

Innovating Art with Augmented Reality: A New Dimension in Body Painting

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Abstract—This study investigates the fusion of augmented reality (AR) and body painting as a novel concept for artistic expression. By combining the immersive capabilities of AR with the creative potential of body painting, this research explores individuals' perceptions and attitudes towards this innovative artistic approach from an HCI perspective. Drawing upon the Technology Acceptance Model (TAM) and the Diffusion of Innovation Theory (DIT), the study examines the factors influencing individuals' acceptance and intention to engage in AR-integrated body painting. Additionally, the research explores the mediating role of artistic expression in understanding the impact of these factors on the actual outcomes of this merged concept. A sample of 212 respondents participated in an online survey to accomplish the research objectives. The survey comprehensively measured participants' perceptions of innovativeness, social system support, perceived usefulness, perceived ease of use, artistic expression, and behavioral intention towards AR-integrated body painting. Rigorous data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine the intricate relationships between the variables. The findings underscore the significant impact of factors such as Innovativeness, social system support, perceived usefulness, and perceived ease of use on individuals' acceptance and intention to engage in AR-integrated body painting from an HCI perspective. Moreover, the study reveals the mediating role of artistic expression in connecting these influential factors with the actual outcomes of this merged concept. These empirical insights substantially contribute to our understanding of the fundamental mechanisms driving the adoption and utilization of AR in artistic practices, particularly within the domain of body painting, from both an artistic and HCI standpoint.

Keywords—*Augmented reality; body paintings; artistic expression; technology acceptance*

I. INTRODUCTION

Our world has undergone a profound revolution driven by digital transformation, permeating every feature of our lives. As technology continues to integrate into various spheres, it has breathed new life into unexplored fields and disciplines beforehand. While technology is conventionally correlated with engineering and computer science, its potential impact on cultural studies, fine arts, and history-related disciplines has often been overlooked. However, within these realms, the intersection of technology and human expression holds immense promise. For instance, digital humanities and cultural preservation can significantly benefit from incorporating technology. Furthermore, recognizing the significance of human interaction with technology within the realms of fine arts and non-technological/non-scientific disciplines is crucial.

Embracing technology in these contexts can unlock new avenues for creative exploration and foster deeper connections between art, culture, and society [1].

The art of body painting has long been an underrated phenomenon, often overlooked in its association with modern technology such as augmented reality. While body painting has a rich historical and cultural significance, its potential for innovation and exploration by integrating augmented reality remains largely undisclosed. By merging the traditional practice of body painting with cutting-edge technological advancements, such as augmented reality, new dimensions of artistic expression and transformative experiences can be unlocked. This uncharted territory offers a unique opportunity to bridge the gap between ancient art forms and contemporary technological advancements, allowing for a reimagining of body painting as a dynamic and immersive artistic medium. By shedding light on the untapped potential of this fusion, we can elevate body painting to a new level of appreciation and redefine its role in the context of modern art and technology.

Integrating Augmented Reality (AR) technology in body painting can potentially revolutionize the fine arts discipline. AR presents unique assistance, including virtual design visualization, interactive and dynamic art experiences, real-time feedback and corrections, digital preservation and documentation, and collaborative and remote opportunities [2], [3]. By overlaying virtual designs onto the body, artists can experiment with various concepts and styles before applying physical paint. AR augments engagement through interactive elements and visual effects, appealing to the audience and raising the impact of the artwork. Artists can receive immediate feedback, leading to precise and accurate designs. Furthermore, AR accelerates digital preservation and documentation, allowing archival and contextual information integration. Collaborative and remote experiences become possible, enabling artists to collaborate regardless of location and expanding the audience's access to body painting as an immersive and innovative art form.

While body painting as an artistic practice has received limited attention in research, the integration of augmented reality (AR) technology with body painting remains largely unexplored. Previous studies on body painting have mainly discussed its potential for teaching anatomy to health science students [4], [5] enhancing anatomical education through AR [6] and utilizing body painting for the teaching of anatomy and public engagement [7]. However, there is a scarcity of research specifically examining the integration of AR with body painting.

While discussions on the application of augmented reality (AR) technology are prevalent in various sectors, integrating AR with body painting is an underexplored area. Research has examined the effects of AR on students' achievement, attitudes towards the course, and participation in classroom activities [8], as well as its impact on body awareness and self-experience through virtual embodiment [9]. Augmented reality marketing has also been studied regarding its definition, complexity, and prospects [10]. Challenges and future research directions in education have been identified in augmented reality [11], and studies have investigated the impact of dimensionality and spatial abilities on learning with augmented reality [12]. Furthermore, AR technology has been applied to improve mirror fitness [13] and explore presence, avatar embodiment, and body perception [14]. Augmented reality has also been examined in the context of face filters as augmented reality art on social media [15], augmented reality art as a creative medium [3], and the motivations and effects of using AR face filters on social media [16]. Additionally, research has focused on the technological advancements and future perspectives of augmented reality and virtual reality displays [17], the development of augmented reality applications for learning [18], the survey of industrial augmented reality [2], and an overview of augmented reality technology [19]. Studies have also explored the impact of augmented reality applications on learning motivation [20] and the use of augmented reality and virtual reality in education [21]. Moreover, social interaction in augmented reality has been investigated [22]. While integrating body painting with augmented reality has received limited attention in research, studies have examined the enhancement of anatomical education through augmented reality [6] and the use of body painting and other art-based approaches to teach anatomy [23].

