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What Drives Designers' Continuance Intention of AIGC to Enhance Creative Ideation in Product Conceptualization?

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Abstract:

With the continuous advancement of Generative Artificial Intelligence Content(AIGC) technology, the application of AIGC drawing tools in product design has shown great potential, and utilizing them to foster creativity generation has become a common method in design innovation. However, the willingness of designers to continue using this technology and the key factors influencing their decisions still require further in-depth research. Based on this, this study establishes a theoretical model for the continuance intention of AIGC drawing tools in fostering creativity generation, integrating the Diffusion of Innovation Theory (DIT) and the Expectation Confirmation Model of IS Continuance (ECM-ISC). Through empirical analysis of 423 valid data points and the application of the PLS-SEM structural equation model, we explored various factors influencing designers' continuance intention and the underlying reasons. The results indicate that satisfaction is the most significant positive factor affecting continued use intention, while perceived usefulness and task technology fit also have a significant positive impact on continuance intention. However, self-efficacy and subjective norm have no significant impact on continuance intention. This study provides important theoretical and practical guidance for the application of AIGC technology in the design field and offers profound insights into the development of design creativity and technology.

Keywords: AIGC; product design; continuance intention; diffusion of innovation theory; expectation confirmation model of IS continuance; creative ideation

1. Introduction

The product conceptualization stage is the creative phase in product development where abstract requirements are transformed into original solutions¹. As the starting point of design innovation, the quality of creative ideation greatly influences subsequent progress. Creative ideation refers to the systematic generation and development of novel and valuable ideas, serving as the foundation for original concepts, continuously driving product innovation, and becoming a key to achieving product differentiation². Although the importance of creative ideation in the product conceptualization stage has been widely recognized, traditional ideation processes often face significant obstacles. Designers are frequently constrained by cognitive biases and resource limitations, and under high-pressure environments, the continuous generation of sufficiently novel and diverse ideas becomes an inherent challenge. These challenges may stifle innovation, resulting in suboptimal or unoriginal product solutions. The recent emergence and rapid development of Artificial Intelligence Generated Content (AIGC) technology has brought transformative potential to enhance the creative ideation process. AIGC can learn from massive datasets, recognize complex patterns, and generate novel outputs (text, images, audio, code, etc.) based on user prompts, providing a powerful tool to address the limitations of traditional ideation³. Demonstrating strong content generation capabilities, AIGC is fundamentally transforming the way designers engage in creative ideation⁴.

Among the many AIGC tools, text-to-image and text-guided image generation tools, such as Stable Diffusion, Midjourney, and DALL-E 2 have attracted widespread attention and seen positive application in product design. Leveraging deep learning models, particularly large-scale diffusion models, these tools can efficiently and iteratively produce high-fidelity, richly detailed synthetic images from textual descriptions⁵. In recent years, more and more product designers have actively integrated such tools into their design processes, using them as auxiliary means to improve the efficiency and quality of creative workflows. For instance, Liu et al. employed AIGC image generation software for chair design, creating diverse chair images to stimulate innovative thinking among designers⁶. Ali Elfa & Dawood highlighted that adopting AIGC-based creative generation methods represents

an important trend in the product design industry and showcased the positive role of AIGC drawing tools in enhancing design creativity⁷. Similarly, Lin et al. assessed the effects of AIGC drawing tools versus brainstorming methods during the product conceptualization stage, revealing that the quality of AIGC-generated images significantly influences creativity, with higher-quality images more effectively sparking inspiration⁸.

Although the practice of using AIGC drawing tools for creative generation has become increasingly common among designers, and many studies have explored their application processes and impact mechanisms, research on designers' continuance intention remains relatively scarce. Continuance intention reflects designers' commitment to integrating tools into their creative ideation workflows over the long term⁹. It is this continued use that allows designers to fully tap into the potential of AIGC and consistently enhance their creativity¹⁰. Therefore, a deep understanding of the drivers behind designers' willingness to incorporate AIGC tools (especially image generators) into their creative ideation processes in the long term is crucial for assessing the true transformative impact of this technology. This will help drive innovation in the product design process and provide important insights for the further iteration and development of AIGC drawing tools, while also offering valuable insights for industry practitioners and academic researchers.

In exploring the continuance intention of AIGC drawing tools in fostering creative generation, the Expectation Confirmation Model of IS Continuance (ECM-ISC) provides a solid theoretical foundation for understanding continuance intention¹¹. This model has been validated by numerous empirical studies and is widely applied in various information system contexts, including e-commerce¹², instant messaging¹³, and social media¹⁴, with its explanatory power widely recognized by academia. Additionally, Diffusion of Innovation Theory (DIT) has been widely used to understand the adoption of AIGC technology in design processes¹⁵. However, in the novel context of creative generation during the product conceptualization stage, new factors may influence designers' continuance intention. Therefore, based on the ECM-ISC and DIT, this study integrates technology task fit, subjective norm, perceived usefulness, and self-efficacy. The study aims to explore in-depth the continuance intention of designers in adopting AIGC drawing tools to assist creative generation and further analyze the interactions and underlying mechanisms between the relevant factors. Through this research, it is hoped to provide theoretical support and practical significance for promoting the widespread application of AIGC technology in product design, thus contributing to the symbiotic development of humans and AI, leading towards a sustainable future¹⁶.

