International Association of Societies of Design Research Congress 2023
LIFE-CHANGING DESIGN
Politecnico di Milano
9-13 October 2023

Measuring designers use of Midjourney on the technology acceptance model

Shen Shuhan*[a]; Chen, Yuetong [a]; Hua, Min [a]; Ye, Mai [a]

[a] Shanghai Jiao Tong University, Shanghai, China
*shuhanshen@sjtu.edu.cn

doi.org/10.21606/iasdr.2023.794

The study uses Technology Acceptance Model (TAM) to gain insights into user reaction to the new Midjourney model. While earlier studies had applied the TAM model to different applications, the TAM framework has not been used in AI-Generated Content applications like Midjourney. The study aims to analyse the relationship between the variables of TAM including Image, Perceived Ease of Use, Perceived Usefulness, Attitude, Behaviour Intention and Actual Use. The participants include 100 designers in which 60 of them have used Midjourney before. The results reveal a strong positive correlation between the actual use of Midjourney and the Perceived Ease of Use, Perceived Usefulness, Attitude, and Behaviour Intention. In addition, the results suggest that Midjourney can be used in design education, and it has a positive influence on creativity.

Keywords: midjourney; technology acceptance model; design creativity; education

1 Introduction

Since ChatGPT launched in 2022, the discussion about AI-Generated Content had been a hot topic. Many users are fond of the experience of chatting with AI. Training a text-to-image model requires a dataset of images paired with text captions. Before the rise of deep learning, attempts to build textto-image models were formed by existing images (Vincent, 2022). The first modern text-to-image model was called alignDRAW. Images created by alignDRAW were blurry, but it revealed that it was not memorizing data(Mansimov, 2015).

After ChatGPT launched, text-to-image models was also developed. In the design field, there are also some models like Midjourney, DALL-E and Stable Diffusion. Among these models, Midjourney begins to approach the quality of real photographs. These models can create billions of pictures in a few minutes. But some people doubt whether we should use Midjourney to help designers do their job.

This study measured designers' experience of using the Midjourney AI as a tool to create new images. The research is based on the theory of the Technology Acceptance Model (TAM). While earlier studies had applied the TAM model to different applications, the survey of existing literature indicates that

the TAM framework has not been used in AI-Generated Content applications like Midjourney. Therefore, this study chose Midjourney as a sample to explore designers' perception of AI-Generated Content.

2 Review of literature

2.1 Ai-generated content

OpenAI launched a new ChatGPT model on November 30, 2022. It has reached 1 million users in just 5 days (Haque, 2022). Its web application allows users to use it for free. ChatGPT can understand human language and answer questions. It is not limited to general chatting, assisting with typing, and dealing with specific problems. ChatGPT has attracted continuous development and attention in social media because of its high-quality answers, efficient way to get information and addictive interactive experience. The emergence of ChatGPT not only provides ideas for the development of the next generation of intelligent search engines but also contributes to the further development of the Artificial Intelligence Generated Content (AIGC) industry.

In the field of content consumption, AIGC has reconstructed the entire application ecosystem (TenCent, 2023). As a new type of content production method, AIGC has taken the lead in achieving major innovation and development in media, e-commerce, film and television, entertainment, and other industries with a high degree of digitalization and rich content demand, and its market potential is gradually emerging. In 2022, AIGC will develop at an astonishing speed, and its iteration speed will explode exponentially. Platform giants such as Google, Meta, and Baidu will continue to deploy, and unicorn start-ups such as Stability AI and Jasper AI will also come out. According to 6pen's forecast, 10%-30% of the picture content will be generated by AI in the next five years, which is expected to create a market space of more than 60 billion.

With the popularity of AIGC, ethical issues about AI have also become a big problem (Smith, 2023). Ethical considerations about copyright are important when AI generates scholarly text. These concerns are especially pertinent because currently human readers cannot detect whether the copy is generated by AI. Additionally, whether AI can provide recognition for work and accountability for its content has also caused many difficulties.

