-RESEARCH ARTICLE-

MEASUREMENT OF CHATBOT ACCEPTANCE FOR BUSINESS INCUBATION IN THAILAND

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─**Abstract**─

Thailand's government agencies, private sectors, and educational institutions value startups through funding, infrastructure, and business incubation programs that are important in educating, guiding business development, and mentoring early-stage startups. The use of technology to support the business incubation process is continuously under consideration, and chatbots are among the most popular technologies on the rise. It is a virtual assistant that provides users with information and recommendations. This study seeks to determine the acceptability of chatbot

technology that serves as incubator program staff, advising startups on business development and providing them with information and fundamental knowledge. Using partial least squares structural equation modeling (PLS-SEM), the technology acceptance of a sample group of Thai entrepreneurs was evaluated. The results indicated that perceived efficacy and service quality were the determinants of user satisfaction. Additionally, user contentment was a factor influencing adoption intent. Therefore, it can be concluded that if the technology for the virtual incubation assistant has a good service model and makes users perceive its benefits, they will be content and want to use it. Chatbot technology can potentially help incubate businesses and provide advice and fundamental knowledge to startups in their early stages.

Keywords: Business Incubation, Chatbot, Startup, Technology Acceptance, Virtual Assistant

1. INTRODUCTION

The business incubation program is a crucial instrument for assisting entrepreneurs with the growth of their enterprises. Access to physical resources, administrative services, financial resources, assistance with start-up procedures, and network access are the goals of business incubation (Shih & Aaboen, 2019). Globally, business incubation programs are prevalent. For instance, business incubation in the United States focuses on economic development, technology transfer, and commercialization (Tsaplin & Pozdeeva, 2017). In the meantime, over 400 incubators in the United Kingdom support approximately 19,600 enterprises annually (CFE, 2022). As innovation is essential, business proprietors must consider many factors, including risk, investment, and benefits (Saengchai, Mitprasat, & Jermsittiparsert, 2019). In this respect, business incubation can be advantageous.

According to the Thailand 4.0 policy, the Thai government has also identified entrepreneurs as the country's primary development driver. Thailand desires to cultivate startups as new economic combatants and to position itself as an open region for ASEAN expansion. The Thai government anticipates that entrepreneurs will become a new economic target industry. Numerous public and private agencies in the country have supported the development of startups in Thailand through various projects and collaborations, such as university business incubators or corporate venture capitals (CVCs), to support investment in potential startups in the country's private sectors. Over 1,700 firms registered with the National Innovation Agency (NIA) in 2019.

Chatbot technology is gaining popularity due to its ability to communicate with users by providing the required information and guidance (Clarizia, Colace, Lombardi, Pascale, & Santaniello, 2018). Chatbots resemble virtual assistants in that they assist users in answering queries. As a result, we acknowledge the potential for chatbot technology to assist entrepreneurs in Thailand by acting as an incubation assistant, and we develop a structural equation model to assess the target group's approval of chatbot technology.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Technology Acceptance Model (TAM) and the DeLone and McLean IS Success Model

In 1989, Fred Davis introduced the Technology Acceptance Model (TAM). The widely recognized framework for measuring the success of user technology adoption. It explains how users adopt the technology. According to the model, external variables affect perceived usefulness. Then, perceived effectiveness and simplicity of use will influence the user's attitude toward using, impacting the user's intention to use and actual use.

The DeLone and McLean IS Success Model is a measurement framework for information system (IS) success. It was proposed in 1992 by William DeLone and Ephraim McLean and enhanced in 2003 (DeLone & McLean, 1992). The revised model included system quality, information quality, service quality, intent to use, user satisfaction, and net benefits. System quality refers to the system's technical excellence. Information quality refers to the veracity and relevance of the output. Service quality refers to the standard of services provided by a system provider to its users. Intention to use refers to a user's intent to utilize a system. User satisfaction refers to the level of satisfaction consumers have with the system. Lastly, net benefits describe the productivity gains realized by system users.

