

## Factors of Chatbot Affecting Customer Engagement in The Health Care Business in Hong Kong

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### Abstract

Due to the social distancing policy to reduce the spreading of COVID-19 and adopt the change in customer behaviours, different industries had to utilize virtual assistants and AI-powered conversational chatbots, for example, Fast-Moving Consumer Goods (FMCG), Insurance, and Healthcare. Regarding advanced technology, the standard of Chatbot and customer expectations are rapidly rising. This study focuses on the factors of chatbots that affect customer engagement which emphasizes the healthcare business in Hong Kong by using qualitative analysis and quantitative analysis to find out the factors of chatbots that will affect the customer engagement in healthcare

business in Hong Kong. In this study, it is discovered that bot accuracy, response time, useful time, privacy, customization and integration can be the factors that affect customer engagement.

**Keywords:** Customer Engagement, Chatbot, Unified Theory of Acceptance and Use of Technology 2, Telemedicine

## Introduction

In 2024, the implication of Chatbots has expanded to different levels. Regarding the Zendesk Customer Experience Trends Report 2024 report, it has been discovered that 67% of business leaders know that chatbots can enhance customer relationships (Zendesk, 2024). The development of chatbots is not only for the user experience but also for healthcare, education and retail. AI is expected to transform multi-channel contact centres in the future through various trends, such as business automation, customer behaviour predictions, and improved experience (*What Is the Future of Chatbots? Top Chatbot Trends to Follow in 2024*, 2024).

This study specifically analyzes the factors of Chatbot that can influence customer engagement in the healthcare business, the reliability test, analyses of results, and hypothesis testing to deliver a reliable insight into the factors of Chatbots that are influential to customer engagement in the healthcare business in Hong Kong. For providing a comprehensive analysis, quantitative and qualitative methodology will be conducted to have a better understanding of Chatbot development and customer perception in Hong Kong.

This research holds importance for both business and academics as it examines the impact of artificial intelligence, particularly chatbots, within the healthcare industry. In terms of business value, comprehending customer expectations and the variables influencing customer interaction is pivotal for the company to formulate marketing tactics and drive profitability. In terms of academics,

this research contributes to the understanding of the restrictions of chatbots in the current stage and recommendations to developers for designing chatbots. Besides, this research investigates the impact of chatbots on decision-making and deepens students' grasp of the intricacies of the marketing mix.

The objectives of this study are:

- To explore the factors that affect customer engagement in the healthcare business in Hong Kong.
- To generate guidelines for designing a chatbot for a healthcare business.

## History of Chatbot

“ELIZA” is the first chatbot designed by Joseph Weizenbaum in 1966. “ELIZA” can transfer the words that the users input to the computer and match them with the possible scripted responses which impacts natural language processing and unnatural intelligence (Zemčák, 2019). Until now, chatbot developers have designed Chatbots based on Weizenbaum's model and pursue interactions that mimic human behaviour. WeChat, one of the largest standalone messaging apps in China, created a sophisticated chatbot in 2009 that marketers and employers can interact with customers online by simply chatbots (Ina, 2023).

Another prominent chatbot will be Siri which was formed by Apple for IOS in 2010 and Google Now by Google Inc in 2012. Siri uses a natural language UI and acts as an intelligent personal assistant and learning navigator. Siri can reply to text, audio, images, and video input by the user and provide a productive interactive experience. Google Now can generate appropriate information based on location and time of the day. However, due to the growth of AI designing strategy and assertive approach, Google Now was replaced by Google Assistant in 2017 (Ina, 2023).

## The importance of customer engagement in the market

COVID-19 changed customer behaviour and the internet has become one of the main sources of health information, for example, lifestyle advice, supplement advice, and treatment recommendations.

Nowadays, businesses try to build relationships by engaging with customers in different ways, for example, social media marketing, event marketing, and mobile application marketing. The trust between the healthcare service providers and the patients or clients can be enhanced if companies have loyalty relationships with them. Most of the engagement in the healthcare industry will be follow-up care and details of treatment. Improving customer engagement can shorten purchase cycles and improve the conversion rate.