There is a pressing need for research to integrate augmented reality (AR) technology with body painting, as it can uncover the potential benefits and challenges of combining these two artistic practices, leading to innovative and immersive experiences for artists, performers, and viewers alike. Such research can contribute to advancements in art education, medical visualization, and interactive performance art. Additionally, investigating the integration of AR technology with body painting from a human-computer interaction (HCI) perspective is essential to shedding light on usability, user experience, and interactive aspects, providing insights into designing intuitive and engaging AR interfaces for artistic expression. Understanding the human factors involved in interacting with AR-enhanced body painting can enhance user satisfaction, immersion, and effectiveness, bridging the gap between art, technology, and human perception.

The integration of augmented reality (AR) technology with body painting can be studied using the Technology Acceptance Model (TAM) and the Diffusion of Innovation Theory (DIT) to understand users' behavioral intentions and perceptions towards this novel artistic medium [24]–[27]. These models provide insights into usability, user experience, perceived usefulness, perceived ease of use, and social influence, which are crucial in determining the acceptance and adoption of AR-enhanced body painting [28], [29]. By considering the findings from these studies, artists, performers, educators, and designers

can optimize the design and development of intuitive and engaging AR interfaces for artistic expression while addressing users' concerns and promoting wider adoption [5], [30], [31].

The integration of augmented reality (AR) technology in the field of body painting poses both opportunities and challenges. While AR has gained significant attention in various domains such as entertainment, education, and healthcare, its application and impact within fine arts, particularly body painting, remains relatively unexplored. This research aims to address this gap and shed light on the factors that influence the adoption of AR in body painting and their effects on artistic expression and behavioral intention. This study explicitly explores AR technology's integration in body painting from an HCI perspective. It investigates the role of HCI principles in enhancing the usability, accessibility, and user satisfaction of AR applications in artistic practices. The research considers the viewpoints of both artists who adopt AR in their body painting techniques and the audience engaging with AR-enhanced artworks. By focusing on the HCI aspect, the study aims to provide insights into the design considerations, interaction patterns, and user-centered approaches that optimize the integration of AR technology in the context of body painting.

The significance of this research lies in its contribution to the understanding and application of HCI principles in the domain of AR-enhanced body painting. By exploring the factors that influence the adoption and usability of AR in artistic practices, this study can guide artists and designers in creating immersive and user-centred AR experiences. From an HCI perspective, the findings offer practical implications for interface design, interaction techniques, and user feedback mechanisms, enabling artists to leverage AR technology effectively. Furthermore, this research expands the body of knowledge on AR in the fine arts domain, particularly in the context of body painting. It fills a gap in the existing literature, which predominantly focuses on AR applications in other industries, such as entertainment and education. By integrating HCI principles, this study advances the theoretical and practical understanding of AR technology in body painting, contributing to the broader field of HCI research and artistic practices.

II. RELATED WORK

A. Augmented Reality and Body Painting

Traditionally, body painting was adept by indigenous cultures for various purposes, such as ceremonial rituals and visual communication [32]. Natural pigments sourced from plants, fruits, and minerals were used to decorate the body, with symbolic colours carrying cultural implications. These ancient techniques relied on the binding medium to adhere the pigments to the surface, creating a vibrant and meaningful art form. Modern body painting can be evolved to incorporate technology, such as AR, to create immersive and interactive experiences [33], [34]. AR integration in body paint allows artists to transcend traditional boundaries, introducing dynamic visual effects and virtual elements onto the human canvas [35]. This fusion of art and technology expands artistic possibilities, enhances viewer engagement, and bridges the gap between physical and digital realms. However, ethical considerations

regarding privacy, consent, and cultural appropriation must be addressed when adopting AR in body painting practices.

Augmented Reality (AR) can transform the body painting domain within the fine arts discipline. By integrating AR technology, body painting can be taken to new elevations, proposing to artists and participants unique and enhanced experiences. Towards explaining the integration of technology application into fine arts, there are various implications in fine arts, such as:

1) AR enables artists to create and visualize intricate designs and patterns on the body without physically applying paint. Using AR applications, artists can project virtual designs onto the body, allowing experimentation and exploration of different artistic concepts and styles before committing to the painting process [36]. This virtual visualization capability saves time and resources while providing artists with broader creative possibilities.

2) AR can transmute body painting into an interactive and dynamic art form. Artists can use AR technology to overlay animated elements, visual effects, and interactive components onto the painted body [10]. This integration adds a new layer of engagement and interactivity, allowing viewers to interact with the artwork using their smartphones or other AR-enabled devices. The combination of body painting and AR creates a multisensory experience that captivates the audience and enhances the overall impact of the artwork [37].

3) AR technology can provide real-time feedback to artists during the body painting process. Through AR applications, artists can view digital overlays of their designs on the body, making identifying and correcting errors or inconsistencies easier [6]. This immediate feedback loop enables artists to refine their work and achieve greater precision and accuracy in their designs. It also facilitates a more efficient and streamlined painting process.

4) AR can play a significant role in digitally preserving body paintings. By capturing AR-enhanced images or videos of the painted body, artists can create digital archives of their work. These digital records serve as documentation and preservation, allowing the artwork to be experienced and appreciated beyond its temporary existence [38], [39]. Additionally, AR can overlay additional contextual information, such as the artist's inspiration, techniques, or cultural significance, providing a deeper understanding of the artwork.

