International Journal of Management and Marketing Research
Vol. 16, No. 1, 2023, pp. 89-97
ISSN: 1931-0269 (print)
ISSN: 2157-0698 (online)

IBFR
www.theIBFR.com

CONSUMER CHANGES INDUCED BY ADOPTION OF THE INTERNET OF THINGS

Zhenpan Wang, Tokyo Institute of Technology
Sulin Chung, Tokyo Institute of Technology
Xiuzhu Gu, Tokyo Institute of Technology

ABSTRACT

The Internet of Things is experiencing rapid development in China and has huge market potential. There is little existing literature examining consumer cognitive changes or behavioral changes induced by Internet of Things technologies. This study is the first attempt at exploratory analysis. The purpose of this study is to examine the predicted and influential relationships between value perception change, satisfaction change, privacy concerns, and changes in word-of-mouth and loyalty caused by the Internet of Things. The results imply that customer value perception changes and satisfaction changes predict word-of-mouth changes and loyalty changes, and there is a positive relationship between them. The findings have ramifications for businesses, as well as for theoretical and practical Internet of Things research.

JEL: 0310

KEYWORDS: Cognitive Changes, Behavioral Changes, Internet of Things

INTRODUCTION

Constantly innovative and evolving technologies are infiltrating all aspects of consumers' lives and influencing their behaviors and decisions (Alimamy & Gnoth, 2022). The IoT has a wide range of important applications, including in healthcare, smart home appliances, smart factories, smart cities, and aviation. Furthermore, researchers have recognized that research on consumer perception of IoT technologies is still needed (Gao & Bai, 2014), and systematic exploration of IoT from the perspective of consumer perception and behavior is necessary (Benamar et al., 2020). Based on the important role of IoT in industry and academia, and recognizing limits on existing literature, this study analyzes the changes that the application of IoT technology will induce in consumers.

Word-of-mouth (WOM) communication is one of the most important roles in marketing, empowered by the various forms of online communication. Therefore, it is essential to understand what factors influence WOM (Cuesta-Valiño et al., 2022). The study of WOM and loyalty have become two important objectives in the discipline of managers and marketing (Cuesta-Valiño et al., 2022). Loyalty is the intention of consumers to return to the retailer (Roy et al., 2017). The previous study focused on the initial stage of customer acceptance of new technology. However, current research on technology-induced changes in WOM and changes in loyalty is inadequate. Therefore, it is necessary to explore which factors can predict changes in WOM and changes in loyalty, and how they are related to each other. To fully understand IoT technology and identify what changes the technology is causing for customers, this study synthesizes the information system (IS), consumer perception, and consumer behavior literature. Based on the above discussion, the objectives of this study are as follows: To analyze how consumer value perception and satisfaction changes are caused by the application of IoT, and how privacy concerns predict and influence the changes in WOM and changes in loyalty.

The rest of this study is organized as follows. Section 2 provides an overview of the theoretical background, including framework and hypothesis development; Section 3 is composed of methodology; Section 4 contains the analysis and result in depth; Section 5 presents the discussion; Section 6 presents the implication, and Section 7 provides the limitations of the study and areas for future research.

LITERATURE REVIEW

Against a background of the use of smart home devices, IoT led to changes in two elements: value perception and satisfaction, and privacy concerns. These in turn have led to changes in two constructs: WOM, and loyalty.

Figure 1: The Framework of This Study

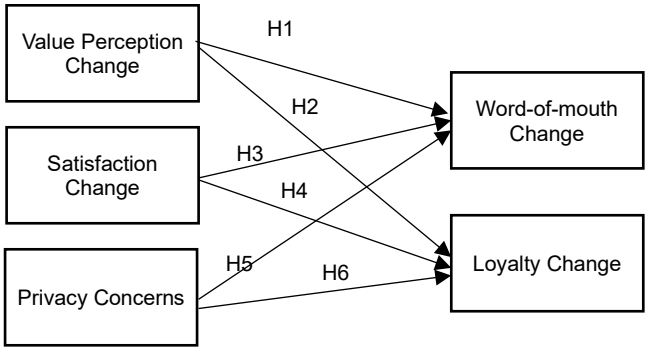

Figure 1 conceptual framework. Figure 1 shows the hypothesized relationships between value perception change, satisfaction change, privacy concerns and WOM change, and loyalty change, respectively.

