JURNAL TEKNOLOGI DAN OPEN SOURCE
Vol. 8, No. 1, June 2025, pp. 1~15
e-ISSN: 2622-1659, accredited Four Grade by Kemenristekdikti, Decree No: 152/E/KPT/2023
DOI: 10.36378/jtos.v3xx

Implications of AI Technology on Higher Level Education Development in Batam

Eryc[1], William Nurdin Wijaya[2], Indasari Deu[3]
[1,2,3]Faculty of Computer Science, Universitas Internasional Batam, Batam, Indonesia

Article Info

Article history:

Received 12 15, 2024
Revised 01 16, 2025
Accepted 04 28, 2025

Keywords:

Artificial Intelligence
Higher Education
Students
Learning
Teaching

ABSTRACT

This study aims to analyze the impact of the application of artificial intelligence (AI) technology on the development of higher education in Batam. The study focuses on enhancing teaching, learning, and administration while addressing challenges like reduced human interaction and ethical dilemmas. Using a quantitative approach with the Cluster Disproportional Random Sampling method, data were collected from 331 students at various universities in Batam. The analysis technique used was PLS-SEM (Partial Least Squares - Structural Equation Modeling) to evaluate seven variables, including Perceived Risk, Performance Expectancy, Effort Expectancy, Facilitating Conditions, Attitude, Behavioral Intention, and AI in Higher Education. The results showed that Perceived Risk had no significant effect on Attitude, while Facilitating Conditions had a weak effect on Behavioral Intention due to students' independent access to AI technology. Ease of use, availability of resources, and performance expectations influenced students' attitudes and intentions in adopting AI. This study provides recommendations for providing supporting resources, educator training, and policies that support the integration of AI in higher education. Limitations of the study include uneven sample sizes and lack of demographic diversity. Further research is recommended to involve a larger sample and a qualitative approach to explore student and educator perceptions of AI.

Corresponding Author:

Eryc
Faculty of Computer Science
Universitas Internasional Batam
Batam, Indonesia
Email: eryc.yeo@gmail.com

1. Introduction

As technology expands, including advancements in Artificial Intelligence, it streamlines tasks for users [1]. AI systems with the capability to perceive, identify, acquire knowledge, respond and solve various problems [2]. It gathers information from different sources and systems, making decisions and learning from observed patterns [3]. Digitalization has brought fundamental changes across various sectors, accelerating access to information and significantly transforming business processes [4]. Technology has changed the way we interact, work, and innovate [5]. These innovations have the potential to revolutionize society with opportunities and challenges. Considering AI's effects on markets, ethics, global stability, and work is crucial. Organizations need to adjust capabilities and establish governance structures to effectively use AI

while safeguarding societal well-being. Integrating AI enhances decision-making processes, automates repetitive tasks, analyses data for insights, and provides personalized customer experiences. AI has made significant strides, not just in portraying AI and human-like traits through robots in fiction, but also by offering various industry-specific advantages [6]. This technological advancement has the potential to revolutionize innovation and bring about far-reaching implications across different fields. Digital platforms serve as crucial sources of data for AI applications, resulting in the emergence of specialized platforms dedicated to AI development. Voice-based service AI is just one example of how AI influences society and offers extensive business opportunities. The societal impact of AI cannot be underestimated as it opens up new possibilities for innovation and transformation. In the future, AI is expected to greatly improve efficiency, productivity, workflow, precision, uniformity, and dependability in the construction industry [7].

The future wave of innovation will be centered around AI technology or combinations of AI with other technological advancements, leading to innovative changes in classrooms[8]. The rapid development of technologies like AI, big data, cloud computing, and IoT has introduced smart devices and products to educational settings. Educators need to assess the current capabilities of AI and explore potential ways to enhance learning [2]. It has also given rise to online schools, educational websites, and specialized institutes focusing on AI education. AI is being increasingly used in universities, which brings both benefits and considerations. The progress of AI in the education sector relies on both economic and political factors, such as market conditions and policy support [9]. To empower students, it is important to create educational AI systems that can interact with them and help them surpass their current abilities [10]. Educators may find it challenging to adjust their responsibilities, but this shift also presents an opportunity for them to enhance their practices. Reliance on technology may lead to a reduced human connection between professors and students [11]. While AI algorithms can personalize learning experiences, they cannot fully replace the personal touch and individual attention of professors. While AI excels at analysing data, performing repetitive tasks, and making decisions within boundaries, humans stand out in areas such as creativity, emotional intelligence, knowledge sharing, and social interactions [12].

AI's role in education has been described in two main ways, 'Using AI for learning' and 'Studying AI' [10]. However, there are instances where AI is misused by individuals who fail to understand its capabilities. To enhance student capabilities, it is important to further develop educational AI that can exceed their current limitations [10]. This raises concerns about the impact of AI on education. To address this issue proactively and ensure a comprehensive understanding, it is crucial to assess not only the potential advantages but also the potential disadvantages that AI may bring to education [13]. AI in Education offers a critical perspective on the benefits and drawbacks of interacting with AI, as well as how this interaction can lead to personal growth and change [14]. This study seeks to explore and examine both sides, of how AI can positively transform education while also considering any drawbacks or challenges it may pose along the way. According to [15], his study conducted in various cities across India including Delhi, Kolkata, Mumbai, and Bengaluru. Each region has its own unique social and cultural attitudes toward technology, particularly AI. Therefore, it's important to also consider research conducted in Batam, Indonesia. It is as important to know how can AI be incorporated into higher education with the advantages and disadvantages. This is relevant not only for India but also for the specific context of Batam.

Batam is tasked with developing proficient and capable human resources, particularly in the technology sector [16]. Therefore, it is imperative to implement tangible measures to enhance the quality of education in Batam City, ensuring its alignment with technological advancements [17]. The objective of this study is to understand the implications that AI has on the education field in Batam. It aims to examine how AI can enhance teaching and learning processes, improve educational outcomes, and address challenges in the local context. All of that is to find out how can AI transform teaching and learning in higher education. Additionally, it seeks to explore the effects and outcomes of using AI in education by investigating its impact on students' learning experiences and academic achievements. With the rapid expansion of artificial intelligence, it is crucial to explore how educators can effectively leverage AI techniques to support students' academic achievements [2]. There are differing opinions on the impact of AI in education, some believe that it will negatively affect students, while others argue that it will bring positive advancements to the field [18]. All of this to get to know the way to utilize AI for greater use.