5) AR opens up prospects for collaborative and remote body painting experiences. Artists can employ AR-enabled platforms to collaborate on body painting projects, regardless of their physical locations. They can stake designs, give feedback, and work together in real time, expanding the boundaries of artistic collaboration. Additionally, viewers can remotely access AR experiences of body paintings, creating opportunities for a wider audience to engage with and appreciate the artwork [8], [10], [13], [19].

Integrating AR technology into body painting within the orbit of fine arts elevates the creative process and unlocks novel channels for expression, engagement, and innovation. Embracing this technology empowers artists to push the limits of body painting, crafting immersive, interactive, and visually mesmerizing experiences that redefine the boundaries of the art form [13], [15], [17], [19].

B. Artistic Expression of Body Painting (AE)

The literature review conducted for body painting as an artistic expression within the positive art framework highlights five consistent positive outcomes across all the aforementioned art forms: sense-making, enriching experience, aesthetic appreciation, entertainment, and bonding. These outcomes emphasize the potential of body painting as a powerful vehicle for individuals to find meaning and purpose, enhance their overall experiences, develop a deeper appreciation for aesthetics, derive entertainment, and establish social connections. In supporting the relevance of body painting within the positive art framework, the article draws on a range of scholarly references. Lomas [40] discusses the concept of positive art and the potential for artistic expression and appreciation to foster flourishing. Javornik et al. [16] explore the motivations and well-being effects of using augmented reality (AR) face filters on social media, which can be considered an extension of body painting. Geroimenko [3] and Hsu and Chin [34] shed light on the emergence of augmented reality as a creative medium in art, including body painting.

The discussion surrounding body painting as a form of positive art also incorporates studies from education and medical sciences. Diaz and Woolley [4], Finn [41], Ribelles-García et al. [5], and Wang et al. [42] explore the pedagogical aspects of body painting in teaching anatomy and enhancing learning experiences. Haugstvedt and Krogstie [43], Vovk et al. [43], Rese et al. [44], and Iqbal and Sidhu [27] studies foster the understanding of technology acceptance, including augmented reality, in various contexts.

C. Diffusion of Innovation Theory (DIT)

The Diffusion of Innovation Theory (DIT), explained by Everett Rogers, approaches a valuable framework for interpreting the adoption and dissemination of innovative ideas, products, and technologies from a social perspective [45]. DIT defines diffusion as the process through which innovations are communicated and embraced by members of a social system over time. It identifies critical factors that impact the speed and extent of adoption, encompassing the innovation's attributes, the characteristics of adopters, the communication channels utilized, the social system involved, and the temporal aspect of the adoption process [46], [47]. By shedding light on adoption stages, adopter types, and influential factors, DIT facilitates comprehension and prediction of innovation acceptance and utilization across diverse domains such as technology, healthcare, and social sciences [48]. In augmented reality (AR) integration with body paintings, DIT helps understand how artists and viewers embrace this innovative artistic practice [49]. Innovators are the first to adopt AR-enhanced body paintings, followed by early adopters who recognize its creative potential. The early majority adopts it based on positive experiences, while the late

majority joins once it becomes well-established. Laggards are the last to adopt, often due to resistance to change or scepticism [50]. Understanding DIT can inform strategies for promoting the acceptance and diffusion of AR-enhanced body paintings [51].

D. Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a widely recognized and validated model for understanding technology integration. It focuses on users' behavioral intentions to adopt technology based on its perceived usefulness and ease of use. Davis initially developed TAM in 1986 to explore the acceptance of novel technologies in workplace settings [52]. By examining individuals' attitudes and perceptions, TAM provides insights into the factors influencing technology adoption and usage, aiding in designing and implementing effective technology solutions [53]. TAM can be applied to understand the acceptance of body painting through augmented reality (AR) technology. By examining users' perceptions of the usefulness and ease of use of AR-enhanced body painting, TAM can provide insights into their behavioral intentions to adopt and engage with this novel artistic medium [42]. Factors such as the perceived benefits, convenience, and user experience of AR-enhanced body painting can be explored within the TAM framework to understand and predict the acceptance and utilization of this technology-driven artistic expression [29]. This understanding can inform the design and development of user-centric AR interfaces and promote wider adoption of AR-enhanced body painting in the artistic community [26].

E. Hypothesis Development

Numerous hypotheses are developed by contemplating the literature and related studies along with the aim of this research. These hypotheses are then validated by multivariate statistical analysis.

1) *Perceived Ease of Use*: Perceived ease of use (PEOU) is a crucial factor in influencing artists' artistic expression (AE) of body painting when considering the adoption of AR technology. Artists who perceive AR as easy to use and navigate are likelier to embrace this technology in their body painting practices [30]. The user-friendly nature of AR facilitates artists' interaction with the technology and enables them to explore its potential for enhancing their artistic expression. When artists perceive AR as easy to use, they are more motivated to incorporate it into their body painting techniques and leverage its capabilities to create visually captivating and interactive artworks [26], [30]. Additionally, perceived ease of use (PEOU) impacts artists' behavioral intention (BI) through the mediator of artistic expression (AE). When artists find AR technology easy to use and navigate, it positively influences their intention to adopt AR for body painting. The ease of use associated with AR enhances artists' confidence in utilizing the technology and encourages them to explore its possibilities for artistic expression [27], [37], [42]. As artists experience the ease of incorporating AR into their body painting practices and witness the positive impact on their artistic expression, their

behavioral intention to adopt AR technology strengthens. Therefore, the following hypotheses are being proposed:

H1: PEOU positively impacts the AE to adopt AR technology.

