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Factors Influencing the Continued Use of Procreate Digital Painting Software by Fine Arts Students in Chongqing, China

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Abstract

Background and Aim: With the rise of digital technology, digital painting software has become a tool for artistic expression. The purpose of this paper is to explore the factors that influence the continued use of Procreate digital painting software by undergraduate art students in Chongqing, China, through three major theories: ECM, UTAUT 2, SCT, and other modeling frameworks.

Materials and Methods: This study adopted a quantitative approach to data collection using a five-point Likert scale for the questionnaire. The sample of this study was undergraduate students of six fine arts programs in different regions of Chongqing, China, and the participants were selected through a Judgmental or purposive sampling technique. The instrument used to collect the data was a questionnaire and the data were analyzed on 487 valid questionnaires, CFA and SEM were executed to validate the fit, validity, and reliability of the model and to confirm the causality between the variables for hypothesis testing.

Results: All hypotheses were supported, with perceived usefulness and satisfaction as direct influences. self-efficacy had the most significant effect on perceived usefulness.

Conclusion: Key factors influencing Chongqing art students' continued use of Procreate digital drawing software include hedonic motivation, confirmation, self-efficacy, and knowledge application, which together contribute to students' continuance intention to use the software by enhancing satisfaction and perceived usefulness. This study provides new perspectives for understanding the use of digital drawing software in art education, offers insights for educational institutions to optimize digital strategies for art education, helps software developers to improve product functionality, and guides art students to make more effective use of digital tools for art creation, thus promoting the in-depth application and development of digital drawing technology in the art field.

Keywords: Procreate; Digital Painting; Fine Arts Education; Influencing Factors

Introduction

The rapid rise of digital technology has led to the rise of digital painting as an art form, which combines technology and art and has become a new favorite in the art world (Korepanova & Pata, 2023). Digital painting, which uses electronic devices such as computers, tablets, or digital drawing boards as well as specialized graphic software to create visual artworks, not only opens up new dimensions of artistic creation but also enriches the means of artistic expression. This art form is redefining the boundaries of art and expanding the vast space of artistic creation (McCready, 2021).

The use of digital painting in modern society has penetrated various fields and has become an important bridge between academia, professions, and the arts. In the field of art education, digital painting opens new doors for diversified and innovative development of education (Sugiarto et al., 2021). This innovative means of art not only overturns the traditional mode of education but also brings about a revolution in teaching methods and provides new teaching tools and media. For art majors, the popularity of digital painting has changed their creative habits, and mastering digital painting skills has become a necessary skill (González & Abad, 2021). At the same time, digital drawing also offers broader career prospects for art majors, and students who master this skill will have more employment opportunities. This suggests that for educational institutions, teaching digital drawing is not only an innovative attempt, but also an anticipation and adaptation to future trends.

Procreate drawing software is widely used in the field of art and design education due to its portability and powerful features. It not only provides rich brush and layer functionality but also supports high-resolution canvases, enabling students to create detailed artwork. Despite the growing use of Procreate

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in art education, art majors hold different opinions about its use. Some students felt that the artwork created using Procreate lacked artistic flavor and did not match their expectations. Other students, on the other hand, felt that Procreate greatly facilitated the creation of their drawings. Therefore, the purpose of this study is to investigate what factors influence art majors' use of Procreate and whether students' autonomy and control over the software are enhanced during their use. In addition, the study will examine whether the students would like to continue to use Procreate for art creation in the future.

Objectives

The main purpose of the study is to explore in depth the key factors that influence art majors in Chongqing, China, to consistently use Procreate digital painting software. With the advent of the digital era, art majors are gradually integrating this software into their daily learning and creation. However, previous literature studies have mainly focused on the technical characteristics of Procreate software such as functional evaluation, operation interface, and usage guidelines, and the research targets a wide range of software users. There is a dearth of research on Procreate's use and psychological motivation among a specific user group, art students, so this study aims to fill that gap. This study focuses on a group of art students with specific needs and higher technical requirements. These students not only pursue the basic functions of the software but also pay more attention to its practical application in art creation and the psychological satisfaction it brings. Therefore, studying factors such as their motivation for use, satisfaction, and continued intention will help educational institutions, software developers, and art major students better understand the value and role of Procreate in art education, promote its wide application and optimization strategies in art education, and provide new perspectives and ideas for future research and practice.

Literature review

After reviewing prior literature and theories, the researcher identified three core research theories to form the conceptual framework of this research. These three core theories are expectation-confirmation theory, unified theory of acceptance and use of technology 2, and social cognitive theory, which are briefly described below.

Expectation-Confirmation Theory (ECM)

Oliver (1980) was the first to introduce expectation-confirmation theory（ECM）, and the idea has been confirmed several times in studies of customer satisfaction and willingness to continue using (Cheng, 2019). Cheng (2019) suggested that users' willingness to continue using is based on their satisfaction, which in turn is based on the confirmation between their expectations and perceptions of the system's performance. Dai et al. (2020) also stated that perceived usefulness is a key factor influencing user satisfaction and willingness to continue using. The ECM focuses on key variables such as perceived usefulness, validation, satisfaction, and willingness to continue using (Al-Emran & Salloum, 2020), and is commonly used in the field of educational technology to explain why students, teachers, or other users continue to use a particular educational technology tool or platform. ECM theory provides a powerful framework for research to help understand and predict why users choose to continue using technology to better understand and promote the use of technology in educational settings.

In this study, validation focuses primarily on the extent to which students' experience with the Procreate software matches their initial expectations. Satisfaction, on the other hand, is the key bridge between initial use and continued willingness to use. Once students have a positive experience with Procreate and this experience meets their expectations, their satisfaction increases, which in turn increases their willingness to continue using it. In addition, perceived usefulness is another key determinant of technology acceptance. In the context of art education, if students perceive Procreate to be effective in helping them create art, then this perceived usefulness will directly motivate them to use the tool consistently. Therefore, based on the ECM model, the researcher can gain a more in-depth understanding

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and explore the various motivations and factors that contribute to the sustained use of Procreate by art students in Chongqing, China. The ECM provides researchers with a complete, structured framework to help them integrate and analyze the data more efficiently so that they can draw targeted conclusions.

