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The Effect of Information Technology Acceptance Model, Diffusion of Innovation, Social Cognitive Learning, and Channel Expansion Theory on Behavioral Intentions of People in Generation Z in Bangkok to Use the DoctorMe Applications

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Abstract

Health problems in Thailand are escalating because the nation has entered into an aging society era. There are more patients, which make it hard for everyone to access hospital care. DoctorMe is the only application in Thailand that provides self-care advice at no charge. DoctorMe could enhance a capacity of public health services. It promotes self-care, which results in diminishing reliance on healthcare professional. When the number of application download is taken into account, the application shows a low success rate in creating a behavioral intention to use. There are only 0.285 percent of Thai smartphone users who have downloaded DoctorMe. This research aims to 1) study factors that comprise the behavioral intention to use, 2) determine an impact that such factors have on the behavioral intention to use, and 3) develop a model to represent the behavioral intention to use among the target population. This research employs a mixed-method research approach, between a qualitative and a quantitative research. For the qualitative research, 17 semi-structured interviews are carried out with individuals, who never use DoctorMe and belong to the target group of Generation Z in Bangkok. A taxonomy analysis is employed for data analysis. For the quantitative research, samples are 300 individuals, who belong to the Generation Z in Bangkok. The sample size complies to the sample size requirements for structural equation model. A multi-stage sampling technique is chosen, and data is collected through questionnaires. For data analysis, the second order confirmatory factor analysis in structural equation modelling is selected. The research finds that 1) technology acceptance model (TAM), diffusion of innovation theory (DOI), social cognitive theory (SCT), and channel expansion theory (CET), which comprise the behavioral intention to use, are high, 2) each has a factor loading score (λ) of: TAM ($\lambda = 0.88$), DOI ($\lambda = 0.91$), CET ($\lambda = 0.91$) and CET ($\lambda = 0.67$). Each factor has an impact on the behavioral intention to use at a statistic significance level of .05, and 3) the author proposes a model called the TDSC (TAM-DOI-SCT-CET) model. It presents concepts and methods to improve Generation Z's behavioral intention to use DoctorMe. This research presents information on mHealth usage among citizens, in which there is limited information, and determines factors that make up a behavioral intention to use. It also provides know-hows to mHealth entrepreneurs to improve a behavioral intention to use, which could promote usage among current users, and attract new groups of users. In addition, it promotes the Thailand 4.0 policy, especially on the part responsible by the Ministry of Public Health, through networks of private bodies and citizens so that they are educated in managing their own behaviors.

Keywords. Behavioral intention to use, self-care applications, generation Z, technology acceptance, diffusion of innovation, social cognitive theory, channel expansion theory.

1. INTRODUCTION

Health problems among Generation Z are not uncommon. The rate of physical activity in Generation Z is quite low because they are surrounded by machines around them. Machines based on modern technologies are helping Generation Z to perform its duties by minimizing its physical role. According to medical science, due to limited physical activity, Generation Z has health issues such as heart disease, diabetes, obesity, etc. which are often abetted by relatively physical activity. Moreover, Generation Z particularly in Thailand has a diet that is relatively high in calories however, no physical activities to burn those calories in the body ultimately result in serious health issues.

Health problems in Thailand are intensifying day by day because the population of the country is facing various health-related issues such as Dengue, Leptospirosis, Hepatitis B, Hepatitis A, HIV, Malaria, Japanese Encephalitis, and Soil-transmitted worm diseases. However, the Department of Medical Services at the Ministry of Public Health finances a reasonable amount to facilitate Thai citizens. Only Bangkok that is the capital of Thailand, holds a 15.3% population of the country's population as shown in Table 1. With such a large population, hospitals are already running at their full capacity in the city. There are more patients hence, accessing hospital care is hard for everyone.