This research will explore how AI is affecting education in Batam and examine the potential benefits and challenges. This research will focus on how AI could help students in doing assignments by offering assistance in areas such as research and information gathering, grammar and style corrections, and assignment structuring. AI tools, such as writing assistants, also provide real-time feedback, enhancing student comprehension and enabling continuous improvements. These tools aid in research by automating literature reviews, offering citation suggestions, and supporting multilingual learning. Furthermore, AI-powered project management platforms can help students manage their time better by breaking down tasks and creating schedules. Additionally, AI fosters collaboration, offering real-time editing and suggestions,

which enhances group work productivity. Emphasizing the importance of being open, responsible, and having well-defined guidelines to address any potential issues [15], the implementation of AI has the potential to positively impact various individuals, including lecturers, teachers, schools, universities, and other educational institutions in Batam. AI made its way into educational institutions and has greatly influenced administrative tasks, teaching methods, and learning experiences [16]. By offering personalized learning paths and automating administrative tasks, AI supports both students and faculty in their educational endeavours. This would ensure that everyone involved directly or indirectly benefits from advancements of AI technology over time, as well as fostering increased government support for higher adoption rates of this innovation.

This research is based on [15]. It offers a thorough examination of the obstacles and advantages linked to incorporating artificial intelligence into Indian higher education. By applying a theoretical framework and the Unified Theory of Acceptance and Use of Technology, the research aims to explain what shapes AI adoption in this particular setting based on responses from 329 participants. The research results highlight the crucial role of performance expectancy, effort expectancy, and facilitating conditions as major factors affecting the acceptance of AI in higher education. These elements significantly shape stakeholders' attitudes and intentions toward integrating AI technologies into the educational system. Additionally, the study underscores the potential advantages of AI integration, including enabling timely and accurate decision-making and promoting knowledge exchange to enhance India's higher education system's intellectual well-being.

The paper also recognizes the difficulties and restrictions connected with implementing AI in higher education. It points out that AI utilization in this area is still relatively new in India, and the results are from non-adopters of AI. This means that the findings may not apply broadly, so the authors recommend more extensive future research that includes long-term data and additional factors. This method is seen as crucial for gaining a deeper understanding of AI integration in Indian higher education. The research offers important insights into the complexities of integrating AI in higher education, highlighting the significance of understanding the factors that affect AI adoption. It also opens up avenues for further exploration on the potential transformative effects of AI in Indian higher education. A key benefit of utilizing AI in Indonesia's education system is its capacity to deliver customized learning experiences [19]. Establishing ethical guidelines for the use of artificial intelligence in Indonesia's education system demands careful consideration and a comprehensive strategy [20].

There are some variables that used in this research,

a. Perceived Risk

Perceived risk in this research refers to the potential risks associated with using AI technology. It is well-known that AI can be quite risky, as applications incorporating AI may access and potentially collect personal data. Consumers may perceive a level of uncertainty or lack of trust in a new technology-based product or service due to its ambiguity or limited credibility [21]. This can be particularly true for emerging technologies like artificial intelligence, which are still being widely researched and developed. Obstacles like perceived risks are slowing down the adoption process and keeping the rate of acceptance relatively low [22].

b. Performance Expectancy

In this research context, Performance Expectancy refers to the perceived effectiveness of AI in the education field. AI has been recognized for its ability to generate ideas and provide answers to questions. ChatGPT's ability to communicate in multiple languages enhances its accessibility for a diverse user base. Furthermore, its language capabilities contribute to expanding its potential impact and reach across different regions and cultures [23]. Performance expectancy refers to the value and advantages a technology provides, helping users complete their tasks more effectively [24]. Performance Expectancy plays a key role in influencing someone's willingness to use a mobile app, as it reflects the benefits and usefulness they anticipate from using it [25]. Performance Expectancy refers to a consumer's belief that a technology is valuable and offers practical benefits in its use [26].

c. Effort Expectancy

In the context of this research, Effort Expectancy refers to people's expectations regarding the use of AI. This involves considering the challenges associated with using AI and how AI has the potential to provide solutions for their problems. Consumers are inclined to adopt applications that deliver substantial benefits and are straightforward to operate [27]. Additionally, it is important to acknowledge that user expectations play a crucial role in determining the success of data science projects, as studies have shown a strong impact on IT project outcomes. Therefore, active management of future users' expectations is recommended to promote accurate understanding and realistic outlooks on performance outcomes when utilizing AI-based assistance systems. The belief that AI has broad applicability and can serve as a solution to almost any problem is closely aligned with the optimistic outlook on the development of AGI (Artificial General Intelligence) [28].

d. Facilitating Conditions

AI is currently one of the emerging technologies that individuals are utilizing. It suggests that universities with higher ranks are more inclined to implement this generative tool, like ChatGPT [29]. If an institution grants access to AI, there is a potential for individuals to be motivated to explore its utilization. This can particularly apply in the field of education where people may be inclined to explore and incorporate AI technology. Facilitating conditions encompass consumers' perceptions of the ease with which essential resources and support can be accessed to enable the adoption and effective utilization of a technology [30].

e. Attitude

In this context, people's Attitudes towards AI can vary. Some may view AI as complex or difficult to understand, while others may recognize the value in learning about and embracing AI technology. Attitudes are described as a person's general judgment or opinion about something, shaped by their thoughts (cognitive), feelings (affective), and actions or experiences (behavioral) [31]. Attitudes towards AI have the potential to vary significantly across different domains of experience, such as private homes, financial markets, and healthcare. The limitless possibilities of AI contribute to this variation in attitudes [32].

f. Behavioural Intention

This research focuses on the Behavioural Intentions of individuals toward AI, exploring whether they have a positive or negative behaviour toward this technology. Behavioural Intentions can be said the psychological intensity of an individual's involvement in the decision-making process of behaviour choice [33]. The behaviours of individuals towards AI-based technologies need to be further studied to understand their true benefits and reliance on these technologies. Behavioral intention describes an individual's perception of their willingness to engage in a particular action in the future [31].

g. AI in Higher Education

AI has become increasingly prevalent in college classrooms and is often utilized by students as a resource for tasks such as generating references or completing assignments. Its role in supporting student learning and facilitating academic tasks has been widely recognized. Out of the universities that have policies regarding ChatGPT, around 67.4% adopted its use for teaching and learning purposes, which is more than double the number of universities that restricted its usage [29].

