“Exploring Digital Artists and AI Collaboration within Augmented Reality”

by

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Final master’s dissertation submitted in partial fulfilment of requirements for the degree of Master of Digital Arts.

This Master's dissertation comprises a 60% written component and a 40% creative component. The creative element involves the development and implementation of an interactive augmented reality application, *Impact: The Pre-Show Interactive Playbill*, designed and developed using Unity.

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Declaration

I, **Gaositwe Mojapelo** (Student number: 2752855), am a student registered at the University of the Witwatersrand. I hereby declare that this dissertation is submitted in partial fulfilment of the requirements for my Master's in Digital Arts in the Department of Humanities. This is my own original work and has not been published or submitted elsewhere as a requirement for a degree programme.

I have followed the required academic conventions in referencing the thoughts and ideas of others. I am aware that plagiarism—using someone else's work without permission and/or without proper acknowledgement—is a serious academic offence. I confirm that all literature cited or quoted has been acknowledged through a comprehensive reference list, except where explicitly stated otherwise.

I understand that the University of the Witwatersrand may take disciplinary action if there is reason to believe that this dissertation is not my own unaided work or that I have failed to properly acknowledge the sources of ideas and words used in my writing.

This research has received ethical clearance from the University of the Witwatersrand, Ethics number: H25/01/26.

Signature: ___Gaositwe Mojapelo___ Date: __4th August 2025___

Acknowledgement

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With all my heart,
Gaositwe Mmapelo Mojapelo

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Abstract

"AI won't steal your job, but those who use AI will excel...even if they seem less skilled than you are now. Fear is natural." — Lyle Kruger

Artificial intelligence (AI) is increasingly shaping creative practices by assisting artists with technical tasks, expanding opportunities for experimentation and innovation. This dissertation investigates how AI-assisted coding tools can support the creation of augmented reality (AR) experiences for live theatre, focusing on their ability to reduce technical barriers while preserving artistic agency. The study adopts a practice-based, autoethnographic approach, culminating in the development of Impact, a pre-show interactive AR playbill for the musical Maiden Voyage.

The research explores how AI-generated code can streamline development processes, particularly for artists without extensive programming expertise. Through iterative design, testing, and critical reflection, the project examines the benefits and limitations of using AI as a collaborative tool in creative production. Key findings highlight that while AI can accelerate coding tasks such as debugging and optimisation, effective use requires informed human oversight, creative decision-making, and iterative refinement.

Ultimately, the study argues that AI functions best as a partner rather than a replacement for human creativity. By documenting the lived experience of integrating AI into AR development, this research contributes to ongoing debates about authorship, agency, and the evolving relationship between technology and artistry in the digital age.

Defining Key Terms

To ensure clarity, the following definitions provide foundational context for key terms used throughout this dissertation:

- **Artificial Intelligence (AI):** AI refers to computational systems capable of performing tasks that typically require human intelligence, such as problem-solving, pattern recognition, and decision-making (Russell & Norvig, 2021).

- **Augmented Reality (AR):** AR is a technology that overlays digital content onto real-world environments through devices such as smartphones, tablets, or AR glasses, enhancing user interaction (Azuma, 1997).

- **AI-Assisted Coding:** The use of AI-generated code to automate development processes in software engineering, particularly in creative fields such as AR, where AI can help reduce technical barriers for artists while supporting creative decision-making (Johnson & Gupta, 2023b).

- **Autoethnography:** A qualitative research method that combines personal narrative with cultural analysis, allowing researchers to reflect on their lived experiences as part of the research process (Ellis et al., 2011). In this study, it was used to document the author's own creative journey with AI-assisted AR development.

- **Reflective Journaling:** A process of recording observations, challenges, and emotional responses during a project. It provides a longitudinal record of experiences and insights for later thematic analysis.

- **Thematic Analysis:** A qualitative method for identifying, analysing, and reporting patterns (themes) within data. This dissertation uses Braun & Clarke's (2006) six-step framework to analyse reflective journals and voice notes.

- **Unity:** A widely used cross-platform game engine for creating real-time 3D content, including AR experiences. Unity was used in this study to develop the *Impact* AR prototype.

- **Impact: The Pre-Show Interactive Playbill:** A beta AR prototype designed and developed by the author as part of this research, intended to enhance audience engagement in live theatre through image-tracked digital content.

Chapter One: Introduction

1.1 Overview of AI and AR in Creative Arts

Artificial intelligence (AI) refers to computer systems designed to perform tasks traditionally associated with human cognition—such as interpreting language, making decisions, and recognising patterns (Russell & Norvig, 2021). Augmented reality (AR) enriches real-world environments by overlaying them with digital content, creating interactive experiences that merge physical and virtual spaces (Azuma, 1997).

The integration of AI and AR is reshaping creative practice by bridging the gap between artistic imagination and technical execution. Artists such as Nettrice Gaskins illustrate how AI can drive immersive experiences that merge cultural narratives with digital aesthetics. Gaskins, an artist and educator, employs AI-generated portraits and digital installations to explore African diasporic aesthetics. While much of her work exists in virtual reality contexts, the same principles of layering digital elements apply in AR, enabling interactive engagements rooted in physical computing and projection mapping inspired by cosmograms—culturally based maps of space and time.

As a Black woman deeply interested in spirituality, I feel strongly connected to this approach, as it demonstrates AI-assisted AR's potential to bridge cultural narratives with digital experiences (Gaskins, 2020). AI offers opportunities for artists to engage with technology in ways that enhance creative storytelling while reducing technical barriers.

Historically, artists without formal programming training have faced challenges in creating AR experiences due to the high level of technical expertise required. AI has transformed this process by automating complex coding tasks, optimising workflows, and providing creative solutions. Platforms such as Runway ML and Unity's ML-Agents illustrate how AI-driven automation enables artists to produce high-quality AR projects without extensive coding expertise (Brown, 2019).

Research suggests that AI-assisted code generation can reduce AR development time by up to 40%, allowing artists to focus on conceptual storytelling rather than coding complexities (Murray & Patel, 2022). This shift has significant implications for independent artists, making AR development more accessible and encouraging broader participation in digital arts.