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

Venkatesh et al. (2012) proposed and tested the unified theory of acceptance and use of technology 2 model (UTAUT2), which is an extended model of the UTAUT model; the expanded UTAUT2 model adds three new variables, namely hedonic motivation (HM), price value (PV) and habit (HB). UTAUT2 synthesizes and extends several previous independent models of technology acceptance and has had a profound impact on the field of technology acceptance (Tamilmani et al., 2021). This model is widely used in academia due to its comprehensiveness and prediction accuracy. The UTAUT2 model is mainly used in the field of consumer technology, but due to its comprehensiveness and flexibility, it is also used in a wide range of other fields, including education.

The purpose of this study was to explore the factors that influence art students' continued use of Procreate digital painting software in Chongqing, China, and UTAUT2 provides a complete framework to understand and measure these influences. In UTAUT2, hedonic motivation (HM) is a core construct used to measure the level of pleasure or enjoyment when using technology. Particularly in the field of fine arts, the pleasure of the creative process and of using the tools themselves is an important factor in a student's choice of a particular technique. the ability of the UTAUT2 model to capture the emotional experience of fun or creative pleasure that students seek when choosing and consistently using Procreate has allowed researchers to gain a more comprehensive understanding of why art majors consistently use Procreate.

Social Cognition Theory (SCT)

Social Cognitive Theory (SCT) was developed by Bandura (1977), who elaborated on this theory in his paper and emphasized the importance of observational learning. self-regulation and self-efficacy. The key concept of SCT is self-efficacy. Self-efficacy refers to an individual's confidence in his or her ability to perform a behavior or achieve a goal. In the field of technology education, this theory has been used to explain the behaviors of technology acceptance and use, specifically about how new technologies are learned and adopted by observing and imitating others' use of the technology. Dikmen & Demirer (2022) explored the use of SCT in the field of educational technology, and social cognitive theory provides researchers in the field of technology education with a powerful theoretical framework to better understand how students select and use technology tools and how to design more effective technology education strategies.

Based on previous research, SCT provides insight into the motivational factors behind individual behaviors and choices. The choice of SCT as the theoretical basis of the study in this research, especially the introduction of the concept of self-efficacy, helped the researcher to delve deeper into the students' internal drivers when choosing whether or not to continue using Procreate. Fine arts students need to be confident enough to believe that they can effectively express their creativity and skills through the use of Procreate. This confidence or self-assurance on their part relates not only to their drawing skills but also to their familiarity and mastery of digital drawing tools. If students feel that they can complete their work effectively using Procreate, they are more likely to use it consistently. and conversely will choose to abandon or move on to other tools. Thus, the theory of self-efficacy in SCT provides researchers with an in-depth perspective on understanding how art majors assess their skills and confidence, and how this affects their decisions about the continued use of Procreate. Helping the researcher gain a more complete understanding of the psychological processes and decision-making factors involved in students' use of digital drawing tools.

Hedonic motivation

Hedonic motivation (HM) refers to the pleasure and anticipation an individual experiences when

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using smart technology (Qu & Wu, 2024). Essentially, it is an intrinsic drive that propels individuals to seek pleasure and satisfaction. Hedonic motivation is considered a key factor influencing the acceptance of technology or systems, especially when users find it enjoyable and pleasurable to use a particular technology. HM can be viewed as an intrinsic motivator and source of pleasure during task execution (Al-Azawei & Alowayr, 2020). HM plays a pivotal role in determining user adoption of AI technology.

Confirmation

Confirmation is defined as the cognitive evaluation of the consistency between a user's prior expectations and their actual usage experience (Dai et al., 2020). It is a key concept in the acceptance of information systems that helps researchers decipher why users choose to continue using or abandon a particular system. User's intention to continue using information systems is based on their perceived usefulness (PU) and confirmation level (Cheng, 2019). Research has shown that users' confirmation of information systems impacts their perceived usefulness (PU), and their PU further influences their satisfaction with the information system as well as their intention to continue using it. When a system performs at or beyond users' expectations, they tend to feel satisfied with the technology, perceive it as valuable, and are more inclined to continue using that system.

Self-Efficacy

Self-efficacy (SE), at its core, is based on a person's deep belief that they can accomplish a task and is a key concept for understanding how individuals perceive their abilities and how they act (Zhao & Zhao, 2021). Self-efficacy plays a critical role in determining the extent to which individuals accept technology. Data show that those with high self-efficacy are more inclined to adopt technological innovations. Self-efficacy reflects students' belief in their ability to execute learning tasks and achieve success. Self-efficacy has been identified to have a direct impact on perceived usefulness (PU) (Al-khresheh & Alkursheh, 2024).

Knowledge Application

Knowledge application (KA) is defined as the process of applying learned knowledge and skills to new, unfamiliar, or complex real-life situations. It is not just about memorizing information, but about how to effectively use that information to solve problems, make decisions, or create new ideas. Students' expectations for knowledge application have a significant and direct impact on their perceptions of technology (Ibrahim & Shiring, 2022). Literature research shows that knowledge application (KA) plays a decisive role in the acceptance of various technologies (Ahmad et al., 2023). KA improves the efficiency of learning, and those who possess knowledge are more likely to accept new technological tools. KA is considered an essential facilitator for successful system adoption.

Satisfaction

Satisfaction is typically defined as a post-purchase evaluation of a product or service in comparison to an individual's expectations (Oliver, 1980). User satisfaction refers to the user's contentment with the system's speed, quality, number of features, and design. Satisfaction is the most important factor in determining the success of new system acceptance. Several studies have shown that students deeply care about whether their expectations are met, as this directly relates to their satisfaction and subsequently influences their usage decisions. Perceived usefulness has been identified as a central factor determining their intention to use (Salimon et al., 2021). Satisfaction has been regarded as a key indicator of the success or failure of any information system.