Value perceptions are defined as customers' overall assessments of a product, based on opinions about the product that has been provided and acquired (Zeithaml, 1988). Value perceptions are important determinants of purchase behavior (Inman & Nikolova, 2017). Satisfaction is defined as a measure of the extent to which a product or service meets consumer expectations (Grigoroudis & Siskos, 2010). One of the most crucial challenges for every commercial organization is measuring consumer satisfaction, which is utilized as a benchmark of corporate success and excellence (Grigoroudis & Siskos, 2010). Privacy concerns include the potential loss of personal information and privacy (Kaur et al., 2020), and they represent customers' doubts about the outcome of their adoption decisions (Arslan et al., 2013). An important indicator of resistance to new services or technologies is privacy risk, which is considered a major obstacle to technology adoption (Lin et al., 2014). Based on the above literature discussion, we believe that studying value perception change, satisfaction change, and privacy concerns is novel and important. WOM is the potential for consumers to promote or speak favorably of a brand to others, and it is one of the elements of consumer loyalty (Tyrväinen et al., 2020). Loyalty refers to customers who are faithful to a specific retail store, and this impression influences consumers' future patronage (Yoon & Park, 2018).

Consumers harvest the information they need during use and will have an overall positive evaluation, in turn sharing positive comments about the experience (M. Talwar et al., 2021). According to Zhang et al.(2017), customers who are both emotionally and cognitively engaged are more inclined to recommend brands. Prior empirical investigations have supported the beneficial influence of perceived value on customers' WOM goals (Mayr & Zins, 2012). In a similar vein, we argue that there is a positive relationship between IoT-induced changes in consumer perceptions and changes in WOM. Therefore, we propose that: H1. The change in value perception has a positive impact on the change in WOM.

Floh et al., (2014) confirmed that value perception is an important factor in determining loyalty. Retail store loyalty is impacted by how customers perceive their value when buying (Adapa et al., 2020). Consumers

complete shopping tasks more efficiently by using IoT technology, therefore consumers will have a higher perceived evaluation of companies that apply IoT, leading to repeat shopping intentions for that retailer. Therefore, we propose that: H2. The change in value perception has a positive impact on the change in loyalty.

Zhang et al. (2019) examined the impact of customer satisfaction on WOM behaviors and attitudes. In social commerce, researchers found that customer satisfaction has a favorable impact on WOM ambitions (Cuesta-Valiño et al., 2022). WOM becomes more important in the service context, as WOM is the intangible nature of the service (Roy et al., 2017), and innovative, unique products may attract interest and may lead to better WOM (Berger & Schwartz, 2011). Furthermore, research has shown that satisfaction has a positive direct effect on WOM towards technology (Roy et al., 2017). Therefore, we propose that: H3. The change in satisfaction has a positive impact on the change in WOM.

Satisfaction can directly affect e-loyalty and online shopping (Pratminingsih et al., 2013). Studies have also revealed that in social commerce, customer satisfaction influences the decision to make a transaction (Cuesta-Valiño et al., 2022). In the hospitality domain, empirical findings also support that satisfaction positively influences behavioral purposes, including revisiting and recommending intentions (Namin, 2017). Based on the above discussion, we propose that: H4. The change in satisfaction has a positive impact on the change in loyalty.

In the case of mobile wallets, scholars highlight that the cognitive uncertainty regarding the use of mobile wallets belongs to consumers' fear of the security of shared information. M. Talwar et al. (2021) find that cognitive uncertainty and WOM is associated. If consumers' risk perceptions are high, they may develop dissonance, and tend to spread negative WOM to others (M. Talwar et al., 2021). Roy et al. (2017) found a direct negative effect of perceived risk on WOM intention. Therefore, we believe that: H5. Privacy concerns have a negative impact on the change in WOM.

Consumers are less likely to recommend their decision to others and are more inclined to switch to other brands when they are unsatisfied with their purchase, according to Grewal et al.(2007). In the context of SRT retailing, Roy et al.(2017) claim that perceived risk negatively influences repeat purchase intention and verifies that perceived risk has a negative direct effect on loyalty. Satisfaction and perceived risk are both seen as major determinants of store loyalty. Therefore, we state that: H6. Privacy concerns has a negative impact on the change in loyalty.