## Unified Theory of Acceptance and Use of Technology 2

Unified Theory of Acceptance and Use of Technology 2 is used to how technology alters customer behaviours in terms of performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit.

### 1. Performance Expectancy

It is defined as the consideration of individuals about the usefulness of the technology and utilize in different activities (Venkatesh et al., 2003; Waheed et al., 2015b). Also, it related to how users can seek information with high efficiency and effectiveness by chatbot compared to traditional methods.

### 2. Effort Expectancy

It is explained that the degree of convenience perceived while using technology. Effort expectancy is also understood as perceived ease of use (Venkatesh et al., 2003) Using effort expectancy to understand how people feel convenience and comfort when they utilize chatbots.

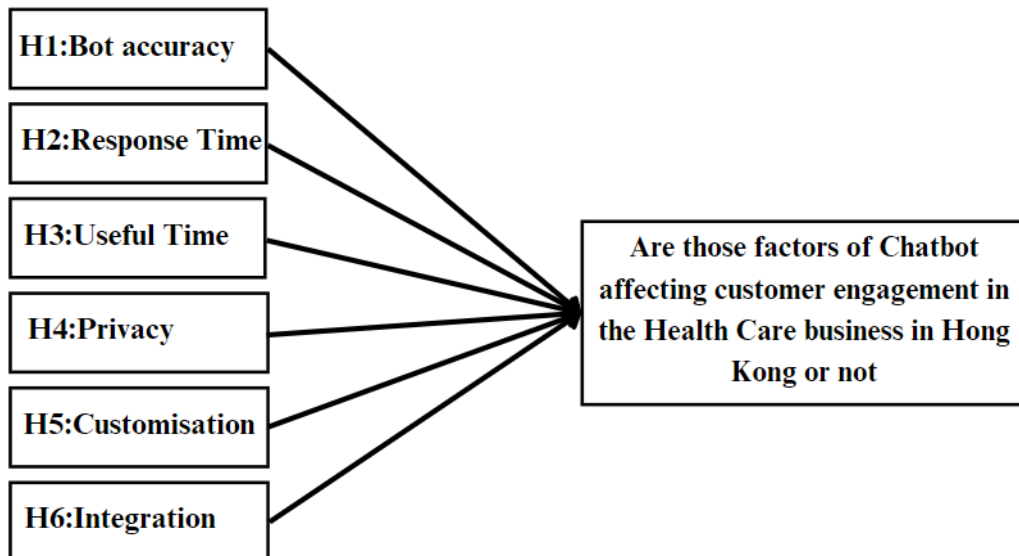
### 3. Social Influence

Social influence refers to the extent to which individuals perceive that someone accepts the new system. Fidani and Idrizi (2012) suggest that there is a significant relationship between social influence and behavioural intention. It can be social integration, user reviews and ratings, and social proof that affect people whether will utilize chatbots or not.

### 4. Facilitating condition

Facilitating conditions are defined as an individual's perception of how the existing organization and technical infrastructure can support the utilization of technology. (Chan et al., 2010).

### Conceptual Framework:



### Hypothesis:

- H1 assumes that bot accuracy of Chatbot influences customer engagement significantly in the healthcare business in Hong Kong.
- H2 suggests that the response time of Chatbot affects customer engagement significantly in the healthcare business in Hong Kong.
- H3 presumes that the useful time of Chatbot alters customer engagement significantly in the healthcare business in Hong Kong.
- H4 posits that the bot privacy of Chatbot elevates customer engagement significantly in the healthcare business in Hong Kong in terms of handling sensitive information.
- H5 asserts that the customization of Chatbot affects customer engagement significantly in the healthcare business in Hong Kong.
- H6 proposes that the integration of Chatbot change customer engagement significantly in the healthcare business in Hong Kong.

### Methods:

The focus of the study is to explore the connection between factors of Chatbot and customer engagement, specifically in the healthcare business in Hong Kong. The quantitative approach includes in-depth insights from Hong Kong people with a dense population of 7,498,100 released by the data of the Census and Statistics Department.