Perceived Usefulness

Perceived usefulness (PU) refers to the degree to which a person believes that using a system will enhance his or her job performance (Ibrahim & Shiring, 2022). PU greatly influences the attitudes of the user, reflecting an individual's belief that the new technology can improve work efficiency. Studies have

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shown that perceived usefulness is seen as a key determinant in whether users accept and adopt new technology. which further influences users' satisfaction with the technology and their intention to use it consistently. Tarhini et al. (2017) noted that perceived usefulness directly affects students' willingness to continue to use.

Continuance Intention

Continuance intention (CI) can be defined as the intention of users to continue using a product, service, or system after their initial exposure and use (Dai et al., 2020). He proposed an expectation confirmation model that aims to explain why users accept or reject the use of information technology. Continuance intention is essentially a reflection of customer satisfaction or loyalty. When users' expectations match the actual use experience, their satisfaction is higher, which leads to an increase in the willingness to continue using (Tarhini et al., 2017). Both perceived usefulness and satisfaction are key determinants of continuance intention, perceived usefulness plays a pivotal role in users' acceptance and continued use of new technologies, with satisfaction also acting as a crucial mediating variable.

Conceptual Framework

The purpose of this research was to explore the factors contributing to art students' intention to continue using Procreate digital painting software in Chongqing, China. The researcher cited the three aforementioned research theories and four modeling frameworks to establish the conceptual constructs of this study. The model in this study involves seven main variables, and 4 independent variables including hedonic motivation, confirmation, self-efficacy, and knowledge application, Camilleri & Camilleri (2017) stated that the independent variables are the factors that influence the other variables. The 2 mediating variables are satisfaction and perceived usefulness, the mediator variables act as a bridge, situated between the independent and dependent variables, and may influence the dependent variable (Nelson & Cheng, 2019). Finally, Kintu et al. (2017) argued that the dependent variable is the central focus of the study. The dependent variable in the current study is the continuance intention and it is the main variable we are trying to explain or predict. The conceptual framework in Figure 1 describes the causal relationships between each variable.

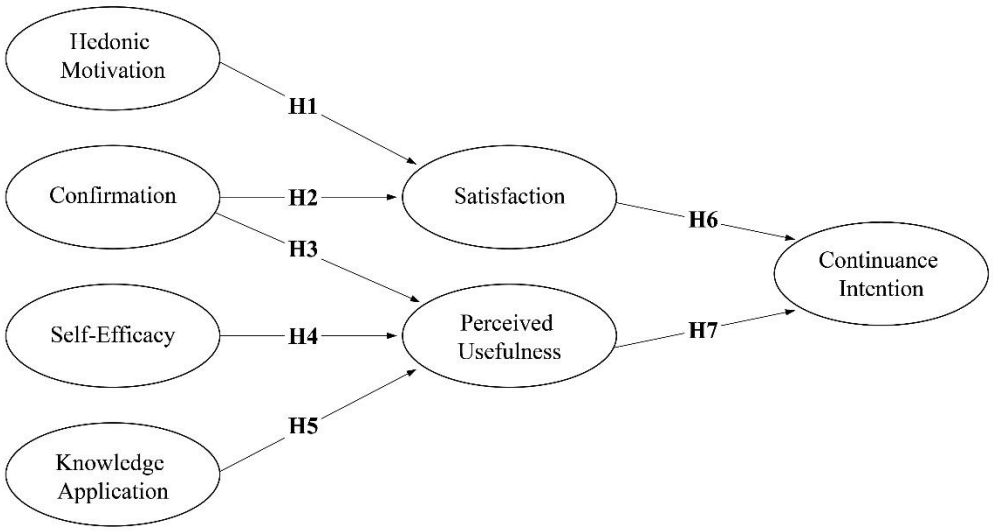

Figure 1 Conceptual Framework

Based on the structure of the conceptual framework, the researcher created the following seven hypotheses to examine the causal relationships between each latent variable.

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$H_0$1: Hedonic motivation has no positive influence on Satisfaction.
H_a1: Hedonic motivation has a positive influence on Satisfaction.
$H_0$2: Confirmation has no positive influence on Satisfaction.
H_a2: Confirmation has a positive influence on Satisfaction.
$H_0$3: Confirmation has no positive influence on Perceived Usefulness.
H_a3: Confirmation has a positive influence on Perceived Usefulness.
$H_0$4: Self-efficacy has no positive influence on perceived usefulness.
H_a4: Self-efficacy has a positive influence on perceived usefulness.
$H_0$5: Knowledge Application has no positive influence on perceived usefulness.
H_a5: Knowledge Application has a positive influence on perceived usefulness.
$H_0$6: Satisfaction has no positive influence on Continuance Intention.
H_a6: Satisfaction has a positive influence on Continuance Intention.
$H_0$7: Perceived Usefulness has no positive influence on Continuance Intention.
H_a7: Perceived Usefulness has a positive influence on Continuance Intention.

Methodology

Population and Sample Size

The target population of this study consists of undergraduate students majoring in fine arts at six universities in various regions of Chongqing, China: Sichuan Fine Arts Institute (SFAI), Chongqing University (CQU), Southwest University (SU), Chongqing Normal University (CQNU), Chongqing University of Posts and Telecommunications (CQUPT), and Chongqing University of Education (CQUE), and the selection criterion is intended to ensure that the sample is representative of the overall Chongqing geographic area. The researcher used a statistical calculator to calculate the required sample size of 425 researchers (Soper, 2006). Judgmental or purposive sampling in non-probability sampling was used in the current study to help the researcher narrow down the sample to get the most relevant information about the respondents to the study and to make an overall judgment about the sample. Etikan & Bala (2017) suggested that in judgmental sampling or purposive sampling, the selection of respondents is based on the judgment of the researcher, who selects respondents based on the characteristics that they have the required information and share the same viewpoints as the shared viewpoints to provide the best information for the success of the targeted research. In this study, the questionnaire was deliberately distributed to 780 students who had at least one experience of completing an artwork using Procreate.