1.2 Research Aim: AI's Role in Assisting Digital Artists with AR Coding

The primary aim of this study is to explore how AI can support digital artists in developing AR experiences by simplifying coding processes, improving code quality, and enhancing creative output. For artists with limited coding knowledge, AI-driven tools—such as ChatGPT for code generation—offer a level of accessibility that enables them to create high-quality AR content without requiring deep technical expertise (Gero & Maher, 2013).

Consider an artist designing an AR exhibit requiring precise object tracking for immersive user interaction. Traditionally, coding this feature would involve extensive debugging and technical knowledge. However, with AI-driven code generation, the artist can automate many of these tasks. For example, an AI tool can generate a Unity script for object tracking using a simple natural language prompt, drastically reducing development time while maintaining functionality.

By focusing on AI's role in coding, this study highlights the growing potential of machine learning to complement artistic practice. Unlike conventional approaches to AR development, which rely heavily on technical skills, AI-assisted methods allow artists to prioritise creative expression while AI handles repetitive, time-consuming tasks (Johnson & Gupta, 2023b). This research positions AI as a collaborative tool that enhances—rather than replaces—human creativity in AR development.

1.3 Importance of Bridging Creativity and Technology for Independent Artists

For independent artists working without large development teams, AI presents transformative opportunities. The intersection of creativity and technology expands new avenues for expression, enabling artists to produce complex interactive experiences without requiring substantial technical resources (Brown, 2019).

Digital artist Refik Anadol, for example, has pioneered AI-driven immersive installations that merge human cognition with machine learning to create large-scale digital environments. His project Melting Memories translates brainwave data into interactive visuals, illustrating how AI can expand artistic expression beyond traditional mediums (Anadol, 2018).

As Turkle (2017a) notes, "When complex technical processes are automated, a broader range of individuals can engage with emerging technologies regardless of their programming skills." AI's ability to automate coding tasks, enhance workflows, and generate creative suggestions opens opportunities for artists from diverse backgrounds to contribute to AR innovation.

By automating complex programming tasks, AI tools allow independent creators to focus on refining storytelling, visual design, and user engagement rather than struggling with technical limitations. This democratisation of AR development fosters diversity and innovation in creative industries, enabling more artists to experiment with interactive and immersive technologies (Lee & Kim, 2020).

1.4 Argument: AI Enhances, Not Replaces, Human Creativity

Refik Anadol's work and Google's Art & Machine Intelligence initiatives exemplify AI as a creative collaborator rather than a mere technical tool. Anadol's *Machine Hallucinations* project, for instance, uses AI models trained on vast image datasets to generate surreal, dream-like digital environments. In an AR context, such algorithms could overlay dynamic, data-driven visuals onto physical spaces, creating evolving interactive experiences.

Similarly, Google's Artist + Machine Intelligence (AMI) program has facilitated collaborations between artists and technologists, equipping creators with AI-driven platforms to experiment with AI-generated imagery, interactive 3D assets, and machine learning-based storytelling. While AI assists with technical execution, the artist retains control over narrative structure, emotional tone, and aesthetic direction—ensuring that human creativity remains central.

This research argues that while AI streamlines technical workflows, it cannot replace the intuitive, emotional, and cultural depth that human artists bring to AR experiences. Floridi (2019) emphasises that AI can mimic creative patterns but lacks the historical, social, and emotional insights necessary for deeply resonant art. By viewing AI as an augmentation tool rather than a replacement for human ingenuity, this research highlights a symbiotic relationship where AI enhances efficiency without diminishing artistic authenticity.

1.5 Research Questions and Objectives

This study is guided by the following primary research question:

How can AI-assisted coding tools support the creation of an augmented reality (AR) experience for live theatre while enhancing artistic agency and reducing technical barriers for non-programmers?

The aims of this research are:

1. To investigate how AI-assisted coding tools can streamline AR development for theatre artists without extensive technical expertise.

2. To design and evaluate a creative output—Impact, an AR application serving as a pre-show playbill for the theatre production Maiden Voyage.

3. To critically reflect on the creative process using an autoethnographic approach, documenting how AI impacted artistic decision-making, problem-solving, and technical execution.

This research contributes to broader discourse on AI in creative industries by exploring how AI empowers artists without diminishing their role as primary creators. Instead of presenting definitive answers, it examines the extent to which AI-driven methods support or challenge artistic control, ensuring that creative intent remains central in AR development.

Chapter Two: Literature Review

2.1 Introduction: AI in Creative Arts and Human-Computer Interaction

The integration of artificial intelligence (AI) into creative industries has become a rapidly expanding area of research, raising questions about artistic agency, authorship, and collaboration between humans and machines. In parallel, augmented reality (AR) has emerged as a transformative tool for live performance, allowing audiences to interact with digital elements layered onto real-world environments (Azuma, 1997). The convergence of AI and AR presents new opportunities for theatre practitioners to create immersive experiences without requiring advanced technical expertise.

Historically, experiments in digital theatre and mixed reality performance began in the late 20th century, with early pioneers incorporating projections and interactive technologies on stage. As AR hardware and software have become more accessible, productions such as Dream (Royal Shakespeare Company, 2021) have demonstrated the potential of AR to extend narrative and audience engagement beyond the stage. This study situates itself in this context, exploring how AI-assisted coding can empower artists to contribute to such innovative practices without needing to master complex programming skills.

2.2 Ethical Considerations of AI in Creative Arts

The increasing reliance on AI in creative production introduces ethical challenges, particularly concerning authorship, transparency, and the potential for bias in AI-generated outputs (Floridi, 2019). AI models are often trained on datasets that reflect dominant cultural perspectives, which risks reinforcing systemic inequalities in representation (Noble, 2018). Artists working with generative AI must therefore critically examine how training data may privilege Western aesthetics while marginalising non-Western artistic traditions (Li et al., 2022).