2.2 The Midjourney

In 2022, the Midjourney Inc. research lab released the Midjourney Discord bot. Midjourney generates images from natural language descriptions, called "prompts", similar to OpenAI DALL-E and Stable Diffusion (Boymamatovich, 2023). Midjourney-AI works mainly on a text-to-illustration-based system called “prompt”. It needs a particular order and system that are built into the “prompt” to recognize (Panicker, 2022).

Using Midjourney in the design process has many advantages. The major benefit is to improve efficiency and productivity. Text-to-image generation tools save designers a lot of time spent on sketching. In the past, designers needed to conceive a large number of sketches, and then modify and design again for the sketches, while generative AI helps designers save this step(Wasielewski, 2023).

AI produces images in just a few minutes, much faster than human being. Also, based on the "prompt" the user enters, Midjourney can produce four variations for a single prompting. These AI tools can illustrate the ideas users want and innovate more creative ideas (Berg, 2022).

However, even if AI is based on millions of images even billions of them, it is limited as it can only create ideas from those previous images (Berg, 2022). So it has a long way to go before AI can eventually replace human jobs.

2.3 Technology Acceptance Model

Technology Acceptance Model (TAM) originated in the psychological Theory of Reasoned Action. It was used to predict human behaviour towards some new technology (Davis, 1989). A lot of studies have confirmed its strength because it has broad applicability to various new technologies and users (Venkatesh, 2003). Davis (Davis, 1989) introduced the Technology Acceptance Model and explain the relationship between attitude and behaviour.

The TAM consists of five basic variables, including perceived ease of use, perceived usefulness, attitude toward use, behavioural intention to use, and actual use. Among these five variables, the most important parts are Perceived Ease of Use (PEU) and Perceived Usefulness (PU). Perceived Ease of Use refers to "the degree to which a person believes that using a particular system would be free of effort" and Perceived Usefulness measures "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989).

The review of TAM has revealed that it is necessary to add some external components to the model that is used. These components are used to provide a more precise explanation for a particular system (Abdullah, 2016).

Table 1. depicts the variables and definitions of TAM, and Fig 1. Represents the relationship among them.

Table 1. TAM variables and definitions

Variable	Definition
External Variables **Image**	The degree to which an individual perceives that the use of an innovation will enhance his or her status in his or her social system (Moore, 1991).
Core Variables	
Perceived Ease of Use	The belief is that effort will not be required(Scherer, 2019).
Perceived Usefulness	The belief is that technology enhances job performance(Scherer, 2019).
Attitude	A personal evaluation of new technology(Lee, 2013).
Outcome Variables	
Behaviour Intention	An individual's willingness to use new technology(Scherer, 2019).
Actual Use	An individual's use of a new technology.

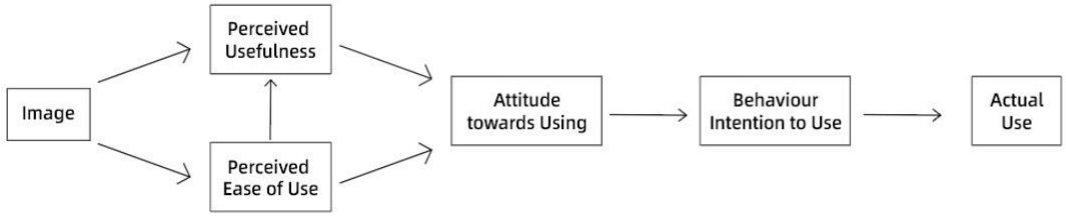

Figure 1. The Technology Acceptance Model

3 Methods

Extend TAM to explore the application of Midjourney in the design process. Based on extensive literature research and actual use of Midjourney, a conceptual framework was developed, including image, PEU, PU, User Attitude and Behavioural Intentions, and actual use to explore the utility of Midjourney in the design process.