Table 1. The population of Cities in Thailand (UN)

Rank	City	Population		Share (%)	Change	
		2020	2021		Population	(%)
1	Krung Thep (Bangkok)	10,539,415	10,722,815	15.3	183,400	1.74
2	Chon Buri	1,398,645	1,417,247	2.03	18,602	1.33
3	Samut Prakan	1,306,937	1,324,319	1.89	17,382	1.33
4	Chiang Mai	1,166,978	1,182,498	1.69	15,520	1.33
5	Songkhla	966,597	979,453	1.40	12,856	1.33
6	Nonthaburi	962,694	975,497	1.39	12,803	1.33
7	Pathum Thani	913,741	925,893	1.32	12,152	1.33
8	Nakhon Ratchasima	774,022	783,180	1.12	9,158	1.18
9	Samut Sakhon	578,273	585,964	0.838	7,691	1.33
10	Udon Thani	570,115	576,666	0.824	6,551	1.15
11	Chiang Rai	549,966	557,280	0.797	7,314	1.33
12	Rayong	538,150	545,307	0.780	7,157	1.33
13	Kalasin	517,635	524,519	0.750	6,884	1.33
14	Nakhon Pathom	503,271	518,433	0.741	15,162	3.01
15	Khon-Kaen	502,594	509,278	0.728	6,684	1.33
16	Surat Thani	495,968	502,564	0.718	6,596	1.33
17	Ubon Ratchathani	495,308	501,747	0.717	6,439	1.30
18	Buri Ram	453,747	459,781	0.657	6,034	1.33
19	Lop Buri	437,305	458,682	0.656	21,377	4.89
20	Lampang	449,481	455,458	0.651	5,977	1.33
21	Phra Nakhon Si Ayutthaya	441,273	447,134	0.639	5,861	1.33
22	Roi Et	440,609	446,468	0.638	5,859	1.33
23	Phuket	432,216	437,963	0.626	5,747	1.33
24	Ratchaburi	405,530	412,761	0.590	7,231	1.78
25	Sakon Nakhon	381,084	386,152	0.552	5,068	1.33
26	Chanthaburi	360,260	371,123	0.531	10,863	3.02
27	Suphan Buri	337,631	347,733	0.497	10,102	2.99
28	Lamphun	317,180	321,399	0.459	4,219	1.33
Source: UN (World Population Prospects 2018) **Date:** 09 Sep 2021						

DoctorMe is an organization aiming to design health care applications to help people to provide them with self-care advice. However, DoctorMe is a free application that can increase public health services. Through DoctorMe application, it becomes comparatively easy for people to promote their health and management of illness when it arises. Moreover, by using DoctorMe application, people are less dependent on healthcare professionals until they are facing a serious health issue. However, the perception of DoctorMe application is quite low. In other words, DoctorMe application fails to perceive people's attention. According to the present study, there is only 0.285% of Thai smartphone users that have downloaded DoctorMe.

Previous literature is evident that the behavioral intentions of people are directly influenced by the technology acceptance model (Vallade, Kaufmann, Frisby, & Martin, 2021). Furthermore, it is also obvious from past studies that both the diffusion of innovation and social cognitive learning have a positive impact on the behavioral intentions of people(Hwang & Kim, 2021). Moreover, a decrease in the value of channel expansion theory also results in a decrease in the value of behavioral intentions of people. People's behavioral intentions in Generation Z particularly in Bangkok especially to use DoctorMe applications are low. Therefore, the present study is aimed to determine the effects of technology acceptance model, diffusion of innovation, social cognitive learning, and channel expansion theory.

The present study is a unique study investigating the role of the technology acceptance model, diffusion of innovation, social cognitive learning, and channel expansion theory on behavioral intentions of people in Generation Z in Bangkok to use the DoctorMe applications. Various studies are available investigating the role of the technology acceptance model for various types of audiences (Al-Emran & Granić, 2021; Al-Rahmi et al., 2021). In the past literature, there are also studies that describe the role of diffusion of innovation, social cognitive learning, and channel expansion theory (Kuo, McManus, & Lee, 2022; J. Lee, Lacy Jr, & Pittman Jr, 2021a; Lim & Richardson, 2021; Vargo, Akaka, & Wieland, 2020) for various industries targeting the population of various cities in the world, however, these studies have missed relating with behavioral intentions of people in Generation Z in Bangkok especially to use the DoctorMe Applications. Hence, the present study is a vital contribution to the body of literature.

The present study has a significant contribution to the literature. Because the present study investigated the value of behavioral intentions of people in Generation Z. Hence, the present study has both theoretical and practical contributions to the literature. Theoretically, the present study described the significant relationship between the technology acceptance model, diffusion of innovation, social cognitive learning, channel expansion theory, and behavioral intentions of people in Generation Z in Bangkok to use DoctorMe applications. Practically the present study is more significant for practitioners to boost the behavioral intentions of people in Generation Z to use the DoctorMe applications.