2.2 Hypothesis Development and research framework

2.2.1 Intention to adopt technology and Satisfaction

Recent research indicates that satisfaction significantly impacts the propensity to employ new technologies. Cheng and Jiang (2020) investigated how chatbots would affect the user experience and discovered that user satisfaction significantly impacts the intention to use chatbots. According to Yosvijit and Nurittamont (2021), businesses should develop a technologically-advanced strategy to increase customer trust, satisfaction, and repurchase intent. Chen, Gong, Lu, and Tang (2022) investigated the use of chatbots in primary service and found that customer satisfaction was positively correlated with continuing to use chatbots. Additionally, Yun and Park (2022) discovered that the gratification of chatbot services and interactivity influences customer repurchase intent. Consequently, we offer the following hypothesis:

H1 – Satisfaction affects the intention to adopt

2.2.2 Perceived usefulness

Davis (1989) defines perceived efficacy as the extent to which an individual believes using a particular system would improve their job performance. As Rese, Ganster, and

Baier (2020) proposed, perceived utility positively influences chatbot technology adoption. Previous research on the development of chatbots for small and medium-sized enterprises by Selamat and Windasari (2021) indicates that chatbot features should prioritize user assistance. In addition, Lim and Zhang (2022) discovered that perceived utility significantly impacts the adoption of AI-related technologies. In a recent study on chatbots for educational purposes, Al-Sharafi et al. (2022) found that if chatbots improve user performance, users will be satisfied with the technology's application to their learning processes. Consequently, the following hypotheses are proposed:

H2 – Perceived usefulness affects the intention to adopt.

H3 – Perceived usefulness affects satisfaction.

2.2.3 Information Quality

Information quality benefits business managers by providing them with high-quality business information so they can modify their strategies and tactics (Lekhawichit, Sriyakul, Jermsittiparsert, & Chienwattanasook, 2022). DeLone and McLean's (2003) model reveals the relationship between information quality and satisfaction. A recent study by Alotaibi and Alshahrani (2022) found that information quality significantly affects learning technology user satisfaction. This relates to the research because the conversational agent will be a learning assistant. Consequently, we propose the following hypothesis:

H4 – Information quality affects satisfaction.

2.2.4 Service Quality

In their 2003 model, DeLone and McLean propose the relationship between service quality and customer satisfaction. As Saengchaia, Pattanapongthornb, and Jermsittiparsertc (2019) suggested, service quality should be considered for service level enhancement to identify technology adoption gaps thoroughly. The study by Nguyen, Chiu, and Le (2021) on bank chatbot service revealed that service quality significantly impacts user satisfaction, which suggests that if the chatbot provides prompt responses, pertinent suggestions, and personalized attention, user satisfaction could be increased. Consequently, the following hypothesis is advanced:

H5 – Service quality affects satisfaction.

2.2.5 Perceived ease of use

Pereira, Limberger, and Ardigó (2021) discovered that perceived simplicity of use influences satisfaction positively for chatbots in service industries. Huang and Chueh's

(2021) study on chatbot technology used for veterinary consultation suggested that chatbots must be basic, straightforward, and devoid of lengthy question-and-answer processes. According to Malison's (2022) research, the usability of technology influences its acceptance. This is comparable to the recommendation by Ashfaq, Yun, Yu, and Loureiro (2020) that chatbot technology should have user-friendly processes. Consequently, the following hypotheses are proposed:

H6 – Perceived ease of use affects satisfaction.

H7 – Perceived ease of use affects intention to adopt.

As depicted in Figure 1, a conceptual framework for this study was developed based on information gleaned from relevant literature reviews in multiple disciplines and the integration of the technology acceptance model and information system success model.
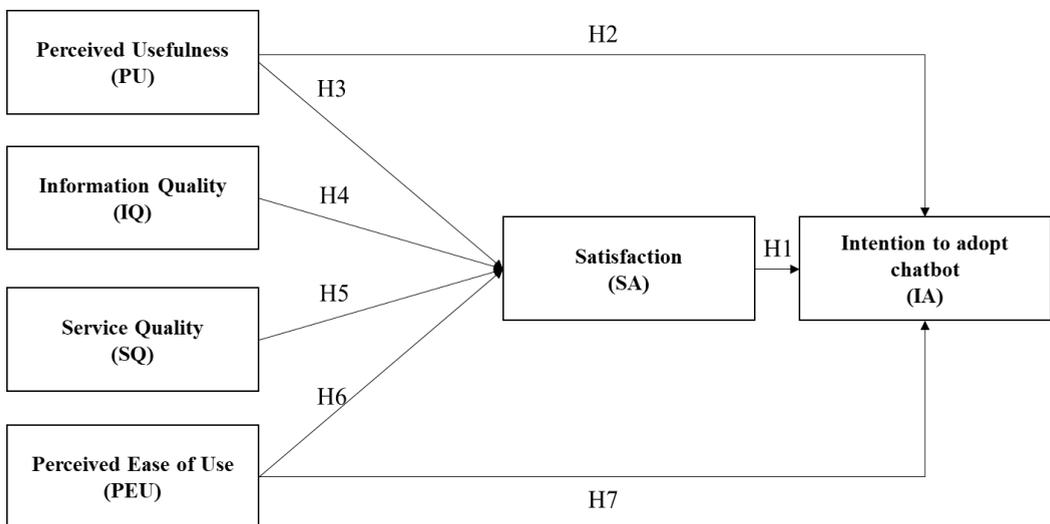
Figure 1. The conceptual framework for this research.