DATA AND METHODOLOGY

To test the framework, we conducted the construct via a self-completion, an online survey administered to the respondents. The survey method was preferred, as the study required us to capture opinions from customers. At the beginning of the questionnaire, we described the IoT technology in detail in the form of pictures and text. As Xiaomi is a leading company in the Chinese market in the field of IoT smart homes, we used the products of Xiaomi's IoT platform as an example to describe in detail the application scenarios and usage of IoT devices, to illustrate the usage and result showcase. In this way, respondents can understand and grasp the technology regardless of whether they have personal experience with the technology or not. In total, 229 completed surveys were returned. There were 96 males (41.92%) and 133 females (58.08%) in the sample population. Respondents were asked to read the description of the technology carefully to ensure that the respondent fully understood the technology. Value perception is measured using two items adapted from (Cronin et al., 2000). Privacy concern is measured using two items adapted from Inman & Nikolova (2017), and van Doorn & Hoekstra (2013). Satisfaction is adapted from Maxham et al. (2003). The two items used to measure WOM are adapted from Maxham et al. (2003). Loyalty is measured using three items adapted from Gao & Bai (2014). Regression analysis is conducted using the multiple stepwise regression method for the retail technologies. The questionnaires for each retail

technology are identical in content and on a 10-item scale. All the items were adapted to suit the context and measured using a 7-point Likert scale ranging from strongly disagree (1) to strongly agree (7).

RESULTS

Predictions are frequently made using regression analysis. By fitting a linear equation using observed data, multiple linear regression models the relationship between a dependent variable and explanatory factors (Liu et al., 2021). This study uses stepwise multiple regression analysis to analyze the predictive and influential relationships between privacy concerns, changes in two elements (value perception, satisfaction), and changes in two constructs (WOM, loyalty). The following regression equations were estimated to identify determinants of WOM change and loyal change.

WOM change = α+ β_1(value perception change) + β_2(satisfaction change) +β_3(privacy concerns) (1)

Royalty change=α+β_1(value perception change) +β_2(satisfaction change)+β_3(privacy concerns) (2)

The results of Equations (1) and (2) are shown in Table (1) and Table (2). From Table 1, we identified that the variables (satisfaction, value perception) have significant predictive power for WOM change. Stepwise regression methods involve criteria, such as the F-test, and adjusted R^2, to choose explanatory variables automatically (Liu et al., 2021). The two predictor variables (satisfaction, value perception) explained a total of 78.6% of the variance in WOM change. This provides support for H1 and H3.

From Table 2, we identified that among the three predictor variables (satisfaction change, value perception change, privacy concern), these variables have significant predictive power for loyalty change. The three predictor variables (satisfaction change, value perception change, privacy concern) can explain a total of 75.1% of the variance in loyalty change. This provides support for H2 and H4. Although privacy concerns can predict loyalty change, privacy concerns have a positive impact on loyalty, therefore, H6 is not supported.

Table 1 Regression Analysis Model Summary of Word of Mouth and Coefficients

	R Square	R Square Change	F Change	Sig. F Change	F	Standardized Coefficients Beta	Sig.	Tolerance	VIF
(constant)	0.786	0.051	53.984	0.000	414.088				
Satisfaction							0.032*		
Value						0.564	0.000***	0.374	2.675
perception						0.370	0.000***	0.374	2.675

*This table shows the regression estimates of Equation (1). It means that satisfaction change and value perception change can predict and have a positive effect on WOM change. Privacy concerns have no significant effect on WOM change, and it is excluded from the model. *p<0.05, **p<0.01, ***p<0.001*

From the standardized regression coefficients (from Table 1 and Table 2), the Beta values of the predictor variables in both the IoT are positive, indicating that the impact of changes in customer perceptions (satisfaction, value perception) triggered by the application of IoT on changes in WOM and loyalty is positive. By convention, multicollinearity is considered to be excessively high if VIF is greater than 10 (Kutner et al., 2004). The tolerance value and the VIF value are less than 10, indicating that there is no multivariate collinearity problem. The hypothesis results are summarized in Table 3.

Table 2 Regression Analysis Model Summary of Loyalty and Coefficients

	R Square	R Square Change	F Change	Sig. F Change	F	Standardized Coefficients Beta	Sig.	Tolerance	VIF
(constant)	0.751	0.007	6.610	0.011	225.773				
Satisfaction						0.559	0.000***	0.373	2.682
Value perception						0.305	0.000***	0.350	2.857
Privacy concern						0.096	0.011*	0.803	1.246

*This table shows the regression estimates of Equation (2). It means that satisfaction change, value perception change, and privacy concerns have a positive impact on loyalty change. *p<0.05, **p<0.01, ***p<0.001*

Table 3 Summary of Analysis Result

H	Hypothesized Relationship	Result
H1	value perception change -> WOM change	supported
H2	value perception change ->loyalty change	supported
H3	satisfaction change -> WOM change	supported
H4	satisfaction change -> loyalty change	supported
H5	privacy concerns -> WOM change	reject
H6	privacy concerns -> loyalty change	reject