2. Literature Review and Theoretical Background

2.1. Continuance Intention

Continuance intention refers to the behavior of users repeatedly using a technology, product, or service after initially using it¹⁷. Compared to initial usage intention, users' continuance intention more accurately reflects the advantages of the information system. This makes analyzing continuance intention crucial for enhancing product competitiveness and optimizing user experience. Currently, some scholars have studied the continuance intention of various information systems. For example, Franque et al. combined the Expectation Confirmation Theory and the Information Systems Success Model to construct a model of factors influencing the continuance intention of mobile payment users¹⁸; Todri et al. integrated the SOR model with Social Support Theory (SST) to explore the factors influencing the continuance intention of users on social shopping platforms¹⁹; and Dai et al. conducted a meta-analysis to study the factors influencing the continuance intention of learners on online education platforms²⁰. Sun's research integrated Interpersonal Attraction Theory (IAT), Expectancy Violations Theory (EVT), and DIT, focusing on the impact of attractiveness on continuance intention for AIGC products. Existing research covers various information systems such as mobile payments, shopping platforms, learning platforms, and AIGC¹⁶. However, research on continuance intention, particularly in the context of AIGC drawing tools assisting creative generation during the product conceptualization stage, remains relatively scarce. Additionally, most studies construct general models with ordinary users as the research subjects, and research focused on university students is relatively lacking. In fact, AIGC drawing tools have a high usage rate among university students, who have a more positive attitude toward new technologies, making the analysis of their continuance intention crucial for optimizing the user experience of the tools²¹. Therefore, this study focuses on exploring the continuance intention of university student users in the field of product design.

2.2. Diffusion of Innovation Theory

Diffusion of Innovation Theory (DIT), proposed by American scholar Everett M. Rogers in the 1960s, primarily explains how new ideas, products, or technologies are accepted and spread in society. The theory emphasizes five key factors: innovation attributes, adopter characteristics, social systems, communication channels, and the innovation-decision process. These five di-

mensions provide a theoretical framework for understanding the factors influencing an individual's acceptance or rejection when adopting innovations²². In the field of AIGC, DIT has been widely applied and validated. For example, Guo et al. used the Unified Theory of Acceptance and Use of Technology (UTAUT), DIT, and Perceived Risk Theory to explore the influencing factors and mechanisms of AIGC²³; Huangfu et al. used Technology Acceptance Theory (TAM) and DIT to explore the factors influencing designers' adoption of AIGC-assisted design²⁴. Additionally, DIT has been widely applied in other fields, including marketing, public health, information systems, and product and media lifecycle research²⁵. However, when faced with the context of product conceptualization and the goal of fostering creative generation, the explanatory power of DIT can be somewhat limited. For example, it does not adequately explain whether AIGC is suitable for the relevant design tasks and users in promoting creative generation. Additionally, there is a lack of proper metrics and influencing factors for measuring creative outcomes. Therefore, this study integrates the five dimensions of DIT to enhance the predictive power of the model. Specifically, task technology fit is introduced in the innovation attributes dimension, self-efficacy is incorporated in the adopter characteristics dimension, and subjective norm are considered in the social systems dimension. The innovation-decision process overlaps with the ECM-ISC, expressed through the relationship between satisfaction and continuance intention. Communication channels primarily affect users' initial awareness and adoption decisions for AIGC tools, but since this study focuses on continuance behavior after adoption, the influence of communication channels is excluded²⁶. By integrating these factors, this study constructs a more predictive integrated model based on DIT, overcoming the limitations of a single theory and addressing the gaps in explaining continuance intention within DIT. At the same time, the inclusion of factors such as perceived usefulness and task technology fit strengthens the evaluation of AIGC drawing tools in assisting creative generation during the product conceptualization stage.

2.3. Expectation Confirmation Model of IS Continuance

The Expectation Confirmation Model of IS Continuance (ECM-ISC), proposed by Bhattacherjee in 2001¹¹, integrates ECT and the TAM. It posits that user expectation confirmation can positively drive perceived usefulness and satisfaction, both of which jointly influence continuance intention. This theory reveals the dynamic psychological mechanisms of long-term user behavior by comparing actual experiences with pre-use expectations²⁷. For example, Tian & Wu used the ECM-ISC and UTAUT to study the factors influencing the continuance intention of mobile healthcare systems among elderly patients with chronic diseases²⁸; Mo applied the ECM-ISC to explore the factors influencing the continuance intention of virtual learning shared spaces²⁹; and Wu & Xie expanded the model to investigate the impact mechanisms of perceived quality, flow experience, and perceived usefulness on individuals' continuance intention to use online live lecture platforms³⁰. Overall, the ECM-ISC has been widely applied in studies on continuance intention across various information systems, including mobile healthcare, virtual learning, and live media, achieving significant research results. This directly proves the model's strong applicability and scalability across different fields. Therefore, this study adopts the ECM-ISC to analyze AIGC drawing tools, a new and highly regarded generation of information systems, with the aim of exploring the factors and mechanisms behind designers' continued use of AIGC for creative generation during the product conceptualization stage.

3. Research Hypotheses and Model Construction

3.1. Integrating Variables under the DIT

3.1.1. Task technology fit

Task technology fit refers to the degree of alignment between technology and the user's task requirements, emphasizing the consistency between technological capabilities and design task demands³¹. The higher the fit, the stronger the technology's impact on task performance. In this study, task technology fit is defined as the degree of alignment between the ability of AIGC drawing tools to facilitate creativity generation and the actual creative task requirements³². It is used to evaluate whether AIGC can effectively promote product creativity generation and meet the designer's requirements. When this consistency requirement is met, designers perceive the advantages of AIGC compared to traditional design thinking processes. Currently, many studies emphasize the critical role of task technology fit in the adoption process of new technologies, and it has been confirmed to positively impact satisfaction and continued usage intention. A study on the acceptance of online open courses found that task technology fit has a positive impact on students' satisfaction with their learning tasks³³. Furthermore, several studies have successively confirmed the positive impact of task technology fit on usage intention^{17, 34, 35}.

