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Measuring Undergraduate Architecture Students' Acceptance Using Artificial Intelligent Image Generator Bot for Conceptual Study: A Case Study of Midjourney

Sayed Muhammad Aiman Sayed Abul Khair[1*], Mohammad Nazrin Zainal Abidin[1], Abdul Rahman Khamaruzaman[1], Izzat Anuar[1], Farid Al Hakeem Yuserrie[1]

[1]Department of Built Environment Studies and Technology, College of Built Environment, Universiti Teknologi MARA (UiTM), 32610, Perak Branch, Perak, Malaysia

*Corresponding Author: sayed705@uitm.edu.my

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Abstract: *The integration of artificial intelligence (AI) in architecture and design education has been influenced by paradigm shifts in the Industry 5.0 era. This has resulted in the incorporation of computational thinking in early design studio tasks. However, there is a noticeable absence of a clear inclination towards utilising artificial intelligence (AI) in the process of architectural design creation or in evaluating the aesthetic attributes of such designs. The integration of artificial intelligence (AI) in the context of design education for undergraduate architecture students in Malaysia is a nascent area that has received limited attention thus far. The objective of this study is to identify the key factors that influence the acceptance and utilisation of artificial intelligence (AI) applications among undergraduate architecture students during their conceptual form study. The study employs the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) framework to investigate seven (7) constructs. A survey encompassing 106 participants, consisting of first and second-year students, was administered to obtain a comprehensive understanding of students' perceptions and experiences. Descriptive statistics were subsequently employed to analyse the collected data. The results indicate that students possess optimistic expectations regarding the utility of AI applications in the context of their architectural conceptual study. AI applications are regarded as valuable tools that have the potential to enhance design performance, increase learning productivity, and accelerate task completion. The constructs of Hedonistic Motivation, Performance Expectancy, and Effort Expectancy exhibit notable significance, as indicated by their high mean scores. The attitudes and behavioural intention of students towards AI applications are influenced by hedonistic motivation and perceived price value. Certain students experience pleasure and a sense of fulfilment when utilising the applications. The process of adopting AI applications as a habit is a gradual one, with students displaying a tendency towards neutrality or a slightly positive attitude. Further investigation is warranted to explore the enduring impacts of artificial intelligence (AI) implementations on students' educational achievements, as well as to scrutinise particular attributes that contribute to improved performance and efficiency. Qualitative research methods have the potential to offer more profound understandings of students' experiences and the contextual factors that influence their acceptance and utilisation.*

Keywords: artificial intelligence, technology acceptance, conceptual study, architecture education, UTAUT2

1. Introduction

Numerous philosophical perspectives, spanning from Plato to Kant, associate the enigmatic essence of creativity with inspiration, imagination, novelty, complexity, and order. These concepts are also related to aesthetics, where the search for evaluations and judgements originates. As computational design technologies such as digital tools, information and communication technologies (ICT), and artificial intelligence (AI) have progressed, so has the understanding of creativity, which has been examined from various perspectives. Creativity support tools (CSI), collaborative efforts, and cognitive research stand out among these studies concerning AI in design (Boden, 1990, 1998; Frich et al., 2018). Some studies focus on descriptive (process) models, while others investigate design-assist tools or critically investigate AI and aesthetics-related creativity (Mazzone & Elgammal, 2019; Suzuki et al., 2019).

In addition to redefining creativity through technological advancements, Aysegul Akcay Kavakoglu et al. (2022) said that incorporating computational design technologies into architecture and design is perpetually influenced by Industry 5.0-era paradigm shifts. As these changes affect thinking and design methods, they also affect learning and teaching techniques. Curriculums for design education have incorporated computational design technologies and fabrication tools, addressing computational design thinking and making activities from the outset. The concept of the Fifth Industrial Revolution involves the integration of human and machine capabilities to enhance the utilisation of human cognitive abilities and creative thinking, thereby improving process efficiency through integrating intelligent systems with existing workflows (Nahavandi, 2019). The primary focus of Industry 4.0 pertains to automation, whereas Industry 5.0 will entail a collaborative relationship between human workers and autonomous machines, resulting in a synergistic dynamic. The future workforce will be able to perceive and comprehend human intention and desire. Nahavandi (2019) added integrating robots into human society will foster a harmonious and secure environment, as individuals will confidently engage in collaborative endeavours with their robotic counterparts, assured of their comprehensive comprehension and proficient cooperation.

