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EVALUATING THE EFFICACY OF GENERATIVE AI TOOLS IN ENHANCING TEACHING METHODS AMONG MANILA'S SENIOR HIGH SCHOOL EDUCATORS

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Article Info

Keywords: Artificial Intelligence, generative AI applications, automation, productivity increase, ChatGPT, Bing Chat, GitHub Copilot, Stable Diffusion, large language models.

Abstract

Artificial Intelligence (AI) has become an integral part of our daily lives, permeating various aspects, such as smartphone technology, self-driving vehicles, and customer service tools. The integration of AI and automation with other technological advancements holds the potential to significantly boost annual productivity, with estimates ranging from 0.20 to 3.30 percentage points. This paper explores the impact of generative AI applications, including ChatGPT, Bing Chat, GitHub Copilot, and Stable Diffusion, on the global landscape, shedding light on their widespread adoption and implications. Notably, Microsoft's Bing Chat stands out as a free and highly versatile tool, capable of understanding and responding to human language using large language models (LLMs). This study aims to provide a comprehensive overview of the evolving AI landscape and its influence on modern society.

1. INTRODUCTION

Artificial Intelligence (AI) has gradually entered our daily routines, from the technology powering our smartphones to self-driving car capabilities to the tool's shops employ to surprise and please customers. Work automation, when combined with all other technologies, might bring 0.20 to 3.30 percentage points to annual productivity increase [1]. ChatGPT, Bing Chat, GitHub Copilot, Stable Diffusion, and other generative AI applications have captivated the attention of people all over the world [2]. Microsoft's Bing Chat is free as it can accept any queries, use large language model (LLM), and has the capability to understand and reply in human language [3].

Academic institutions, for instance, have started crafting rules and held discussions to take into account the emergence of AI-written research and papers [4]. Additionally, generative AI has the potential to improve student learning results. Increasing school education availability and quality will help to secure opportunities for future scientists and researchers which will ultimately lead to future technological advances [5]. Furthermore, there was a dearth of research suggesting that generative AI tools such as Bing Chat were widely embraced by senior high school instructors, particularly in Manila, as a means of assisting them in fulfilling their teaching jobs and needs.

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The most influential, most tested, and bestoperationalized method on the potential impact on the acceptance of information systems is the Technology Acceptance Model (TAM) [6].

Recent studies have used the TAM in the field of education [7][8], autonomous vehicles [9], virtual reality [10], even telemedicine [11].

In this paper, the authors investigated the acceptability of Generative AI tools in the context of Senior high school teachers teaching performance in the Division of Manila, Philippines. It aims to provide inputs to educators, head teachers, principals, and district supervisors with implications for better application of generative AI tools.

In light of the research gaps, this study attempts to determine "The acceptability of Generative AI Tools of Selected Senior High School Teachers in SDO-Manila, Philippines." Specifically, it sought to answer the following research questions:

1. Senior High School Teachers' behavioural intention to use generative AI tools is affected by their attitude (H11), perceived usefulness (H12), perceived ease of use (H13), selfefficacy (H14), subjective norm (H15), and system accessibility (H16).
2. Senior High School Teachers' generative AI tool attitude is affected by their perceived usefulness (H21), perceived ease of use (H22), self-efficacy (H23), subjective norm (H24), and system accessibility (H25).
3. Senior High School Teachers' perceived usefulness of generative AI tools is affected by their perceived ease of use (H31), self-efficacy (H32), subjective norm (H33), and system accessibility (H34).
4. Senior High School Teachers' perceived ease of use of generative AI tools is affected by their self-efficacy (H41), subjective norm (H42), and system accessibility (H43).