Beyond cultural considerations, the environmental impact of AI is an emerging concern. Training large language and generative models requires significant computational power, leading to substantial energy consumption and carbon emissions (Bender et al., 2021). As AI tools become more prevalent in creative industries, practitioners must balance innovation with sustainable technological practices.

For this project, ethical responsibility was central to the creative process. AI-assisted coding was treated as a collaborative tool rather than a replacement for human creativity, ensuring that artistic decisions remained grounded in intentional, human-led choices. Transparency was maintained by documenting all AI-generated code and its modifications, clarifying which

contributions came from AI versus the author. This approach aligns with calls for clearer authorship practices and responsible use of generative technologies (Sanchez, 2020).

2.2.1 Authorship in AI-Assisted Creativity

AI's collaborative role challenges traditional authorship models. Historically, artists were considered the sole originators of creative work, but AI's ability to generate substantial aspects of a project complicates this notion. For example, in AI-generated AR environments, machine-learning models may autonomously determine layout, visual effects, or interaction sequences—raising questions about who should receive creative credit (Gero & Maher, 2013).

A notable example is Portrait of Edmond de Belamy (2018), produced by the art collective Obvious through a Generative Adversarial Network (GAN). Its sale at Christie's for over $400,000 sparked debate around AI authorship and intellectual property. The AI model had been trained on pre-existing artworks, leading to concerns about whether the creators of the training dataset should also be credited (Elgammal et al., 2017).

To address this ambiguity, scholars suggest documenting human and AI contributions separately within AR projects. Frameworks such as AI-assisted coding annotations allow developers to specify which segments were AI-generated versus human-modified, ensuring transparency and accountability (Brown, 2019).

2.2.2 Bias in AI-Generated Content

AI systems are inherently shaped by their training datasets, leading to potential biases that influence creative outputs. AI models trained in Western artistic traditions may prioritise certain aesthetic styles, marginalising non-Western or under-represented cultural expressions (Noble, 2018).

This issue became evident in 2020 when the AI music composition tool AIVA (Artificial Intelligence Virtual Artist) faced criticism for generating compositions predominantly in Western classical music styles—highlighting dataset limitations. Similarly, AI-generated AR experiences may inadvertently reinforce cultural stereotypes unless creators actively curate diverse datasets and critically examine AI outputs (Li et al., 2022).

To mitigate bias, developers should incorporate multicultural training datasets and involve diverse teams in AI model evaluation. In AR development, strategies such as collaborative

co-creation with cultural experts can help ensure that AI-generated content remains inclusive and representative (Turkle, 2017a).

2.2.3 Intellectual Property Challenges

AI's ability to generate new artistic outputs from existing datasets raises legal questions about ownership and copyright. AI-generated designs, particularly in AR projects, may unintentionally replicate elements from copyrighted works, leading to intellectual property disputes (Wang, 2023).

The controversy surrounding OpenAI's DALL-E—where artists raised concerns that their works were used in AI training datasets without consent—highlights the urgent need for updated copyright frameworks (Xu, 2023). Organisations such as WIPO and UNESCO have proposed new legal structures to distinguish between AI-assisted and AI-autonomous creations, ensuring that human oversight remains a prerequisite for copyright claims (Floridi, 2019).

2.2.4 Transparency and Ethical Standards

Transparency in AI-assisted creativity is critical to maintaining trust and integrity in AR projects. Creators should document AI involvement clearly, ensuring that audiences and stakeholders understand where and how AI was used. Ethical coding practices—such as annotating AI-generated code snippets—can improve transparency and prevent misrepresentation of authorship (Sanchez, 2020).

2.2.5 Implications for the Creative Arts

The ethical concerns surrounding AI in creative fields underscore the need for proactive governance and responsible integration. Collaboration between regulatory bodies, professional organisations, and the artistic community can establish best practices that prioritise authorship transparency, inclusivity, and ethical coding (Turkle, 2017b).

2.3 The Role of AI in Enhancing or Replacing Creativity

The role of AI in creative processes has sparked an ongoing debate around human agency and the extent to which machines may enhance or diminish artistic authorship. Scholars such as Gero and Maher (2013) argue that AI can function as a co-creative partner, augmenting rather than replacing human creativity. By automating repetitive and technical tasks, AI frees artists to focus on conceptual and aesthetic decision-making (Johnson & Gupta, 2023b).

However, concerns persist regarding authorship and originality. Turkle (2017a) warns that as technology increasingly mediates creative processes, artists risk ceding too much control to machines, blurring the distinction between human and AI contributions. This study addresses these concerns by framing AI as a supportive tool—a collaborator in technical problem-solving—while maintaining that the artist remains the primary creative agent who drives intent, meaning, and artistic direction.

The autoethnographic methodology used in this dissertation reinforces that AI cannot independently provide vision or artistic purpose. Instead, AI serves as a facilitator, enabling the author to execute complex technical tasks while retaining narrative and aesthetic control. This perspective emphasises the enduring importance of human creativity in an age of generative technologies.

2.3.1 Enhancing Creativity: AI as a Collaborative Tool

AI enhances creativity by automating repetitive tasks, freeing artists to focus on conceptual and aesthetic decisions. Tools such as Runway ML, DeepArt, and Unity's ML-Agents illustrate how AI can facilitate artistic production without diminishing human agency (Johnson & Gupta, 2023b).

Refik Anadol's immersive installations demonstrate AI's collaborative potential. Anadol employs machine-learning algorithms to process vast datasets—ranging from architectural archives to meteorological patterns—and translate them into interactive digital environments (Anadol, 2018). His Machine Hallucinations project, for example, analyses urban imagery to generate dream-like visuals that Anadol curates and integrates into large-scale installations. AI contributes computational precision, while the human artist directs narrative and emotional tone.

Similarly, Google's Art & Machine Intelligence initiative highlights AI's potential as a creative partner. Through TensorFlow-based experiments, AI-assisted animation, and interactive AR elements, artists can generate 3D assets or prototype AI-driven installations without requiring deep coding expertise (Brown, 2019).