H1a: PEOU positively impacts the BI through AE to adopt AR technology.

2) *Perceived usefulness*: Perceived usefulness (PU) plays a vital role in shaping artists' artistic expression (AE) of body painting when considering the adoption of AR technology. Artists who perceive AR as helpful in enhancing their creative process and expanding the possibilities of artistic expression are likelier to embrace this technology [26]. Incorporating AR into body painting offers a range of features and functionalities that enhance artists' ability to create visually captivating and interactive artworks. As artists recognize the usefulness of AR in enriching their artistic expression, they are motivated to explore its potential and incorporate it into their body painting practices. Furthermore, perceived usefulness (PU) impacts artists' behavioral intention (BI) through the mediator of artistic expression (AE). When artists perceive AR as a valuable tool for enhancing their artistic expression, it positively influences their intention to adopt AR for body painting [29], [31]. The perceived usefulness of AR in body painting fuels artists' motivation to explore and experiment with this technology, leading to greater engagement and a stronger intention to incorporate it into their artistic practice. As artists witness the positive impact of AR on their artistic expression, their behavioral intention to adopt AR technology for body painting increases [24], [42]. Therefore, following hypotheses are being proposed:

H2: PU positively impacts the AE to adopt AR technology.

H2a: PU positively impacts the BI through AE to adopt AR technology.

3) *Social systems*: The social system (SS) can significantly influence the artistic expression (AE) of body painting and the adoption of AR technology. Within the social system, artists are influenced by various factors such as societal norms, cultural values, and peer interactions. The acceptance and support of the social system towards body painting as an art form can positively impact artists' willingness to explore innovative technologies like AR for their artistic expression [15], [25]. Artists feel encouraged and empowered to incorporate AR technology into their practices when the social system embraces body painting as a legitimate artistic expression. The acceptance and recognition of body painting within the social system motivate artists to experiment with AR and explore its potential for enhancing their artistic expression. Moreover, the social system provides a platform for artists to showcase their AR-enhanced body paintings, which can further influence the adoption and acceptance of AR technology within the artistic community [25], [28]. Furthermore, the social system influences artists' behavioral intention (BI) through the mediator of artistic expression

(AE). Artists who receive support and recognition from the social system for their body painting endeavours, especially when augmented by AR, are more likely to develop a stronger intention to adopt AR technology. The positive response from the social system reinforces artists' belief in the value and significance of incorporating AR into their body painting practices. The social system's acceptance and appreciation of AR-enhanced body painting contribute to artists' confidence in embracing this technology and their intention to use it for future artistic endeavors [49], [51]. Therefore following hypotheses are being proposed:

H3: SS positively impacts the AE to adopt AR technology.

H3a: SS positively impacts the BI through AE to adopt AR technology.

4) *Innovativeness*: The relationship between the Innovativeness of individuals and the artistic expression of body painting (AE) can be explored through the Innovation Diffusion Theory (IDT) lens. According to IDT, Innovativeness refers to the willingness and eagerness of individuals to adopt new ideas or technologies [47]. In the context of AE, individuals with a high level of Innovativeness are likelier to embrace and experiment with novel approaches, techniques, and mediums in their body painting practices. They are open to integrating augmented reality (AR) technology with body painting, leveraging its capabilities to enhance and expand their artistic expression. By keeping such an analogy, AE can instigate the adoption of AR as a mediator between the Innovativeness of personality and Behavioral Intention to adopt (BI) the AR technology for body painting [9], [13], [17]. Therefore two hypotheses for Innovativeness are developed. These hypotheses can be formulated as follows:

H4: Innovativeness positively impacts the AE to adopt AR technology.

H4a: Innovativeness positively impacts the BI through AE to adopt AR technology.

F. Conceptual Framework

Based on the proposed hypotheses, a conceptual framework is established, in Fig. 1, to understand the adoption of AR technology for body paint purpose to fortify the fine arts discipline into digital transformational tools.

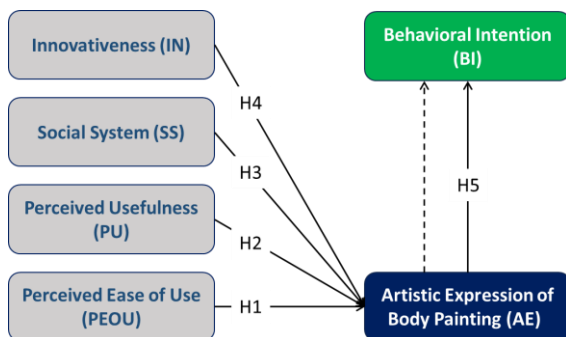


Fig. 1. Conceptual framework.

III. METHODOLOGY

This study ensued a deductive approach within the research onion framework utilized by Saunders [54]. It adopted a cross-sectional design and employed quantitative research methods to investigate the phenomenon under examination. The deductive approach was employed in this study, which involved testing existing theories of TAM and IDT and hypotheses to draw conclusions. By employing a deductive approach, the study aimed to explore the relationships between variables identified in the theoretical framework, namely the perceived usefulness, perceived ease of use, Innovativeness, social system, and behavioral intention in the context of digital body painting and augmented reality (AR) for artistic expression in Yunnan.