The computational domain fosters new mental frameworks and skills by adopting these technologies as instruments and worldviews (Terzidis, 2003; Akcay Kavakoglu, 2014; Senske, 2014). Numerous early design studio tasks are founded on computational thinking, which includes abstraction, [de]composition, pattern creation or detection, and algorithmic thought. While artificial intelligence in education has been studied within instructional and constructivist theories (McArthur et al., 2005; McCormack et al., 2020), AI in design education appears as a research topic predominantly at the graduate level. Others discuss its incorporation for future architectural engineering construction implications (Khean et al., 2018; Basarir, 2021). Currently, most data processing is performed by physical users who rely on their knowledge and experience to analyse the data and execute design or planning tasks. What is lacking, however, is a distinct trend toward employing AI in the creation process or assessing the aesthetic qualities of an architectural design. According to Hamza Shaikh (RIBA, 2023), architects must adopt hybrid methods and consider the potential integration of AI workflows into the RIBA work stages soon. Sarly said (StarProperty - News : Architecture: Outlook for 2023 and Beyond, n.d.) the field of architecture design and construction has been significantly influenced by computerisation, with the emergence of parametricism in the early 2010s. This approach allows systems to undergo training through algorithms, resulting in parametric variability and mutual adaptability. In the 2020s, advancements in machine learning and

artificial intelligence (AI) have advanced this area, enabling architects to generate, optimise, and iterate on design variations. This approach reduces design generation time and increases creative exploration. AI tools like Spacemaker, Digital Blue Foam, Hypar, and Archistar are used to achieve these objectives. Autodesk acquired Spacemaker AI in 2020, indicating future industry adoption of AI tools. Conceptualisation and visualisation tools like Stable Diffusion, Dall E2, and Nightcafe have simplified the process of illustrating ideas, making it easier for architects to select appropriate descriptive language. The future will see significant advancements in AI-driven tools, enabling architects and designers to push the limits of creativity.

AI in design education for Malaysian undergraduate architecture students is a relatively new and under-explored field. It is hard to find journals and research articles from Malaysia's perspective discussed on the topic from an online database except for industry talks, exhibitions and design workshops from Pertubuhan Arkitek Malaysia (PAM). Thus, can they efficiently adopt and utilise the technology in their conceptual design phase? What constructs may impact their intent to utilise the technology? The study aims to determine the significant constructs of undergraduate architecture students' acceptance and use of AI applications in their conceptual form study.

2. Literature Review

Artificial Intelligence in Architecture Education

Technological advancement has proved to support and assist in various disciplines, predominantly in the field of engineering, economy, medicine, and marketing (Ceylan, 2021). In architecture, design has evolved into a prescriptive activity in which models and drawings are used to anticipate reality and everything must be addressed before the construction phase (Celani, 2012). In order to perform the process, technology did come in handy, for instance, in the work of more complex design intentions and forms (Ceylan, 2021). To accomplish this, architects ought to take advantage of the opportunities provided by artificial intelligence (Bhatt et al., 2016). In recent years, artificial intelligence applications and architectural research have advanced more rapidly (Belem et al., 2019). Some researchers investigate artificial intelligence tools within the context of generative algorithms, and their efficiency is used to assist designers during the architectural design phase, with decision-making processes expected to be under the architect's control (Cudzik et al., 2018).

Research conducted by Basarir in 2021 addresses the need for Artificial Intelligence application and adoption in architectural education curriculum. The researcher argued that the fast pace and rapid technological advances poignant the architectural design process, mainly in the scope of AI (Basarir, 2021). The research also suggests raising students' awareness of the vast architectural design field through AI integration (Basarir,2021). Ceylan (2021) underlined the application of AI into three (3) different spheres of work. Firstly, AI supplies architecture with an immense amount of data and processing speed to provide analytical knowledge that substantially influences design decisions at any stage (Ceylan, 2021). Next, the computational aspect explores computer-aided design (CAD) programs and parametric design tools. It will assist in creating forms that would not be possible without computation (Steenson, 2018). AI enables quick, efficient, innovative visualisation and prototype development through Building Information Modelling (Ceylan, 2021). Lastly, AI enhances architecture in its development phases by providing automated construction opportunities (Ceylan, 2021).

AI tools are already being used in many aspects of the educational process, including content development, instructional methods, student assessment, and teacher-student communication (Chassignol et al., 2018). Due to the complicated construct of architectural education, implementing AI should require more attention and practical adaptation (Ceylan, 2021). The architectural curriculum is made up of fundamental courses that develop design knowledge, courses that develop architectural and scientific formation, courses that strengthen architectural representation, and design courses, which are a combination of the others and are the essential part of design education (Demirbas & Demirkan, 2003). Ceylan (2021) made an effort to propose a strategy to converge AI with the four-fold architectural education definition by Demirbas et al.(2003) through three (3) modules of education, namely the Theory Module, Technical Module, and Representation Module. As for this study concern, the application of AI in the Representation Module was considered.