People generally consider risk as a factor that influences their decision-making. AI often involves collecting data and compromising privacy in order to function effectively, which raises concerns about potential misuse of the data or security breaches. In addition, the performance and usability of AI also play a role in people's willingness to adopt it for daily use. If AI can enhance routine tasks while being user-friendly, then individuals are more likely to embrace the technology. Currently, despite the impressive performance of AI and its ease of use, not all places have embraced this new technology equally. Accessibility constraints may deter people from using AI if it is not readily available or permitted for use. However, there are many free-to-use AIs available even though they may come with limited features compared to paid versions. Overall, these factors influence how people perceive and engage with AI in their daily lives including within Higher Education systems. In the context of higher education, the implementation and adoption of AI technology are significantly influenced by several factors.

2. Research Method

2.1 Method Description

To carry out this research, it is important to use a selected quantitative method approach. Quantitative research involves using statistical methods or measurements to produce findings [34]. This approach is chosen because it aims to test existing theories or hypotheses using data and quantitative analysis. This method can provide more objective results and can be relied upon as the foundation of the research. Quantitative methods provide a precise and objective approach to collecting and analyzing data, ensuring reliable research results [35]. By using standardized methods and numerical measurements, researchers can minimize subjectivity and bias, thereby improving the reliability and accuracy of their results [36]. Additionally, adopting quantitative methods allows for large-scale data collection, enabling representative and significant results to be obtained.

2.2 Research Design

In this study, the research design used was a survey. A survey was chosen because it allows for data collection from a large population with a significant number of respondents. The purpose of this research is to understand the implications of AI in higher education, which requires gathering a substantial amount of data to obtain accurate results. Surveys are typically used to gather information about a group to draw reliable conclusions about that population [37].

2.3 Population and Sample

This study focuses on higher education in Indonesia, specifically targeting college students. The population of college students in Batam for 2024 is not available. Therefore, the researcher obtained a sample of 330 respondents using the Hair et al. formula [38]. The method used for this study is Cluster Disproportional Random Sampling due to its efficiency in collecting large amounts of data within a reasonable timeframe.

2.4 Instrument and Collecting Data

By adopting a quantitative research method and using a survey design, the questionnaire was chosen as the instrument. The questionnaire provides respondents with short questions and effective multiple-choice answers [39]. The questionnaire was created using Google Forms.

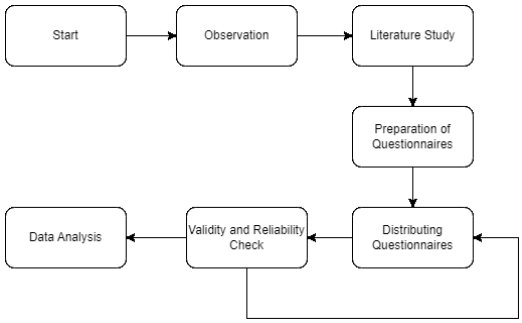

Figure 1. Data Gathering Flow

2.5 Data Analysis

The data analysis used in this study is PLS-SEM. In the PLS-SEM method, there is no assumption that the data needs to be normally distributed or have a large sample size [40]. This study references previous research conducted by [15]. With seven variables, namely Perceived Risk, Performance Expectancy, Effort Expectancy, Facilitating Conditions, Attitude, Behavioural Intention, and AI in Higher Education. The key benefit of PLS-SEM is that it allows researchers to analyze complex models with many components and relationships, even when the data doesn't follow standard distribution rules [41].

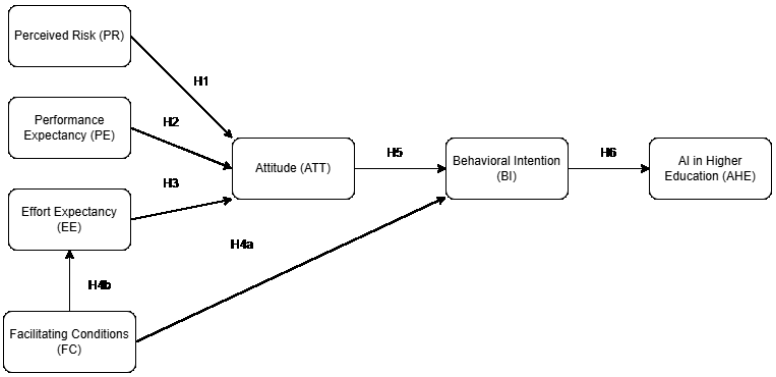

Figure 2. Research Model

Based on the diagram, six hypotheses can be defined.

1. **H1**: Perceived Risk (PR) has a negative and significant influence on the users Attitude (ATT) towards AI in Higher Education.
2. **H2**: Performance Expectancy (PE) has a positive and significant impact on Attitude (ATT) of users in AI in Higher Education.
3. **H3**: Effort Expectancy (EE) has significant and positive influence on Attitude (ATT) towards AI in Higher Education.
4. **H4a**: Facilitating Conditions (FC) have positive and significant impact on Behavioural Intention (BI) of the users in AI in Higher Education
5. **H4b**: Facilitating Conditions (FC) has positive and significant impact on Effort Expectancy (EE)
6. **H5**: Attitude (ATT) of individuals in AI in Higher Education positively and significantly impacts on the Behavioural Intention (BI) of users

7. **H6**: Behavioural Intention (BI) of users to Adopt AI in Higher Education positively and significantly impacts on the AI in Higher Education (AHE).

Table 1. Measurement Items Table

No	Variables	Measurement Items	Source
1.	Perceived Risk	1. I believe AI-powered educational content is not always correct 2. I feel that the use of AI in campus administration processes may lead to inaccurate decisions or data errors. 3. I feel that the use of AI in campus services could potentially reduce my privacy. 4. Use of AI technology for answering lecturer query is risky	[15]
2.	Performance Expectancy	1. believe AI applications can improve the accuracy of campus administrative services related to students. 2. AI powered learning activity will enhance the efficiency of higher education system 3. Using educational content prepared by AI technology is useful 4. Using AI powered chatbot technology I can get accurate answer 5. Smart educational content can be learn using AI technology	[15]
3.	Effort Expectancy	1. AI technology is not easy to learn 2. I need to put a lot of effort to learn AI technology 3. If I know the basic AI technology, I can easily learn AI based applications 4. Individualized content can be learn using AI-technology	[15]
4.	Facilitating Conditions	1. My institute has all the necessary resources to use AI technology for smart content creation 2. I can have all the required resources from AI to smart content learning 3. My institute sponsor any AI related learning opportunity 4. All the classrooms of my institute are equipped with necessary devices for using AI technology for learning purpose 5. My institute encourages its student to use modern technology	[15]
5.	Attitude	1. I can learn AI technology quickly 2. AI technology is useful for learning activities 3. Using AI technology for query answering is a good idea 4. People should learn AI technology for the future need of the higher education sector 5. AI technology can cater the individual needs more accurately	[15]
6.	Behavioural Intention	1. I am willing to use AI technology for smart content learning 2. I believe AI technology could be used for answering lecturer query 3. I shall recommend all my friend to explore AI technology for their learning purpose 4. I intend to use AI technology for learning purpose by next couple of years.	[15]
7.	AI in Higher Education	1. Application of AI in higher education is good for society 2. Application of AI in higher education will make education more interactive 3. Application of AI in higher education will make it cost effective	[15]

