corporation, 2022; Shneiderman, 1992) emphasized that UI included several items such as time to learn and speed of performance. Low latency is one of important aspects for UI. So, it is obvious that UI will remain as one of most popular features in smartphone markets.

Cyberbuzz (2020) predicts that market size of influencer marketing in Japan will grow from JPY21.9B in 2018 to JPY72.3B in 2025. YouTube, Instagram and Twitters drive growth in the markets, and more companies are expected to use those marketing channels for their marketing activities (Cyberbuzz, 2020). This research reveals SI could enhance the perception of the various benefits of 5G smartphones. Marketers is recommended to consider those points when establishing 5G smartphone marketing strategies. It is confirmed that the indirect effect between PV and AT is the largest (indirect effect: 0.16). This result indicates that market players in Japan could deliver price-related messages to Japanese consumers more efficiently if they use both direct marketing channels and indirect marketing channels (e.g. influencers). In addition, SI's influence toward AT was higher for male ($\beta = 0.330$, $p < 0.001$) than female ($\beta = 0.242$, $p < 0.001$). This result indicates that market players in Japan are recommended to prioritize Japanese male consumers for 5G smartphone campaign rather than female consumers when they use indirect marketing channels (e.g. influencers).

6. Conclusion, limitation and directions for future research

This research confirms HV, UI and PV's influences toward AT on 5G smartphone purchase, but not UV. This research result indicates that a simple tagline emphasizing such usefulness may not be convincing enough to promote the 5G smartphones to Japanese consumers. Alternatively, the research indicates that introducing the concepts of joyfulness, improved UI and greater PV of the 5 G smartphone could attract more consumers in Japan. In addition, this research proves that SI could enhance the perception of the various benefits of 5G smartphones. Therefore, the messages to consumers can be amplified by using social influencers.

This research has some limitations, which provide a path forward for future studies. First, the scope of this research is limited to consumers' behavior on 5G smartphones in Japan.

Research results may differ, depending on products, countries and regions. Future research could be performed in other countries to obtain a wider perspectives of consumers' behaviors toward 5G smartphone purchase. Second, the occupation for the majority of respondents was businessman. As a result, the current study might not fully reflect needs of consumers other than business respondents. Future research is needed with the larger samples to gather further inputs with broader demographics. Lastly, this study indicates that gender may cause the different results especially for SI's indirect effects through mediation analysis. Future research can be performed with the broader aspects. For example, moderation effect of various aspects such as gender, age can be performed to assess the indirect effects to further understand different consumer segments in the smartphone market.

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