On the contrary, early literature by Mustoe (1990) suggests three (3) possibilities for adopting AI in architecture; cognitive simulation, mainstream topics, and intelligent artifacts. Of the three possibilities, Mustoe proposed intelligent artifacts with more promising outcomes and called out for a model to be developed. Since the connection between AI and Architectural is evident, more research has emerged rapidly due to the advancement of AI respectively. In recent years, more friendly-user applications such as Midjourney and DALL-E 2 have been developed. Those applications adopting text-to-image generation AI have been a talking point among researchers nowadays. This reasonably new application of AI will be discussed in the next chapter in relation to architectural practice and education.

Midjourney Application in Architecture Practices and Education

An article published in January 2023 by Bloomberg entitled "The Architects Designing Surreal Worlds with AI" by Gaelle Faure depicted the current trend of so-called AI art generators, such as Dall-E, Stable Diffusion, and Midjourney had become significant hits among designers, illustrators, artists, and architects in becoming their favourite artificial intern (Faure, 2023). A designer in Zaha Hadid Architects' Computational research group (ZHACODE) in London, Tim Fu quoted, "Midjourney is the very creative, artistic one that will give you a visual aesthetic superior to all the rest." As for researchers and academicians, these text-to-image AI generators also draw a lot of interest and inspiration in pursuing the quest of perfecting the process of idea generation and representation.

Created in February 2022 by a team of programmers led by David Holz (Jaruga-Rozdolska, 2022), Midjourney is considered an image-generative tool made available in the Discord application. It is a text-to-image AI programme that allows users to submit content and generate an image in response (Yildirim, 2022). This technology offers various possible uses, from helping artists and designers swiftly draw down ideas to assisting persons with visual impairments in reading written material. MidJourney can help artists and designers sketch out ideas and thoughts quickly. It benefits those without solid experience in traditional art techniques but who want to explore their creative ideas.

Researchers in architecture have seen the potential of these such applications or tools to aid the advancement of the field, but some researchers predicted it would be a downfall of traditional architecture comprehension and understanding. Yildirim (2022) suggested that using text-to-image generation in architecture is beneficial for the early phase of design work. It could help the architect iterate quickly on multiple design concepts and explore various choices. For instance, a text-to-image generator is argued to create; interactive and immersive exploration

of the design process, automated detailed drawing creation, and generate unbuilt buildings to aid visual interpretation (Yildirim, 2022). Yildirim (2022) also stressed that swift and rapid work can be achieved in the representation phase of design. Jaruga-Rozdolska (2022) shared the same point of view after conducting extensive research on the performance of Midjourney to support creative processes. The research showed the tools' potential but raised an issue of who could claim the ownership or authorship of the works.

The Role of Conceptual Form Study in Architecture Education.

The study of conceptual design is essential to architecture education. It is a problem-solving technique involving generating ideas and concepts for a design undertaking. Design education is still taught with a combination of traditional methods and digital technologies (Özgen et al., 2021). Conceptual design is essential for the design's authenticity, individuality, and innovation. The study of conceptual design is essential to architecture education because it is a problem-solving technique involving generating ideas and concepts for a design undertaking. Design education is still taught using traditional methods and digital technologies (Özgen et al., 2021). Workshops are also used as an instrument for informal design education, learning and comprehending culture-environment relations, and raising awareness of diverse environments and contexts.

In recent years, artificial intelligence programmes have been utilised in the conceptual design phase to generate original content images from narratives to assist students in generating building concepts (Sadek, 2023). In addition, architecture education has been revised to include 21st-century graduate attributes such as problem-solving, critical and creative thinking, interpersonal and intrapersonal skills, and technological and global awareness (Ng et al., 2022). In this case, the connections and uses of art and words as the very means of thinking within the field of the building have also been explored. A conceptual framework has been created for understanding the acceptance of Computer-aided architectural design (CAAD) in the teaching and learning of architecture in the Schools of Architecture (Cikis & Ek, 2010). Therefore, incorporating programming in the CAD curriculum within an appropriate conceptual framework may revolutionise the notion of architectural education (Celani, 2008).

In conclusion, it is suggested that it must progress beyond certain industrial-era learning assumptions to lay the conceptual groundwork for a dynamic concept of architecture for education. In architecture, sketching is an effective means of conveying creative thought and conceptual concepts. The Royal Institute of British Architects (RIBA) publishes the RIBA Plan of Work. The RIBA Plan of Work is a shared framework for design and construction that provides both a process map and a management instrument (RIBA, 2020). It is divided into several essential project phases. The RIBA 2020 Work Plan superseded the 2013 version. The structure of the stages was altered, as shown below:

Table 1: The RIBA 2020 Work Plan

Stage	2013	2020
0	Strategic definition.	Strategic definition.
1	Preparation and brief.	Preparation and briefing.
2	Concept design.	Concept design.
3	Developed design.	Spatial coordination.
4	Technical design.	Technical design.
5	Construction.	Manufacturing and construction.

