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BARRIERS TO ADOPTION: INVESTIGATING PROFESSIONAL 3D ARTISTS' TRUST AND USABILITY CONCERNS REGARDING GENERATIVE AI TOOLS

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Abstract:

This study investigates the technical trust and interface control factors that currently impede the adoption of emerging generative technologies among three-dimensional (3D) design professionals. Employing a mixed-methods methodology, the research evaluated usability friction and AI topology confidence across a cohort of 16 participants, comprising both students and senior industry practitioners. Quantitative analysis reveals that 56% of users identify a "Lack of Precision" as their principal frustration, significantly surpassing all other reported operational barriers. Furthermore, user confidence regarding AI-generated geometry and UV mapping remains critically low, yielding an average trust metric of less than 2.9 out of 5.0. This structural inadequacy frequently renders generated assets incompatible with standard animation pipelines. Qualitative findings highlight an emerging "Editability Paradox," wherein professionals report that remediating AI-generated models is often more labor-intensive than traditional, manual modeling from scratch. The study concludes that while Generative AI facilitates rapid conceptual ideation, it currently fails to meet professional production standards due to a foundational "precision deficit," thereby inhibiting comprehensive market acceptance. Future technological development must prioritize "assisted-editing" workflows that empower artists with granular control over mesh topology, mitigating the current limitations and over-reliance on autonomous text-to-model generation.

Keywords: *Generative AI, 3D Modeling, Technology Adoption, Usability Friction, AI Topology Confidence, Editability Paradox, Assisted-Editing Workflows, Human-Computer Interaction (HCI).*

1. Introduction

The creative processes in graphic design, illustration, and software development have experienced disruption because of the fast expansion of Generative Artificial Intelligence (GenAI) technologies. Luma AI, Meshy and Spline have introduced tools that enable 3D computer graphics (CG) users to create assets through text prompts which transform into complete volumetric models. The traditional 3D pipeline which includes the stages of modeling, retopology and UV mapping and texturing requires extensive manual work because of its complex technical requirements. The ability to automate these stages can theoretically shorten production time for independent creators and small studios by several times. The entertainment and gaming and architectural sectors need organizations to understand AI integration because it will determine their economic success in the coming years. The expansion of automation capabilities has made it necessary to determine whether AI systems can create 3D content and if that content can achieve professional standards which are essential for commercial production.

The current market for these tools exists because artists need solutions which operate as backup systems but AI developers fail to deliver the needed backup options. The studies by Amershi *et al.* (2) on human-AI interaction demonstrate users face challenges when using AI systems because they find it difficult to understand how algorithms reach their decision results which remain hidden to them. Creatives show increasing anxiety about copyright issues and job loss according to research results from Lawton (4) conducted in the digital ethics domain. The current academic literature mainly studies 2D image generation systems, which include Midjourney and DALL-E, and Large Language Models (LLMs). Research exists that examines UV unwrapping and edge flow and mesh topology in 3D workflows but there remains a research gap which requires empirical studies to identify all the technical friction areas within 3D workflows. The research conducted by Liu *et al.* (5) studies 3D generation algorithms, yet researchers fail to assess how the resulting assets will function when artists need to use them for 3D rigging and animation and rendering.

The study aims to establish a connection between the algorithmic abilities and the usability requirements of professionals who work with the technology. The research studies "trust" and "control" variables to assess which technical barriers her research identifies as reasons that organizations will not adopt her technology. The study investigates the "Editability Paradox" by examining which AI-generated assets require more time to modify than to produce from the beginning. The paper presents empirical evidence about professional trust in AI-generated topology while it measures the usability friction that current interfaces create. This research investigates whether current GenAI tools function as effective "copilots" which assist 3D experts or function merely as novel tools for designing initial concepts.

2. Literature review

The academic and industrial fields have conducted extensive research to examine how Artificial Intelligence (AI) affects productivity in creative industries. The research path began with 2D image synthesis but has now shifted its focus to intricate 3D computer graphics work. AI technology serves as a field asset democratization tool because its current development enables users to create 3D models using NeRF and diffusion model-based text-to-3D systems. Liu *et al.* (5) present the technological advancements as "productivity multipliers" because they demonstrate how automation reduces the time needed for work that requires extensive labor to complete texturing and conceptualization. The research selects algorithmic capabilities as the main evaluation metric

because it shows what software can create, but it does not include direct evidence of how software operates in real-world production settings as users assume that software output corresponds to usability.