3.1 Research hypotheses

The Primary research questions for this study are: What is the attitude of designers towards Midjourney? What are their Attitude and Behavioural Intention for using Midjourney in the process of getting inspired?

These questions are examined in terms of six specific hypotheses that are directly based on TAM:

- Hypothesis 1: Images produced by Midjourney will have a positive and significant impact on perceived usefulness.
- Hypothesis 2: Perceived ease of use will have a positive and significant impact on user acceptance of Midjourney.
- Hypothesis 3: Perceived usefulness will have a positive and significant impact on user acceptance of Midjourney.
- Hypothesis 4: Perceived ease of use will positively and significantly affect perceived usefulness.
- Hypothesis 5: Perceived ease of use will positively and significantly affect the generation of user design ideas.
- Hypothesis 6: Perceived usefulness will positively and significantly affect the educational role of Midjourney.

3.2 Participants

The research participants comprised designers and some students majoring in design. Most of them are from Zhejiang University and Shanghai Jiao Tong University. These designers used Midjourney as a tool for creative inspiration. One hundred participants responded to an online questionnaire about their perception of using Midjourney in the design process.

The sample comprised 46.53% male and 53.47% female designers. Sixty participants (59.41%) of them have used Midjourney and are familiar with this tool. 76.23% of the participants are between the ages of 22 to 25, so most of them are young students or have just 3-5 years of design work experience.

3.3 Instrument

The instrument used in this study was a modification of a questionnaire created by Yang and Wang (Yang & Wang, 2019). This questionnaire has two main parts. The first part is questions about participants' personal information, including age, gender, and their design experience. In the second part, participants' responded to their agreement level on every item with a 7-point Likert scale. In this scale, 1 represents "Strongly Disagree", 2 represents "Disagree", 3 represents "Relatively Disagree", 4 represents "Neutral", 5 represents "Relatively Agree", 6 represents "Agree" and 7 represents "Strongly Agree". The questions are listed in the "Appendix". The reliability was .992 using SPSS, as shown in Table 2.

Table 2. The questionnaire reliability

Cronbach's Alpha	No. of items
.992	30

3.4 Data collection and analysis

The Data was collected from 100 questionnaires. An online survey was created and completed online. First, the measurement model was used to evaluate the reliability and it was .992. According to Cronbach, this data can reveal that this questionnaire is reliable.

Then the structural model was used to test the significance of the relationship be-tween the variables. Person's correlation coefficients were used to evaluate the strength of the relationship. According to Taylor (Taylor, 1990), the Person's correlation between 0.68 to 1 was considered high. To get the strength of the relationship between the six variables, a correlation coefficient analysis was performed.

3.5 Results

Table 3 reveals the results of the test.

Table 2. The correlation between the constructs

Construct	Image	PEU	PU	Attitude	Behaviour Intention	Actual Use
Image	1	.83**	.74**	.87**	.86**	.59*
PEU	.83**	1	.82**	**.91****	.89**	.70**
PU	.74**	.82**	1	.86**	.85**	.73**
Attitude	.87**	**.91****	.86**	1	**.95****	.66**
Behaviour Intention	.86**	.89**	.85**	**.95****	1	.74**
Actual Use	.59*	.70**	.73**	.66**	.74**	1

**Correlation is significant at the 0.1 level(2-tailed)

* Correlation is significant at the 0.5 level(2-tailed)

Based on the result shown in Table 3, most of the correlations between these six variables are strong. For example, the AVE between Attitude and Behaviour Intention is 0.95, which indicates that users' attitude has great influence on their behaviour (Arndt S, 1999). The following part is an examination of each hypothesis.

4 Discussions

- Hypothesis 1: Images produced by Midjourney will have a positive and significant impact on perceived usefulness.

According to the results in Table 3, it is clear that there is a substantial positive correlation between Midjourney's image and PU (.74). The results also show that there is a strong positive correlation between image and PEU (.83), Attitude (.87), and Behaviour Intention (.86), so the first hypothesis is fully supported. However, the positive correlation between image and Actual Use is not that strong (.59).