6	Handover and close out.	Handover.
7	In use.	Use.

Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

The transition to online platforms for learning architectural design is relatively new, and the recent adoption of multiple platforms by each institution has created an urgent need to assess students' behaviour in using and accepting technology. The UTAUT2 model developed by Venkatesh et al. (2012) is useful for measuring this. The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) is a well-established theoretical framework that has been widely used to understand and predict individuals' acceptance and use of new technologies, including in the context of architectural design (Venkatesh et al., 2012).

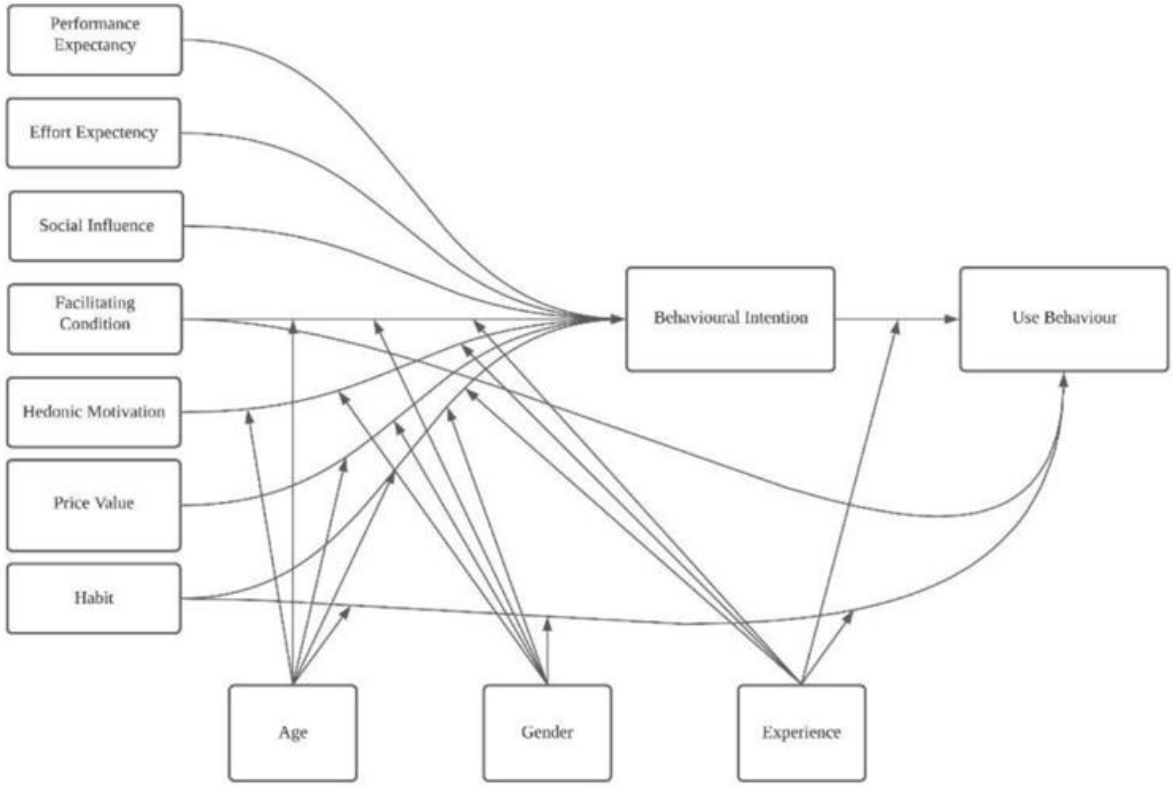

Figure 1: The Unified Theory of Acceptance and Use of Technology (UTAUT2) by Venkatesh et al., (2012)

The constructs in UTAUT2 are composed of four initial key factors based on the previous UTAUT theoretical framework, including performance expectancy, effort expectancy, social influence, and facilitating conditions, plus another additional three key factors, which include hedonic motivation, price value, and habit (Venkatesh et al., 2012). All seven key factors have different values. Performance expectancy refers to the extent to which users believe technology use will improve their productivity or performance. Effort expectancy pertains to how easy or difficult users perceive technology to be. Social influence reflects the extent to which users think essential others expect them to use the technology. Facilitating conditions encompass how much organisational and technical infrastructure support technology use. Additionally, hedonic motivation describes the level of pleasure or enjoyment users derive from technology use, price value concerns the perceived value of technology about cost, and habit indicates the degree to which users have developed automated and routine technology use patterns.