Taro Yamane's formula will be used to determine the sample size of approximately 400 respondents with about 95% confidence level. Apart from that, to ensure the validity of the questionnaire, a validity test and reliability will be conducted.

The primary data will be collected from a structured questionnaire and interview. The distribution method is mainly online through social media and Facebook groups. The validity of the research will be calculated by Item Objective Congruence (IOC) which includes three expert reviews and the refinement of questions. The reliability of the question will be calculated by Cronbach's Alpha Method which is the measurement of internal consistency. In the questionnaire, descriptive analysis will summarize the demographic features, including gender, age, and occupation. Pearson Chi-Test and logistic regression will be used to explain the interrelationship between the independent variables (bot accuracy, response time, useful time, privacy, customization, and integration) and the dependent variable (customer engagement).

For qualitative analysis, the interview with chatbot service providers in Hong Kong which are PRIZM Digital and Asiabot. The analysis method will be the comparison of clients' expectations among different industries.

The major limitations of this study include the demographic which the respondents only reflect the Hong Kong people's perspective of using Chatbot in the healthcare business. To overcome the constraint, the opinions of Chatbot service providers could increase reliability and validity.

## Result and discussion:

The reliability test and validity test are fundamental to ensure the credibility of survey results.

Table 1 Reliability testing

Reliability Statistics (Cronbach Alpha) - Bot Accuracy			
Items	Corrected Item- Total Correlation (CITC)	Cronbach Alpha if Item Deleted	Cronbach $\alpha$
9. To what extent does the information authenticity of Chatbot affect your trustfulness of telemedicine?	0.526	-	0.689
10. To what extent do you find the Chatbot accurately understands your queries or requests?	0.526	-	
Cronbach $\alpha$ (Standardized): 0.689			
Reliability Statistics (Cronbach Alpha) - Response Time			
Items	Corrected Item- Total Correlation (CITC)	Cronbach Alpha if Item Deleted	Cronbach $\alpha$
11. To what extent does the response time of the Chatbot affect your customer satisfaction during telemedicine?	0.580	-	
12. To what extent does the response time of the Chatbot influence your loyalty and continued use of telemedicine?	0.580	-	0.734
Cronbach $\alpha$ (Standardized): 0.734			
Reliability Statistics (Cronbach Alpha) - Useful Time			



Items	Corrected Item- Total Correlation (CITC)□	Cronbach Alpha if Item Deleted□	Cronbach <b>α</b> □
1. Have you ever interacted with a Chatbot from the healthcare business?	0.501	-	
2. Do you know what telemedicine is?	0.501	-	0.666
Cronbach <b>α</b> (Standardized): 0.666			
Reliability Statistics (Cronbach Alpha) - Bot Privacy			
Items	Corrected Item- Total Correlation (CITC)□	Cronbach Alpha if Item Deleted□	Cronbach <b>α</b> □
18. Do you think Chatbot should offer unique personal services to your needs according to the data stored before?	0.799	-	
19. Do you think the Chatbot should memorize your information and everything it will you for the next chat?	0.799	-	0.888
Cronbach <b>α</b> (Standardized): 0.888□			
Reliability Statistics (Cronbach Alpha) - Integration			
Items	Corrected Item- Total Correlation (CITC)□	Cronbach Alpha if Item Deleted□	Cronbach <b>α</b> □
13. To what extent does the integration of Chatbot enhance your customer satisfaction during telemedicine?	0.565	0.696	0.758
14. To what extent does the integrated Chatbot effectively address your needs and queries?	0.590	0.681	

16. To what extent does the ability to provide follow-up service of Chatbot affect customer satisfaction?	0.548	0.705	
17. To what extent does the functionality of Chatbot affect the customer satisfaction during telemedicine?	0.517	0.721	
Cronbach $\alpha$ (Standardized): 0.758□			
Reliability Statistics (Cronbach Alpha)- Customization			
Items	Corrected Item-Total Correlation (CITC)□	Cronbach Alpha if Item Deleted	Cronbach $\alpha$ □
18. Do you think Chatbot should offer unique personal services to your needs according to the data that was stored before?	0.555	-	0.714
19. Do you think the Chatbot should memorize your information and everything it will you for the next chat?	0.555	-	
Cronbach $\alpha$ (Standardized): 0.714□			