A cross-sectional design was adopted, enabling data to be collected at a single point in time. This design allowed for the examination of relationships between variables. It provided a snapshot of individuals' attitudes, perceptions, and behavioral intentions regarding using digital body painting and AR for artistic expression in Yunnan. The cross-sectional design was suitable for investigating the interplay between the independent variables (perceived usefulness, perceived ease of use, Innovativeness, social system) and the dependent variable (behavioral intention) within a specific time frame. A non-probability sampling technique called snowball sampling was employed in this study. Initially, several participants with relevant knowledge and experience in digital body painting and AR were purposively selected. These participants were asked to refer to other potential participants who met the criteria. This iterative process continued until the desired sample size of 212 participants was reached, as suggested by the previous research [55].

Data were collected through an online self-administered close-ended questionnaire. The questionnaire consisted of two parts: demographic features and variables questions. The demographic section collected participants' age, gender, educational background, and artistic experience. The variables questions assessed perceived usefulness, perceived ease of use, Innovativeness, social system, and behavioral intention using a 5-point Likert scale (ranging from 1=strongly disagree to 5=strongly agree). Each variable's questionnaire items were adopted from previously validated studies to make the inferences significant and robust.

The collected data were subjected to statistical analysis using appropriate techniques. Quantitative analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM). This method allowed for assessing both the measurement and structural models, enabling the examination of relationships between variables. Additionally, PLS-predict analysis was conducted to understand the model's predictive power and relevance in predicting behavioral intention based on the assessed variables [56]–[58]. Ethical guidelines and principles were followed throughout the study. Informed consent was obtained from all participants, ensuring their voluntary participation and the confidentiality of their responses. The study adhered to ethical standards to protect the participants' rights and well-being and ensure the research findings' integrity and credibility.

IV. DATA ANALYSIS

A. Demographic Results

Demographic results are detailed in the following Table I.

TABLE I. DEMOGRAPHIC RESULTS

Category	Percentage	Category	Percentage
Gender		Exposure to AR Technology	
Male	72%	Yes	54%
Female	28%	No	46%
Age Group		Education	
18-25	38%	High School	27%
26-35	45%	Bachelor's Degree	48%
36-45	17%	Master's Degree	25%
Experience in Body Painting			
Well Aware		62%	
Minimum		38%	

B. Reliability and Validity

The minimum accepted standards for reliability measures in PLS-SEM analysis include a Cronbach's alpha of 0.7, composite reliability of 0.7 or higher, and average variance extracted (AVE) of 0.5 or higher [59]. In this study, all the constructs meet or exceed these minimum standards, indicating good reliability. As per the result Table II, Cronbach's alpha values range from 0.912 to 0.969, composite reliability ranges from 0.921 to 0.976, and AVE ranges from 0.7 to 0.889. These results suggest that the measurement scales used for each construct are internally consistent and reliable, providing confidence in the validity of the research findings.

TABLE II. RELIABILITY AND VALIDITY

Factors	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Artistic Expression	0.92	0.94	0.70
Behavioral Intention	0.96	0.97	0.889
Innovativeness	0.91	0.94	0.782
Perceived Ease of Use	0.82	0.92	0.7
Perceived Usefulness	0.91	0.92	0.728
Social System	0.91	0.93	0.712

C. Discriminant Validity

Discriminant validity is assessed using the Heterotrait-Monotrait (HTMT) ratio of correlations in PLS-SEM analysis. The HTMT values should be below the threshold of 0.85 to confirm discriminant validity [59]. As per the results, all the HTMT values are below this threshold, indicating satisfactory discriminant validity among the constructs. It suggests that the constructs are distinct and measure different aspects of the research variables. In Table III, the values range from 0.162 to 0.754, demonstrating no significant overlap between the constructs, supporting the validity of the measurement model.

TABLE III. DISCRIMINANT VALIDITY (HTMT)

	AE	BI	IN	PEOU	PU	SS
AE						
BI	0.754					
IN	0.402	0.415				
PEOU	0.573	0.522	0.217			
PU	0.541	0.415	0.254	0.281		
SS	0.347	0.419	0.162	0.143	0.187	

D. Outer Loadings

In PLS-SEM analysis, it is generally accepted that outer loadings should be at least 0.7 to 0.8 to demonstrate a strong relationship between latent constructs and their indicators [60]. In this study, see Table IV, all the outer loadings surpass the minimum accepted value, indicating that the research meets this criterion. It confirms that the selected indicators successfully capture and represent the underlying constructs, enhancing the validity and reliability of the research outcomes.