This study will apply the UTAUT2 theoretical framework in measuring undergraduate architecture students' acceptance using an artificial intelligent (AI) image generator bot, Midjourney. Several studies have recently applied the UTAUT2 framework to investigate intentions and behaviours regarding adopting technology or AI-based tools. For instance, Kumar, J. A. & Bervell, B. (2019) developed an integrated UTAUT2-Google Classroom framework to investigate students' initial perceptions of Google Classroom as a mobile learning platform. Their study found that the students' positive intentions to accept Google Classroom were anchored on Habit, Hedonic Motivation, and Performance Expectancy. More recently, Mohammed Alhwaiti (2023) applied the UTAUT2 framework to assess the acceptance of Artificial Intelligence Applications in the Post-covid Era and its impact on faculty members' occupational well-being and teaching self-efficacy. The study indicating that faculty members are influenced by the constructs established in the UTAUT2 model in adopting AI found a significant positive relationship between key factors in the framework and occupational well-being.

The utilisation of UTAUT2 holds significant relevance as a framework for measuring undergraduate architecture students' acceptance of an artificial intelligent image generator bot for conceptual study. UTAUT2 offers a comprehensive model that encompasses essential factors influencing technology adoption. Therefore, by employing UTAUT2, we can gain a deeper understanding of how these factors contribute to the acceptance and intention of architecture students to engage with AI-based tools for image generation in conceptual studies. This comprehension is crucial in assessing the effectiveness and potential advantages of integrating AI technology within architectural education. Moreover, UTAUT2 serves as a theoretical basis for identifying barriers and drivers of technology adoption, guiding the development and implementation of strategies to enhance the acceptance and utilisation of AI tools among undergraduate architecture students.

In conclusion, the transition to online platforms for learning architectural design has created a need to assess students' behavior in using and accepting technology. The UTAUT2 model has proven to be a useful framework for measuring technology acceptance, including in architectural design. The seven key factors in UTAUT2, namely performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit, provide valuable insights into users' acceptance and utilisation of new technologies. By applying UTAUT2 to measure undergraduate architecture students' acceptance of an AI image generator bot, we can better understand their intentions and behaviors in utilising this technology. Therefore, this study is crucial for enhancing architectural education and identifying strategies to promote the effective integration of AI tools soon. However, further research is needed to explore AI technology's specific features and benefits in architectural design.

3. Methodology

Data Collection

The study was applied through a quantitative research design amongst a purposive sampling of 1st- and 2nd-year undergraduate architecture students from Universiti Teknologi MARA Perak Branch, Seri Iskandar Campus. The respondents were selected based on their syllabus content, where they were introduced to conceptual form study in the design phase. Then, they were invited to participate in Artificial Intelligence Midjourney Workshop. The survey was distributed after the workshop for the study to measure the acceptance level of Midjourney in

the conceptual design phase using Google Forms. Six (6) constructs adapted from UTAUT2 by Venkatesh et al. (2012) comprise 37 items. The total population is 133 students with a 5% margin error, and to achieve 95% confidence in this research, the study collected 106 respondents. According to Krejcie and Morgan (1970) sample calculation, the sampling size should be a minimum of 97 respondents.

Data Analysis

The Statistical Package for the Social Sciences (SPSS) software was used to examine quantitative data gathered through structural questions involving Likert scale questions in structured questionnaire forms. The scale is drawn from 1- Strongly Disagree, 2- Disagree, 3- Moderate, 4- Agree and 5- Strongly Agree. The data were examined using descriptive statistics that included frequency distribution and were displayed in tables. For univariate analysis, this data was summarised into frequency distribution forms.

4. Findings

The sample analysis of 106 undergraduate architecture students provides significant insights into the demographic profile, specifically regarding gender distribution, semester classification, and previous exposure to an AI image generator for architectural conceptual study. In relation to gender, the sample is primarily composed of female students, constituting 62.3% (66 individuals) of the respondents. On the other hand, the proportion of male students is 37.7%, corresponding to 40 individuals. Upon analysing the distribution of semesters, it is evident that most students, comprising 45.3% (48 individuals), are enrolled in their second semester, while 32.1% (34 individuals) are in their fourth semester. The sample group with the lowest representation consists of students in their first semester, comprising only 6.6% (7 individual