Data Collection and Analysis

The questionnaires for this study were distributed through online channels such as WeChat, QQ, and e-mail. The researcher distributed 780 questionnaires in a targeted manner and finally received 612 responses to the questionnaires, out of which 487 questionnaires were valid. Subsequently, the researcher used Jamovi 2.4.6 and AMOS 23.0 statistical tools to analyze the data from the 487 questionnaires, performed confirmatory factor analysis (CFA), to validate the model, fit, validity, and reliability, and extracted the average variance (AVE), etc., and then the study used the structural equation model (SEM) to verify the causal relationship between variables for hypothesis testing.

Research Instrument

This study used quantitative research methods and questionnaires to collect data from the target group. The researcher distributed questionnaires to undergraduate students majoring in fine arts at six universities in different regions of Chongqing, China. The researcher designed the questionnaire into three parts; the first part of the questionnaire consisted of screening questions that were used to screen eligible respondents to determine if they were qualified to be interviewed. The second part of the questionnaire consisted of demographic information, which was used to gather an overview of the respondents' demographic characteristics. The third part of the questionnaire is about the measurement of variables to

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determine whether the students have the intention to use the Procreate digital painting software on an ongoing basis. All the questions in the questionnaire of this study were one-way choices and the respondents could only choose one answer to answer. To ensure the quality of the questionnaire and to encourage respondents to be patient enough to fill out the entire questionnaire, the questions in the questionnaire were stated in layman's terms to avoid any misunderstanding of the meaning of the questions or any confusion on the part of the respondents. The questionnaire was created and distributed through the online survey tool "QuestionStar". The questionnaire was tested on a five-point Likert scale.

Validation of the Research Instrument

To ensure the high relevance, completeness, and appropriateness of the questionnaire designed for this study, five professors with deep academic backgrounds and practical experience in the field of fine arts were invited as experts to conduct the IOC test. The main task of these experts was to carry out an in-depth evaluation and assessment of the questionnaire to ensure the rigor and applicability of its content. The acceptable value of the expert measure should be between 0.5 and 1.00, and items scoring 0.5 or higher will be retained (Jenkinson, 2009). After validation, all 30 items in this study had scores higher than 0.8, proving that the validity of the research instrument was adequate. In addition, in the course of this study, Pilot tests and small-scale research activities were used in the pre-study period to ensure the scientific validity and appropriateness of the instruments applied in the main study.

Cronbach's Alpha was used in this study to measure the stability and reliability of the research instrument. It is generally accepted that $0.7 < \text{alpha} < 0.8$ indicates acceptable internal continuity, and the higher the Cronbach's alpha, the tighter the correlation between items in the scale and the higher the level of internal consistency reliability (Taber, 2018). This study used a sample size of 51 for pilot testing. The results of the study showed that all items had alpha values of 0.8 or higher. This indicates that the reliability of the instrument in this study is high and the results are shown in Table 1.

Table 1 Results of Cronbach's Alpha of the research instruments

Variable	Number of Items	Cronbach's Alpha	Strength of Association
Hedonic Motivation	5	0.917	Excellent
Confirmation	4	0.898	Very good
Self-Efficacy	4	0.890	Very good
Knowledge Application	4	0.928	Excellent
Satisfaction	4	0.921	Excellent
Perceived Usefulness	5	0.918	Excellent
Continuance Intention	4	0.874	Very good

Note: Constructed by the Author

Results and Discussion

Demographic Information

Demographic information collected from 487 participants included gender, school, and grade level. The statistics showed that the majority of the participants were female with 355 participants or 72.9% of the total sample. There were 132 male respondents, representing only 27.1%. In terms of the university that the participants belonged to, 40.65% of the participants were from the Sichuan Fine Arts Institute (SFAI) with 198 participants. The smallest percentage of participants came from Chongqing University of Posts

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and Telecommunications (CQUPT) with only 47 participants, accounting for 9.65% of the total. In terms of the grade level of the participants, the third-year students with 169 participants had the largest number and the largest percentage of 34.8%, followed by the fourth-year students with 146 participants or 29.9%, the second-year students with 121 participants or 24.9%, and the smallest percentage of the first-year students with only 51 participants or 10.4% of the total percentage. Please see Table 2 for detailed information.

Table 2 Demographic Profile

Variable	Category	Frequency	Percentage
Gender	Male	132	27.1%
	Female	355	72.9%
University	SFAI	198	40.65%
	CQU	63	12.93%
	SU	67	13.75%
	CQNU	58	11.90%
	CQUE	54	11.08%
	CQUPT	47	9.65%
Academic Year	Year 1	51	10.4%
	Year 2	121	24.9%
	Year 3	169	34.8%
	Year 4	146	29.9%

Note: Constructed by the Author

Assessment of Normality

Normality is an important concept in statistical analysis, which refers to whether the data distribution conforms to normal distribution (Das & Imon, 2016). In normality testing, two statistics, skewness and kurtosis, are usually concerned to assess the degree of normal distribution of data. Skewness tests the symmetry or asymmetry of the data. A skewness value of 0 indicates that the data are perfectly symmetrical or normally distributed. According to Dugar (2018), a skewness value between the range of -0.50 to 0.50 indicates a fairly symmetrical distribution of the data; -1 to -0.50 (negatively skewed) or 0.50 and 1 (positively skewed) indicates moderate skewness, while data less than -1 (negatively skewed) or greater than 1 (positively skewed) is highly skewed. Dugar (2018) mentioned that a kurtosis value in the range of between -2 and +2 is acceptable. Kurtosis tests the strength or weight of the tails of the data distribution, with positive values of kurtosis representing heavier tails of the distribution and negative values representing lighter tails of the distribution (McNeese, 2016). The statistics of skewness and kurtosis for this study are shown in Table 5.3.