2.3.2 Limitations of AI-Generated Creativity

While AI facilitates technical execution, its limitations become apparent in areas requiring emotional depth, originality, and cultural nuance. Critics argue that AI-generated content often lacks the intentionality and authenticity that define human-created art, as AI relies on pattern recognition rather than conceptual innovation (Floridi, 2019).

For example, AI-generated music has faced criticism for producing formulaic compositions that mimic pre-existing styles without demonstrating true artistic intent. Sony's Flow Machines project Daddy's Car (2016) illustrates this challenge. Trained on patterns from The Beatles, the AI produced a composition that mirrored the band's sound but lacked originality and emotional depth (Gonzalez & Miller, 2021).

AI-generated visual art—such as that produced by DeepDream and DALL-E—often rearranges familiar elements rather than introducing novel artistic concepts. This raises concerns about derivative outputs, where AI remixes cultural artefacts rather than generating truly original works (Xu, 2023).

AI's dependence on training datasets limits its ability to break new artistic ground. Because AI models learn from pre-existing artworks, they risk reinforcing dominant cultural aesthetics while marginalising under-represented artistic traditions (Noble, 2018)

2.3.3 AI as a Tool for Experimentation

Despite these limitations, AI remains a valuable tool for artistic experimentation. By providing new mediums and methods, AI encourages creative risk-taking and cross-disciplinary collaboration.

In AR development, AI enables artists to rapidly prototype and refine interactive experiences, reducing the time and resources required for experimentation (Brown, 2019). Google's Artist + Machine Intelligence (AMI) program exemplifies this potential, offering tools for AI-powered visualisations, interactive installations, and AI-generated soundscapes.

2.3.4 Striking a Balance Between AI and Human Creativity

The key to effective AI integration lies in maintaining a balance where AI serves as an enabler rather than a replacement. This balance is achieved when AI handles technical complexities while the artist retains narrative and aesthetic control.

The development of *Impact: The Pre-Show Interactive Playbill* demonstrates this principle. While AI-assisted coding streamlined development, human oversight ensured artistic coherence. Floridi (2019) and Turkle (2017a) emphasise that AI should be viewed as a collaborator, augmenting human potential rather than replacing it.

2.4 Limitations of AI-Assisted Art

While AI offers significant potential as a creative partner, its use in artistic production also introduces several limitations. These challenges include issues of technical adaptability, dataset bias, financial barriers, and ethical considerations regarding authorship and cultural inclusivity.

2.4.1 Technical Rigidity and Lack of Adaptability

AI-generated outputs often lack the flexibility required for highly customised artistic projects. While AI can automate foundational coding tasks in AR development, unconventional artistic features still require substantial manual refinement (Chen & Lee, 2021). In this study, scripts produced by ChatGPT and Unity's ML-Agents frequently required additional debugging, refactoring, and alignment with the author's creative vision (Murray & Patel, 2022).

2.4.2 Dependency on Datasets

AI relies on training data that reflect dominant cultural norms. As Noble (2018) argues, this dependence can reinforce systemic biases, privileging Western aesthetics and marginalising non-mainstream artistic expressions. For instance, an AI model trained predominantly on Euro-American art traditions may fail to represent diverse cultural practices, limiting the inclusivity of AI-generated outputs (Xu, 2023). These biases raise concerns about cultural homogenisation in AI-generated art and underscore the need for curating diverse datasets.

2.4.3 Financial Barriers for Independent Artists

While AI has increased access to creative tools, many platforms require costly subscriptions or licensing fees (Brown, 2019). Tools such as Runway ML, while powerful, often reserve advanced features for paid users, creating financial barriers for emerging or self-funded artists (Johnson & Gupta, 2023b). This commercialisation of AI technologies risks excluding independent practitioners from fully benefiting from AI-driven creativity.

2.4.4 Ethical Challenges and Cultural Representation

AI's inability to grasp cultural nuance often results in outputs that fail to reflect diverse perspectives. For example, early AI-generated trivia questions in the development of Impact reflected Western-centric narratives and required manual revisions to ensure cultural inclusivity. Such issues highlight the importance of human oversight in verifying and refining AI-generated content.

Additionally, the blurred boundary between human and AI contributions complicates authorship and transparency. As Turkle (2017a) notes, this raises important questions about how artistic ownership should be attributed in AI-assisted work.

2.4.5 Lessons for Independent Artists

Despite AI's limitations, independent artists can take proactive steps to navigate these challenges effectively:

- Combine AI outputs with manual refinements to ensure that technical automation does not override artistic intent.
- Critically evaluating datasets for diversity and inclusivity, while advocating for transparent AI integration practices. Leverage open-source AI alternatives to mitigate financial barriers and maintain creative autonomy.
- Documenting the role of AI in the creative process to ensure clear authorship attribution and transparency.

2.5 Broader Professional Opportunities for Digital Artists

The integration of AI in digital arts and AR development has expanded creative possibilities and opened new career pathways for artists. By automating complex coding tasks, AI tools enable creators to participate in technologically advanced fields that were previously inaccessible to those without programming expertise (Brown, 2019). These developments have fostered an inclusive digital arts ecosystem, allowing artists to experiment with AR storytelling, interactive installations, and AI-generated design elements.

However, these opportunities come with new challenges, including professional recognition, financial sustainability, and evolving skill requirements. This section explores emerging career paths, opportunities, and challenges associated with AI-driven creative industries.

2.5.1 Expanding Career Paths in Creative Industries

AI-driven tools have democratised access to digital art production, enabling artists to take on multidisciplinary roles that blend technical execution with artistic vision. Examples include:

- **Immersive Experience Designers:** Artists specialising in AR and VR storytelling now play key roles in industries such as theatre, museum curation, live performances, and interactive exhibitions (Chen & Lee, 2021). Studios like TeamLab have pioneered AI-enhanced installations that merge digital and physical environments to craft immersive audience experiences.

- **Interactive Marketing Specialists:** Brands increasingly use AI and AR to create interactive consumer experiences. Companies such as Nike and IKEA have implemented AR-powered applications for product visualisation, demonstrating how AI and AR are reshaping marketing strategies (Johnson & Gupta, 2023b). For digital artists, this trend opens new opportunities to work with brands developing innovative campaigns that combine AI-generated visuals with interactive AR elements.