Other studies have found that, in different contexts, task technology fit positively affects perceived usefulness, such as in studies of smartwatches for learning³⁶, online videos³⁷, and MOOCs learning software³⁵. When designers believe that the ability of AIGC to assist in creativity generation aligns highly with their design task requirements, they may think that AIGC can better

141 promote the divergence of creative ideas and innovate product design plans and processes. This perception of usefulness will also
142 encourage them to continue using AIGC drawing tools to assist in design. Based on the above, we propose the following hypothe-
143 sis:

144 H1: Task technology fit has a positive impact on satisfaction.

145 H2: Task technology fit has a positive impact on continuance intention.

146 H3: Task technology fit has a positive impact on perceived usefulness.

147 3.1.2. Self-efficacy

148 Self-efficacy, derived from Self-Efficacy Theory (SET)³⁸, refers to an individual's belief and confidence in successfully com-
149 pleting a specific task or achieving a particular goal³⁹. Its core idea is that an individual's expectations of their own capabilities
150 influence their behavior choices and level of commitment. The level of commitment, in turn, affects their mindset and attitude
151 towards difficulties, ultimately influencing their behavioral intentions⁴⁰. In this study, self-efficacy is defined as the designer's
152 confidence in their ability to use AIGC drawing tools to facilitate creativity generation. Furthermore, studies have shown that in-
153 dividuals with high self-efficacy tend to have a more open attitude toward AI⁴¹. Therefore, we propose the following hypothesis:

154 H4: Self-efficacy has a positive impact on continuance intention.

155 3.1.3. Subjective norm

156 Subjective norm, derived from the Theory of Planned Behavior (TPB) , refers to the psychological factors that influence an
157 individual's behavior decisions and behavioral intentions, based on the expectations, social standards, or norms of others in the
158 social environment⁴². In this study, subjective norm is defined as the social pressure experienced by designers during the product
159 conceptualization phase when using AIGC drawing tools to facilitate creativity generation. Many studies have shown that subjec-
160 tive norm has a positive correlation with behavioral intention, such as the study by Van Acker et al. on the relationship between
161 subjective norm and teachers' adoption of electronic learning materials⁴³; Lee & Wan added the subjective norm variable in the
162 Technology Acceptance Model to study Chinese users' willingness to use electronic tickets⁴⁴. Users tend to comply with the social
163 norms formed by external factors to a large extent, and thus regulate their decisions to align with these norms, leading to corre-
164 sponding behaviors. In the design field, designers usually improve their skills and knowledge through communication and learn-
165 ing with peers and other professionals. In addition, they often acquire relevant information through social platforms. Understand-
166 ing the attitudes and perceptions of peers or professionals towards AIGC may allow designers to gain a deeper understanding of
167 AIGC's effect on creativity generation, influencing their own willingness to continue using it. Therefore, we propose the following
168 hypothesis:

169 H5: Subjective norm has a positive impact on continuance intention.

170 3.2. Expectation Confirmation Model of IS Continuance

171 3.2.1. Perceived usefulness

172 Perceived usefulness, derived from the TAM model, refers to an individual's subjective judgment and perception of how a
173 particular technology or tool can effectively improve their work performance or achieve goals in a specific context^{45, 46}. Perceived
174 usefulness plays a key role in determining the adoption of new technologies. If users believe that using a technology can improve
175 performance, they will perceive the technology as useful⁴⁷. In this study, perceived usefulness is defined as the benefits perceived
176 by designers after adopting AIGC to assist in creativity generation, which may manifest as the proposal of innovative solutions or
177 improvements in design efficiency. The greater the perceived benefits, the more pronounced the positive impact on satisfaction.
178 Additionally, numerous studies have shown the positive impact of perceived usefulness on the intention to use⁴⁸⁻⁵⁰. Therefore, this
179 study proposes the following hypotheses:

180 H6: Perceived usefulness has a positive impact on satisfaction.

181 H7: Perceived usefulness has a positive impact on continuance intention.

182 3.2.2. Expectancy confirmation

183 Expectancy confirmation refers to the degree to which a user's actual experience with a product or service matches their ini-
184 tial expectations. When users experience a product or service, if the actual benefits are lower than expected, expectations are not
185 effectively confirmed; conversely, when the actual experience exceeds expectations, expectations are effectively confirmed, and
186 user satisfaction will increase accordingly. Existing research clearly shows that expectancy confirmation has a positive impact on
187 satisfaction⁵¹⁻⁵³. In this study, expectancy confirmation is defined as the designer's confidence in whether the AIGC drawing tool
188 can continue to meet their creative needs and deliver the expected results. When the actual utility or experience of designers using

the AIGC drawing tool aligns with or exceeds their expectations, expectations are effectively confirmed, significantly positively impacting the user's perceived usefulness and satisfaction. Therefore, this study proposes the following hypotheses:

H8: Expectancy confirmation has a positive impact on satisfaction.

H9: Expectancy confirmation has a positive impact on perceived usefulness.

3.2.3. Satisfaction

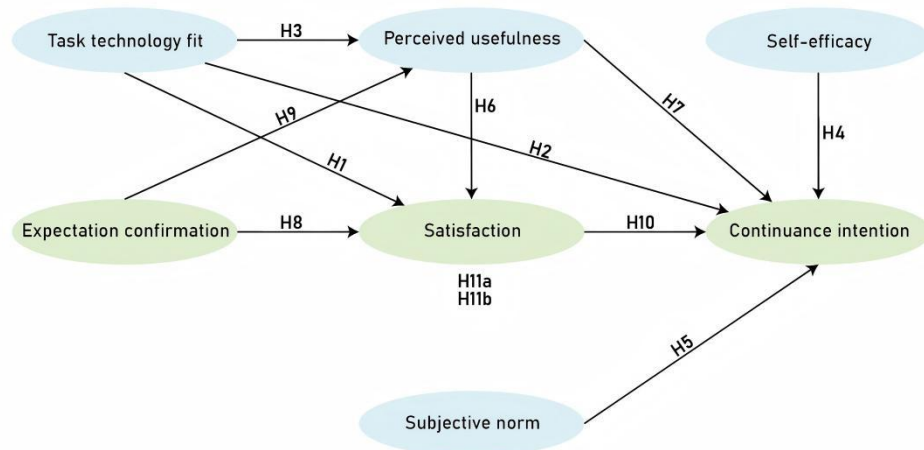
Satisfaction refers to an individual's overall evaluation and perception of how well a service or product meets their expected needs. In this study, satisfaction is used to measure the designer's overall perception of the AIGC in the creative generation process, and it is also the result of comparing the user's actual benefits with their expectations. According to the U&G theory, user satisfaction is a key determinant of whether they will continue using a product or service. Previous research has also supported this view, particularly in diverse information environments such as social media⁵⁴, instant messaging services⁵⁵, and mobile gaming applications⁵⁶, where user satisfaction has shown a significant positive impact on their continuance intention. Additionally, according to the Stimulus-Organism-Response (SOR) paradigm⁵⁷, external stimuli affect an individual's internal perception state, which then influences their willingness to engage in certain behaviors. In this study, perceived usefulness and expectancy confirmation can serve as external stimuli that influence continued usage intention through the mediating role of satisfaction. This is consistent with many research findings^{58, 59}. Therefore, this study proposes the following hypotheses and show our research model in Figure 1.