Table 2: Gender Frequency

Gender		
	N	%
Female	66	62.3%
Male	40	37.7%

Semester		
	N	%
1	7	6.6%
2	48	45.3%
3	17	16.0%
4	34	32.1%

Table 3: Students' Experience Using AI Image Generator

State your experience of using an Artificial Intelligence Image Generator for Architectural Conceptual Study		
	N	%
1 month	32	30.2%
3 months	11	10.4%
6 months	5	4.7%
None	58	54.7%

In contrast, third-semester students comprise 16.0% (17 individuals) of the sample. Concerning the utilisation of an AI image generator for architectural conceptual analysis, most students (54.7%, n=58) indicated a lack of prior experience in this domain. Individuals with prior experience primarily utilised the application for a relatively brief period. Specifically, 32 individuals, accounting for 30.2% of the sample, reported using the application for one month. Additionally, 11 individuals (10.4%) reported a usage duration of three months, while a minority of 5 individuals (4.7%) reported using the application for six months. This discovery implies that using AI technology is relatively novel among most students, potentially impacting their perspectives and attitudes toward its implementation.

Table 4: Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
0.947	0.951	37

The obtained Cronbach's alpha value was 0.947, and when computed using standardised items, it slightly increased to 0.951. The values above demonstrate exceptional dependability, as values exceeding 0.9 are commonly regarded as exceptional. This finding indicates that the 37 items employed in the survey exhibit high internal consistency and effectively assess the same underlying constructs of interest. The robustness of this high level of reliability enhances the assurance of the study's outcomes and the soundness of the inferences derived from them.

Table 5: Frequency of Constructs for Undergraduate Architecture Students' Acceptance Using Artificial Intelligent Image Generator Bot for Conceptual Study

Constructs	Items	N		Mean	Std. Deviation	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis
		Valid	Missing						
Performance Expectancy	PE1	106	0	4.10	0.792	-0.774	0.235	1.095	0.465
	PE2	106	0	3.98	0.884	-0.807	0.235	0.975	0.465
	PE3	106	0	4.00	0.840	-0.689	0.235	0.607	0.465
	PE4	106	0	3.92	0.943	-0.819	0.235	0.856	0.465
	PE5	106	0	2.67	1.193	0.359	0.235	-0.634	0.465
Effort Expectancy	EE1	106	0	3.92	0.874	-0.705	0.235	0.868	0.465
	EE2	106	0	3.90	0.872	-0.849	0.235	1.161	0.465
	EE3	106	0	4.01	0.811	-0.673	0.235	0.798	0.465
	EE4	106	0	3.85	0.814	-0.362	0.235	0.271	0.465
	EE5	106	0	2.62	1.261	0.458	0.235	-0.741	0.465
Social Influence	SI1	106	0	3.41	0.993	-0.239	0.235	-0.154	0.465
	SI2	106	0	3.54	0.875	-0.161	0.235	-0.218	0.465
	SI3	106	0	3.74	0.887	-0.453	0.235	0.374	0.465
	SI4	106	0	3.90	0.872	-0.498	0.235	0.080	0.465
	SI5	106	0	3.56	1.024	-0.698	0.235	0.357	0.465
Facilitating Condition	FC1	106	0	3.53	0.928	-0.522	0.235	0.544	0.465
	FC2	106	0	3.54	0.917	-0.302	0.235	-0.061	0.465
	FC3	106	0	3.60	0.824	-0.183	0.235	0.087	0.465
	FC4	106	0	4.00	0.905	-0.629	0.235	0.009	0.465
	FC5	106	0	3.58	0.965	-0.570	0.235	0.361	0.465
	FC6	106	0	3.21	1.177	-0.057	0.235	-0.816	0.465
	HM1	106	0	4.42	0.742	-1.416	0.235	3.046	0.465

Hedonistic Motivation	HM2	106	0	4.42	0.755	-1.428	0.235	2.814	0.465
	HM3	106	0	2.13	1.113	1.042	0.235	0.562	0.465
	HM4	106	0	4.15	0.871	-0.918	0.235	0.717	0.465
Price Value	PV1	106	0	3.16	1.139	-0.125	0.235	-0.657	0.465
	PV2	106	0	3.53	0.978	-0.236	0.235	-0.158	0.465
	PV3	106	0	3.44	0.996	-0.224	0.235	-0.111	0.465
Habit	H1	106	0	2.95	1.133	0.134	0.235	-0.560	0.465
	H2	106	0	3.00	1.179	0.036	0.235	-0.762	0.465
	H3	106	0	3.07	1.157	0.095	0.235	-0.716	0.465
	H4	106	0	2.92	1.088	0.036	0.235	-0.399	0.465
Behavioural Intention	BI1	106	0	3.91	0.845	-0.493	0.235	0.236	0.465
	BI2	106	0	3.33	0.993	-0.112	0.235	-0.459	0.465
	BI3	106	0	3.03	1.055	0.141	0.235	-0.400	0.465
	BI4	106	0	3.62	0.845	-0.153	0.235	-0.046	0.465
	BI5	106	0	4.14	0.878	-0.799	0.235	0.324	0.465

The present study assessed various constructs on the acceptance and utilisation of an artificial intelligence (AI) application, Midjourney, among undergraduate architecture students. Each construct was evaluated using multiple items. The constructs examined in this study encompassed Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Hedonistic Motivation (HM), Price Value (PV), Habit (H), and Behavioural Intention (BI).