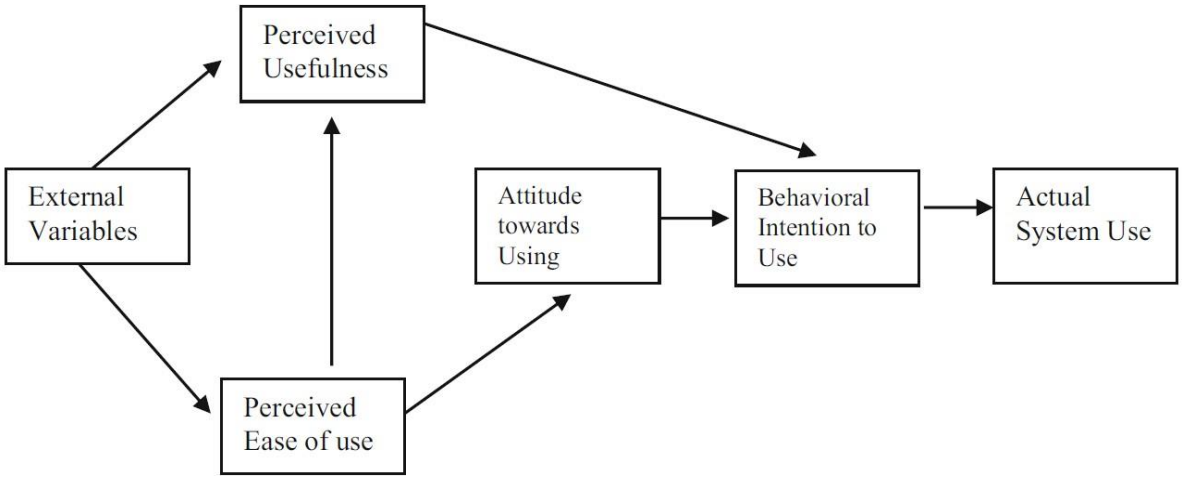

Fig.1 Technology Acceptance Model.

To examine and explain how and why senior high school teachers accept or reject Bing Chat tool and specifically to infer the impact on them, the Technology Acceptance Model (TAM) was used in this study as a research framework shown in Figure 1.

2. METHODOLOGY

A. Research Design

This paper employs a one-shot case study in attaining a quantitative analysis of the acceptability of senior high school teachers in using Bing Chat. Data were collected through an online survey using Google Forms that was administered in different schools to accomplish.

B. Participants and Sampling

This study aims to investigate the acceptability of senior high school teachers of the Bing Chat application. A voluntary response sampling method was employed with a total of 125 participants (54 males and 71 females)

both from private and public senior high schools in Manila City participated. Slovin's Formula was used to calculate the sample size of 95.24 from the result of the survey, given the population size of 125 and a margin of error of 0.50.

C. Research Instrument

The instrument was developed by the authors based on both studies of Park [12] and Revythi & Tselios [13]. Content reliability via Cronbach's Alpha (α) was measured on the curated instrument with 125 senior high school teachers across six (6) districts in Manila. The completed instrument consisted of six (6) sections. The questionnaire mainly comprises closed-ended multiple-choice questions and its objective is to assess the acceptance of a generative AI tool, particularly the Bing Chat web application. The first part asks the participants about their demographics. The second part of the instrument comprised 18 questions about the acceptance of the generative AI tools platform, which are based on the key variables of an extended TAM with appropriate configuration factors for the platform, and finally responses to the systems given in the Likert scale.

D. Ethical Considerations

The authors sought assistance from the Department of Education Schools Divisions Office of Manila in the validation of the research instrument and letter of consent to conduct research. This was also administered in selected senior high schools in six (6) districts of Manila with the help of both the public schools district supervisors (PSDS) and school heads.

E. Data Gathering Procedure

Participation in the study was voluntary and the completion of the questionnaire took place online via answering Google Forms prepared by the authors. In particular, one of the authors wrote the goals of the study while introducing the questionnaire to the participants. The process of filling out the evaluation lasted approximately 10-15 minutes.

F. Statistical Treatment

Data collected by the questionnaire were coded by the authors. The data were recorded first in an MS Excel program and later transferred to SPSS for analysis and visualization. Descriptive statistical analyses such as mean, standard deviation, frequency, percent, and correlation were implemented using both MS Excel and SPSS. Lastly, Structural equation modeling (SEM) was used to test the hypotheses.