3. RESEARCH METHODOLOGY

By introducing the developed virtual business incubator assistant technology to early-stage startups, this study investigated technology adoption among the sample population. The samples consisted of entrepreneurs from across the country, regardless of business type. The number of samples utilized was consistent with the statistics employed in this investigation, partial least squares structural equation modeling (PLS-EM). The sample-to-variable ratio was set at 5:1. According to Guilford's theory (1954), the minimum sample size cannot exceed 100. In the meantime, Comrey and Lee (1992) recommended a sample size of 200. Therefore, a sample size of 200 early-stage enterprises was chosen for this study. Purposive sampling was used to select samples from business incubators and business incubation initiatives nationwide.

This research employed a web-based chatbot called IncBot (Incubation Chatbot) to acquire data. It provides incubation services such as fundamental information, knowledge advice for startups, business status evaluation, and the recommendation of essential business development tools. As a data collection instrument, this study utilized a questionnaire with a total of 39 questions covering the following topics:

1. personal details (six elements)

Factors influencing the intent to employ virtual business incubation assistants (30 items).

Factors influencing the propensity to pay for virtual business incubation assistants

Specialists evaluated the content validity of the questionnaire, and its reliability was determined using a sample of 30 participants. Through a link sent by the researcher, the sample group utilized the prototype of the virtual business incubator assistant technology. The researcher then sent an online survey to the sample group to determine their acceptance of the technology.

Combining descriptive and inferential statistics, the data were analyzed. Included in the descriptive statistics were percentage, mean, and standard deviation (SD). The percentage was used to analyze the demographic information of the samples, including gender, age, level of education, business type, business period, and willingness to pay for the service. Mean, and standard deviation was utilized to analyze the level of opinion or significance that influenced the decision to adopt the technology. Using the Smart PLS software, a structural equation model was employed for statistical inference.

4. RESULTS

4.1. Measurement Model Evaluation Results

204 respondents completed the survey. Then, the measurement model was evaluated by considering the extreme loading values, which must be greater than 0.70, the average variance extracted (AVE), which must be greater than 0.50, the composite reliability (CR), and Cronbach's alpha coefficient, both of which must be greater than 0.70. Table 2 displays the results.

When evaluating the measurement model, it was also important to consider the discriminant validity of the questionnaire, which was determined by testing the level of latent variables. According to Table 3, the discriminant validity based on the Fornell - Larcker Criterion must be greater than the correlation between the latent variable of interest and other latent variables (Fornell & Larcker, 1981).

According to the evaluation results of the questionnaire's consistency and discriminant validity, as shown in Tables 2 and 3, it can be concluded that the measurement model possessed the questionnaire's consistency and discriminant validity. It could therefore be utilized to analyze the structural equation model.

**Table 1. Measurement model evaluation results.**

Construct	Items	Loading	AVE	CR	Cronbach's Alpha
Information Quality	IQ1	0.825	0.644	0.900	0.861
	IQ2	0.851			
	IQ3	0.835			
	IQ4	0.758			
	IQ5	0.739			
Construct	Items	Loading	AVE	CR	Cronbach's Alpha
Service Quality	SQ1	0.817	0.662	0.908	0.873
	SQ2	0.832			
	SQ3	0.819			
	SQ4	0.806			
	SQ5	0.795			
Construct	Items	Loading	AVE	CR	Cronbach's Alpha
Perceived Ease of Use	PEOU1	0.714	0.607	0.885	0.840
	PEOU2	0.811			
	PEOU3	0.789			
	PEOU4	0.799			
	PEOU5	0.778			
Construct	Items	Loading	AVE	CR	Cronbach's Alpha
Perceived Usefulness	PU1	0.821	0.756	0.939	0.919
	PU2	0.866			
	PU3	0.907			
	PU4	0.899			
	PU5	0.853			
Construct	Items	Loading	AVE	CR	Cronbach's Alpha
Satisfaction	SA1	0.836	0.760	0.941	0.921
	SA2	0.891			
	SA3	0.86			
	SA4	0.874			
	SA5	0.895			
Construct	Items	Loading	AVE	CR	Cronbach's Alpha
Intention to Adopt	IA1	0.886	0.783	0.947	0.931
	IA2	0.91			
	IA3	0.892			
	IA4	0.889			
	IA5	0.846			

Table 2. Discriminant validity values according to the Fornell-Larcker criterion.