- **Educational Content Developers:** The use of AI-powered AR in education and training has created new possibilities for interactive learning. Platforms like Merge Cube and Google Expeditions use AI-generated 3D assets to enhance student engagement and understanding of complex topics (Lee & Kim, 2020). These roles show how digital artists can contribute to both creative and educational industries.

2.5.2 Enhancing Accessibility for Independent Creators

AI has lowered technical barriers by simplifying coding tasks, allowing independent artists to prototype and develop interactive projects without requiring extensive programming expertise (Brown, 2019). Tools such as Unity and Runway ML enable creators to experiment with AR storytelling and AI-generated assets, making advanced technology more accessible.

However, financial barriers persist as premium AI features remain locked behind paid subscriptions (Johnson & Gupta, 2023b). Additionally, concerns around authorship, originality, and ethical use of AI highlight the need for transparent practices in creative industries (Floridi, 2019). Independent artists can address these challenges by leveraging open-source AI solutions, combining automated outputs with manual refinement, and critically evaluating AI-generated content to ensure inclusivity.

2.5.3 Professional Recognition and Industry Growth

The rise of AI-driven creative industries has led to growing professional recognition for digital artists. Examples include:

- New award categories for AI-assisted AR, storytelling, and digital scenography at events like the Augmented World Expo (AWE).
- Increased demand for AI-trained digital artists in film, gaming, and marketing sectors.
- Hybrid creative roles combining coding, machine learning, and artistic direction.

AI-powered AR development is also reshaping traditional notions of artistic labour. Productions such as The Mandalorian (Disney, 2019) highlight how AI-integrated pipelines can reduce costs and enhance creative flexibility (Murray & Patel, 2022). This shift underscores the expanding opportunities for digital artists to integrate AI-generated assets into large-scale productions.

2.5.4 Challenges and Opportunities

The table below summarises the main opportunities and challenges associated with AI-assisted creativity in digital arts:

Opportunities	Challenges
AI streamlines technical workflows, allowing artists to focus on creative storytelling and design.	Ethical debates on authorship raise concerns about creative ownership.
Expanding career paths in immersive experiences, marketing, and education.	Access to premium AI tools remains financially restrictive for many independent artists.
Rising demand for AI-literate artists in creative industries.	AI automation risks homogenising artistic outputs, potentially reducing originality.
Hybrid creative roles enhance employability across multiple industries.	Over-reliance on AI may limit hands-on artistic development and weaken creative control.

Table 1: This table displays the opportunities and challenges that AI can offer digital artists. (Authors Own)

AI's potential to transform digital arts and AR development depends on how artists choose to engage with these tools. Those who embrace AI's capabilities while maintaining critical oversight and ethical practices are well-positioned to thrive in the evolving creative landscape.

2.6 AI-Assisted Code Generation for Impact: The Pre-Show Interactive Playbill

AI-assisted code generation plays a central role in reducing technical barriers for artists developing augmented reality (AR) experiences. This section contextualises how AI-supported coding aligns with existing research on creative autonomy, accessibility, and iterative prototyping.

Studies by Johnson and Gupta (2023a) and Murray and Patel (2022) emphasise that AI tools like ChatGPT, Unity ML-Agents, and Runway ML can automate scripting tasks while enabling artists to prioritise storytelling and interaction design. These platforms simplify AR development by supporting marker detection, prefab instantiation, and animation handling, significantly reducing manual coding workloads.

However, scholars such as Floridi (2019) and Turkle (2017a) warn that without human oversight, AI risks producing outputs that lack originality, cultural nuance, or artistic intentionality. This

project therefore positioned AI as a collaborative assistant, integrating generated scripts with manual debugging and refinement to ensure coherence, inclusivity, and artistic quality.

By situating AI-assisted AR development within both ethical and theoretical frameworks, the study contributes practical insights into responsible adoption of generative tools in digital arts.

2.6.1 Automating Core Functionalities

AI-assisted coding was primarily used to generate essential components of the Impact playbill, including:

- **AR Marker Detection:** Scripts generated by AI facilitated real-time image recognition, enabling users to scan predefined theatre programmes and access interactive digital content.

- **Multimedia Integration:** AI-assisted code supported the seamless integration of video, audio, and 3D assets to enhance audience engagement.

- **Interactive Features:** AI-driven logic was employed to create gamified elements, such as trivia quizzes and touch-based navigation, encouraging user interaction.

2.6.2 Accelerating Iterative Development

One of the key benefits of AI-assisted coding in Impact was its ability to speed up development through real-time error detection and rapid prototyping.

Key benefits included:

- AI models that identified syntax errors and suggested optimised solutions.
- Faster testing cycles that reduced manual programming time by approximately 40% (Johnson & Gupta, 2023b).

While AI provided efficient technical solutions, manual refinements remained necessary to tailor outputs to the project's narrative and aesthetic goals (Floridi, 2019).

2.6.3 Bridging the Gap Between Creativity and Technology

A primary objective of Impact was to demonstrate how AI tools can lower technical barriers, enabling artists with limited programming expertise to create AR-enhanced theatre experiences.

This approach aligns with Lee and Kim (2020), who argue that AI-powered tools expand opportunities for non-technical creatives to engage with digital storytelling and interactive media. However, as with other creative AI applications, human oversight remained essential for maintaining narrative coherence, refining outputs, and ensuring cultural inclusivity.

2.6.4 Limitations and Lessons Learned

Despite its advantages, AI-assisted coding introduced several challenges that required critical adaptation and problem-solving:

Limitation	Challenge in Impact	Solution
Rigidity in Outputs	Scripts lacked flexibility for customised AR experiences.	Manual refinements aligned outputs with artistic vision.
Cultural Sensitivity	AI-generated trivia defaulted to Western-centric narratives.	Revised and diversified content to reflect inclusivity.
Device Compatibility	Early prototypes experienced performance issues on older devices.	Scripts optimised for low-memory devices.