For the measurement of bot accuracy, response time, useful time, bot accuracy, integration and customization, the reliability coefficient value is 0.689, 0.734, 0.666, 0.888, 0.758 and 0.714 accordingly which means the reliability quality of all measurements is valid. Moreover, the CITC value greater than 0.4 which means there is a correlation between the analysis items and the level of reliability is good.

The Demographic analysis presents the demographic characteristics of the 400 respondents. The analysis reveals that most respondents were male (73.75%), aged between 36 and

45 (43.25%), and employed (75.75%). Furthermore, a significant portion of respondents reported spending between \$1001 and \$2000 (34.75%) on healthcare per month. Additionally, a large proportion of respondents had interacted with chatbots from the healthcare sector (77.75%) and possessed knowledge of telemedicine (62.5%). These findings indicate that the use of chatbots in the healthcare industry in Hong Kong is widespread. The most frequently used chatbot function is booking services with clinics/hospitals (33.96%). This is followed by medical information seeking (21.7%), consultation (17.92%), and follow-up services (13.21%). Online shopping (8.49%) and other functions (4.72%) were less commonly used. These findings underscore the importance of maintaining the stability of chatbot functions related to booking services and information seeking.

Table 2 Pearson Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Bot Accuracy	19.453 <sup>a</sup>	4	<.001
Response Time	29.844 <sup>a</sup>	3	<.001
Useful Time	14.106 <sup>a</sup>	4	0.007
Privacy	17.759 <sup>a</sup>	4	0.001
Customization	21.874 <sup>a</sup>	4	<.001
Integration	27.663 <sup>a</sup>	4	<.001

Table 3 Logistic Regression Model

### Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Bot Accuracy	.110	.198	4.309	1	.038	1.116	.757	1.646
Response Time	.641	.205	9.784	1	.002	1.898	1.270	2.837
Useful Time	.182	.194	3.879	1	.049	1.200	.820	1.755
Privacy	.132	.205	4.416	1	.036	1.141	.764	1.705
Customization	.128	.193	4.440	1	.035	1.137	.778	1.661
Integration	.387	.207	5.492	1	.034	1.473	.981	2.209
Constant	1.119	.503	4.953	1	.026	3.061		

a. Variable(s) entered in step 1: Bot Accuracy, Response Time, Useful Time, Privacy, Customization, and Integration

Furthermore, in terms of bot accuracy, response time, useful time, privacy, customization and integration, the interview perspective of PRIZM Digital and AsiaBot highlighted the diverse applications of Chatbots across different industries and underscored the importance of tailoring Chatbot solutions to meet the unique needs and objectives of each client. This approach ensures that Chatbots are effectively utilized to address specific challenges and deliver tangible benefits to businesses and their customers alike.

(H1): The coefficient of 0.110 with a significance level of 0.038 indicates that as bot accuracy increases by one unit, the odds of the dependent variable occurring increase by a factor of 1.116. The confidence interval ranges from 0.757 to 1.646, excluding 1, suggesting a statistically significant impact. It shows that bot accuracy can be one of the factors that encourage customer engagement of Chatbot in the healthcare business in Hong Kong.