The development of algorithms needs to connect with the requirements needed for Human-Computer Interaction (HCI) work. Research in HAI establishes that users need to have efficient capabilities when correcting system errors to achieve successful automation outcomes. The application of these principles becomes problematic because they cause 3D modeling to experience major workflow breaks. Lawton (4) describes the current AI tools as "black boxes" because they restrict user control over output results to an excessively minimal degree. The limitation causes assets to require extensive time for generation because the process demands additional time to fix all defective assets.

The evaluation of AI systems for technical correctness demonstrates a significant gap between testing methods and evaluation standards used by research institutions. The animation and gaming industry requires companies to follow standard pipelines which use "quad-based topology" rules because these rules guarantee proper deformation during rigging. The AI generators create "voxelized" or "triangulated" meshes which produce chaotic results according to Zhang *et al.* (9). The visual outputs from computer vision researchers reach their acceptable standards, but professional animators see these outputs as production failures which demand complete reconstruction work. The research lacks quantitative studies which explore the standards used by AI developers who focus on visual fidelity compared to artists who need structural fidelity for their work.

AI adoption faces multiple technical barriers, but these barriers become more complex because of obstacles related to social ethics. The study by Muller & Baumer (6) shows that creative professionals experience rising anxiety about their skills declining and they face difficulties understanding copyright laws. The current literature treats ethical dilemmas as abstract policy discussions, whereas studies have focused on matching particular artist fears with their decision to integrate AI technology into their artistic practices. Researchers have produced extensive studies about generation algorithms, but there is a shortage of empirical data which investigates the "Professional Usability Gap" about how people trust technical assets like UV maps and topology. The study addresses the existing research gap by delivering quantitative evidence which shows the friction points that block AI from becoming an accepted standard in the business sector.

3. Research methodology – Barriers to AI adoption in 3D modeling

The study's research design applies a mixed-methods strategy, combining numerical and narrative data for a thorough investigation of the obstacles to the deployment of Generative AI in professional 3D pipelines. This choice was made so that the research would include both the quantifiable technological installation barriers, topology and UV mapping, in addition to the subjective mental barriers, trust and ethics (10). The research combines numerical data from Likert scales together with narrative answers from open-ended questions to create a complete picture of the 3D artists' current experience with usability friction. The methodology uses User Experience (UX) research principles to establish its theoretical framework, which evaluates user satisfaction through specific efficiency and control metrics. The study tests the "Editability Paradox" by examining how AI-generated content could save time while manual cleanup work takes time away from the art-making process, creating a measurable way to assess workflow efficiency.

A structured questionnaire was designed using Google Forms to collect responses from participants.

3.1 Sampling strategy and data collection

The research uses purposive sampling, which is a non-probability method to select people with specialized knowledge in 3D content creation. The selection process required active professionals who ranged from students to senior industry experts to use common industry software programs like Blender and Maya and ZBrush. The data collection process ensures that all information gathered relates directly to actual production work instead of public common understanding. The study includes 16 participants who were digitally recruited through professional networks and academic groups and the study has a sample size of 16 participants. The study requires a larger sample size for general statistical applications yet the research uses purposive sampling to explore specific technical topics through detailed qualitative research (11).

3.2 Generalizability and instrumentation

The research results show that their findings from studying 3D artists can be used to understand 3D artists who work in different parts of the industry. The research maintains validity through its specific participant inclusion requirements because only people with 3D topology and production pipeline knowledge can take part. The researchers conducted their study through an online structured questionnaire which they created to assess three distinct variables: usability integration and technical trust and ethical apprehension. The qualitative data becomes valid through themes reaching saturation because 16 participants reported identical specific failures which include "bad edge flow" and "copyright fear" according to industry-wide reports. The researchers acknowledge that their sample size limits their ability to apply statistical results to all artists who work across the world. The analysis approach needs to identify more deeply into the research material because of this requirement.