This table summarizes the conclusions of the hypotheses, which are supported except for H5, H6

CONCLUDING COMMENTS

This study considers the prediction and impact of two customer changes (satisfaction, value perception) and privacy concerns on loyalty change and WOM change induced by IoT. The empirical results confirm the hypotheses regarding satisfaction and value perception, similar to the results of previous studies (Tyrväinen et al., 2020) (Roy et al., 2017) (Cuesta-Valiño et al., 2022). Although privacy concerns can predict loyalty change and there is a negative relationship between these factors, the results are contrary to the hypothesis proposed in this study, and it is different from previous research findings. This study is based on the Chinese market, where the application of IoT technology in the smart home sector is booming and rapidly developing. IoT technology brings great convenience to people's lives, and although people have privacy concerns about the new technology, the value of IoT technology can largely offset the privacy concerns. For companies, it is possible to increase customer loyalty if they adequately protect customer privacy, and further provide explanation to customers of the purpose and security of collecting customer data. Companies can improve customer value perception by adopting IoT, invariably allowing customers to recommend products, services, and brands to other customers, and increasing the company's competitive advantage. Additionally, customer loyalty allows the company to achieve success and profitability (Cuesta-Valiño et al., 2022). Companies can improve customer satisfaction through IoT technologies to influence future shopping behavior, drive repeat purchase behavior, and build long-term sustainable customer relationships.

Previous studies have primarily focused on customer experience, customer perception, loyalty, and behavioral purpose in the context of brick-and-mortar retailing (Roy et al., 2017)(Meilatinova, 2021)(Tyrväinen et al., 2020). Few studies have focused on the changes in customer perceptions and behaviors due to technology. In this regard, this study expands on previous research by focusing on the predictive and influential relationships between perception changes and behavior changes in China. This study, by integrating information system literature, contributes to the literature by providing valuable

insight regarding the predictive analysis of IoT technology. This study provides a beneficial framework for future research in IoT.

IoT-induced privacy concerns can predict loyalty change, and there is a positive relationship between these factors. The results of this study suggest that privacy concerns cannot predict WOM change, which differs from previous findings. Therefore, we believe that there is significant research potential in the field of cognitive changes and behavioral changes, and this study provides new research ideas and directions for the study of customer cognition and behavior under the influence of technology. Finally, our study is based on the Chinese market where IoT is booming and rapidly developing and provides implications for future research on the development and application of IoT in emerging markets in other countries.

This study found that value perception change and satisfaction change triggered by IoT can predict WOM change and loyalty change, and there is a positive relationship between these factors. IoT is simpler to operate and influential to customers, which is beneficial to a company for a number of reasons. Companies adopting IoT can let customers master the use of IoT devices through simple instructions, which is conducive to the rapid promotion of products or services and can improve customer value perception and satisfaction. Thus, gaining positive WOM, cultivating and consolidating a loyal customer base, while quickly harvesting potential customers, establishing long-term customer relationship management, and gaining long-term benefits. Additionally, the study specifically found that IoT-induced privacy concerns can predict loyalty change and that there is a positive relationship between these factors. These are important factors for company applying IoT. We suggest that companies can enhance customer data security through processes and algorithms, and truthfully explain to customers the security and privacy of their data and how it will be used to increase consumer loyalty. Furthermore, we suggest that companies train their sales staff to make them proficient in using IoT, which is conducive to communication and exchange between sales staff and customers, attracting a large number of customers and gaining more revenue. Companies need to apply IoT according to the different characteristics of their products or services so that they can acquire customers in the short-term time, cultivate customers in the long term, establish perfect customer relationship management, and be in an advantageous position in the fierce market competition.

We recognize this study has limitations, for example, this study is investigating the market situation in China and therefore has geographical limitations. Future studies can explore the situation in other cultural contexts. Future research could also focus on other elements such as store reputation, service quality, etc.

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ACKNOWLEDGMENTS

This work was supported by JST SPRING, Grant Number JPMJSP2106.

BIOGRAPHY

Zhenpan Wang is a Ph.D. candidate in the Department of Industrial Engineering and Economics, at Tokyo Institute of Technology.

Sulin Chung is an Associate Professor in the Department of Industrial Engineering and Economics, at Tokyo Institute of Technology.

Xiuzhu Gu is an Associate Professor in the Department of Industrial Engineering and Economics, at Tokyo Institute of Technology.