Table 3 Evaluation for Normality

Variable	Item	Skewness		Kurtosis	
		Statistic	Std.Error	Statistic	Std.Error
Hedonic Motivation (HM)	HM1	-0.848	0.111	-0.1020	0.221
	HM2	-0.648	0.111	-0.2800	0.221
	HM3	-0.768	0.111	-0.0824	0.221

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	HM4	-0.586	0.111	-0.3144	0.221
	HM5	-0.615	0.111	-0.5417	0.221
Confirmation (CON)	CON1	-0.200	0.111	-0.6421	0.221
	CON2	-0.225	0.111	-0.5574	0.221
	CON3	-0.609	0.111	-0.2450	0.221
	CON4	-0.334	0.111	-0.4647	0.221
Self-Efficacy (SE)	SE1	-0.433	0.111	-0.4129	0.221
	SE2	-0.159	0.111	-0.9914	0.221
	SE3	-0.354	0.111	-0.4223	0.221
	SE4	-0.271	0.111	-0.4099	0.221
Knowledge Application (KA)	KA1	-0.633	0.111	-0.2741	0.221
	KA2	-0.623	0.111	-0.3636	0.221
	KA3	-0.573	0.111	-0.4180	0.221
	KA4	-0.611	0.111	-0.4918	0.221
Satisfaction (SAT)	SAT1	-0.365	0.111	-0.4986	0.221
	SAT2	-0.315	0.111	-0.6462	0.221
	SAT3	-0.445	0.111	-0.5033	0.221
	SAT4	-0.613	0.111	-0.4590	0.221
Perceived Usefulness (PU)	PU1	-0.767	0.111	0.0294	0.221
	PU2	-0.365	0.111	-0.4232	0.221
	PU3	-0.443	0.111	-0.3686	0.221
	PU4	-0.330	0.111	-0.4030	0.221
	PU5	-0.260	0.111	-0.5316	0.221
Continuance Intention (CI)	CI1	-0.547	0.111	-0.4270	0.221
	CI2	-0.340	0.111	-0.6319	0.221
	CI3	-0.314	0.111	-0.7677	0.221
	CI4	-0.319	0.111	-0.6966	0.221

Note: Constructed by the Author

Table 3 reveals the results of the skewness and kurtosis calculations for each latent variable. For hedonic motivation (HM), the skewness values range from -0.586 and -0.848, while the kurtosis values range from -0.082 and -0.541. For confirmation (CON), the skewness ranges from -0.200 and -0.609, while the kurtosis is between -0.245 and -0.642. For self-efficacy (SE), the skewness ranges from -0.159 and -0.433, while the kurtosis is between -0.409 and -0.991. For knowledge application (KA), the skewness ranges from -0.573 and -0.633, while the kurtosis is between -0.2741 and -0.491. For satisfaction (SAT), the skewness ranges from -0.315 and -0.613 while the kurtosis is between -0.459 and -0.646. For perceived usefulness (PU), skewness ranged from -0.260 and -0.767, and kurtosis ranged from -0.029 and -0.531. Finally, for continuance intention (CI), skewness values ranged from -0.314 and -0.547, and kurtosis values ranged from -0.427 and -0.767. Therefore, the values of skewness and kurtosis are acceptable in this study.

Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis (CFA) is a component of structural equation modeling (SEM), a statistical technique. Confirmatory factor analysis (CFA) was conducted in this study to assess whether the values of the variables and factor loadings were consistent with expectations based on theory or hypotheses (Inder, 2021). CFA measures the consistency of items before hypothesis testing (Cheng, 2019).

According to the statistical results in Table 4, the internal consistency of HM and PU was good, 0.907 and 0.893, respectively. The Cronbach's alpha values of CON, SE, KA, SAT, and CI were all greater than 0.70. The factor loading was all greater than 0.50, and the CR results of the present study were higher than

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the threshold value. The composite reliability values ranged from 0.829 to 0.908. Average variance extraction (AVE) was more significant than 0.50 (Fornell & Larcker, 1981). Thus, these model measures consolidate discriminant validity and validate the validity of the structural model estimates for subsequent measures.

Table 4 Confirmatory Factor Analysis Result, Composite Reliability (CR) and Average Variance Extracted (AVE)

Variables	Source of Questionnaire	No. of Items	Cronbach 's Alpha	Factors Loading	CR	AVE
HM	Shah & Khanna (2022)	5	0.907	0.758-0.803	0.908	0.665
CON	Cheng (2019)	4	0.841	0.684-0.901	0.840	0.574
SE	Kulviwat & Neelankavil (2014)	4	0.841	0.597-0.784	0.847	0.585
KA	Ahmad et al. (2023)	4	0.866	0.724-0.899	0.860	0.609
SAT	Cheng (2019)	4	0.805	0.695-0.790	0.829	0.548
PU	Nikou & Economides (2017)	5	0.893	0.723-0.745	0.886	0.609
CI	Cheng (2019)	4	0.865	0.794-0.797	0.865	0.616

Note: Constructed by the Author

CFA is used to determine whether the number and loading pattern of each observed variable is consistent with the theoretical predictions derived from the assumption of robustness (Brow, 2015). The fit indices selected for this study include the relative chi-square (CMIN/df), goodness of fit index (GFI), adjusted goodness-of-fit index (AGFI), normed fit index (NFI), comparative fit index (CFI), Tucker-Lewis's index (TLI) and root mean square error of approximation (RMSEA). According to the results in Table 5, CMIN/DF = 1.883, GFI = 0.915, AGFI = 0.896, RMSEA = 0.043, CFI = 0.957, NFI = 0.914, and TLI = 0.951. All the metrics obtained in this study passed the CFA test through the adjustments, and therefore, it can be confirmed that all the indicators used in the CFA assessment goodness-of-fit indicators are valid.