3. RESULTS AND DISCUSSION

Table 1: Demographic Profile of the Sample

Variables	**Number (*N*)**	**Percentage (%)**
Age		
20-30	45	36.00
31-40	37	29.60
41-50	26	20.80
51 and above	17	13.60
Gender	Number (*N*)	Percentage (%)
Male	54	43.20
Female	71	56.80
Length of Service	Number (*N*)	Percentage (%)
5 years under	56	44.80
6-10 years	36	28.80

11-15 years	13	10.40
16-20 years	6	4.80
21-25 years	5	4.00
26-30 years	4	3.20
31 years and above	5	4.00
Highest Educational Attainment	Number (*N)*	Percentage (%)
Doctorate Degree	10	8.00
Master's Degree	50	40.00
Bachelor's Degree	65	52.00
Subjects Taught	Number (*N)*	Percentage (%)
Science	14	11.20
Mathematics	17	13.60
Physical Education and Health	14	11.20
Media and Information Literacy	9	7.20
Filipino	19	15.20
English	19	15.20
Research	14	11.20
Computer	19	15.20

As shown in table 1, the majority of the respondents are 45 or 36.00 percent were aged between 20 – 30 years senior high school teachers among the 125 respondents who are used as the subject of the study. As reflected in the data, most of the respondents were female with 71 or 56.80 percent. It can be noted that in terms of length of service, five (5) years under has the highest number equivalent to 44.80 percent or 56 of the total respondents. Furthermore, in terms of highest educational attainment, bachelor's degree was dominated with 65 or 52 percent. Meanwhile, Filipino, English and computer subjects got the greatest number or equivalent to 15.20 percent among the senior high school teachers subject taught.

Table 2: Computer and Internet-related skills.

Do you have computer access at home?	**Number (*N)***	**Percentage (%)**
Yes	116	92.80
No	9	7.20
Do you have Internet access at home?	Number (*N)*	Percentage (%)
Yes	125	100.00
No	0	0.00
Computer Skills	Number (*N)*	Percentage (%)
Not skilled	5	4.00
Beginner	7	5.60
Intermediate	55	44.00
Advanced	12	9.60
Expert	46	36.80
Internet Skills	Number (*N)*	Percentage (%)

Not skilled	5	4.00
Beginner	9	7.20
Intermediate	52	41.60
Advanced	48	38.40
Expert	11	8.80
Awareness on Generative AI Tools?	Number (*N)*	Percentage (%)
Yes	78	62.40
No	47	37.60
How often do you use Generative AI tool in your school?	Number (*N)*	Percentage (%)
Never	20	16.00
Occasionally	43	34.40
Frequently	25	20.00
Always	37	29.60
Chat GPT	Number (*N)*	Percentage (%)
Never heard of it	14	11.20
I heard it but I don't know how to use it	27	21.60
I know how to use it	58	46.40
I am very knowledgeable about it	26	20.80
Bing Chat	Number (*N)*	Percentage (%)
Never heard of it	36	28.80
I heard it but I don't know how to use it	42	33.60
I know how to use it	27	21.60
I am very knowledgeable about it	20	16.00
Google Bard	Number (*N)*	Percentage (%)
Never heard of it	63	50.40
I heard it but I don't know how to use it	42	33.60
I know how to use it	16	12.80
I am very knowledgeable about it	4	3.20

Table 2 manifests the respondents as to their computer and internet related skills. As manifested in the data, there are 116 or 92.80% have access to computer at home. Surprisingly, 125 or 100% of the respondents were able to access internet at home. Similarly, there were 55 or 44% of the respondents were intermediate users as to computer skills. Likewise in terms of internet skills 52 or 41.60% of the respondents were intermediate users.

It can also be gleaned that the awareness on Generative AI tools (Chat GPT, Bing Chat, GitHub CoPilot, Google Bard, etc), 78 or 62.40% were aware. Furthermore, there were 43 or 34.40% that Generative AI tool were used occasionally in the workplace or school. Finally, Chat GPT got the highest number of users in terms of technical know-how.

The internal reliability of the instrument was measured using Cronbach alpha of 0.985 among 125 senior high school teachers. Factor loading of each item was conducted after the data was transferred to IBM SPSS tool as a spreadsheet file.