		4. Application of AI in higher education will make the learning activity more interesting	

3.6 Validity and Reliability

Using the quantitative method yields a result in terms of validity and reliability. To determine good validity values, three criteria can be observed: Loading Factor > 0.708, Average Variance Extracted > 0.5, and Discriminant Validity when the AVE value is greater than its correlation [42]. A Composite Reliability (CR) value exceeding 0.70 is generally regarded as satisfactory, indicating an acceptable level of consistency and reliability in the measurement model [43]. Cronbach's Alpha, representing reliability, is regarded as sufficient when it falls within the 0.60 to 0.80 range, indicating a moderate but satisfactory level [44]. A commonly accepted guideline is that a Cronbach's Alpha between 0.6 and 0.7 reflects an acceptable level of reliability, while values of 0.8 or above indicate a very good level. On the other hand, values exceeding 0.95 may not be ideal, as they could suggest redundancy [45].

3 Result and Discussion

In this study, a total of 331 sample data were collected from university students in Batam, utilizing the Hair er al formula for sampling. When the population size is unknown, the sample size can be determined by multiplying the total number of questions by a factor of 10 [38]. With a total of 33 questions, the minimum required sample size is calculated to be 330 respondents. The sample included students from seven universities: Universitas Internasional Batam, Universitas Putera Batam, Politeknik Negeri Batam, Institut Teknologi Batam, Universitas Universal, Universitas Batam, Universitas Riau Kepulauan.

Table 2. Demographic Table

No	Instruments		Total	Percents
1	Universities	Universitas Internasional Batam	206	62.2%
		Universitas Putera Batam	22	6.6%
		Politeknik Negeri Batam	27	8.2%
		Institut Teknologi Batam	21	6.3%
		Universitas Universal	19	5.7%
		Universitas Batam	17	5.1%
		Universitas Riau Kepulauan	19	5.7%
2	Semester	Semester 1-2	27	8.2%
		Semester 3-4	92	27.8%
		Semester 5-7	182	55%
		Semester >7	30	9.1%

3.1 Reliability

To assess the reliability of the variables, this study utilizes Cronbach's Alpha as the primary indicator.

Table 3. Reliability Table

Variables	Cronbach's Alpha
AHE	**0.796**
ATT	**0.805**
BI	**0.829**
EE	**0.780**
FC	**0.879**
PE	**0.810**
PR	**0.783**

All variables are considered reliable, as their Cronbach's Alpha values exceed 0.7. Cronbach's Alpha between 0.6 and 0.7 indicates acceptable reliability, 0.8 or higher signifies good reliability, while values above 0.95 may suggest redundancy.

3.2 Outer Model

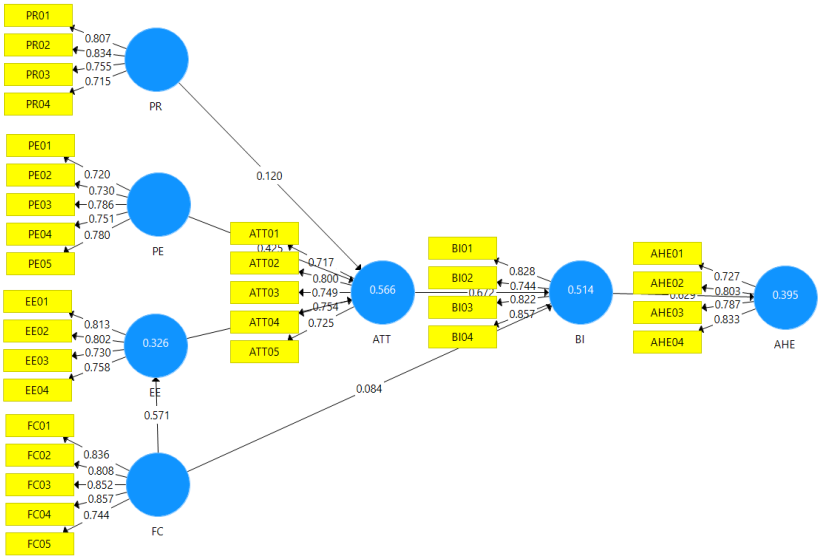

Figure 3. Outer Model

Using Smart PLS 3 software, researcher analyses and interpret the data gathered for the Outer Model test. This paper will utilize the Loading Factor, Composite Reliability, Average Variance Extracted, and Discriminant Validity as indicators of the outer model to assess the validity of the variables.

A. Loading Factor (LF)

Table 4. Loading Factor Table

	AHE	ATT	BI	EE	FC	PE	PR
AHE01	**0.727**						
AHE02	**0.803**						
AHE03	**0.787**						
AHE04	**0.833**						
ATT01		**0.717**					
ATT02		**0.800**					
ATT03		**0.749**					
ATT04		**0.754**					
ATT05		**0.725**					
BI01			**0.828**				
BI02			**0.744**				
BI03			**0.822**				
BI04			**0.857**				
EE01				**0.813**			
EE02				**0.802**			
EE03				**0.730**			
EE04				**0.758**			
FC01					**0.836**		
FC02					**0.808**		
FC03					**0.852**		

FC04					**0.857**		
FC05					**0.744**		
PE01						**0.720**	
PE02						**0.730**	
PE03						**0.786**	
PE04						**0.751**	
PE05						**0.780**	
PR01							**0.807**
PR02							**0.834**
PR03							**0.755**
PR04							**0.715**

B. Composite Reliability (CR)

Table 5. Composite Reliability Table

Variables	Composite Reliability
AHE	**0.868**
ATT	**0.865**
BI	**0.887**
EE	**0.858**
FC	**0.911**
PE	**0.868**
PR	**0.860**

C. Average Variance Extracted (AVE)

Table 6. Average Variance Extracted

Variables	Average Variance Extracted (AVE)
AHE	**0.622**
ATT	**0.562**
BI	**0.662**
EE	**0.603**
FC	**0.673**
PE	**0.568**
PR	**0.607**

D. Discriminant Validity

Discriminant validity, as assessed through the Fornell-Larcker criterion, requires that the square root of the Average Variance Extracted (AVE) for each construct exceeds the correlations between that construct and all other constructs within the model [46].