Table 5 Goodness of Fit for Measurement Model

Index	Acceptable Criteria	Before Adjustment	After Adjustment
CMIN/DF	<3 (Hair et al., 2010)	2.194	1.883
GFI	>0.90 (Bagozzi and Yi, 1988)	0.897	0.915
AGFI	>0.80 (Filippini & Farsi (2004)	0.875	0.896
RMSEA	<0.05 (Browne & Cudeck, 1992)	0.050	0.043
CFI	>0.90 (Hair et al., 2006)	0.942	0.957
NFI	>0.90 (Hair et al., 2006)	0.899	0.914
TLI	>0.90 (Hair et al., 2006)	0.934	0.951

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According to Wang & Lu (2021), the absolute critical value of the association between two constructs is defined as discriminant validity. The square root AVE of each potential variable should be much greater than the causal association of that conceptual framework with any construct, with the average square root of the variables enumerated in the diagonal direction (Fornell & Larcker, 1981). The data for discriminant validity discriminant validity are summarized in Table 6. The square roots of the AVEs are shown on a diagonal and are 0.815, 0.578, 0.765, 0.780, 0.740, 0.780, and 0.785, with a maximum coefficient value of 0.462 for any two latent variables. Therefore, the discriminant validity is guaranteed.

Table 6 Discriminant Validity

	HM	CON	SE	KA	SAT	PU	CI
HM	**0.815**						
CON	0.181	**0.578**					
SE	0.126	0.222	**0.765**				
KA	0.005	0.166	0.159	**0.780**			
SAT	0.279	0.394	0.137	0.079	**0.740**		
PU	0.191	0.395	0.462	0.406	0.262	**0.780**	
CI	0.219	0.200	0.206	0.124	0.398	0.375	**0.785**

Note: Constructed by the Author

Structural Equation Model (SEM)

Following the assessment of CFA, the researcher conducted a structural equation modeling (SEM) goodness-of-fit assessment to validate the causal relationships between the variables in the structural model. The researcher conducted 2 data tests for Structural equation modeling goodness of fit and the corrected SEM matrix matched the criteria indicated in this study.

Table 7 shows the SEM's goodness of fit criteria and the results before and after all adjustments. The modified structural model was recalculated with goodness-of-fit indices, and the statistical values for each index were CMIN/df = 1.995, GFI = 0.906, AGFI = 0.889, RMSEA = 0.045, CFI = 0.950, NFI = 0.905, and TLI = 0.945. The corrected model fit confirms the soundness of the structural model. Figure 2 shows the adjusted structural matrix.

Table 7 Goodness of Fit for Structural Model

Index	Acceptable Criterion	Before Adjustment	After Adjustment
CMIN/DF	<3 (Hair et al., 2010)	2.306	1.995
GFI	>0.90 (Bagozzi, 1992)	0.887	0.906
AGFI	>0.80 (Filippini & Farsi (2004)	0.868	0.889
RMSEA	<0.05 (Browne and Cudeck, 1992)	0.052	0.045
CFI	>0.90 (Hair et al., 2006)	0.934	0.950
NFI	>0.90 (Gold et al., 1995)	0.890	0.905
TLI	>0.90 (Hair et al., 2016)	0.928	0.945

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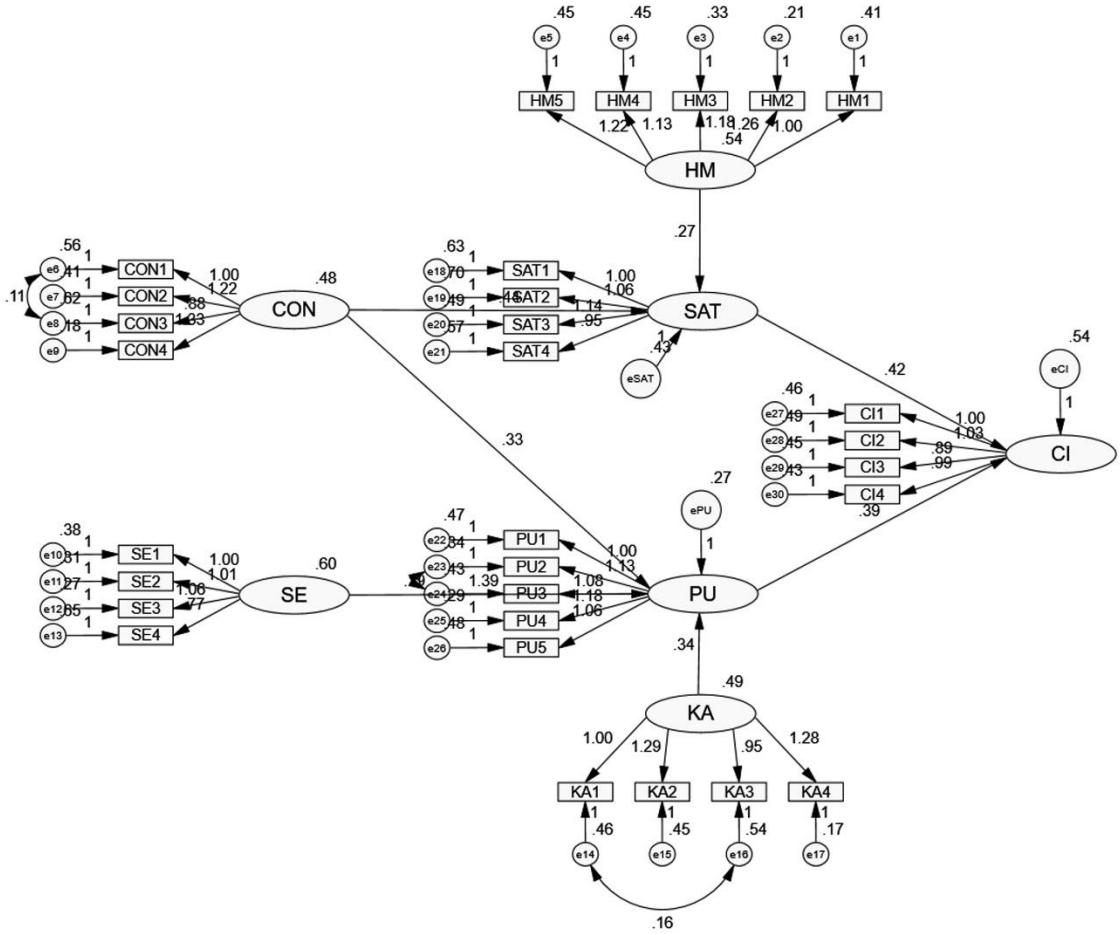

Figure 2 Structural Equation Modeling Analysis

Research Hypothesis Testing Result

The results of the hypothesis testing were determined by the significance of the regression weights and R^2 variances of each variable. The results in Table 8 show that all the hypotheses were supported. Self-efficacy had the greatest effect on perceived usefulness, standardized path coefficient (β) of 0.439 (t-value = 8.719***). Hedonic motivation had the smallest effect on satisfaction, standardized path coefficient (β) of 0.261 (t-value = 5.145***).