H10: Satisfaction has a positive impact on continuance intention.

H11a: Satisfaction mediates the relationship between perceived usefulness and continuance intention.

H11b: Satisfaction mediates the relationship between expectancy confirmation and continuance intention.

208



209

Figure 1. Conceptual model.

211

4. Research Methodology and Data Collection

4.1. Research Design

This study uses a survey method to measure the relationships between variables in the theoretical model. Each variable is measured using three items, assessed on a five-point Likert scale. The questionnaire consists of two main sections: demographic information and factors influencing users' adoption of AIGC drawing tools for creativity generation. All items are sourced from existing literature. With improvements based on the perspective of AIGC facilitating creative generation, specifically: Task technology fit comes from the research of Suhail et al.⁶⁰, self-efficacy comes from the research of Maillet et al.⁶¹, subjective norm come from the research of Taylor & Todd⁶² and Cordano & Frieze⁶³, perceived usefulness comes from the research of Rai et al.⁶⁴, expectation confirmation comes from the research of Bhattacharjee et al.⁶⁵ and Hu & Zhang⁶⁶, satisfaction comes from the research of Hu & Zhang⁶⁶ and Bhattacharjee¹¹, and continuance intention comes from the research of Ashfaq et al.⁶⁷. The specific items for the scales are provided in Appendix A.

222

223 To improve the credibility of the questionnaire, this study used the Delphi method to discuss the rationality of the items with
224 three experts in the field of product design and made the first round of revisions based on three rounds of iterative feedback. Sub-
225 sequently, a small-scale pilot test was conducted to re-evaluate the questionnaire content, test its reliability and validity, and en-
226 sure its reliability and effectiveness. Based on the results of the pilot test, a second round of revisions was made. After these two
227 rounds of revisions, the questionnaire was finally distributed on a large scale and entered the formal experimental phase.

228 *4.2. Data Collection*

229 The AIGC drawing tools surveyed in this study were mainly MidJourney, Stable Diffusion, and Jimeng AI. We conducted a
230 one-month questionnaire survey, selecting students as our main research subjects, as they represent the new generation of design-
231 ers who are generally more open to new technologies and innovations⁶⁸. Additionally, students are in an active phase of learning
232 and acquiring new knowledge during their university years, making them more likely to reflect attitudes and acceptance levels
233 toward AIGC technology.

234 We strictly adhered to research ethics. According to the *Guidelines for Life Sciences and Medical Research Involving Hu-*
235 *mans issued by the National Health Commission of China*, ethical review is exempted when the research involves the use of hu-
236 man information or biological samples without causing harm to individuals, does not involve sensitive personal information, and
237 is unrelated to commercial interests⁶⁹. This study was exempt from ethical review as it met the above criteria. Furthermore, This
238 study strictly complies with the *Declaration of Helsinki* to ensure that all participants participate in the study on the basis of in-
239 formed consent and their personal information and responses are strictly confidential⁷⁰. The research plan was approved for ex-
240 emption by the ethics review institution of Shandong University of Art & Design. To ensure that participants were actual users of
241 AIGC drawing tools, the survey included a screening question: "Have you used AIGC drawing tools?" Only respondents who
242 answered "Yes" were allowed to continue completing the questionnaire. A total of 500 questionnaires were distributed. After the
243 survey ended, we cleaned the data by removing incomplete or poor-quality samples, including those with excessively short com-
244 pletion times or consistency issues. In the end, 423 high-quality valid questionnaires were successfully collected and retained,
245 resulting in a response rate of 84.6%. This sample size is sufficient to support subsequent data analysis. The demographic infor-
246 mation of the survey participants is shown in Table 1.

247 *4.3. Data Analysis Method*

248 In the data analysis process, this study used Smart-PLS software to construct a structural equation model and applied Partial
249 Least Squares Structural Equation Modeling (PLS-SEM) technique to analyze the data. This method offers high flexibility in
250 terms of data distribution requirements and can effectively handle the complex relationships between latent variables. Even with a
251 limited sample size, it can accurately assess the model paths and the strength of associations between variables⁷¹.

252 **5. Results**

253 *5.1. Measurement Model Assessment*

254 Evaluating the measurement model ensures that the measurement results are reliable while effectively supporting the struc-
255 ture of the theoretical model. Typically, this evaluation is done through the analysis of reliability and validity. Reliability is meas-
256 ured by two indicators: CR and Cronbach's alpha (CA), with a passing threshold of 0.7 for both indicators^{72, 73}. As can be seen
257 from Table 2, both CA and CR values exceed the threshold of 0.7, indicating that the questionnaire data is reliable and has strong
258 reliability.