Table 7. Fornell-Larcker Table

	AHE	ATT	BI	EE	FC	PE	PR
AHE	0.789						
ATT	0.730	0.749					
BI	0.629	0.713	0.814				
EE	0.643	0.653	0.560	0.777			
FC	0.536	0.494	0.415	0.571	0.820		
PE	0.687	0.704	0.676	0.660	0.530	0.754	

PR	0.576	0.596	0.539	0.620	0.488	0.684	0.779

4.3. Inner Model

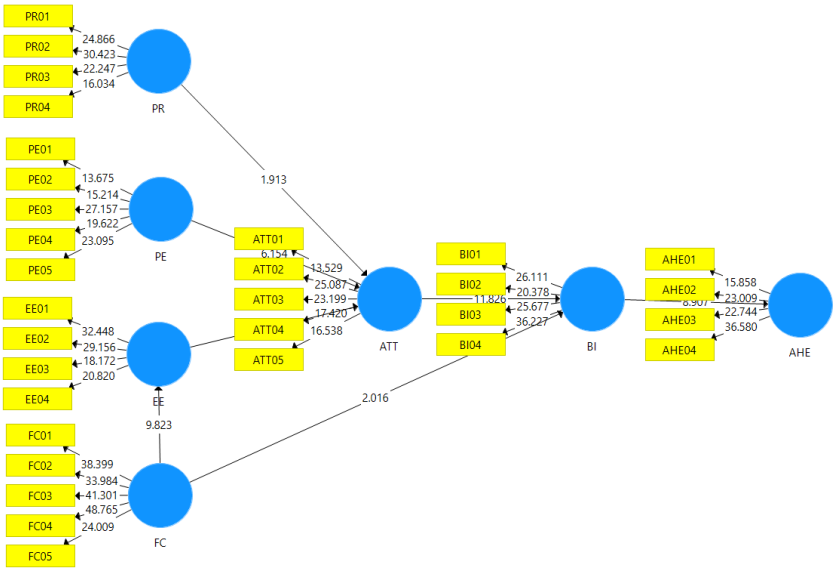

Figure 4. Outer Model Bootstrapping

A. Path Coefficient

The concept of the p-value was introduced by Ronald A. Fisher, who also established the 0.05 threshold as a widely accepted criterion for determining statistical significance in hypothesis testing [47]. This threshold has since become a common standard in many fields, helping researchers assess whether their results are statistically significant and unlikely to have occurred by chance.

Table 8. Path Cofficient Table

	P Values
ATT -> BI	**0.000**
BI -> AHE	**0.000**
EE -> ATT	**0.000**
FC -> BI	**0.044**
FC -> EE	**0.000**
PE -> ATT	**0.000**
PR -> ATT	**0.056**

1. **H1**: The Effect of Perceived Risk (PR) towards Attitude (ATT)
   The findings of the study indicate that Perceived Risk (PR) does not have a negative significant impact on Attitude, as evidenced by a p-value of 0.056, which is higher than the 0.05 threshold for statistical significance. The results also suggest that students view Artificial Intelligence (AI) as a tool that, despite its advancements, may still produce outcomes with some uncertainty. However, this perception does not significantly influence their attitude toward AI. Consequently, the hypothesis is not supported, as the findings demonstrate that there is no significant relationship between Perceived Risk (PR) and Attitude, based on the statistical evidence provided.

2. **H2**: The Effect of Performance Expectancy (PE) towards Attitude (ATT)

The p-value of 0 indicates that Performance Expectancy (PE) has a significant impact on Attitude (ATT), providing strong evidence that changes in Performance Expectancy are closely related to changes in Attitude. With a p-value of 0, it is highly unlikely that this relationship is due to chance, confirming the importance of Performance Expectancy in influencing Attitude. This finding suggests that students perceive the use of AI as highly beneficial for educational purposes, as it supports and enhances the learning process. This happens because if AI is perceived as lacking practical value or not providing significant benefits, students may decide to discontinue using it, as they would not find it useful or beneficial in their academic or daily activities.

3. **H3**: The Effect of Effort Expectancy (EE) towards Attitude (ATT)
   The p-value of 0 demonstrates that Effort Expectancy (EE) has a significant effect on Attitude (ATT), indicating that students attitudes toward AI are significantly influenced by their perception of its ease of use. This finding suggests that a more favorable attitude toward AI is associated with a greater perception of its ease of use. When AI is perceived as difficult to use or overly complex, students may decide to stop using it. If the technology proves challenging to navigate or lacks user-friendliness, students might determine that it doesn't provide enough value or convenience, leading them to abandon it in favor of simpler, more effective alternatives.

4. **H4a**: The Effect of Facilitating Conditions (FC) towards Behavioural Intention (BI)
   A p-value of 0.044 suggests that Facilitating Conditions (FC) influence Behavioural Intention (BI). However, since the p-value is close to 0.050, the evidence is insufficient to confirm a statistically significant relationship, indicating the possibility that this connection may be due to chance. The relationship may not be significant because individuals might place more emphasis on other factors, rather than prioritizing the role of facilities, when forming their behavior or intentions toward AI technology. Despite the easy access to AI provided by educational institutions, it does not entirely determine student behavior. This can be attributed to the widespread availability of AI technology on personal devices, which allows students to access it independently of institutional resources.

5. **H4b**: The Effect of Facilitating Conditions (FC) towards Effort Expectancy (EE)
   The p-value of 0 indicates that Facilitating Conditions (FC) strongly affect Effort Expectancy (EE), showing that students perceptions of the ease of using AI are heavily influenced by the availability of supportive resources. This implies that a higher level of support and resources is associated with a greater perception of AI being easy to use. The ease of using AI is not solely influenced by the available facilities. It is primarily determined by the functionality of the technology itself. If the AI system is inherently complex or difficult to navigate, it remains challenging to use, regardless of the supporting infrastructure.