Table 2: This table displays the challenges experienced amidst creating the Augmented Reality experience. (Authors Own)

These challenges emphasise the need for continuous human input when integrating AI into creative workflows, particularly in projects requiring inclusivity and cultural sensitivity.

2.6.5 Lessons for Future AI-Assisted AR Projects

Key insights from Impact's development process include:

- AI effectively accelerates technical implementation but requires human oversight for adaptation and creativity.
- Ethical AI integration must prioritise cultural inclusivity and content representation.
- Combining automated code generation with iterative manual refinement ensures outputs remain coherent and aligned with artistic intent.

By adopting a human-in-the-loop approach, the project illustrates how AI can enhance creative efficiency without compromising narrative control or artistic authorship.

2.7 Limitations of AI in AR Coding for Independent Artists

Although AI has significantly lowered technical barriers in augmented reality (AR) development, independent artists still face numerous challenges when integrating AI-assisted coding into their creative workflows. These challenges include rigid code outputs, cultural biases in datasets, financial accessibility issues, and ethical concerns around authorship and originality.

The following subsections examine these limitations in detail, highlighting where human oversight remains essential.

2.7.1 Customization Challenges

AI-generated code is often standardised, making it difficult for independent artists to implement highly customised or experimental features. While AI tools like ChatGPT and Unity's ML-Agents can produce functional scripts, these outputs typically:

- Generate generic coding patterns that require significant manual adjustments to align with artistic intent (Li et al., 2022).
- Struggle with complex interactivity and narrative-specific features, requiring iterative human refinements (Murray & Patel, 2022).

During the development of Impact: The Pre-Show Interactive Playbill, AI-generated scripts required substantial manual edits to ensure narrative flow, spatial mapping, and user interaction design aligned with the project's artistic vision.

2.7.2 Dataset Dependency and Cultural Bias

Generative AI models are trained on pre-existing datasets, which can reinforce dominant cultural aesthetics while marginalising under-represented artistic traditions (Noble, 2018; Xu, 2023).

Without intervention, these biases can manifest in culturally narrow outputs. For example, early iterations of Impact's AI-generated trivia defaulted to Western-centric references, requiring manual revisions to reflect a broader diversity of theatre audiences.

Scholars highlight the need to curate more diverse datasets and incorporate multicultural perspectives to prevent AI from perpetuating cultural bias (Li et al., 2022)

2.7.3 Financial Accessibility

Despite making advanced tools more available, AI-powered AR platforms often lock premium features behind paywalls, creating barriers for independent creators (Brown, 2019).

Key financial challenges include:

- Subscription fees for AI-enhanced tools (e.g., Runway ML, Unity Pro).
- High hardware requirements for real-time AI processing.
- Limited funding opportunities for independent artists (Johnson & Gupta, 2023b).

To address these constraints, creators can leverage open-source AI tools (e.g., TensorFlow, Stable Diffusion) and explore grant-funded creative programs, though such options remain less accessible than commercial solutions.

2.7.4 Ethical and Practical Considerations

AI's role in content generation raises ethical questions about authorship, originality, and transparency. Scholars such as Floridi (2019) and Turkle (2017a) emphasise the need for clear attribution frameworks and transparent AI integration practices to protect artistic agency.

Concerns include:

- Bias in AI-generated visuals or text, requiring manual intervention for accuracy.
- Ongoing debates about ownership of AI-generated outputs and their creative credit (Elgammal et al., 2017).
- Over-reliance on AI potentially diminishing artistic experimentation and agency.

Addressing these concerns requires explicit documentation of AI involvement, ensuring that the human artist's contribution remains central (Sanchez, 2020).

2.7.5 Lessons for Independent Artists

Independent artists can mitigate these challenges through practical strategies, including:

- Combining AI outputs with manual refinements to preserve originality and creative intent.

- Curating diverse datasets or collaborating with AI developers to enhance inclusivity (Noble, 2018).
- Leveraging open-source tools to reduce financial barriers while maintaining creative autonomy.

Refik Anadol's work demonstrates how AI can act as a co-creative partner, supporting but not replacing artistic vision (Anadol, 2018). Similarly, the Impact project reinforced that iterative, human-in-the-loop approaches are essential for maintaining narrative control, cultural sensitivity, and ethical authorship.

2.8 Summary of Key Insights from Literature Review

The literature review has examined AI's role in AR development, its impact on digital artistry, and the ethical and practical challenges associated with AI-assisted creativity. The key insights are categorized into three major themes:

- AI's potential to democratize AR creation by reducing technical barriers.
- Ethical and practical limitations of AI-generated content.
- The need for a balanced, human-centred approach to AI integration in creative industries.

This section synthesizes the findings, highlighting both opportunities and challenges in AI-driven AR development.

2.8.1 Key Benefits of AI in AR Development

The literature identifies several advantages of AI-assisted AR development:

- **Democratisation of AR Creation:** AI tools like Unity ML-Agents and ChatGPT reduce the technical expertise required to build AR applications (Murray & Patel, 2022). Independent creators can now generate code for features such as object tracking and animation without extensive programming knowledge (Johnson & Gupta, 2023b).

- **Acceleration of Creative Workflows:** AI facilitates faster prototyping and debugging, cutting manual coding time by up to 40% and enabling artists to focus on higher-level storytelling and user experience design (Brown, 2019; Floridi, 2019).

- **Expansion of Career Opportunities:** AI has created new professional pathways in immersive media, interactive marketing, and educational technology (Chen & Lee, 2021). Demand for AI-literate artists continues to grow across film, gaming, and experiential media industries (Murray & Patel, 2022).

2.8.2 Key Challenges and Limitations

Despite these benefits, significant limitations remain:

- **Technical Rigidity and Dataset Bias:** AI-generated code often lacks adaptability, requiring substantial human intervention for customisation (Li et al., 2022). Additionally, AI models trained on historical datasets risk reinforcing dominant cultural narratives and reducing creative diversity (Noble, 2018).