TABLE IV. OUTER LOADINGS

Factor	Item	O.L	Factor	Item	O.L
Innovativeness	IN1	0.927	Perceived Ease of Use	PEOU1	0.881
	IN2	0.731		PEOU2	0.816
	IN3	0.857		PEOU3	0.912
	IN4	0.812		PEOU4	0.871
	IN5	0.782		PEOU5	0.932
Social System	SS1	0.909	Artistic Expression	AE1	0.915
	SS2	0.819		AE2	0.824
	SS3	0.811		AE3	0.919
	SS4	0.86		AE4	0.783
	SS5	0.825		AE5	0.912
Perceived Usefulness	PU1	0.917	Behavioral Intention	BI1	0.906
	PU2	0.815		BI2	0.931
	PU3	0.813		BI3	0.887
	PU4	0.835		BI4	0.865
	PU5	0.857			

E. Path Analysis

Based on the structural model, the path analysis shows that all the hypotheses' t-statistics and p-values are accepted, as shown in Table V. It implies a significant relationship between the independent variables (Innovativeness, Social System, Perceived Usefulness, and Perceived Ease of Use) and the dependent (Artistic Expression and Behavioral Intention) variables. The betas associated with each hypothesis represent the strength and direction of the relationships. The overall R-squared value of the model is 0.513, as portrayed in Fig. 2.

TABLE V. PATH ANALYSIS

Hypothesis		Beta	T Stat	P	Decision
H1	IN -> AE	0.201	5.156	0.000	Accepted
H1a	IN -> AE -> BI	0.144	4.751	0.000	Accepted
H2	SS -> AE	0.177	4.755	0.000	Accepted
H2a	SS -> AE -> BI	0.127	4.473	0.000	Accepted
H3	PU -> AE	0.333	6.221	0.000	Accepted
H3a	PU -> AE -> BI	0.238	6.292	0.000	Accepted
H4	PEOU -> AE	0.379	9.239	0.000	Accepted
H4a	PEOU -> AE -> BI	0.272	7.581	0.000	Accepted
H5	AE -> BI	0.716	19.309	0.000	Accepted

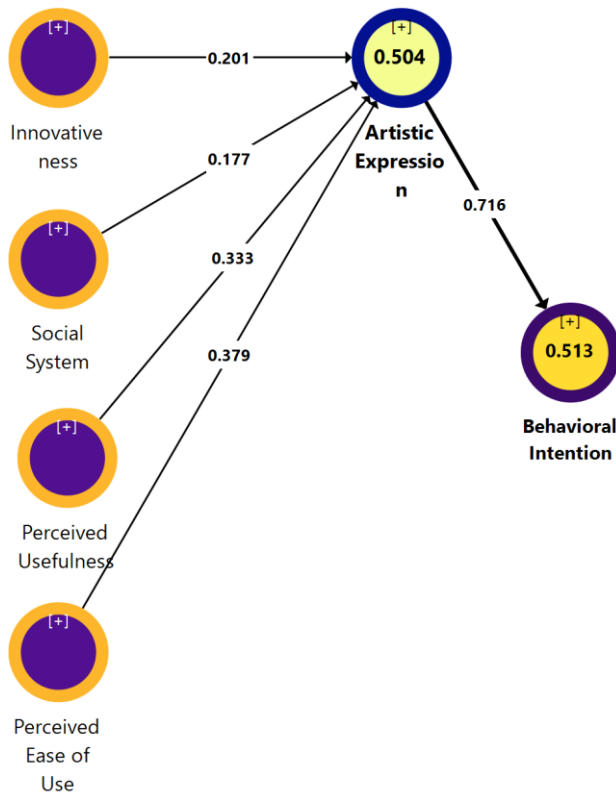


Fig. 2. PLS-SEM model.

V. HYPOTHESIS RESULTS

The results of hypothesis H1 indicate that there is a significant positive relationship between Innovativeness and artistic expression in the context of AR technology for body painting. The beta coefficient of 0.201 suggests that higher levels of Innovativeness among artists lead to increased artistic expression in body painting. This finding is supported by a high T statistic of 5.156 and a p-value of 0.000, indicating a strong level of confidence in the results. Therefore, we can conclude that Innovativeness positively influences artistic expression in the context of AR technology for body painting. Additionally, hypothesis H1a examines the relationship between Innovativeness, artistic expression, and behavioral intention. The results show a significant positive relationship, with a beta coefficient of 0.144, a T statistic of 4.751, and a p-value of 0.000. It indicates that as artists demonstrate higher levels of Innovativeness and engage in more artistic expression

through AR technology for body painting, their behavioral intention to adopt and continue using this technology also increases. These findings support the notion that Innovativeness and artistic expression play crucial roles in shaping artists' behavioral intention to embrace AR technology for body painting.

The results of hypothesis H2 suggest a significant positive relationship between the social system and artistic expression in the context of AR technology for body painting. The beta coefficient of 0.177 indicates that a supportive social system positively influences artistic expression. With a T statistic of 4.755 and a p-value of 0.000, the results provide strong evidence to accept this hypothesis. Therefore, it can be concluded that a favourable social system characterized by societal norms, cultural values, and peer interactions contributes to enhanced artistic expression in the context of AR technology for body painting. Likewise, hypothesis H2a examines the relationship between the social system, artistic expression, and behavioral intention. The results indicate a significant positive relationship, evidenced by a beta coefficient of 0.127, a T statistic of 4.473, and a p-value of 0.000. It suggests that when artists experience a supportive social system that encourages and recognizes their artistic expression through AR technology for body painting, it positively influences their behavioral intention to adopt and continue using it. These findings emphasize the importance of a supportive social environment in fostering artistic expression and the intention to adopt innovative technologies in body painting.