6. **H5**: The Effect of Attitude (ATT) towards Behavioural Intention (BI)
   A p-value of 0 demonstrates that Attitude (ATT) has a significant impact on Behavioural Intention (BI), indicating that students' intentions to use AI are strongly shaped by their overall perception of it. This suggests that a more positive attitude toward AI corresponds to a stronger intention to engage with it. When students hold a positive attitude toward using AI, they are more likely to engage with it in a constructive manner and demonstrate favorable behavior towards its use. In contrast, if students have a negative perception of AI, they are less likely to interact with it effectively or use it to its full potential.

7. **H6**: The Effect of Behavioural Intention (BI) towards AI in Higher Education (AHE)
   A p-value of 0 indicates that Behavioural Intention (BI) significantly influences AI in Higher Education (AHE), suggesting that students' willingness to adopt AI is largely driven by their intentions. This implies that stronger intentions to use AI are linked to greater integration of AI in their educational experiences.
   Whether students exhibit positive or negative behavior toward AI, it will significantly impact its role and integration within higher education. Positive engagement with AI can enhance learning experiences and academic outcomes, while negative attitudes or reluctance to adopt the technology may hinder its potential benefits in educational settings. The overall acceptance or rejection of AI by students will therefore influence its effectiveness and adoption in the academic environment.

B. R Squared

The value ranges from 0 to 1, showing how much of the data's variation is explained by the model [48]. However, it is not possible to set a fixed value as a threshold, because this depends on the subject being studied and the complexity of the model [48]. For example, an R^2 value of 0.20 might be seen as significant in certain fields but considered weak in others, depending on the expectations and standards of each discipline [49]. Effect size interpretation guidelines state that a value below 0.02 indicates no effect, values between 0.02 and 0.15 indicate a small effect, values from 0.15 to 0.35 represent a moderate effect, and values greater than 0.35 signify a large effect [50].

Table 9. R Squared

	R Square	R Square Adjusted
AHE	0.395	0.393
ATT	0.566	0.562
BI	0.514	0.511
EE	0.326	0.324

The R^2 values for all variables, namely AI in Higher Education (AHE), Attitude (ATT), Behavioral Intention (BI), and Effort Expectancy (EE), exceed 0.35, demonstrating a significant and substantial effect.

C. Q Squared

To assess how relevant a model is at predicting a dependent variable, researchers use Stone-Geisser's Q^2 statistic [48]. This tool measures the model's ability to predict the outcomes of a specific variable effectively [48]. The threshold values of 0.02, 0.15, and 0.35 indicate small, medium, and large levels of predictive relevance for a specific endogenous latent construct [50].

Table 10. Q Sqaured

	Q^2 (=1-SSE/SSO)
AHE	0.235
ATT	0.308
BI	0.332
EE	0.194
FC	-
PE	-
PR	-

The Q^2 results indicate that all variables, including AI in Higher Education (AHE), Attitude (ATT), Behavioral Intention (BI), and Effort Expectancy (EE), exhibit medium predictive relevance. This is because their values fall between 0.02 and 0.35.

4 Conclusion

Artificial Intelligence (AI) is transforming industries by automating repetitive tasks, enhancing decision-making, and providing personalized experiences, including in education. It introduces tools like online platforms, voice-based services, and smart devices that optimize teaching and learning processes. While AI can analyze data and adapt learning experiences, it cannot replace the creativity, emotional intelligence, and personalized attention of educators. These advancements bring both opportunities for innovation and challenges in maintaining human connections and addressing ethical concerns, especially as reliance on technology grows. The findings aim to guide educators in leveraging AI effectively to support students' achievements and foster innovation in education. As AI continues to expand globally, balancing its advantages with ethical and social considerations will be essential for its sustainable integration into education.

In this study, it shows that the risk of using AI does not give an impact toward the attitude of the students. The findings suggest that students recognize Artificial Intelligence (AI) as a useful technology but acknowledge its potential to deliver flawed or inconsistent results despite its advancements. Looking at it from the facilities' perspective, it becomes clear that while facilities do have some influence on how

students interact with and perceive AI, their overall impact on student behavior is minimal and not particularly significant. This minimal impact may be because students tend to prioritize other factors over the role of facilities. Apart from those two aspects, it highlights how AI's performance is influencing students' perceptions of the technology. In addition to its performance, the complexity of using AI is another factor influencing how students respond to it. The ease of using AI is greatly influenced by the resources students possess, including their access to proper tools and technological support. From the attitude perspective, it demonstrates that students attitudes significantly impact their behavior. This suggests that their perspectives strongly influence how they interact with and respond to AI. Lastly, students' behavior toward AI significantly impacts their overall experience and utilization of the technology in higher education. This behavior serves as a critical factor in determining how effectively AI is integrated into their academic activities and learning processes. Universities could support learning activities by integrating AI through teaching effective usage, offering insights into its applications, and providing tools for students, starting with small-scale initiatives.

This study has several limitations that could provide important insights and serve as a foundation for consideration in future research endeavors. First, this study only includes a limited number of universities in Batam, making it insufficient to fully represent the entire higher education landscape in the region. Second, the distribution of respondents is predominantly from a single university, which means the findings of this study are more reflective of that particular institution rather than representing a broader cross-section of universities. Third, the demographic information provided in this study lacks detailed variation. Future research could benefit from incorporating a more diverse range of demographic factors that are better aligned with the objectives of the study. Fourth, employing alternative methods, such as qualitative research, could provide a deeper understanding of the current state of AI in Higher Education. A qualitative approach may offer richer, more detailed insights by capturing individual perspectives and reasoning, which can help to better explain the underlying factors influencing AI adoption and use.

References

[1] Y. Minghai, L. Wenqing, W. Akbar Khan, A. Kasture, and S. Riasat, "Supercharge Your Productivity with Artificial Intelligent," *Bincang Sains dan Teknologi*, vol. 2, no. 02, pp. 72–81, Jun. 2023, doi: 10.56741/bst.v2i02.359.

[2] X. Zhai *et al.*, "A Review of Artificial Intelligence (AI) in Education from 2010 to 2020," 2021, *Hindawi Limited*. doi: 10.1155/2021/8812542.

[3] H. Hassani, E. S. Silva, S. Unger, M. TajMazinani, and S. Mac Feely, "Artificial Intelligence (AI) or Intelligence Augmentation (IA): What Is the Future?," *AI (Switzerland)*, vol. 1, no. 2, Jun. 2020, doi: 10.3390/ai1020008.