The Performance Expectancy (PE) construct was assessed by evaluating five items labeled PE1 through PE5. The mean scores for these items ranged from 2.67 to 4.10, suggesting that the respondents generally held positive expectations regarding performance. PE1 through PE4 displayed negative skewness, indicating that the distribution of responses was skewed towards higher ratings. Conversely, PE5 exhibited positive skewness, suggesting a skew towards lower ratings because it is a reverse item. Therefore, it can be deduced that Midjourney supported their learning performance.

The measurement of Effort Expectancy, evaluated by five items (EE1 through EE5), resulted in average scores ranging from 2.62 to 4.01. Most of the items exhibited a negative skewness, consistent with the construct of PE. However, it is worth noting that item EE5, a reverse item, displayed a positive skewness. The students disagree that Midjourney is troublesome in their architectural conceptual study.

The construct of social influence was assessed using five items (SI1 through SI5). The mean scores for these items ranged from 3.41 to 3.90. It is worth noting that all of the items exhibited negative skewness, indicating a prevailing tendency among the respondents to provide higher ratings. Eventhough, it was negative skewness, SI4 and SI5 were reverse items. The students agreed only to use the application if needed and when their course prescribes it. It can be inferred that Midjourney is still not in their preference application

The assessment of the Facilitating Conditions constructs involved utilising six items, specifically FC1 through FC6. The mean ratings for these items ranged from 3.21 to 4.00. Most skewness values exhibited negative tendencies, except for FC6, a reverse item. It displayed a

slight positive skewness. The finding shows the students are pretty balanced in terms of often facing problems using the application due to insufficient data Internet.

The evaluation of Hedonistic Motivation, measured by four items (HM1 through HM4), yielded mean values ranging from 2.13 to 4.42. The data from HM1 and HM2 exhibited pronounced negative skewness and elevated kurtosis, suggesting that the responses were heavily skewed towards higher ratings and had a peaked distribution. In contrast, HM3 exhibited a significant positive skewness, indicating a propensity towards lower ratings because it is a reverse item. Therefore, they are positive that the application is not depressing and enjoy using it in their learning and it can be deduced that the students enjoy using it.

The measurement of Price Value, evaluated using three specific items (PV1 through PV3), exhibited mean values ranging from 3.16 to 3.53. Notably, all of the items displayed a negative skewness. Eventhough the application needed to be subscribed to, the students inferred that it was not a significant problem for them compared to what Midjourney could assist them in the learning process, which showed by the mean score from the Performance Expectancy and Hedonistic Motivation constructs.

As assessed by four items (H1 through H4), the Habit construct resulted in mean ratings ranging from 2.92 to 3.07. These ratings indicate a generally neutral to a slightly positive tendency towards developing a habit of utilising the application. The skewness values for the items above exhibited positive values close to zero, suggesting a relatively symmetrical response distribution.

The Behavioural Intention assessment involved using five items, namely BI1 through BI5. The means of these items ranged from 3.03 to 4.14. The skewness values exhibited variability, as BI1, BI2, BI4, and BI5 displayed negative skewness, while BI3, the reverse item, demonstrated a slight positive skewness. Therefore, they intend not to choose another platform but rather than using the application for architectural conceptual study.

5. Discussion

Based on the findings above about the constructs derived from the Unified Theory of Acceptance and Use of Technology, it is possible to deduce several significant observations concerning the acceptance and utilisation of Midjourney for conceptual form study among undergraduate architecture students.

Positive Attitudes With Potential For Enhancement: Students generally exhibit a predominantly positive disposition towards using artificial intelligence (AI) applications in their academic pursuits regarding performance, effort expectancy, and hedonistic motivation. Students enjoy the application in their learning process. Rudhumbu (2022) found that performance expectancy significantly influences students' behavioral intentions to accept blended learning in universities. Students perceive blended learning as productive and will accept it if they perceive it as useful for achieving their learning goals. Previous studies have also shown that PE significantly influences students' behavioral intentions to adopt blended learning. Nevertheless the study is on the blended learning but it is relevant in aspect of technology mediated and use in education. Furthermore, studies have shown that performance and effort expectancy positively influences students' willingness to accept technology (Abbad, 2021). Nevertheless, certain areas of these applications require enhancement, explicitly

concerning the lower average scores found in constructs such as Habit. Uniquely, Kumar, J. A. & Bervell, B. (2019) found habit was the strongest predictor of Behavioural Intention.