4. Results

The section presents all survey results which contain both numerical data and descriptive information about 16 participants who investigated how Generative AI affects 3D modeling processes. The study population consisted primarily of early-career artists. The majority of participants identified as Students or Hobbyists (68.8%) according to Table 1, while the rest of the participants included Freelancers (12.5%), Junior Artists (12.5%), and Senior Leads (6.3%). The sample used both open-source and industrial-standard software environments, with Blender serving as the main software for 56.3% of users, while 43.8% of users operated within the Maya/3ds Max ecosystem. The 87.5% of respondents who had used Generative AI tools before (such as Luma AI and Spline) reported their experience with AI technology, while the remaining 12.5% stated they had never used such tools.

Table 1: Participant Demographics by Role

Role	Count	Percentage
Student / Hobbyist	11	68.8%
Junior Artist (1–3 years)	2	12.5%
Freelancer	2	12.5%
Senior Artist / Lead	1	6.3%
Total	16	100%

The participants evaluated how current AI tools can be integrated into their existing workflow through a 5-point Likert scale assessment. The usability assessment resulted in an average score of 2.94 with a standard deviation of 0.77. The respondents identified "Lack of precision" as their primary interface challenge which they considered their biggest obstacle to face. The figure shows that 56.3% of users reported their main problem as an inability to

manage particular details which they followed by export problems and inconsistent outcomes. The data about AI-generated assets modification showed that 68.8% of users found it easier to fix an AI model than to create one from scratch while 31.3% of users reported that the process became slower because of bad geometry.

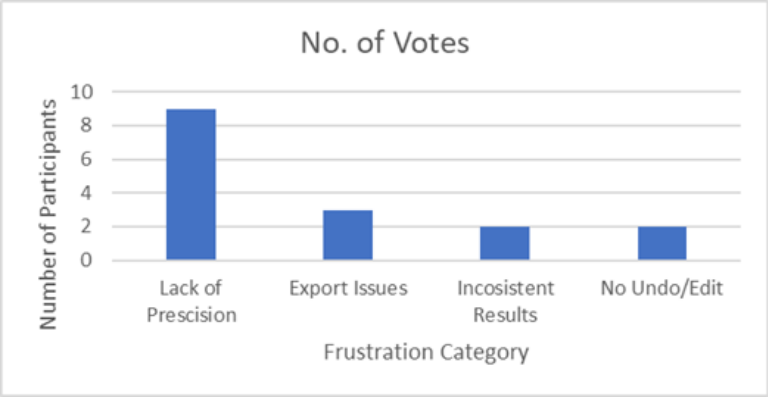

Figure 1: Primary UI frustrations reported by participants when using text-to-3D generators

Trust in the technical integrity of AI outputs was measured across two specific variables: Topology (mesh flow) and UV Maps (texture coordinates). The results indicate trust levels below the neutral threshold of 3.0. Topology received a trust score of 2.81 with a standard deviation of 0.98 while UV Maps received a trust score of 2.69 with a standard deviation of 0.87. The trust metrics shown in Figure 2 demonstrate that technical reliability continues to be the main concern for all user groups.

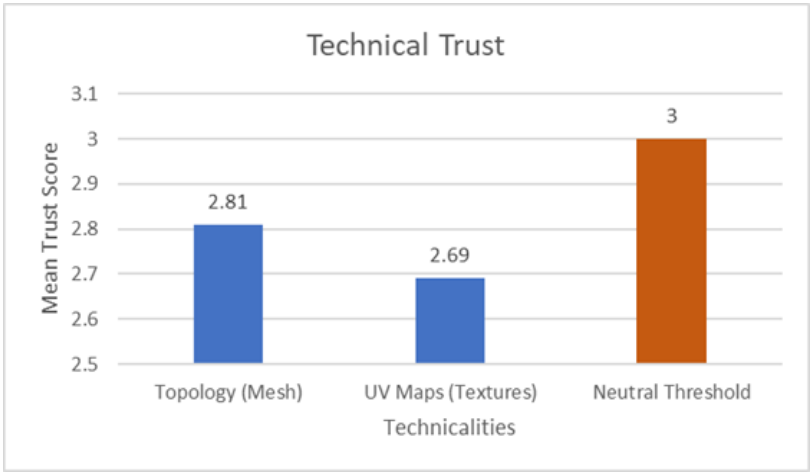

Figure 2: Comparison of mean participant trust levels regarding AI-generated Topology versus UV Maps (Scale 1–5)

The data about adoption barriers shows that the main reason for incomplete adoption process stands at 43.8% which identifies "Low Quality / Technical Limitations" as the main obstacle. The two most important challenges were "Fear of replacing human skill" at 25.0% and "Copyright/Legal issues" at 18.8%. The survey measured anxiety about skill loss which showed that participants in the study agreed with the statement "I worry that relying on AI tools will degrade my personal modeling skills" at a score of 3.94 out of 5.