[4] E. Eryc and Cindy, "ADOPTION OF ECO-INNOVATION AND DIGITALIZATION INFLUENCE ON THE BUSINESS PERFORMANCE OF UMKM IN BATAM CITY," *Jurnal Teknologi Informasi dan Komunikasi*, vol. 14, no. 1, pp. 67–77, 2023, [Online]. Available: http://ejurnal.provisi.ac.id/index.php/JTIKP

[5] E. Eryc, "Systematic Literature Review of Critical Success Factors in Online Advertising," *JOURNAL OF INFORMATICS AND TELECOMMUNICATION ENGINEERING*, vol. 5, no. 2, pp. 551–561, Jan. 2022, doi: 10.31289/jite.v5i2.6204.

[6] F. Tahiru, "AI in education: A systematic literature review," Jan. 01, 2021, *IGI Global*. doi: 10.4018/JCIT.2021010101.

[7] M. Regona, T. Yigitcanlar, B. Xia, and R. Y. M. Li, "Opportunities and Adoption Challenges of AI in the Construction Industry: A PRISMA Review," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 8, no. 1, Mar. 2022, doi: 10.3390/joitmc8010045.

[8] S. Vincent-Lancrin and R. Van Der Vlies, "Trustworthy artificial intelligence (AI) in education: Promises and challenges," 2020, doi: 10.1787/a6c90fa9-en.

[9] B. Williamson, "The Social life of AI in Education," 2023, *Springer*. doi: 10.1007/s40593-023-00342-5.

[10] J. Kim, H. Lee, and Y. H. Cho, "Learning design to support student-AI collaboration: perspectives of leading teachers for AI in education," *Educ Inf Technol (Dordr)*, vol. 27, no. 5, pp. 6069–6104, Jun. 2022, doi: 10.1007/s10639-021-10831-6.

[11] L. Chen, P. Chen, and Z. Lin, "Artificial Intelligence in Education: A Review," *IEEE Access*, vol. 8, pp. 75264–75278, 2020, doi: 10.1109/ACCESS.2020.2988510.

[12] D. Long and B. Magerko, “What is AI Literacy? Competencies and Design Considerations,” in *Conference on Human Factors in Computing Systems - Proceedings*, Association for Computing Machinery, Apr. 2020. doi: 10.1145/3313831.3376727.
[13] D. Aggarwal, “Exploring the Scope of Artificial Intelligence (AI) for Lifelong Education through Personalised & Adaptive Learning,” *Journal of Artificial Intelligence, Machine Learning and Neural Network*, no. 41, pp. 21–26, Nov. 2023, doi: 10.55529/jaimlnn.41.21.26.
[14] W. Holmes *et al.*, “Ethics of AI in Education: Towards a Community-Wide Framework,” *Int J Artif Intell Educ*, vol. 32, no. 3, pp. 504–526, Sep. 2022, doi: 10.1007/s40593-021-00239-1.
[15] S. Chatterjee and K. K. Bhattacharjee, “Adoption of artificial intelligence in higher education: a quantitative analysis using structural equation modelling,” *Educ Inf Technol (Dordr)*, vol. 25, no. 5, pp. 3443–3463, Sep. 2020, doi: 10.1007/s10639-020-10159-7.
[16] M. Y. M. S. K. Aswirawan and A. Lawi, “Exploring the English Language Skills Needed at Engineering Companies,” *International Journal of Education, Science, Technology, and Engineering (IJESTE)*, vol. 5, no. 1, pp. 1–14, Jun. 2022, doi: 10.36079/lamintang.ijeste-0501.344.
[17] A. Lawi *et al.*, “PENINGKATAN KUALITAS PEMBELAJARAN MELALUI METODE PENGAJARAN BERBASIS TEKNOLOGI INTERAKTIF: PELATIHAN UNTUK GURU-GURU DI KOTA BATAM,” *MINDA BAHARU*, vol. 7, no. 2, pp. 310–324, Dec. 2023, doi: 10.33373/jmb.v7i2.5833.
[18] Dr. P. C and Dr. Rama. C, “A Study of Artificial Intelligence in Education System & Role of AI in Indian Education Sector,” *INTERANTIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT*, vol. 06, no. 03, Mar. 2022, doi: 10.55041/IJSREM11854.
[19] G. Yulianti, B. Bernardi, N. Permana, and F. A. K. W. Wijayanti, “Transformasi Pendidikan Indonesia: Menerapkan Potensi Kecerdasan Buatan (AI),” *Journal of Information Systems and Management (JISMA)*, vol. 2, no. 6, pp. 102–106, 2023.
[20] I. B, A. N. Thamrin, and A. Milani, “Implementasi Etika Penggunaan Kecerdasan Buatan (AI) dalam Sistem Pendidikan dan Analisis Pembelajaran di Indonesia,” *Digital Transformation Technology*, vol. 4, no. 1, pp. 714–723, Aug. 2024, doi: 10.47709/digitech.v4i1.4512.
[21] A. O. Mathew, A. N. Jha, A. K. Lingappa, and P. Sinha, “Attitude towards drone food delivery services—role of innovativeness, perceived risk, and green image,” *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 7, no. 2, 2021, doi: 10.3390/joitmc7020144.
[22] R. Hasan, R. Shams, and M. Rahman, “Consumer trust and perceived risk for voice-controlled artificial intelligence: The case of Siri,” *J Bus Res*, vol. 131, pp. 591–597, Jul. 2021, doi: 10.1016/j.jbusres.2020.12.012.
[23] K. Y. Thakkar and N. Jagdishbhai, “Exploring the capabilities and limitations of GPT and Chat GPT in natural language processing,” *Journal of Management Research and Analysis*, vol. 10, no. 1, pp. 18–20, Apr. 2023, doi: 10.18231/j.jmra.2023.004.
[24] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, “User Acceptance of Information Technology: Toward a Unified View,” *MIS Quarterly*, vol. 27, no. 3, pp. 425–478, 2003, doi: 10.2307/30036540.
[25] N. Rizkalla, H. Tannady, and R. Bernando, “Analysis of the influence of performance expectancy, effort expectancy, social influence, and attitude toward behavior on intention to adopt live.on,” *Multidisciplinary Reviews*, vol. 6, no. Special Issue, 2023, doi: 10.31893/multirev.2023spe017.
[26] P. Thusi and D. K. Maduku, “South African millennials’ acceptance and use of retail mobile banking apps: An integrated perspective,” *Comput Human Behav*, vol. 111, Oct. 2020, doi: 10.1016/j.chb.2020.106405.
[27] F. D. Davis, “Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology,” *MIS Quarterly*, vol. 13, no. 3, pp. 319–340, 1989, doi: 10.2307/249008.
[28] J. S. Brennen, P. N. Howard, and R. K. Nielsen, “What to expect when you’re expecting robots: Futures, expectations, and pseudo-artificial general intelligence in UK news,” *Journalism*, vol. 23, no. 1, pp. 22–38, Jan. 2022, doi: 10.1177/1464884920947535.
[29] P. Xiao, Y. Chen, and W. Bao, “Waiting, Banning, and Embracing: An Empirical Analysis of Adapting Policies for Generative AI in Higher Education.” [Online]. Available: https://www.celt.iastate.edu/resources/ai-teach-learn/
[30] V. Venkatesh, S. A. Brown, L. M. Maruping, and H. Bala, “Predicting Different Conceptualizations of System Use: The Competing Roles of Behavioral Intention, Facilitating Conditions, and Behavioral Expectation,” 2008.
[31] G. Maio and G. Haddock, *The Psychology of Attitudes and Attitude Change*. London: SAGE Publications Ltd, 2010. doi: 10.4135/9781446214299.