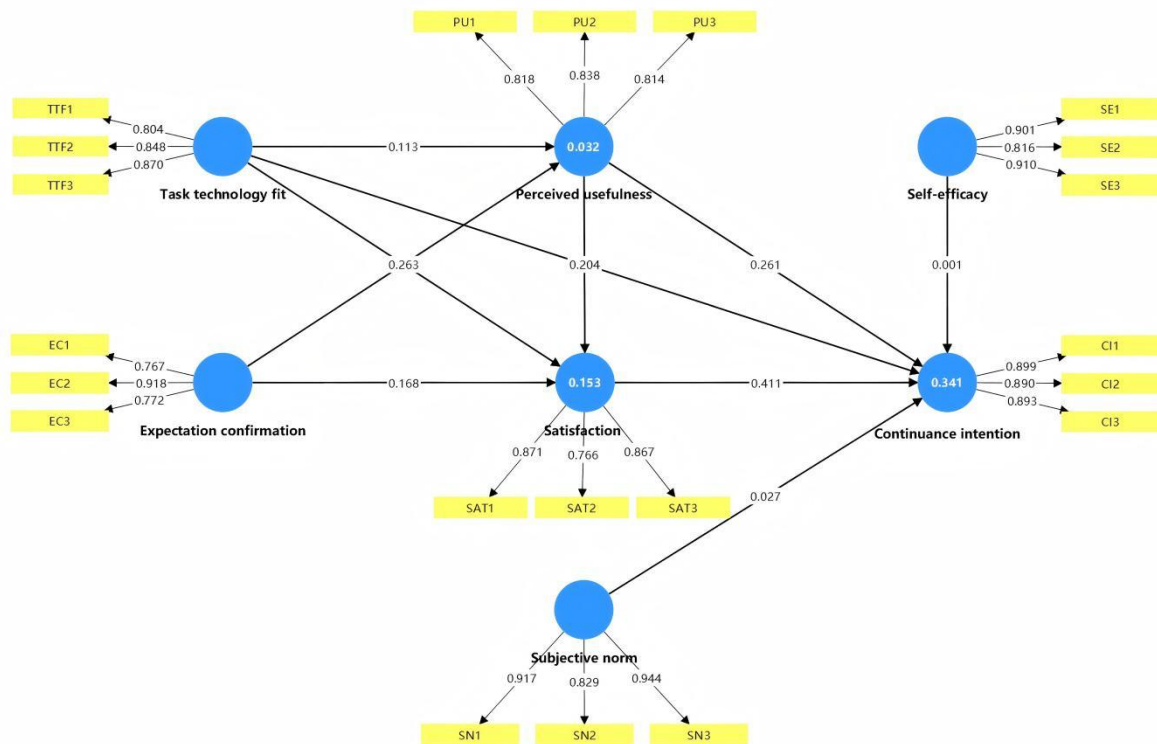
259 The measurement of validity focuses on convergent validity and discriminant validity⁷⁴. Convergent validity is generally re-
260 flected by the AVE indicator, and an AVE value greater than 0.5 indicates good convergent validity. The Table 2 shows that the
261 AVE values of all latent variables exceed 0.5, proving that the questionnaire has strong convergent validity. Discriminant validity
262 was assessed using the Fornell Larcker criterion and the Heterotrait-Monotrait ratio (HTMT) of correlations. In Table 3, the
263 square root of AVE for each latent variable surpassed its correlation with other variables⁷⁵. Furthermore, HTMT is generally less
264 than 0.85⁷⁶. The Table 4 show all HTMT values are below the recommended value of 0.85, indicating that the discriminant valid-
265 ity performs well. In conclusion, the measurement model has good reliability and validity, making it suitable for further empirical
266 research.

267 *5.2. Structural Model Assessment*

The evaluation of the structural model is primarily conducted through R^2 values and path coefficients. R^2 is a measure of the model's predictive capability, typically ranging from 0 to 1⁷⁷. The R^2 values for continuance intention, perceived usefulness, and satisfaction are all between 0 and 1, with specific indicators shown in Table 5. Q^2 value greater than 0 confirms the model's predictive relevance⁷². In this study, the Q^2 values for all factors are non-zero, indicating that the hypothesized model has acceptable predictive relevance, with specific indicators shown in Table 5. Additionally, the Variance Inflation Factor (VIF) of all latent variables are below 3.3⁷⁸, confirming that there is no multicollinearity issue among them. Table reveals that the VIF values in this study range from 1.471 to 2.936.

Subsequently, path coefficients and significance analysis were conducted to assess the validity between the hypotheses. The results of the tests are presented in Table 6 and Figure 2. The results show: (1) Task technology fit significantly and positively affects satisfaction continuance intention, and perceived usefulness, confirming the validity of H1, H2, and H3. (2) The positive impact of self-efficacy on continuance intention to use does not hold, and the positive impact of subjective norm on continuance intention to use also does not hold, thereby rejecting H4 and H5. (3) Perceived usefulness has a significant positive impact on satisfaction and continuance intention, confirming the validity of H6 and H7. Expectancy confirmation has a significant positive impact on satisfaction and perceived usefulness, confirming the validity of H8 and H9. (4) Satisfaction has a significant positive impact on continuance intention, confirming the validity of H10.

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284

285

Figure 2. Path Diagram.

5.3. Mediation Effect Test

To better test the mediating effect of satisfaction, we used the Bootstrap method to detect the mediating effect in the study. We conducted 5,000 bootstrap resamples^{16, 79}. The results, as shown in Table 7, indicate that the 95% confidence intervals for both mediating paths do not include 0, suggesting the presence of an indirect effect and supporting the validity of H11a and H11b.

6. Discussions

6.1. Direct Influencing Factors of Continuance Intention

291

By analyzing the results of standardized path coefficients, our research reveals the significant impact of satisfaction, perceived usefulness, and task technology fit on continuance intention. This indicates that these three elements are key factors influencing designers' behavioral intentions to adopt AIGC drawing tools for creativity generation.