Table 3: Factor loading and Cronbach Alpha results.

Item	Mean (μ)	SD (σ)	Factor Loading	Cronbach Alpha (α)	Item	Mean (μ)	SD (σ)	Factor Loading	Cronbach Alpha (α)
E1	3.45	1.103	0.803	0.984	A1	3.39	1.023	0.770	0.985
E2	3.38	1.113	0.775	0.985	A2	3.39	1.039	0.778	0.985
E3	3.34	1.107	0.821	0.984	A3	3.43	1.065	0.753	0.985
U1	3.31	1.103	0.796	0.985	SE1	3.30	1.047	0.830	0.984
U2	3.35	1.094	0.826	0.984	SE2	3.29	1.099	0.826	0.984
U3	3.35	1.116	0.818	0.984	SN1	3.26	1.069	0.720	0.985
B1	3.27	1.103	0.847	0.984	SN2	3.26	1.062	0.848	0.984
B2	3.29	1.069	0.829	0.984	SA1	3.23	1.108	0.776	0.985
B3	3.32	1.119	0.778	0.985	SA2	3.23	1.101	0.834	0.984

Table 3 shows the result of factor loading of constructs and internal validity of the instrument. Cronbach Alpha (a) values greater than 0.70 are deemed satisfactory. Interestingly, their coefficient alpha values are either 0.984 or 0.985, indicating internal consistency.