- Hypothesis 2: Perceived ease of use will have a positive and significant impact on user acceptance of Midjourney.

Based on the results in Table 3, it is clear that there is a substantial positive correlation between PEU and Actual Use of Midjourney (.70). The results also reveal that there is a positive relationship between PEU and Attitude (.91). Overall, the relationships found between PEU and other variables are positive and support the second question. The findings are also in agreement with previous studies about TAM (Tarhini, 2014).

- Hypothesis 3: Perceived usefulness will have a positive and significant impact on user acceptance of Midjourney.

The results shown in Table 3 reveal that there is a substantial positive correlation between Midjourney's PU with Attitude (.86) and Behaviour Intention (.85). It suggests that in the design process, PU will influence users' attitudes towards using Midjourney. The finding is in line with the current research suggesting the existence of a strong relationship between perceived usefulness and attitude towards computer use.

- Hypothesis 4: Perceived ease of use will positively and significantly affect perceived usefulness.

The results shown in Table 3 indicate that there is a substantial positive correlation between PEU and PU (.82). The result reveals that the ease of use will substantially affect users' feelings about the usefulness. This finding is in line with the finding of previous studies (Alfadda & Mahdi, 2021).

- Hypothesis 5: Perceived ease of use will positively and significantly affect the generation of user design ideas.

In the Behaviour Intention part of the questionnaire, the questions are about creative ideas. The results shown in Table 3 indicate that there is a substantial positive relationship between PEU and Behaviour Intention (.89). The result indicates that Perceived Ease of Use motivates designers to create more design ideas.

- Hypothesis 6: Perceived usefulness will positively and significantly affect the educational role of Midjourney.

Based on the results in Table 3, there is a substantial positive correlation between PU and Actual Use (.73). In the Actual Use part, questions are about the educational role of Midjourney. The results reveal

that Perceived Usefulness encourages users to believe in the important role of Midjourney in university education.

5 Conclusions

Despite the growing interest in AI-Generated Content research, there is still a lack of studies investigating the acceptance of Midjourney in the AI-Generated Content field. This study extended the model of TAM on the use of the Midjourney application in the design process. It revealed that there is a strong correlation between the actual use of Midjourney and the designers' attitudes and behaviour intention. In addition, the results also show that Midjourney has a positive impact on design inspiration.

Practically, the results of the study could provide suggestions for designers, teachers, and the designer of Midjourney or similar application developers. For designers, TAM has shown that Midjourney has a strong influence on design inspiration. Combining AI-Generated Content for design creativity is more effective than traditional ways of designing ideas, such as brainstorming. In addition, the PEU is confirmed to have an influence on design students' motivation towards learning designing, which means Midjourney or similar models can be considered for inclusion in the higher education system. As for the developers, the findings of this study could facilitate their understanding of designers' actual needs. For example, PU is confirmed to be in correlation with their Attitude towards Midjourney. Therefore, they can strengthen the awareness that Midjourney is indeed helpful.

This study has some limitations that may be addressed in future studies. Firstly, the sample size is small, so the results may not be general. Also, the participants are mostly designers, which have been trained in designing. In the future, participants with different design levels may be included in the sample. Finally, Midjourney is a new AI model, so the perception may evolve over time. In the future study, the data may be more variable.

Acknowledgements

This research project received funding from Shanghai Jiao Tong University's USC-SJTU Institute of Cultural and Creative Industry, and from Zizhu National High-Tech Industrial Development Zone, via the Zizhu New Media Management Research Center and the International Association of Cultural and Creative Industry Research. The researchers acknowledge the generous financial and administrative support from the institutions and their staff.

References

Alfadda, H. A., & Mahdi, H. S. (2021). Measuring Students' Use of Zoom Application in Language Course Based on the Technology Acceptance Model (TAM). J Psycholinguist Res, 50(4), 883900. https://doi.org/10.1007/s10936-020-09752-1

Arndt S, T. C., Andreasen N C. (1999). Correlating and predicting psychiatric symptom ratings: Spearmans r versus Kendalls tau correlation. Journal of Psychiatric Research, 33(2):97-104.