Creativity generation in the product concept phase is a typical exploratory task, where the core goal is not to maximize efficiency but to stimulate the diversity of inspiration and break cognitive boundaries⁸⁰. In this process, AIGC drawing tools trigger the possibility of innovation through their random generation characteristics, potentially further stimulating users' positive awe and flow experiences⁸¹. When the generated product concept drawings exceed expectations, users experience a strong sense of surprise. This sense of surprise and pleasure, compared to the utilitarian feedback of the results, is more likely to enhance user satisfaction and further promote continued usage intention driven by emotional feedback.

Perceived usefulness significantly indicates that designers regard performance improvement as an important factor influencing their continuance intention. Designers tend to focus on the performance improvements achievable through the use of new technologies⁸². The traditional design conceptualization process typically involves multiple steps, such as requirement analysis, the formation of abstract concepts, hand-drawn sketches, and digital modeling. These steps often require a significant amount of time and effort, and the iterative revision process is resource-intensive. However, with the help of AIGC drawing tools, designers can generate numerous visual design solutions with a single click by simply editing a prompt, and quickly modify and redraw them as needed. This efficient and high-quality generation method significantly increases the speed of creativity generation and allows designers to explore multiple innovative solutions in a shorter period of time. This greatly enhances designers' continuance intention.

Design innovation relies not only on the latest technologies but also on how to effectively integrate these tools into the design process. Product conceptualization involves various tasks, and the complexity of the tasks raises higher demands for technology matching. Professional users require fine control over generation details, while novices rely on templates to simplify operations. For example, Stable Diffusion's custom parameter system can meet the needs of both types of users, providing high freedom and personalization, thus achieving a high match between technology and tasks. This high level of match improves users' satisfaction with the tool, thereby significantly influencing their continuance intention.

6.2. Relationships among Designers' Internal Cognitions

Empirical analysis results show that task technology fit has a significant positive impact on user satisfaction. This means that when users perceive that the functions of AIGC drawing tools can precisely match their creative needs in the product conceptualization phase, their satisfaction will significantly increase. For example, in the early stages of product development, designers often need to quickly transform vague ideas into sketches. If the AIGC software can accurately understand natural language input and efficiently generate multiple style options that meet the requirements, designers may experience high satisfaction due to the tool helping them efficiently achieve their conceptualization goals. Additionally, task technology fit also shows a significant positive impact on perceived usefulness. When users believe that the functions of AIGC drawing software are highly aligned with their creativity generation tasks, they are more likely to perceive the actual value of the tool. For example, in product concept design, designers typically need to deeply optimize the selected solutions, which raises higher demands for AIGC. The tool needs to allow real-time editing based on the original design style, according to the requirements. This ability to precisely meet specific needs will significantly enhance designers' evaluation of the tool's usefulness.

The research results show that perceived usefulness has a significant positive impact on satisfaction. This means that if designers believe that using AIGC drawing tools can effectively promote creativity generation, their satisfaction with the tool will significantly increase. This finding is consistent with the conclusions of many recent studies.

The impact of expectation confirmation on perceived usefulness is a significant positive effect, and expectation confirmation also has a significant positive impact on satisfaction. In the product conceptualization phase, when designers' expectations of AIGC drawing tools promoting creativity generation are confirmed, the direct result is that users' perceived usefulness and satisfaction are enhanced. Specifically, when users use AIGC drawing tools to assist in creativity generation and the innovative solutions obtained or the perceived user experience meet or even exceed their expectations, users perceive AIGC as beneficial, and that using AIGC drawing tools for creativity generation yields better results compared to traditional methods, and they are also satisfied with the solutions and experiences obtained. On the other hand, when designers find that the reality of AIGC drawing tools promoting creativity generation does not align with their expectations, they inevitably adjust their expectations of AIGC, lowering satisfaction. Furthermore, the study also found that satisfaction plays a significant mediating role between perceived usefulness, expectation confirmation, and continuance intention. This indicates that once designers perceive the value of AIGC drawing tools and their expectations are met, their satisfaction will first increase, and this satisfaction will further promote their

intention to continue using the tool in the product conceptualization phase. Therefore, the mediating effect of satisfaction highlights the important role of emotional experiences in enhancing user stickiness and promoting continuance intention.

6.3. Analysis of non-significant hypotheses

The results show that self-efficacy does not have a significant effect on users' continuance intention (H4 is not supported). This finding is contrary to our expectations and also differs from existing research. The influence of self-efficacy may be moderated by individuals' attribution styles⁸³. For designers—especially those from Generation Z—living in a social environment that encourages innovation and embraces new technologies, the focus is more on the process of exploration and learning rather than solely relying on personal self-efficacy. In the initial adoption stage, designers usually assess whether they possess the ability to use AIGC tools to facilitate creative generation, and they may worry about whether they can effectively utilize the tool. At this stage, self-efficacy may have some impact on their willingness to use it. However, once entering the continuance intention stage, users' focus shifts, and their decision to continue using the tool depends more on the actual perceived value and usage experience. For example, the performance of AIGC drawing tools in improving design conceptualization efficiency, inspiring creative solutions, providing enjoyment, and delivering satisfaction will all affect users' continuance intention. Furthermore, AIGC drawing tools have gradually become a common auxiliary tool in the design field, and many studies have confirmed their effectiveness and ease of use in creative generation and design assistance^{84, 85}. Designers' generally positive perceptions of AIGC drawing tools may reduce their reliance on self-efficacy.

Subjective norm do not have a significant impact on users' continuance intention (H5 is not supported), a result that is contrary to our expectations and also differs from existing research⁸⁶. In the product conceptualization stage, the core goal of using AIGC drawing tools is to stimulate individual design inspiration and explore possibilities for innovation. The creative process of human-computer collaboration grants users substantial autonomy in decision-making, leading them to focus more on whether the tool can directly and effectively assist their thought process and produce satisfactory results or directions, rather than yielding to external expectations. Furthermore, for designers, the selection of efficient and appropriate tools is a reflection of their professional competence. Their judgment of a tool's value is based on their own practical experience and actual performance, rather than simply following trends or complying with external mandates. Designers' professional ethics and their desire for innovation drive them to focus more on how new technologies and methods can advance the development of the design field. The willingness to continuously use a new tool largely stems from whether the tool genuinely enhances design efficiency and output quality. Lastly, students' social exposure is relatively limited, typically confined to educational settings, which may limit their understanding of social diversity and complexity.