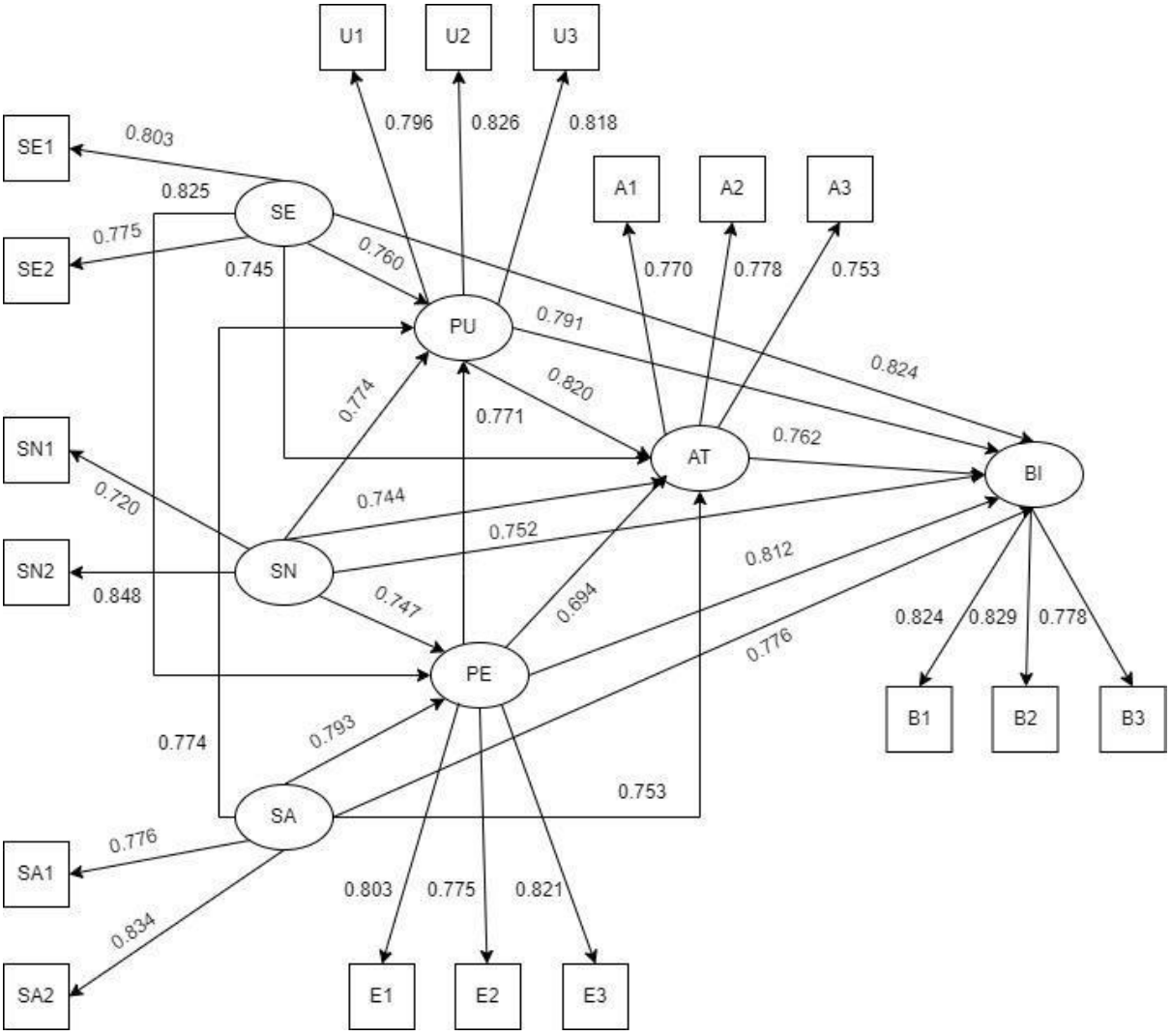

Fig.2 Factor loading, and Parameter estimates of the general structural model.

To build the model shown in Fig. 2, the bootstrapping procedure (two-tailed test) and an analysis of t-statistics values (significance level p 0.05 and t-statistics >1.96) were used. With regard to the data acquired, it was discovered that all of the relationships are statistically significant and have strong effects. Furthermore, self-efficacy (SE) has the highest of 0.824 coefficient value followed by the factor perceived ease of use (PE) of 0.812 indicating their influence on Bing Chat behavioural intention of use (BI), leaving attitude (AT) the lowest among five (5) factors with 0.762 coefficient value.

Table 4: Parameter Estimates and Results of Hypotheses.

Factor Relationship	**Direct Effect**	**p-value**	**Result of hypothesis**
AT → BI (H11)	0.762**	*0.000*	Supported
PU → BI (H12)	0.791**	*0.000*	Supported
PE → BI (H13)	0.812**	*0.000*	Supported
SE → BI (H14)	0.824**	*0.000*	Supported
SN → BI (H15)	0.752**	*0.000*	Supported
SA → BI (H16)	0.776**	*0.000*	Supported
PU → AT (H21)	0.820**	*0.000*	Supported
PE → AT (H22)	0.694**	*0.000*	Supported
SE → AT (H23)	0.745**	*0.000*	Supported
SN → AT (H24)	0.744**	*0.000*	Supported
SA → AT (H25)	0.753**	*0.000*	Supported
PE → PU (H31)	0.771**	*0.000*	Supported
SE → PU (H32)	0.760**	*0.000*	Supported
SN → PU (H33)	0.774**	*0.000*	Supported
SA → PU (H34)	0.774**	*0.000*	Supported
SE → PE (H41)	0.825**	*0.000*	Supported
SN → PE (H42)	0.747**	*0.000*	Supported
SA → PE (H43)	0.793**	*0.000*	Supported

* P-values less than 0.05 were italicized.

The results of both comparison and direct effects of each item obtained were summarized in Table 4. The four hypotheses were confirmed with their respective coefficient value of influence on another item. All hypotheses on the acceptability of Bing Chat tool have statistically significant effects and were supported. It can be gleaned from the table that the effects of all items were very strong, having a p-value of 0.000. The result does not represent that same outcome of each hypothesis found on the study of Park [12] and Revythi & Tselios [13] mainly due to their intervention medium was on e-Learning applications that was checked for acceptability.

4. CONCLUSIONS

This paper concluded that all factors in the research instrument were evidently statistically significant in the acceptability of the Bing Chat application. This implies that senior high teachers in Manila are much willing to abreast the idea of including generative AI tools in promoting their productivity in the workplace. Despite the fact that the authors followed the method for conducting an acceptability study, the results differed depending to the context of technology being observed.

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