Berg, N. (2022). AI tools like DALL-E 2 and Midjourney are helping architects—And their clients— Design new buildings. Fast Company. (https://www.fastcompany.com/90780871/ai-tools-likedall-e-2-and-midjourney-are-helping-architects-and-their-clients-design-new-buildings)

Lee, D. Y., & Lehto, M. R. (2013). User acceptance of YouTube for procedural learning: An extension of the technology acceptance model. Computers & Education,, 61, 193–208. https://doi.org/https://doi.org/10.1016/j.compedu.2012.10.001.

Mansimov, E. P., Emilio; Lei Ba, Jimmy; Salakhutdinov, Ruslan (2015). Generating Images from Captions with Attention. ICLR.
Moore, G. C., Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. Inf. Syst. Res., 2, 192–222.
Scherer, R., Siddiq, F., & Tondeur, J. . (2019). The technology acceptance model (TAM): A metaanalytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. . Computers & Education,, 128, 13–35.
https://doi.org/https://doi.org/10.1016/j.compedu.2018.09.009
Vincent, J. (2022). All these images were generated by Google's latest text-to-image AI. The Verge. Vox Media.
Wasielewski, A. (2023). "Midjourney Can't Count": Questions of Representation and Meaning for
Text-to-Image Generators. The Interdisciplinary Journal of Image Sciences, 37(1), 2023, S. 71-
82. https://doi.org/ 10.1453/1614-0885-1-2023-15454
Boymamatovich, S. M. (2023). Exploring the Benefits and Future of Artificial Intelligence. CENTRAL ASIAN JOURNAL OF THEORETICAL AND APPLIED SCIENCES, 04 (03).
Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–339.
Haque, M. U., Dharmadasa, I., Sworna, Z. T., Rajapakse, R. N., & Ahmad, H. (2022). "I think this is the most disruptive technology": Exploring Sentiments of ChatGPT Early Adopters using Twitter Data.
Lee, D. Y., & Lehto, M. R. (2013). User acceptance of YouTube for procedural learning: An extension of the technology acceptance model. Computers & Education, 61, 193–208.
https://doi.org/https://doi.org/10.1016/j.compedu.2012.10.001.
Moore, G. C., Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. Inf. Syst. Res., 2, 192–222.
Panicker. (2022). AI-Inflected Art/Architecture: Who (or rather, what) is the artist/architect? . BLUEPRINT SEPTEMBER, 3(2), 15–36.
Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A metaanalytic structural equation modelling approach to explaining teachers' adoption of digital technology in education. Computers & Education, 128, 13–35.
https://doi.org/https://doi.org/10.1016/j.compedu.2018.09.009
Smith, M. L. R. S. R. S. A. B. D. B. A. (2023). Generating scholarly content with ChatGPT: ethical challenges for medical publishing. The lancet Digital Health.
Tarhini, A., Hone, K., & Liu, X (2014). Measuring the moderating effect of gender and age on elearning acceptance in England: A structural equation modelling approach for an extended technology acceptance model. Educational Computing Research, 51(2), 163–184.
https://doi.org/https://doi.org/10.2190/ec.51.2.b.
Taylor, R. (1990). Interpretation of the correlation coefficient: A basic review. Journal of diagnostic medical sonography, 6(1), 35–39.
https://doi.org/https://doi.org/10.1177/875647939000600106
TenCent. (2023). AIGC Development Trend Report (2023).
Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User acceptance of information technology: Towards a unified view. MIS Quarterly, 27(3), 479–501.
Yang, Y., & Wang, X. (2019). Modelling the intention to use machine translation for student translators: An extension of Technology Acceptance Model. Computers & Education, 133, 116126. https://doi.org/10.1016/j.compedu.2019.01.015