7. Conclusions

7.1. Theoretical contributions

This study makes several important contributions to the theory. First, based on the IDT framework, this study introduces task technology fit, self-efficacy, and subjective norm, constructing an integrated model that significantly enhances the applicability of IDT in design creative ideation. Second, through the combination of the IDT integrated model and the ECM-ISC, this study explores the application of AIGC drawing tools in creative generation, becoming one of the few attempts to provide a new perspective on AIGC issues in the design ideation field, while strengthening the explanatory power of both theoretical models in the context of new technologies. Third, the study confirms that satisfaction is the most significant positive factor influencing users' continuance intention, indicating that designers are not only concerned with the usefulness of the tool's performance, but also highly value the emotional experience during the usage process, especially in the early stages of design. Finally, the empirical results show that the hypotheses regarding the positive influence of self-efficacy and subjective norm on continuance intention were not supported. These findings deepen our understanding of the mechanisms that drive designers to continuously use AIGC drawing tools to facilitate creative generation.

7.2. Practical implications

The practical significance of this study is not only in providing clear directions for the development and application of AIGC technology, but also in driving transformation and innovation in the design field, injecting new momentum into the sustained development of the design industry. Based on this, this study proposes several specific strategies: The key to designers' continuous use of AIGC drawing tools during the creative ideation stage is to maximize user satisfaction. AIGC product developers should track and optimize user satisfaction as a core KPI. On one hand, it is necessary to ensure that users can clearly perceive the pow-

erful role of the tool in the creative generation process, improving AIGC drawing tools performance, including enhancing prompt word understanding, image generation quality, and processing speed. On the other hand, the overall user experience should be optimized to make users feel pleasant and convenient during the use process, even exceeding expectations. Specific measures could include: improving the operation process, providing generation results that meet or even exceed expectations, responding promptly to user feedback and iteratively optimizing, etc.

Designers, while focusing on design innovation and emotional experience, also place great importance on the alignment between specific design tasks, processes, and technologies. In the development and iteration of AIGC drawing tools, it is essential to deeply understand users' pain points during the design ideation phase, ensuring that new features and algorithm improvements can effectively support these key tasks. In terms of processes, it is necessary to analyze the stages in the product design process with high cognitive load and introduce AIGC technology to empower these stages based on traditional ideation processes, continuously reducing operational difficulty. For example, enhancing semantic recognition capabilities, simplifying image redrawing processes, and streamlining secondary image processing functions. Additionally, opening up architectures to link data and operational flows can eliminate the conversion costs between traditional modeling and rendering tools and AIGC drawing tools, enabling more efficient tool interoperability.

When promoting the use of AIGC drawing tools for creative ideation, both businesses and academia should shift their focus from strategies aimed at enhancing user confidence or creating social influence to other aspects. Whether users continue to use such tools depends more on the tool's actual utility and the resulting satisfaction rather than their confidence in their own ability to use it or the expectations of others around them. Therefore, promotion strategies should focus on precisely demonstrating how the tool efficiently solves specific ideation tasks and the actual value and satisfaction that users can experience after trial or short-term use. In addition, universities should establish a more comprehensive and diverse educational system, offering AI-related theoretical courses, seminars, and practical projects to provide ongoing and in-depth AIGC training through the integration of theory and practice. This will help users better understand and experience the practical value of AIGC in creative generation.

7.3. Limitations and future work

Although our research findings have certain inspirational and practical value, there are still several limitations. First, this study adopts a cross-sectional design and fails to capture the long-term and dynamic changes in creativity generation facilitated by AIGC during the product conceptualization phase. Future research could consider a longitudinal design to track the sustained impact of AIGC drawing tools on creativity generation and to gain a more comprehensive understanding of its development trends and changes in user attitudes.

Second, this study did not consider the impact of AI anxiety, which has a profound effect on individuals' acceptance and usage behavior of technology, especially when adopting emerging tools like AIGC. Future research should incorporate AI anxiety and analyze ethical factors such as algorithmic black boxes, intellectual property ownership, and data privacy, thereby enhancing the explanatory power and general applicability of the structural model.

Third, the research subjects in this study are mainly students majoring in design, with no consideration given to professional designers. Compared to students, professional designers differ in terms of practical experience, feasibility of creative implementation, and limiting factors, which may restrict the generalizability of the research findings. Therefore, future research should include more professional designers to better reflect the impact of AIGC drawing tools in actual design work.

Fourth, this study is conducted within the context of a developing country represented by China, lacking a cross-national comparison with other developing countries and Western nations. Given cultural differences, users from different countries may have varying attitudes toward the sustained willingness to use AIGC drawing tools for creativity generation. Therefore, future research should expand existing findings through cross-national comparisons, offering a more comprehensive perspective for the study.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author contributions

Conceptualization, GW, CX; methodology, GW, DP; software, CX; validation, GW, CX; formal analysis, GW; investigation, GW, CX; resources, GW; data curation, JZ; writing—original draft preparation, GW, GX; writing—review and editing, MS, JZ;

436 visualization, GW, CX; supervision, JC; project administration, MS; funding acquisition, JZ. All authors have read and agreed to
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440 **Institutional Review Board Statement**

441 Not applicable.

442 **Informed Consent Statement**

443 Informed consent was obtained from all subjects involved in the study.

444 **Data Availability Statement**

445 The datasets used during the current study are available from the corresponding author upon reasonable request.

446 **Ethical statement**

447 Participants in this study were invited to complete an questionnaire survey, and all collected information was handled with
448 strict confidentiality. Responses were entirely anonymous, and no personal identifying information was linked to the data. There-
449 fore, the data set does not contain any information identifying individual participants. Furthermore, this study does not cause harm
450 to the human body and does not involve sensitive personal information or commercial interest information. In conclusion, the
451 study meets the *Declaration of Helsinki* and *Guidelines for Life Sciences and Medical Research Involving Humans issued by the*
452 *National Health Commission of China*, so formal ethical approval is not required.