The results of hypothesis H3 indicate a significant positive relationship between perceived usefulness and artistic expression in the context of AR technology for body painting. The beta coefficient of 0.333, a T statistic of 6.221, and a p-value of 0.000 provide strong evidence to accept this hypothesis. It suggests that when individuals perceive AR technology as beneficial for their body painting practices, it positively influences their artistic expression. This finding emphasizes the importance of perceiving the usefulness of AR technology in enhancing the creative process and expression within the field of body painting. Building upon H3, hypothesis H3a explores the relationship between perceived usefulness, artistic expression, and behavioral intention. The results indicate a significant positive relationship, with a beta coefficient of 0.238, a T statistic of 6.292, and a p-value of 0.000. It suggests that when artists perceive AR technology as valuable for their artistic expression in body painting, it impacts their artistic expression and positively influences their behavioral intention to adopt and continue using it. These findings highlight the role of perceived usefulness as a driver of artistic expression and the intention to adopt AR technology in body painting [50].

Similarly, hypothesis H4 examines the relationship between perceived ease of use and artistic expression. The results demonstrate a significant positive relationship, as indicated by a beta coefficient of 0.379, a T statistic of 9.239, and a p-value of 0.000. It suggests that when individuals perceive AR technology as easy to use for body painting, it positively influences their artistic expression. This finding underscores the importance of perceiving the ease of use of AR

technology in facilitating and enhancing artistic expression in body painting. Expanding on H4, hypothesis H4a investigates the relationship between perceived ease of use, artistic expression, and behavioral intention. The results reveal a significant positive relationship, with a beta coefficient of 0.272, a T statistic of 7.581, and a p-value of 0.000. It implies that when artists perceive AR technology as easy to use for their artistic expression in body painting, it impacts their artistic expression and positively influences their behavioral intention to adopt and continue using it. These conclusions highlight the role of perceived ease of use in promoting artistic expression and the intention to adopt AR technology in body painting [42].

Hypothesis H5 explores the relationship between artistic expression and behavioral intention. The results indicate a highly significant and robust positive relationship, with a beta coefficient of 0.716, a T statistic of 19.309, and a p-value of 0.000. These findings provide strong evidence to accept the hypothesis, suggesting that artistic expression in the context of body painting has a substantial impact on individuals' behavioral intention. Specifically, when individuals engage in artistic expression through body painting, it positively influences their intention to adopt and continue using AR technology. It highlights artistic expression's pivotal role as a behavioural intention driver in adopting and utilizing AR technology for body painting [38].

VI. DISCUSSION

This study aimed to investigate the factors influencing the adoption of augmented reality (AR) technology in body painting and to understand their impact on artistic expression and behavioral intention. A comprehensive analysis was conducted using partial least squares structural equation modelling (PLS-SEM) to achieve this. The results revealed that the proposed model accounted for a substantial proportion of artistic expression and behavioral intention variance. The R-squared values for artistic expression were 0.504 and 0.499 for the regular and adjusted models. Similarly, the R-squared values for behavioural intention were 0.513 and 0.512 for the regular and adjusted models, respectively. These R-squared values indicate that the model explains a significant portion of the variability observed in the dependent variables.

Through examining various hypotheses, several valuable lessons have been learned from the results of this study. Firstly, it is evident that factors such as Innovativeness, social system support, perceived usefulness, and perceived ease of use significantly influence artistic expression and behavioral intention. It highlights the importance of considering these factors when integrating augmented reality (AR) technology into body painting. Furthermore, the positive impact of AR technology on artistic expression and behavioral intention underscores its potential as a powerful tool for artists to enhance their creative processes and engage with their audience. The findings emphasize the significance of embracing technological advancements in the arts and utilizing AR to captivate viewers and create immersive artistic experiences.

Moreover, accepting the hypotheses provides empirical evidence supporting the adoption of AR in the fine arts

industry. It suggests that AR has the potential to drive innovation within the industry, offering unique opportunities for artists, galleries, and exhibition spaces to differentiate themselves and attract audiences by leveraging the immersive and interactive nature of AR. Likewise, the results indicate that integrating AR technology in body painting opens up collaboration opportunities between artists and technology experts. It underscores the importance of interdisciplinary collaborations, where artists can collaborate with AR developers, programmers, and designers to explore new creative possibilities and push the boundaries of artistic expression.

The research findings make significant contributions both theoretically and practically.

A. Theoretical Contribution

This study contributes to the theoretical landscape by utilizing Roger's Innovation-Decision Process Theory as a guiding framework. By applying this theory, the research provides a comprehensive and structured approach to understanding AR technology's innovation process in body painting. This theoretical foundation enhances our understanding of the underlying mechanisms that shape the acceptance, adoption, and utilization of AR in artistic expression. Moreover, the study extends the theoretical discourse by highlighting the significant role of artistic expression as a mediator between the adoption of AR technology and behavioral intention. This finding emphasizes the importance of artistic expression as a critical factor in determining artists' intention to adopt and use AR technology in their creative endeavours. By contributing to the theoretical understanding of AR adoption in fine arts, this study fills a gap in the existing literature, which has predominantly focused on the medical, entertainment, aviation, and educational applications of AR. It expands the theoretical boundaries and provides insights into the unique dynamics and implications of incorporating AR technology in the artistic domain.