2. LITERATURE REVIEW

2.1 Behavioral Intentions and Technology Acceptance Model

To examine and explore technology acceptance, the Technology Acceptance Model (TAM) is one of the most significant theories (Deng, Zheng, Lu, Zeng, & Liu, 2021; Man, Alabdulkarim, Chan, & Zhang, 2021; Wong, Man, & Chan, 2021). The TAM comes with the investigation of technology acceptance through two factors that are Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). However, recognition and application of TAM are clear from previous studies that have paged to go into its application details by introducing new concepts and variables that acknowledge individual behavior concerning technology acceptance and use to be made accurately clear (Unal & Uzun, 2021; Zhong, Oh, & Moon, 2021). According to the present study Behavioral Intentions (BI) of people in Generation Z in Bangkok to use the DoctorMe applications has significant effects on TAM. It is determined behavior of the people having a positive attitude towards using DoctorMe applications is just under the TAM. However, the people with a negative attitude towards using DoctorMe applications are quite contradictory to the TAM. While the people with no information about DoctorMe

applications have a neutral attitude. Hence, the increased value of BI of the people of Generation Z particularly in Bangkok to use DoctorMe applications results in the frequent use of TAM. Hence, it is hypothesized that.

H1: Behavioral intentions have positive effects on the technology acceptance model.

2.2 Behavioral Intentions and Diffusion of Innovation

Diffusion of Innovation (DOI) refers to the model and speed at which modern ideas, services, products, or practices spread through a population. However, early adopters, innovators, early majority, laggards, and a late majority are considered significant players in DOI. According to a past study, available information about a product or service in public plays a significant role in the use or consumption of the product or service. However, according to the present study technology awareness is one of the basic elements that is useful for DOI. It is observed that people residing in the areas having increased value of technology awareness also increases the value of DOI that ultimately increasing the value of BI. The increased value of BI of the people to use DoctorMe applications is promising rapid DOI that ultimately results in higher use of DoctorMe applications. The people with a lower value of BI to use DoctorMe applications in Bangkok that have already downloaded DoctorMe applications on their smartphones normally prefer to go to the hospitals. Moreover, the present study described that the interest of people to use DoctorMe applications is quite low due to lack of technology awareness among people. Hence, it is hypothesized that.

H2: Behavioral intentions have positive effects on the diffusion of innovation.

2.3 Behavioral Intentions and Social Cognitive Learning

Social Cognitive Learning (SCL) refers to the environmental elements on individual health behaviors, actions of others, and observing and watching results of others' performance aiming to mold the desired behavior (Ghazali et al., 2021). A past study described that self-efficacy, response efficacy, and technology anxiety are the basic elements that are common in people particularly when they are to adopt something new in the market (Hong, Cao, Liu, Tai, & Zhao, 2021). It is clear from the results of previous studies that SCL increases by increasing the values of self-efficacy and response efficacy whereas a decrease in the value of technology anxiety results in an increase in the value of SLC (Yang, Zhang, Kong, Wang, & Hong, 2021). However, according to the present study, there is a significant relationship between BI and SCL. It is determined that for the people with prominent BI values, the SCI process becomes easy and advantageous. Because SCI is one of the most appropriate methods to determine the value of people how they interact with their surroundings, therefore, DoctorMe applications using the SCT gain positive BI of the people. However, the people especially in Bangkok with a lower value of their BI normally prefer to concern their private doctors or public hospitals instead of using the DoctorMe applications installed on their smartphones especially when they require a medical assistant. Hence, it is hypothesized that.

H3: Behavioral intentions have positive effects on social cognitive learning.

2.4 Behavioral Intentions and Channel Expansion Theory

Channel Expansion Theory (CET) describes that the experience of a person serves as a significant role in examining the level of richness development and perception towards specific media tools. According to CET, the more experience and knowledge normally users gain from using a channel, the richer they understand the medium to be. However, according to the present study, only two mediums such as internet experience and mobile experience are emphasized. It is clear from various studies describing the dimensions of the modern world that users with more value for internet experience and mobile experience are considered as potential members. Moreover, it is also clear from the results of the present study that people especially in Bangkok with higher expertise in internet and mobile channels usually prefer to use DoctorMe applications when they need medical assistance. However, BI in people who don't emphasize enhancing their knowledge and

experience about the internet and mobile usage is comparatively low. Moreover, people having sufficient knowledge and experience about the usage of their smartphones and the basic applications running on their smartphones, frequently use DoctorMe applications. Hence, it is hypothesized that.