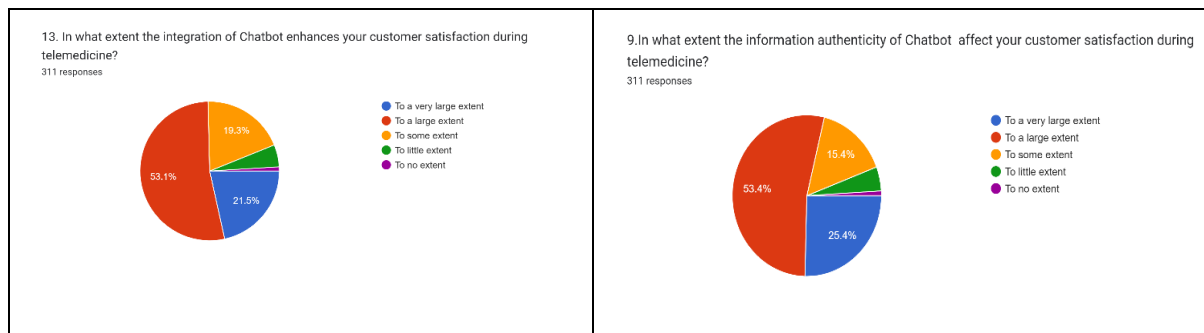
(H2) This predictor has a coefficient of 0.641 and a p-value of 0.002, this variable significantly increases the odds of the dependent event by a factor of 1.898 for each unit increase. The confidence interval (1.270 to 2.837) further supports its strong influence on the outcome. This emphasizes response time can be one of the factors that encourage customer engagement of Chatbot in the healthcare business in Hong Kong.

(H3) With a coefficient of 0.182, a significance level of 0.049, and an odds ratio of 1.200. Its effect is statistically significant at the margin, implying that longer useful time slightly increases the likelihood of the dependent event. The confidence interval (0.820 to 1.755) reinforces this interpretation. It shows useful time is one of the favourable factors that encourage customer engagement of Chatbot in the healthcare business in Hong Kong since the bias on artificial intelligence and habits of Hong Kong people.

(H4) With a coefficient of 0.132 and a p-value of 0.036. With a significant level of  $p < 0.05$ , privacy slightly increases the odds of the outcome by a factor of 1.141 for each unit increase. The confidence interval (0.764 to 1.705) indicates a statistically significant but modest effect. This highlighted bot privacy can be one of the factors that encourage customer engagement of Chatbot in the healthcare business in Hong Kong.

(H5) The positive coefficient of 0.128 and a significance level of 0.035 suggest that improvements in privacy are associated with a slight increase in the likelihood of the dependent event (odds ratio = 1.137). The confidence interval (0.778 to 1.661) confirms its significant role. The result shows customization can influence the degree of customer engagement while users interact with Chatbot.

(H6) This variable shows a significant positive effect with a coefficient of 0.387 and a p-value of 0.034. These findings suggest integration can be one factor that encourages customer engagement of Chatbot in the healthcare business in Hong Kong.



According to the questionnaire, it reflects the integration and information authenticity of chatbot affect customer satisfaction during telemedicine. Therefore, chatbot developers should make more adjustments to the information authenticity and integration of chatbots.

Based on the interview with the Chatbot service providers, PRIZM Digital and AsiaBots, there are slight differences in point of view between these two chatbot service providers. The most significant difference between the two providers will be the useful time. Due to the target audiences of the two providers being different, the expectations and practices of the customer are different. The customers of PRIZM are mainly related to FMCG and the clients of AsiaBots are patients. As a result, the customers of PRIZM will be actively engaged with the chatbot but the patients of AsiaBots will have more consideration during the use chatbot. Apart from that, it is discovered that social norms will affect the customers on usage of Chatbot which also validates the social influence in the Unified Theory of Acceptance and Use of Technology 2.

## Conclusion:

In conclusion, the findings show that there are improvements needed in healthcare providers and chatbot developers. For healthcare providers, this study shows how chatbots can overcome the insufficient manpower of hospitals and increase customer satisfaction by improving customer engagement. For the chatbot developers, it is necessary to be concerned about the design of the chatbot, for example, customization and integration with a different platform to synchronize with other platforms to increase coverage.

The purpose of this research is to investigate which factors are influential to customer engagement of Chatbot which emphasize utilized chatbot in healthcare business in Hong Kong. This research also reveals that there is a lot of preparation involved in promoting the application of Chatbots in the healthcare business, no matter whether the target is the user, company or government.

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