453 **Appendix A**

454 *Appendix A.1. Questionnaire on the continuance intention use AIGC drawing tools to promote creative generation*

455 **Table A1.** Questionnaire items.

Constructs	Code	Items
Task technology fit	TTF1	“The AIGC drawing tools meet my creative design needs”.
	TTF2	“AIGC drawing tools integrate seamlessly with my design process”.
	TTF3	“AIGC drawing tools simplify brainstorming creative ideas for me”.
Self-efficacy	SE1	“I can learn AIGC drawing tools on my own.
	SE2	“AIGC drawing tools enhance my creative thinking efficiency”.
	SE3	“I will seek help from classmates or teachers if needed”.
Subjective norm	SN1	“I accept recommendations to use AIGC drawing tools for creativity”.
	SN2	“Social media success stories encourage me to use AIGC drawing tools”.
	SN3	“Many people in design believe AIGC drawing tools enhance creativity”.
Perceived usefulness	PU1	“AIGC drawing tools inspire my design creativity”.
	PU2	“AIGC drawing tools help me discover new creative possibilities”.
	PU3	“AIGC drawing tools help break creative bottlenecks and provide solutions”.
Expectation confirmation	EC1	“AIGC drawing tools exceeded my expectations in creativity support”.
	EC2	“The user experience with AIGC drawing tools exceeded my expectations”.
	EC3	“Most of my expectations for AIGC drawing tools were met”.
Satisfaction	SAT1	“I’m satisfied with the creative solutions from AIGC drawing tools”.
	SAT2	“I enjoy using AIGC drawing tools for design”.
	SAT3	“I prefer AIGC drawing tools over traditional design methods”.
Continuance intention	CI1	“I plan to continue using AIGC drawing tools for creative solutions”.

CI2	“I plan to use AIGC drawing tools more frequently”.
CI3	“I will recommend AIGC drawing tools for product creative thinking”.

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629 **Tables**

630 **Table 1.** Demographic information of respondents.

Items	Category	Frequency	Percentage (%)
Gender	Male	194	45.86
	Female	229	54.14
Age	18-23	338	79.91
	24-33	77	18.20
	Above 33	8	1.89
Grade level	Associate Degree students	115	27.19
	Undergraduate students	205	48.46
	Master's students	82	19.39
	Doctoral students	21	4.96

631 **Table 2.** Reliability and convergent validity.

Constructs	Code	Factor Loading	CA	CR	AVE
Task technology fit	TTF1	0.804	0.793	0.879	0.708
	TTF2	0.848			
	TTF3	0.870			
Self-efficacy	SE1	0.901	0.857	0.909	0.769
	SE2	0.816			
	SE3	0.910			
Subjective norm	SN1	0.917	0.890	0.926	0.807
	SN2	0.829			
	SN3	0.944			
Perceived usefulness	PU1	0.809	0.764	0.864	0.679
	PU2	0.844			
	PU3	0.818			
Expectation confirmation	EC1	0.768	0.769	0.861	0.676
	EC2	0.918			
	EC3	0.772			
Satisfaction	SAT1	0.870	0.787	0.874	0.699
	SAT2	0.770			
	SAT3	0.864			
Continuance intention	CI1	0.899	0.875	0.923	0.799
	CI2	0.890			
	CI3	0.893			

632 **Table 3.** Fornell and Larcker test results.

	TTF	CI	SE	PU	EC	SAT	SN
Task technology fit	0.841						
Continuance intention	0.253	0.894					

Self-efficacy	0.015	0.039	0.877				
Perceived usefulness	0.103	0.382	-0.008	0.824			
Expectation confirmation	-0.073	0.134	0.012	0.133	0.823		
Satisfaction	0.272	0.51	0.085	0.254	0.177	0.836	
Subjective norm	-0.046	0.08	0.114	0.142	0.026	0.05	0.898

633 **Table 4.** HTMT ratio test results.

Constructs	TTF	SN	CI	SE	PU	EC	SAT
Task technology fit							
Subjective norm	0.075						
Continuance intention	0.302	0.081					
Self-efficacy	0.043	0.142	0.049				
Perceived usefulness	0.130	0.161	0.461	0.043			
Expectation confirmation	0.085	0.037	0.151	0.052	0.161		
Satisfaction	0.337	0.081	0.599	0.105	0.313	0.214	

634 **Table 5.** Model fit indices.

Constructs	R ²	Q ²
Perceived usefulness	0.032	0.021
Satisfaction	0.153	0.101
Continuance intention	0.341	0.077

635 **Table 6.** Hypotheses testing results.

Hypotheses	Path	Path Coefficient(β)	t	p	Remarks
H1	TTF -> SAT	0.263	5.724	0.000	Supported
H2	TTF -> CI	0.116	2.731	0.006	Supported
H3	TTF -> PU	0.113	2.444	0.015	Supported
H4	SE -> CI	0.001	0.023	0.982	Unsupported
H5	SN -> CI	0.027	0.660	0.510	Unsupported
H6	PU -> SAT	0.204	4.805	0.000	Supported
H7	PU -> CI	0.261	6.319	0.000	Supported
H8	EC -> SAT	0.168	3.788	0.000	Supported
H9	EC -> PU	0.146	3.230	0.001	Supported
H10	SAT -> CI	0.411	9.512	0.000	Supported

636 **Table 7.** Path coefficients of mediation effect model.

Hypotheses	Path	Path Coefficient(β)	P	95%CI	Remarks
H11a	PU -> SAT -> CI	0.084	0.000	(0.047,0.123)	Supported
H11b	EC -> SAT -> CI	0.069	0.001	(0.033,0.112)	Supported

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