H4: Behavioral intentions have positive effects on channel expansion theory.

3. METHODOLOGY

The present study preferred a mixed method research approach between quantitative and qualitative. The research method is selected based on the nature of the study under consideration. The nature of the present study was based on both qualitative and quantitative. Hence, a mixed-method approach was opted based on the nature of the present study. However, for the qualitative research 17 semi-structured interviews were carried out with individuals however, these individuals have never used DoctorMe. Moreover, all the respondents of the present study were belonging to Generation Z in Bangkok. After collecting primary data from the 17 respondents, this primary data was analyzed by using taxonomy analysis.

For the quantitative research, a sample size of 300 was selected. Because a 300-sample size is considered a satisfactory sample size. Moreover, this sample size was selected because it was just in accordance with the requirements for the structural equation model. After selecting the sample size, the area cluster sampling approach was applied because the area cluster approach is considered one of the best approaches for a population residing in a wide area. As 300 respondents were selected in Bangkok which is a wide area. However, all the respondents were belonging to Generation Z in the city.

Furthermore, to collect primary data from the quantitative respondents of the present study, a questionnaire was designed based on a multi-stage sampling technique. However, the questionnaire was divided into three major sections. The first section of the questionnaire was enclosed with the questions asked for demographic information of the respondents such as name, age, gender, specified health issue (if any), etc. In the second section, the respondents were responsible to answer the questions related to the key variables of the present study. However, the third section of the questionnaire was enclosed with 20 questions based on a 5-point Likert scale starting from "1" as "Strongly Agree" to "5" as "Strongly Disagree".

An email survey was conducted to collect primary data from the 300 respondents of the present study. Initially, all the respondents were personally communicated, and they were told about the purpose and a brief introduction to the present study. Hence, the questionnaire was sent to the email address of each respondent. After 12 days the questionnaire was sent to the respondents, there were 120 responses received. A reminder message was sent to the rest of the respondents, after 5 more days from the reminder message there was 90 more response received. Now there were 210 responses in total, 15 responses were excluded because these were partially filled. Hence, 195 responses were considered as primary data for the present study. After collecting the primary data from the respondents, data analysis was completed by selecting the second-order confirmatory factor analysis in structural equation modeling.

Table 2. Statistical test of empirical variables (n=300)

Variable	M	S.D.	%CV	Sk	Ku	χ^2	P-value
PEOU	4.13	.49	11.86	.-530	-1.197	1.714	.425
PU	4.14	.49	11.84	.-596	-1.678	3.173	.205
TA	4.00	.55	13.75	.-715	.-769	1.102	.576
SE	4.08	.55	13.48	.-222	-2.120	4.542	.103
RE	4.09	.54	13.20	.-478	-1.865	3.707	.157
TE	3.29	1.04	31.61	.-399	-1.371	2.038	.361
IE	3.91	.62	15.86	.-607	.-666	0.812	.666
ME	3.97	.59	14.86	.-371	.-484	0.372	.830

4. RESULTS

The present study stated the results by using Structural Equation Modeling (SEM). According to the past several studies SEM is considered one of the best data analysis techniques to investigate primary data (Chen et al., 2021; T. Lee & Shi, 2021). SEM is based on two important structures that consist of confirmatory factor analysis (CFA) to determine the validity, reliability, and factor loadings. Behavioral Intentions (BI) was measured by using scale items related to the Technology Acceptance Model (TAM), Diffusion of Innovation (DOI), Social Cognitive Learning (SCL), and Channel Expansion Theory (CET). However, all these items are present in Table 3 along with the factor loading, t-value, and r-square value. Whereas all the items have met the minimum threshold level of 0.5 for factor loading.

Table 3 Factor Loadings. (n=300)

Behavioral Intention to Use: BI ρ_c= .91 ρ_v = .72	Factor Loading (λ)	Error (θ)	t	R^2
Technology Acceptance: TAM ρ_c= .86 ρ_v = .76	.88	.23	13.72	.77
Perceived Ease of Use: PEOU	.83	.32	-	.68
Perceived Usefulness: PU	.92	.16	18.72	.84
Diffusion of Innovation Theory: DOI ρ_c= .83 ρ_v = .82	.91	.17	15.34	.83
Technology Awareness: TA	.91	.17	-	.83
Social Cognitive Theory: SCT ρ_c= .98 ρ_v = .95	.91	.16	17.14	.84
Self-Efficacy: SE	.97	.05	-	.95
Response Efficacy: RE	.81	.03	19.15	.97
Technology Anxiety: TE	.85	.04	14.64	.96
Channel Expansion Theory: CET ρ_c= .88 ρ_v = .79	.67	.56	10.32	.44
Internet Experience: IE	.85	.28	-	.72
Mobile Experience: ME	.93	.14	15.33	.86