Table 8 Research Hypotheses Test Results

Hypotheses	Path	Standardized Path Coefficient (β)	t-Value	Tests Result
H1	SAT ← HM	0.261	5.145 ***	Supported
H2	SAT ← CON	0.402	7.104 ***	Supported
H3	PU ← CON	0.328	6.795 ***	Supported
H4	PU ← SE	0.439	8.719 ***	Supported

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H5	PU	← KA	0.347	7.193 ***	Supported
H6	CI	← SAT	0.373	6.838 ***	Supported
H7	CI	← PU	0.311	6.109 ***	Supported

Note: Constructed by the Author

All the hypotheses in the study were supported as shown by the data in Table 8. The data results can be interpreted in the following ways:

H1, the result of the standardized coefficient (β) value of 0.261 shows that there is a causal relationship between hedonic motivation (HM) and satisfaction (SAT), and this causal relationship can be used as an internal driver for students' use of Procreate digital drawing software. Studies have shown that students' satisfaction while using Procreate digital drawing software increases with the pleasure they experience while experiencing the software. This finding is supported by the study of Qu & Wu (2024).

H2, the results based on the standardized coefficient β value of 0.402 show that the degree of confirmation (CON) of the Procreate software by the target students will have a direct impact on their satisfaction (SAT) with the software. Students' acceptance of the drawing software is one of the most important factors in the use of the software. Dai et al. (2020) also confirmed in their study that there is a significant correlation that confirmation will have a positive impact on their satisfaction.

H3, according to the standardized path coefficient (β) of 0.328 shows that confirmation (CON) has a positive effect on perceived usefulness (PU). It suggests that students' continued willingness to use the Procreate software is largely based on how useful they perceive the software to be. Mun et al. (2006) also believe that user confirmation positively affects the perceived usefulness of a system, and is a key factor in determining whether users accept and sustain the use of the new technology.

H4, From the point of view of hypothesis 4, the standardized path coefficient (β) of 0.439, which is the highest among all results. The results of the study table that self-efficacy (SE) has a very significant effect on perceived usefulness (PU), and self-efficacy plays a key role in determining the degree of acceptance of the software by the students. According to Al-thresher & Alkursheh (2024), the higher the self-efficacy, the higher the perceived usefulness of the technology by the user, which is consistent with the results of this study. As a result, students with high levels of SE will be more inclined to use the Procreate software technology, believing it to be beneficial for artistic creation.

H5, regarding hypothesis 5, standardized path coefficient (β) of 0.347, the results confirm that knowledge application (KA) has a significant effect on perceived usefulness (PU). The target students believed that they could correctly apply relevant knowledge when using the Procreate software, facilitating the continuous transformation of their professional knowledge. Ibrahim & Shiring (2022) hold the same view on this.

H6, the standardized path coefficient (β) is 0.373, indicating that satisfaction (SAT) has a significant effect on the continuance intention (CI). Research has shown that target student satisfaction with the Procreate software is a key indicator of continued use of the software. In using the software, the target student is strongly concerned about whether his or her expectations are being met, which in turn directly influences his or her decision whether or not to continue to use it. Salimon et al. (2021) view also validates the positive impact of the SAT on CI.

H7, the standardized path coefficient (β) of 0.311, which indicates a significant correlation between perceived usefulness (PU) and continuance intention (CI). The study revealed that the perceived usefulness of the Procreate software by the target students was an important factor in determining their continued use of the software in the future. Dai et al. (2020) also noted that the perceived usefulness of the users has been identified as a central factor in determining their intention to continue using the software.

Direct, Indirect, and Total Effects

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The model further examines several factors that influence students' intentions to consistently use the Procreate software and the relationships between the factors. Included in this study are four independent variables, two intermediate variables, and one dependent variable, with the dependent variable being the focal point of the study and summarizing the core results of this study. Figure 3 visualizes the complex interactions and relationships between these factors in a path analysis diagram.

The model showed that two factors had a direct effect on CI, PU (0.311) and SAT (0.373), with SAT having a greater effect on CI than PU. The indirectly affected factors were KA (0.108), SAT (0.137), CON (0.252), and HM (0.097). The R2 was 0.266 indicating that the independent variables explained 26.6% of the variance of the persistent willingness to use the Procreate digital painting software. willingness to use Procreate digital drawing software is explained by 26.6%.