[32] L. Hadlington, J. Binder, S. Gardner, M. Karanika-Murray, and S. Knight, "The use of artificial intelligence in a military context: development of the attitudes toward AI in defense (AAID) scale," *Front Psychol*, vol. 14, 2023, doi: 10.3389/fpsyg.2023.1164810.
[33] S. M. Wang, Y. K. Huang, and C. C. Wang, "A Model of Consumer Perception and Behavioral Intention for AI Service," in *ACM International Conference Proceeding Series*, Association for Computing Machinery, Apr. 2020, pp. 196–201. doi: 10.1145/3396743.3396791.
[34] N. V. C. Saputri, D. K. B. Surbakti, A. D. Tarmizi, B. Supriatno, and S. Anggraeni, "Desain Eksperimen Fotosintesis Pengaruh Suhu Bermuatan Literasi Kuantitatif," *Jurnal Basicedu*, vol. 6, no. 4, pp. 7608–7618, Jun. 2022, doi: 10.31004/basicedu.v6i4.3482.
[35] M. Munther, M. Zyoud, R. Tahani, T. Bsharat, and K. Dweikat, "Quantitative Research Methods: Maximizing Benefits, Addressing Limitations, and Advancing Methodological Frontiers," vol. II, pp. 11–14, Apr. 2024, doi: 10.5281/zenodo.10939470.
[36] E. G. Carmines and R. A. Zeller, "Reliability and Validity Assessment," 1979. [Online]. Available: https://api.semanticscholar.org/CorpusID:61813512
[37] J. Calder, "Survey research methods."
[38] J. Hair, W. Black, B. Babin, and R. Anderson, *Multivariate Data Analysis: A Global Perspective*. 2010.
[39] T. S. Rahayu, N. Hendri, and A. Kurniawan, "PENGARUH PENERAPAN RULE OF LAW, CONSENSUS ORIENTATION, DAN EQUALITY TERHADAP KESEJAHTERAAN MASYARAKAT DI MASA PANDEMI COVID-19 (STUDI KASUS PADA DESA TOTOKATON KECAMATAN PUNGGUR)," 2021.
[40] A. Rahma Salsabila, A. Kinanti Febriany, H. Cantya Danahiswari, M. Daffa, and M. Kandias Happy Maulana, "Prosiding Seminar Nasional Teknologi dan Sistem Informasi (SITASI) 2022 ANALISIS KESUKSESAN DELONE MCLEAN ISSM PADA APLIKASI SPOTIFY MENGGUNAKAN SEM-PLS ANALYSIS OF DELONE MCLEAN ISSM IN SPOTIFY APPLICATION USING SEM-PLS." [Online]. Available: http://sitasi.upnjatim.ac.id/|31
[41] J. F. Hair, J. J. Risher, M. Sarstedt, and C. M. Ringle, "When to use and how to report the results of PLS-SEM," *European Business Review*, vol. 31, no. 1, pp. 2–24, Jan. 2019, doi: 10.1108/EBR-11-2018-0203.
[42] J. F. Hair, J. J. Risher, M. Sarstedt, and C. M. Ringle, "When to use and how to report the results of PLS-SEM," Jan. 14, 2019, *Emerald Group Publishing Ltd.* doi: 10.1108/EBR-11-2018-0203.
[43] J. F. Hair, G. Tomas, M. Hult, C. M. Ringle, and M. Sarstedt, *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. 2022. [Online]. Available: https://www.researchgate.net/publication/354331182
[44] K. A. M. Khidzir, N. Z. Ismail, and A. R. Abdullah, "Validity and River," *International Journal of Development and Sustainability*, vol. 7, no. 3, pp. 1026–1037, 2018, [Online]. Available: www.isdsnet.com/ijds
[45] C. Hulin, R. Netemeyer, and R. Cudeck, "Can a Reliability Coefficient Be Too High?," *Journal of Consumer Psychology*, vol. 10, pp. 55–58, Jan. 2001.
[46] S. M. Rasoolimanesh, "Discriminant validity assessment in PLS-SEM: A comprehensive composite-based approach," *Data Analysis Perspectives Journal*, pp. 1–8, 2022, [Online]. Available: https://www.scriptwarp.com,
[47] R. A. Fisher, "Statistical Methods for Research Workers," in *Breakthroughs in Statistics: Methodology and Distribution*, S. Kotz and N. L. Johnson, Eds., New York, NY: Springer New York, 1992, pp. 66–70. doi: 10.1007/978-1-4612-4380-9_6.
[48] D. Russo and K.-J. Stol, "PLS-SEM for Software Engineering Research: An Introduction and Survey," *ACM Comput. Surv.*, vol. 54, no. 4, May 2021, doi: 10.1145/3447580.
[49] J. Hair, C. Ringle, and M. Sarstedt, "PLS-SEM: Indeed a silver bullet," *The Journal of Marketing Theory and Practice*, vol. 19, pp. 139–151, Mar. 2011, doi: 10.2753/MTP1069-6679190202.
[50] J. Cohen, *Statistical power analysis for the behavioral sciences*, 2nd ed. Hillsdale, NJ: Lawrence Erlbaum Associates, 1988.