The relationship between BI, TAM, DOI, SCL, and CET was examined after the confirmatory factor analysis (CFA) as shown in Figure 1. Moreover, from the results, it is determined that BI has significant effects on TAM. BI also has a significant effect on DOI, SCL, and CET respectively. Hence, all the direct effects of the present study are supported. However, there was no indirect effects was examined in the present study.

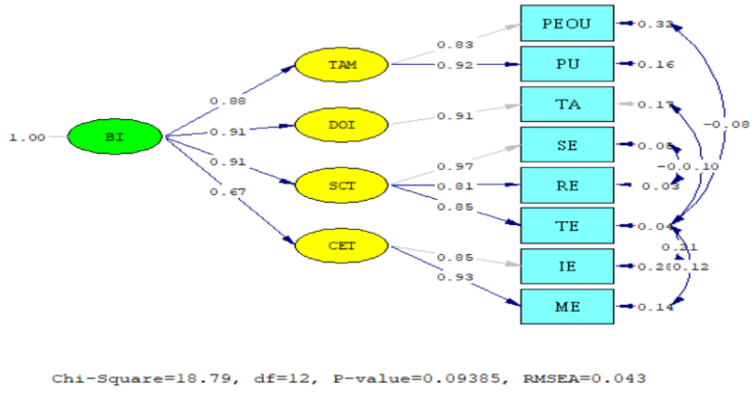

Figure 1 Model (n=300)

Note: BI= Behavioral Intention, TAM= Technology Acceptance, DOI= Diffusion of Innovation Theory, SCT= Social Cognitive Theory, CET= Channel Expansion Theory

5. Discussion and Conclusion

The first hypothesis of the present study is "behavioral intentions have positive effects on technology acceptance model." Sprenger and Schwaninger (2021) investigated that behavioral intentions have positive effects on the TAM of digital learning technologies such as classroom response time, e-lectures, classroom chat, and mobile virtual reality. Kartal, Kiziltepe, and Kartal (2022) described that TAM is directly influenced by the BI of teachers instilling knowledge about Science Teaching Efficiency Belief. Hence it is concluded that BI of people especially in Bangkok to use DoctorMe applications has a positive relationship with TAM.

The second hypothesis of the present study is: "behavioral intentions have positive effects on the diffusion of innovation." According to a past study conducted by Warner, Diaz, Silvert, Hobbs, and Reisinger (2021) described that persuasion, implementation, knowledge, confirmation, and decision are the stages of diffusion of innovation that have a significant relationship with behavioral intentions. Zdanowska (2021) purposed that when the BI of people increases it also increases the value of technical awareness that ultimately nurtures the problem-solving skills of the people. Hence, it is concluded that increasing the BI of the people using DoctorMe applications, especially in Bangkok increases the speed of DOI.

The third hypothesis of the present study is: "behavioral intentions have positive effects on social cognitive learning." Behavioral intentions result in consideration of the effects of the desired modeling of behavior (Kim & Cooke, 2021; Liu & Liu, 2021; Piancatelli, Massi, & Vocino, 2021). According to Rasoolimanesh, Seyfi, Rather, and Hall (2021) intentions are dependably related to behavior that has significant positive effects on the social cognitive learning of customers. Moreover, it is also obvious from the past literature that people's intentions predict behavior better than beliefs and feelings which again also add significant meanings to social cognitive learning. Hence, it is concluded that the BI of people is positively related to their SCL.

The fourth hypothesis of the present study is: "behavioral intentions have positive effects on channel expansion theory." J. Lee, Lacy Jr, and Pittman Jr (2021b) concluded that with effective BI, CET can be used to anticipate effective communications through media that ultimately result in changing users' understanding and changing their communication regarding a specified message. Another past study also described that through CET it becomes easy and more effective to diminish the equivocality or possible misunderstanding of a message (Aben, van der Valk, Roehrich, & Selviaridis, 2021). Hence, it is concluded that increasing the value of BI, especially of the people in Bangkok allows effective implementation of CET that results in an increase in the usage of DoctorMe applications.

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