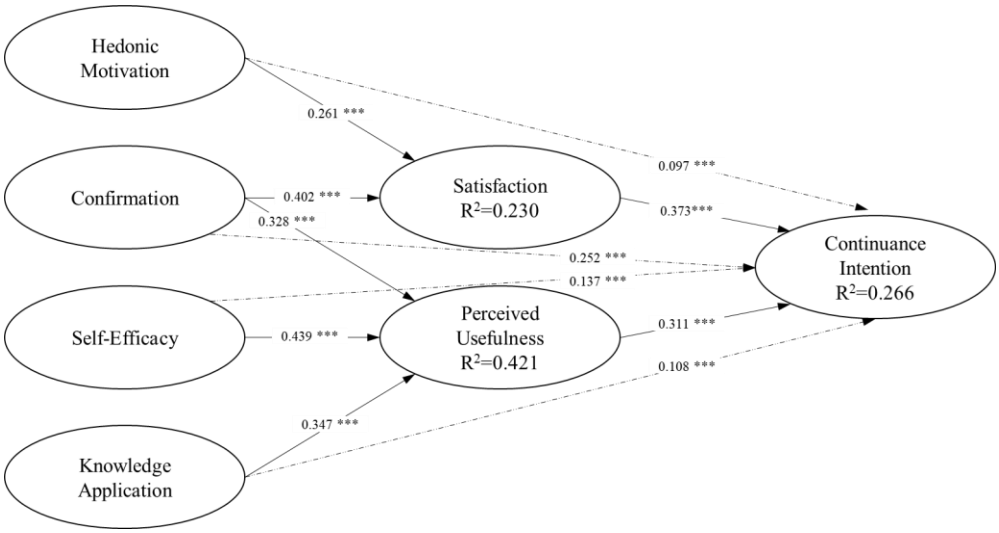

Figure 3 Path Diagram Consequences

Conclusion

From a novel perspective, focusing on a specific group of art majors, this study explored the factors that influence art majors' continued use of Procreate software in Chongqing. A quantitative research method was used in this study, and 487 valid questionnaires were collected using a questionnaire survey from undergraduate students who had used Procreate at least once for art creation at six art professional schools located in different regions of Chongqing, China. The study developed a conceptual framework based on the theoretical foundations of ECM, UTAUT2, TAM, and SCT, containing seven latent variables, four independent variables: Hedonic Motivation, Confirmation, Self-Efficacy, Knowledge Application, and two mediating variables: Satisfaction and Perceived Usefulness, and one dependent variable: Continuance Intention. The study contained 30 significant variables and seven hypotheses. The researcher used Jamovi 2.4.6 and AMOS 23.0 software tools to conduct confirmatory factor analysis including convergent validity, discriminant validity, (Composite Reliability) combined reliability and internal consistency. In addition, the study used the SEM statistical analysis technique to test the research hypotheses and also to validate the structure of the model to guarantee the reliability and accuracy of the results.

First, the results of the study showed that all seven hypotheses of the study were supported. The key factors that directly influence students' intention to use the Procreate software are perceived usefulness and satisfaction, with SAT having a greater effect on CI than PU. high satisfaction suggests that the software not only meets the creative needs of the target students but also drives users' continued use behavior more than pure functionality (perceived usefulness). This finding is consistent with Davis (1989), who noted that Perceived Usefulness (PU) is a central factor influencing users' acceptance and intention to use technology, but as users become more familiar with the technology, satisfaction gradually becomes a more persistent

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and deeper factor influencing whether or not they continue to use the technology. Therefore, educators should emphasize the experience of using software in their instruction to help students discover and take advantage of its benefits to increase their satisfaction and creative productivity.

Secondly, the results of the study found that the effect of SE on PU was significant. This means that students' increased confidence in their skills and knowledge of using the Procreate software made them more likely to recognize and trust the value and benefits of the software in their artistic creations. In other words, students' self-confidence enhanced their positive perceptions of the software's practical benefits. At the same time, since perceived usefulness is usually positively correlated with users' intention to continue using the software, the study verified that enhanced SE self-efficacy also indirectly contributed to users' continued use of the Procreate software. This finding is consistent with the findings of Venkatesh & Davis (2000), in which they found that self-efficacy significantly influenced users' perceived usefulness. This finding is important for educators. Educators can enhance students' self-efficacy by improving training in software technology and by providing the necessary resources, which will not only help students to better master the technology but will also help to improve their perceptions of the usefulness of the software.

Finally, the study showed that HM, CON, and KA all had significant indirect effects on CI. The study suggests that when students find using the Procreate software interesting, this positive emotional experience enhances their intention to continue using the software in the future. This sense of validation also increases the likelihood that students will continue to use the Procreate software if they find that their experience with the software meets or exceeds their expectations. If students felt that the Procreate software helped them to apply their knowledge more effectively in their artistic endeavors, this would increase their intention to continue using the software. In this study, perceived usefulness and satisfaction served as mediating variables that bridged the gap between the aforementioned independent variables and intention to continue using.

In conclusion, the objectives of this study were achieved. The combined effect of these factors suggests that students' intentions to continue using a program do not depend solely on a single factor, but rather are the result of a combination of multiple psychological and social factors. For educators and software developers, understanding these direct and indirect influences can help them design instructional strategies and software features that are more responsive to the needs of specialized students to improve students' intentions to persist. In addition, the results of the study provide directions for future digital arts education by facilitating the integration of art creation and digital technology to provide students with more diverse creative tools and platforms.

Recommendation

Based on a study of the factors influencing the continued use of Procreate digital painting software by art students in Chongqing, China, the researcher concluded that the interconnections between HM, CON, SE, KA, SAT, PU, and CI must be carefully considered. The following recommendations are made about the impact of digital painting on art education:

1. The study revealed a strong positive relationship between students' self-efficacy (SE) and perceived usefulness (PU) of digital drawing software. In response to this finding, it is recommended that educational institutions regularly organize special training sessions to help enhance students' self-confidence by, on the one hand, making them more proficient in the use of digital drawing software such as Procreate, and, on the other hand, focusing more deeply on students' needs, challenges, and strengths in the use of digital drawing software. In addition, the creation of exclusive online workshops is encouraged so that students can share their experiences, skills, and creative achievements with Procreate, thus further enhancing students' self-efficacy, their satisfaction with the software, and their willingness to use it, and enabling them to recognize the practical use and value of the software.

2. From the perspective of KA application, it is suggested that art educators should teach students how to effectively combine traditional painting techniques with digital painting tools and provide appropriate teaching strategies so that students can see how knowledge can be transformed and applied in

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digital painting software. At the same time, art educators can also provide students with the latest digital painting learning resources and tools to further modernize and bring teaching to the forefront.

3. It is critical for developers of Procreate and other related software to understand the needs and feedback of their target user groups. It is recommended that developers communicate regularly with art schools and educators about how to further improve the software's functionality and user experience. In addition, based on the feedback from students and educators, the software should be continuously adjusted and updated to better meet the actual needs of users at different levels, to further increase its popularity and sustained usage among art students.

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