- **Financial Accessibility:** Premium AI-powered AR tools remain financially restrictive for independent artists. While open-source alternatives exist, they often lack robust support and advanced features, posing barriers for creators without funding (Johnson & Gupta, 2023b).

- **Ethical and Cultural Considerations:** AI's growing role in artistic production raises debates over authorship, ownership, and intellectual property (Elgammal et al., 2017). Biases in training data can marginalise non-Western artistic traditions, underscoring the need for ethical oversight and dataset diversity (Turkle, 2017a).

These challenges highlight the necessity of human-in-the-loop approaches, where AI supports—but does not replace—artistic agency and decision-making.

2.8.3 Balancing AI's Potential and Limitations

The reviewed literature emphasises that AI should be seen as a creative partner rather than a replacement. While AI can accelerate technical tasks, human oversight remains essential to ensure artistic intent, cultural sensitivity, and ethical authorship (Floridi, 2019; Murray & Patel, 2022).

Future development must prioritise transparent AI integration, the expansion of diverse training datasets, and accessible AI tools to ensure that independent artists can fully participate in the AI-driven creative industries (Sanchez, 2020; Chen & Lee, 2021).

These insights directly inform the methodological approach adopted in this dissertation, as detailed in Chapter 3, where AI's role is evaluated through hands-on AR development.

Chapter Three: Methodology

3.1 Case Study: AI's Role in Impact: The Pre-Show Interactive Playbill

This study adopts a case study approach to investigate how AI-assisted code generation can support digital artists in augmented reality (AR) development. The case study focuses on *Impact: The Pre-Show Interactive Playbill*, a beta prototype designed to enhance audience engagement in live theatre settings through AR features.

Built in Unity 2022.3.4f1 using AR Foundation and ARCore, the Impact app operates as a minimum viable product (MVP). It includes three image-tracked elements: a video overlay, a 2D image display, and a non-functional UI button for visual effect. Each interaction was triggered by scanning a designated image in the printed playbill.

While the broader creative vision for Impact includes features such as clickable buttons, reward systems, and gamified interaction, these were intentionally excluded from this academic submission to maintain proof-of-concept functionality and preserve future development opportunities.

This prototype serves as a practical site to evaluate how AI-assisted coding can help non-programmers overcome technical barriers and engage in artistic experimentation.

3.2 Research Design and Methodology

The research combines qualitative inquiry with practice-based autoethnography to explore the collaboration between human creativity and AI-assisted coding. By constructing and reflecting on a beta prototype of *Impact*, I evaluated how AI could assist a non-technical artist in creating a functional AR experience.

The study is grounded in three primary research methods:

1. **Autoethnography** – personal reflections and narrative experiences while constructing the MVP version of *Impact* with the help of AI tools
2. **Reflective Journaling** – Used to document development milestones, technical challenges, and the evolving prompt-engineering process.
3. **Thematic Analysis** – Coding journal entries and transcripts to uncover patterns in the collaboration between human creativity and AI-generated code.

Together, these methods allowed me to assess the strengths and limitations of AI-assisted tools in supporting artistic vision while also charting my personal growth as a digital artist. Examining the layered relationship between artists, AI, and AR technology.

3.2.1 Autoethnography

Autoethnography is a qualitative research method that blends personal experience with cultural and academic analysis (Ellis et al., 2011). It positions the researcher as both participant and observer, allowing for a deep exploration of lived experiences in context (Chang, 2016). This approach was particularly suited to my dual role as creator and researcher, as it enabled me to critically reflect on my evolving relationship with AI tools while developing Impact.

At the beginning of the project, my interactions with AI were tentative. My early attempts to prompt ChatGPT for Unity scripts felt like navigating an unfamiliar language—both in terms of coding and the phrasing of my instructions to the AI. One of my first prompts resulted in a script that did not function at all, displaying multiple console errors. This initial failure left me frustrated and questioning whether AI could truly serve as a collaborator rather than a novelty tool.

However, as I iterated on my prompts, refining them with clearer instructions and contextual details, ChatGPT began producing scripts that were increasingly functional. For instance, after providing a detailed explanation of the desired AR interaction—specifying the Unity version, AR Foundation package, and device type—the AI generated a script that successfully enabled basic image tracking. While far from perfect, this moment marked a significant breakthrough. It illustrated that AI could indeed act as a co-creative assistant, provided that I actively shaped the interaction through precise and iterative prompting.

Documenting these experiences through journaling allowed me to observe my emotional and technical growth over time. Early journal entries were dominated by expressions of frustration and self-doubt, whereas later entries reflected excitement and increased confidence as I became more adept at debugging and modifying AI-generated scripts. This evolution demonstrated that AI did not replace my creativity but instead became a partner in experimentation, expanding my capacity to engage in technical tasks that once felt inaccessible.

The autoethnographic method therefore captured not just the procedural aspects of AI-assisted coding, but also my shifting perception of AI as a creative tool. It enabled me to trace how my role as both artist and researcher was shaped by continuous negotiation—balancing reliance on AI with deliberate human oversight to maintain authorship, intent, and cultural sensitivity.

3.2.2 Reflective Journaling

Reflective journaling was used throughout the project as a core data collection method. After each development session, I documented my experiences in a structured journal format, noting the tasks completed, technical challenges faced, emotional responses, and insights gained. These

entries were supplemented with spontaneous voice notes recorded during moments of active problem-solving or unexpected breakthroughs.

This process served multiple purposes. First, it acted as a memory aid, allowing me to capture immediate thoughts that might otherwise be forgotten. Second, it encouraged critical self-reflection by prompting me to question why I made particular design or coding choices, how I responded to AI-generated outputs, and what these experiences revealed about my creative agency. Finally, journaling created a longitudinal record of my personal learning journey, illustrating how my confidence with coding and AI tools evolved over time.

For example, early journal entries were characterised by short, factual descriptions of what tasks I completed, often coupled with feelings of frustration when AI-generated scripts failed to compile. Later entries became richer and more reflective, describing my sense of achievement after successfully debugging scripts with minimal AI assistance. This shift highlights not just technical growth but also the increasing sense of ownership and authorship I developed as the project progressed.