	IA	IQ	PEOU	PU	SA	SQ
IA	0.885					
IQ	0.562	0.876				
PEOU	0.576	0.613	0.779			
PU	0.746	0.625	0.559	0.870		
SA	0.763	0.709	0.626	0.795	0.872	
SQ	0.609	0.822	0.663	0.652	0.750	0.814

4.2. Structural model assessment results

After concluding the measurement model evaluation, the researcher analyzed the coefficient determination, tested the research hypotheses, and analyzed the structural model relationships. Figure 2 depicts the outcomes.
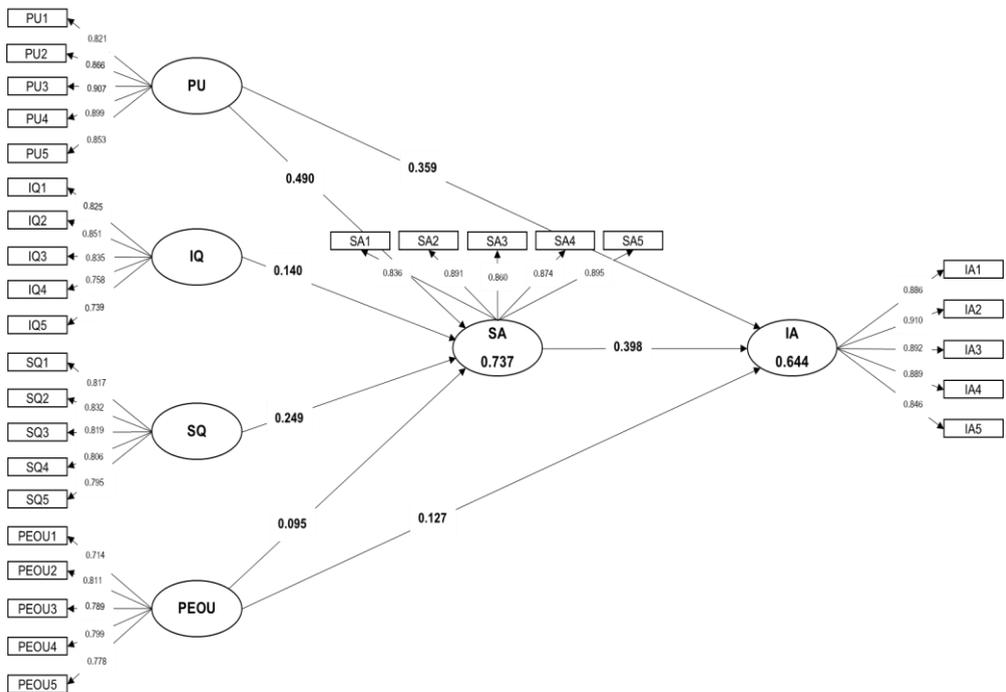
Figure 2. Structural model assessment results.

4.2.1 Research hypothesis testing

The research hypotheses were tested by considering the path coefficient at the significance level of 0.05 ($p<0.05$). A t-value higher than 1.96 indicates that the hypothesis is valid.

Table 3. Research hypothesis testing.

Hypothesis	Path Coefficients	t-statistics	p-value	Result
H1. SA → IA	0.398***	4.907	0.000	Support
H2. PU → IA	0.359***	5.136	0.000	Support
H3. PU → SA	0.490***	9.412	0.000	Support
H4. IQ → SA	0.140	1.665	0.096	Not Support
H5. SQ → SA	0.249***	3.316	0.001	Support
H6. PEU → SA	0.095	1.507	0.132	Not Support
H7. PEU → IA	0.127*	2.450	0.014	Support

*$p < 0.05$ ($1.960 \leq$ t-value < 2.576)
** $p < 0.01$ ($2.576 \leq$ t-value < 3.29)
***$p < 0.001$ (t-value ≥ 3.29)

4.2.2 Coefficient of determination testing

This research tested the coefficient of determination (R^2) of 2 variables: satisfaction and intention to adopt. Table 5 demonstrated that the factor that had the highest total effect on satisfaction was perceived usefulness (TE = 0.490), followed by service quality (TE = 0.249), information quality (TE = 0.140), and perceived ease of use (TE = 0.095), respectively. All these factors caused satisfaction with a coefficient of determination of 73.7% and an adjusted coefficient of determination (adjusted R^2) of 73.2%. These values indicated that the accuracy of the prediction was moderate.