Influence of Social and Environmental Factors: The acceptance and utilisation of the application are significantly influenced by social and environmental factors, particularly social influence and facilitating conditions. Social influence has been found to significantly affect the acceptance of mobile learning (m-learning) applications among higher education students (Alyoussef, 2021). Additionally, facilitating conditions, including performance expectancy, effort expectancy, and social influence, have been identified as significant factors affecting the integration information and communication technology (ICT) in educational practice (Al-Zboon et al., 2021). This statement underscores the significance of establishing a conducive learning environment and robust infrastructure to facilitate the utilisation of these applications while fostering favourable social norms surrounding their usage.

Cost-Benefit Analysis: According to Price Value, students who hold the belief that the advantages of blended learning surpass the financial expenses associated with the system are more likely to develop behavioural intentions to embrace blended learning as a mode of education in their academic pursuits. Several studies have emphasised the impact of price value on users' behavioural intentions to accept a system. The studies conducted by Moorthy et al. (2019), Abu-Gharrah and Aljaafreh (2021), and Alalwan et al. (2017) are of academic significance. The findings of the Price Value construct indicate that students are aware of both the application's advantages and disadvantages. It highlights the necessity of implementing cost-effective solutions or strategies to alleviate the financial implications associated with utilising these tools.

The significance of habitual use: The relatively diminished scores in the Habit construct indicate that the utilisation of the application has not yet ingrained itself as a customary or reflexive behaviour among many students. Promoting consistent utilisation and incorporating these tools into one's daily study routines may yield promising outcomes.

Behavioural Intention Variability: The variability in behavioural intention suggests that certain students may exhibit a greater inclination to persist in using the application, while others may display a higher degree of reluctance. This proposition posits that individual differences and personal preferences can significantly influence the intention of students to utilise these applications. On the other hand, the results of the study indicate that various factors, namely performance expectancy, openness, social influence, hedonic motivations, and generativity, exert a positive influence on an entrepreneur's intention to accept artificial intelligence (AI) technology (Upadhyay, Upadhyay, and Dwivedi, 2022)

Thus, the inferences above emphasise the intricate nature of technology acceptance and utilisation within an educational setting, underscoring the significance of adopting a comprehensive and nuanced approach to facilitate the adoption of innovative tools such as artificial intelligence applications in architecture education.

6. Conclusion

The utilisation of AI applications regularly has emerged as a domain with significant potential for improvement. Encouraging regular and frequent utilisation of these tools can contribute to the transition of AI applications from being perceived as a novelty to becoming a customary

practice, thereby cultivating a sustained embrace of technology within the academic realm of students. From the study, it can be concluded the significant constructs that exhibit a predominantly positive disposition towards using artificial intelligence (AI) applications in their academic pursuits regarding performance expectancy, effort expectancy, and hedonistic motivation. The students believed the Midjourney offers aid in their conceptual form study by its advanced functionalities and the tasks faster. Hence, it is easy to use by only using creative prompt in the dialogue box interface. It is also fun, enjoyable and the user's interface (UI) and user's experience (UX) of Midjourney is interactive where the students can get the immediate results and design output from the prompt given.

The importance of individual differences is emphasised by the range of behavioural intentions towards the continued use of AI application, indicating the necessity for personalised strategies in promoting and integrating these tools. The acceptance and utilisation of artificial intelligence (AI) applications in architectural education involve a complex interaction of personal, social, and environmental factors. The findings obtained from this study are expected to provide significant guidance for educators, developers, and policymakers as they collaborate to improve the educational experience through the utilisation of technology. Further investigation is necessary to examine these concepts and their connections and investigate potential approaches to enhance the efficient use of artificial intelligence tools in architectural education.

Notwithstanding these significant findings, the research was not devoid of limitations. The research was primarily centred on a specific educational institution, thereby constraining the extent to which the findings can be applied to broader contexts. Although sufficient for preliminary investigations, the current sample size may benefit from enlargement in subsequent research endeavours to enhance statistical power and the ability to generalise findings. Moreover, it is essential to acknowledge that self-reported measures, although convenient, are susceptible to bias and may not provide a precise depiction of actual usage patterns. In order to gain a more comprehensive understanding of the phenomena, future research could consider incorporating longitudinal designs to observe the evolution of acceptance and utilisation over an extended period. This approach would offer a more dynamic perspective on the subject matter.

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