B. Practical Contribution

Based on the study's findings, the research makes several practical contributions. It guides artists looking to incorporate augmented reality (AR) technology into their body painting practices. It offers insights into factors such as Innovativeness, social system support, perceived usefulness, and perceived ease of use. This knowledge can help artists make informed decisions and leverage AR to enhance their artistic expression. Additionally, integrating AR technology in body painting enhances audience engagement by creating interactive and immersive experiences. This practical contribution allows artists to captivate viewers in novel ways, allowing active participation in the artwork and creating memorable artistic encounters.

The research findings also have implications for art education, suggesting the inclusion of AR in curricula. By recognizing the significance of AR in fine arts, educational programs can prepare students for the evolving art industry and foster their innovative thinking. Moreover, the study highlights the potential of AR technology to drive industry innovations within the fine arts sector. Artists, galleries, and exhibition spaces can leverage AR to differentiate themselves, attract

audiences, and offer unique and immersive experiences. Lastly, the adoption of AR in body painting opens up collaboration opportunities between artists and technology experts. This practical contribution encourages interdisciplinary collaborations, leading to innovative projects and the development of cutting-edge artworks that push the boundaries of artistic expression.

This study aims to contribute to understanding the fusion of augmented reality and body painting as an innovative concept for artistic expression. By examining the factors influencing individuals' acceptance and intention to engage in AR-integrated body painting, the research offers insights for researchers and practitioners in digital art. The findings will extend the existing literature on technology adoption and diffusion by shedding light on the role of perceived usefulness, ease of use, Innovativeness, and social factors in the context of this merged concept. Moreover, the mediating role of artistic expression emphasizes the importance of considering the creative outcomes when exploring the adoption and use of AR-integrated body painting.

C. Limitations of the Study

Despite its contributions, this research has certain limitations that should be acknowledged. Firstly, the study focused on a specific context of body painting, which may limit the generalizability of the findings to other artistic domains. Future research could explore the application of AR in different forms of visual arts to provide a more comprehensive understanding. Additionally, the study relied on self-reported measures, subject to response biases and may not capture the full complexity of participants' experiences. Using objective measures or combining self-reports with observational data could enhance the validity of the findings. Furthermore, the research primarily examined the perspectives of artists and audience members, neglecting other stakeholders such as AR developers and technicians. Future studies could incorporate the viewpoints of these stakeholders to gain a holistic understanding of the challenges and opportunities in AR implementation.

D. Future Directions

Building upon the findings of this study, several avenues for future research can be identified. Firstly, longitudinal studies could investigate the long-term effects of AR integration in body painting and its impact on artists' creative processes, audience engagement, and market sustainability. Additionally, exploring the cultural and societal influences on the adoption and acceptance of AR in fine arts could provide valuable insights into the cross-cultural applicability of the technology. Furthermore, investigating the potential ethical and privacy concerns associated with AR in artistic practices would be relevant in ensuring responsible and inclusive implementation. Additionally, examining the role of different types of AR interfaces, such as wearable devices or projection-based systems, could shed light on the user experience and interaction design aspects. Finally, studying the integration of AR with other emerging technologies, such as artificial intelligence or virtual reality, could open up new dimensions for artistic expression.

VII. CONCLUSION

In conclusion, this research has significantly contributed to understanding and applying augmented reality (AR) technology within body painting from an HCI and digital technology perspective. By examining the relationships between various factors and their impact on artistic expression and behavioral intention, valuable insights have been gained into the usability, user experience, and practical implications of AR in this context. Theoretical contributions have been made by establishing the importance of factors such as Innovativeness, social system support, perceived usefulness, and perceived ease of use in driving the integration of AR technology in body painting while considering the principles of HCI and digital technology. These findings enrich our understanding of the underlying mechanisms that influence the adoption and utilization of AR in artistic practices, taking into account human-computer interaction, interface design, and user-centred approaches.

Practically, this research offers guidance for artists seeking to incorporate AR technology into their body painting endeavours from an HCI and digital technology perspective. By understanding the positive influence of the identified factors and considering HCI principles, artists can make informed decisions and strategically leverage AR to enhance their artistic expression in a user-friendly and immersive manner. Moreover, integrating AR technology provides an avenue for enhanced audience engagement, allowing artists to create interactive and immersive experiences that captivate viewers and foster a deeper connection with the artwork. From an educational standpoint, the implications are noteworthy as well. This research emphasizes the significance of integrating AR into educational programs, leveraging HCI and digital technology to equip students with the skills and knowledge to navigate the evolving landscape of the art industry. By incorporating AR as a tool for artistic exploration, art educators can foster innovative thinking and prepare students for the future by embracing technological advancements and user-centred design principles.

From an industry perspective, the findings underscore the potential for AR to drive innovation within the fine arts industry, with a particular focus on HCI and digital technology. Artists, galleries, and exhibition spaces can leverage AR to offer unique and immersive experiences, attracting audiences and distinguishing themselves in a competitive landscape. This encourages industry professionals to embrace AR as a means of differentiation, considering HCI and digital technology principles and staying at the forefront of artistic advancements. Lastly, the research highlights the collaboration opportunities that arise from integrating AR in body painting, emphasizing the interdisciplinary nature of HCI and digital technology. Artists can collaborate with technology experts to explore new creative possibilities, harnessing the power of AR to push the boundaries of artistic expression and foster innovative projects. Such collaborations bridge the gap between art and technology, developing cutting-edge artworks and opening up new realms of artistic exploration and digital creativity.

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