In addition, the factor that had the highest total effect on the intention to adopt was satisfaction (TE = 0.398), followed by perceived usefulness (TE = 0.195), service quality (TE = 0.099), information quality (TE = 0.056), and perceived ease of use (TE = 0.038), respectively. All these factors together made the intention to adopt have a coefficient of determination of 64.4% and an adjusted coefficient of determination of 63.9%, indicating moderate prediction accuracy.

Table 4. Direct, indirect, and total effects of the independent variables.

Dependent Variable	R^2	Adjusted R^2	Effect	PU	IQ	SQ	PEOU	SA
SA	0.737	0.732	DE	0.490***	0.140	0.249***	0.095	N/A
			IE	N/A	N/A	N/A	N/A	N/A
			TE	0.490***	0.140	0.249***	0.095	N/A
IA	0.644	0.639	DE	N/A	N/A	N/A	N/A	0.398***
			IE	0.195***	0.056*	0.099**	0.038*	N/A
			TE	0.195***	0.056*	0.099**	0.038*	0.398***

*$p < 0.05$ ($1.960 \leq$ t-value < 2.576)
** $p < 0.01$ ($2.576 \leq$ t-value < 3.29)
***$p < 0.001$ (t-value ≥ 3.29)

5. DISCUSSION

According to the findings, contentment influences adoption intent positively. Therefore, hypothesis 1 is confirmed. This is consistent with previous research (Cheng & Jiang, 2020; Huang & Chueh, 2021), indicating that satisfaction influences technology adoption intent. This study also hypothesizes that user perception of the technology's usefulness influences their intention to employ it. Therefore, hypothesis 2 is supported. This is consistent with the findings of Chocarro, Cortiñas, and Marcos-Matás (2021), who discovered a significant influence of perceived utility on adopting chatbots as education assistants. According to Paenchan and Kookkaew's (2022) findings, the perception of benefits can influence the decision to adopt a technology.

Similarly, Ho et al. (2022) investigated the adoption of AI-powered services and discovered that it is substantially influenced by users' perceptions of utility. Similarly, based on the outcome, perceived utility directly affects target user satisfaction. This is consistent with earlier research (Al-Sharafi et al., 2022; Alotaibi & Alshahrani, 2022). The third hypothesis is thus substantiated.

Similarly to the DeLone & McLean model (2003), both information quality and service quality substantially impact customer satisfaction in this study. This is consistent with the findings of Orden-Mejía and Huertas (2022), who discovered that tourists are more likely to be pleased when utilizing a chatbot that provides valuable and high-quality information. Furthermore, the relationship between technology service quality and customer satisfaction is consistent with previous studies (Chen et al., 2022; Nguyen et al., 2021; Vanitha & Alathur, 2021). Consequently, both hypothesis 4 and hypothesis 5 are substantiated.

Because perceived simplicity of use does not significantly affect satisfaction, Hypothesis 6 is not supported. This concurs with a previous study by Nguyen et al. (2021), indicating that using a chatbot requires little effort. To operate the technology, only text entry is required. This is supported by the findings of Li (2016), who discovered that the usability of online technologies does not correlate with user satisfaction. Nonetheless, the results of this study indicate that perceived simplicity of use influences chatbot adoption intent. This supports hypothesis 7 and corroborates a previous study by Pillai and Sivathanu (2020) on implementing chatbots in the hospitality industry, which proposed that the design must be user-friendly to increase technology adoption.

6. CONCLUSION AND LIMITATION

This study aimed to assess the acceptability of virtual incubation assistant technology. The research produced a prototype of chatbot technology for use in experiments with a representative sample of Thai entrepreneurs. The results indicated that perceived utility and service quality influenced satisfaction, whereas perceived information quality and

perceived usability had no effect. This demonstrates that if startups view chatbots as useful assistants with the proper service quality, this will be agreeable for them. In addition to perceptions of usefulness and usability, their satisfaction will generate a positive intent to continue using the technology. Based on the findings, it can be inferred that chatbots may be utilized in business incubation. Developers can concentrate on accessibility, user interface, and features comparable to incubation, such as information, knowledge, and navigation to vital resources. The benefit of this research is the explanation of the relationship between the main factors that influence satisfaction and the intention to adopt chatbots for business incubation, as well as the creation of new opportunities to explore and design potential technologies that can be used in the future for startup incubation.

Nonetheless, there are limitations to this research. Firstly, this research focuses solely on the results of relatively small Thai startups. Future research may examine additional nations with various startup and business incubation ecosystems for further insights. The second target audience for this study is early-stage companies with specific needs and requirements. This may differ from data collected from more mature fledgling businesses. Therefore, future research should be conducted with later-stage startups to ensure that technology can be tailored to meet the needs of all user categories in general.

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