5. Discussion

The study sought to determine which main obstacles prevent professionals from using Generative AI technology in 3D modeling production. The findings demonstrate that AI tools successfully enable entry for beginners, but

the tools still lack the technical standards needed for professional work. The study discovered that AI generation produces random results which clash with the fixed requirements established by professional 3D production pipelines. The data shows proof for the recent human-computer interaction research which identified "Black Box" systems as the main reason participants experienced "Lack of Precision" while using the system. Professionals work in environments where they must match specific vertices to rig bones but current text-to-3D interfaces prioritize visual appearance above visual appearance. Participants showed strong need for "Granular Control" which demonstrated that users require both automation and assistance. The current "prompt-and-pray" workflow disables artist control over the process, which results in complete tool obsolescence for artists who need to create precise architectural visualizations and hard-surface models.

The data shows that different experience levels create different trust levels which researchers call the "Trust Gap." The research findings show that students and hobbyists have higher trust levels toward AI topology than senior leads. Novices prefer AI output because it exceeds their ability to create manual content which brings them increased satisfaction. Experts create "Technical Debt" because they need to fix AI output errors that occur during their work. The survey responses indicate that the generated topology usually creates triangulation or messy results, which forces senior artists to spend additional time repairing the mesh instead of creating it from scratch. The research demonstrates the existence of the "Editability Paradox," which describes how people find it simple to produce AI assets but they encounter difficulties when trying to change those same assets. Users who wanted professional development stated that they found it difficult to repair AI models because "bad geometry" slowed down their work progress. The finding disproves industry claims which assert that AI functions exclusively as a time-saving solution. A professional pipeline considers a "bad" mesh to be more problematic than "no" mesh because the latter requires retopology work. AI tools need to adopt "quad-dominant" algorithms which maintain edge loops to achieve practical applications beyond static assets that can change character shapes. The participants showed major anxiety about skill loss which matched with ethical worries that appeared in wider AI studies. The research shows that both psychological obstacles and technical challenges create equal barriers to adoption. There exists a widely held belief that using text-to-model generators will diminish basic spatial comprehension which will cause directors to restrict AI use in studios to maintain traditional standards in their work.

The study has several limits which include a small sample size of $N=16$ that reduces statistical strength for quantitative analysis. Digital communities used purposive sampling to recruit participants which introduces a "technophile bias" because online respondents show higher likelihood of being technology early adopters compared to regular artists. The research project depended entirely on self-reported hands-on experience which introduces subjective limitations. Future research should explore "Assistive" tools instead of "Generative" tools based on the "Precision Deficit" which has been identified. The research needs to study "Human-in-the-loop" workflows, which use AI for sub-task functions including UV unwrapping and texture generation, instead of complete geometry development. Research needs to track trust gap changes through time as new algorithms solve the topology problems that professional users encounter.

Conclusion

The research concludes that Generative AI has great potential for improving 3D production ideation work yet it currently lacks the required technical standards and usability standards to function in real professional environments. The research presents its main finding by showing that the text-to-3D generation process creates

a "precision gap" because its random nature conflicts with the industry standards that require exact outcomes. The study shows that AI tools operate at high speed yet professionals experience major difficulties because they cannot control details with precision and 56 percent of users identified detail manipulation as their most important problem. The trust scores for AI-generated topology and UV maps show that current algorithms use visual fidelity as their main priority which results in unusable assets for complex animation and rigging until manual work is done to fix them. The research shows that current automation will eliminate manual modeling skills because this belief needs to be corrected. The data supports a "human-in-the-loop" model where AI helps beginners who find it easier to fix AI models than to build from nothing yet it creates obstacles for experts who need production-ready geometry. Participants reported high anxiety about losing their skills, which shows how adopting these tools creates psychological stress, while the industry must deal with a future risk in which workers will lose essential skills because of increasing automation use and insufficient training in 3D principles. The study suggests that software developers should stop building generative "text-to-model" systems and start developing "assisted-editing" workflows which let users control the creation process. Educational institutions and studios should treat AI as a tool for quick prototyping and mood-boarding which should not be used to replace their final asset development process.

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