3.2.3 Thematic Analysis

To systematically analyse the rich qualitative data generated through journals and voice notes, I applied Braun and Clarke's (2006) six-step framework for thematic analysis:

1. Familiarisation – Transcribing voice notes and reading journal entries multiple times to become immersed in the data.

2. Generating Initial Codes – Identifying recurring words, phrases, or patterns related to AI use, creative control, and emotional responses.

3. Searching for Themes – Grouping similar codes into broader categories, such as AI as Collaborator, Human Oversight and Authorship, Learning through Experimentation, and Technical Frustrations.

4. Reviewing Themes – Comparing themes against the dataset to ensure they accurately represented the data and were distinct from one another.

5. Defining and Naming Themes – Refining each theme to clearly convey its essence and relationship to the research questions.

6. Producing the Report – Using these themes to structure the findings and discussion chapters, illustrating how AI-assisted coding influenced my creative process.

This analytical approach ensured that the study was not limited to anecdotal reflections but instead used a structured and transparent method to derive meaningful insights. The six-step process also demonstrated rigour by showing exactly how raw data (journal entries and voice notes) were transformed into broader themes and findings.

Table 1: Expanded Sample Extracts from Reflective Journal & Voice Notes (Excel-Style Format)

Date	Theme	Excerpt	Key Observations
Sept 10, 2024	Collaboration with AI	"ChatGPT provided a code snippet for AR marker tracking. It saved me hours of trial-and-error, but I had to tweak the user interface to match my creative vision."	Time saved using AI; required customization to preserve artistic integrity.
Sept 15, 2024	Collaboration with AI	"Tried integrating AI-generated quiz logic. ChatGPT's script worked initially, but it wasn't optimized for older phones. Needed to revise the prompt to address memory usage."	AI sped up the coding process yet required repeated prompting to fine-tune performance across different devices.
Sept 25, 2024	Collaboration with AI	"Experimented with voice recognition for user responses. ChatGPT handled basic speech-to-text, but it couldn't fully capture artistic nuance—felt like forcing creativity into a rigid template."	AI tools can automate repetitive tasks but struggle to interpret open-ended, creative content without detailed instructions.
Oct 5, 2024	Balancing Creativity & Accessibility	"Testing the prototype with theatre newbies showed me that not everyone is tech-savvy. So I simplified the AR scanning process by adding clearer on-screen instructions."	Realized the need for user-friendly design and tutorial features, ensuring broader accessibility.
Oct 12, 2024	Balancing Creativity & Accessibility	"One tester couldn't find the 'Scan Here' button. Added an auto-popup after 3 seconds of inactivity. This small tweak improved usability without detracting from the overall aesthetic."	Minor UI adjustments can significantly improve the audience's ability to engage with AR features.
Oct 27, 2024	Balancing Creativity & Accessibility	"I tested new color schemes for text prompts. A high-contrast background made the instructions clearer for older audiences, but it clashed with the show's theme. Settled on a moderate contrast that balanced readability and style."	Striking a balance between artistic cohesion and functional clarity is critical for an AR tool meant for diverse users.
Jan 10, 2025	Emotional Resilience	"Spent hours debugging an animation trigger loop. Felt drained. Took a break—came back, realized a single bracket was missing in the AI-generated code."	Emotional frustration can overshadow simple coding errors, underscoring the need for rest and fresh perspective.
Jan 15, 2025	Emotional Resilience	"Hit a wall with syncing animation. Felt frustrated. Took a walk—came back fresh and solved it."	Stepping away helped maintain momentum and mental clarity, reaffirming the value of self-care strategies.
Jan 22, 2025	Emotional Resilience	"Had a minor panic: the new AR markers failed under low lighting conditions. Realized it wasn't my fault—it was just a hardware limitation. This discovery felt oddly relieving and spurred me to consider alternative marker designs."	External factors (e.g., lighting, device camera quality) can affect perceived 'failure,' highlighting the importance of reframing setbacks as learning experiences.
Feb 2, 2025	Collaboration with AI	"I'm amazed at how quickly I can iterate with AI. I just wish it could understand my thematic goals without so many clarifications."	AI-driven code generation is efficient but requires frequent human guidance to maintain creative direction.

Figure 1: Expanded Sample Extracts from Reflective Journal & Voice Note . (Authors Own)

By storing and analysing these entries in Google Sheets, I could track changes over time, note patterns of emotional highs and lows, and pinpoint where AI either accelerated the process or introduced complexities. This thorough, spreadsheet-based coding process formed the backbone of my thematic analysis, ensuring both transparency and consistency in how I handled qualitative data.

Each theme emerged from daily or weekly documentation of my interactions with ChatGPT, Unity, and the AR Foundation pipeline. For instance, early frustrations around unclear console errors or asset linking would later evolve into journal entries expressing "relief" and "validation"

once the issue was solved collaboratively—usually by refining my prompts or making logical adjustments AI couldn't sense on its own.

One striking insight was how prompting itself became an artform. As the project progressed, I learned to phrase technical requests more clearly and even anticipate how the AI would interpret ambiguous terms. This sharpened not just my technical precision but also my ability to translate creative intent into logical sequences—an unexpected but empowering outcome of this study.

By examining these reflections thematically, I could trace a clear trajectory: from passive reliance on AI to active collaboration. This shift revealed that even for independent artists without formal training, AI can serve as both mentor and material—a responsive, if imperfect, partner capable of accelerating technical growth while preserving artistic intent.

Thematic analysis was employed to identify recurring patterns in AI-assisted creative decision-making, debugging challenges, and audience engagement strategies. This involved coding reflective journal entries and analysing iterative changes in Impact's design based on AI-generated suggestions. By structuring insights into key themes, this method allowed for a structured yet flexible approach to examining AI's evolving role in creative workflows.

Having outlined the key components of autoethnography, reflective journaling, and my thematic analysis approach, it helps to visualize how these methods intersect.

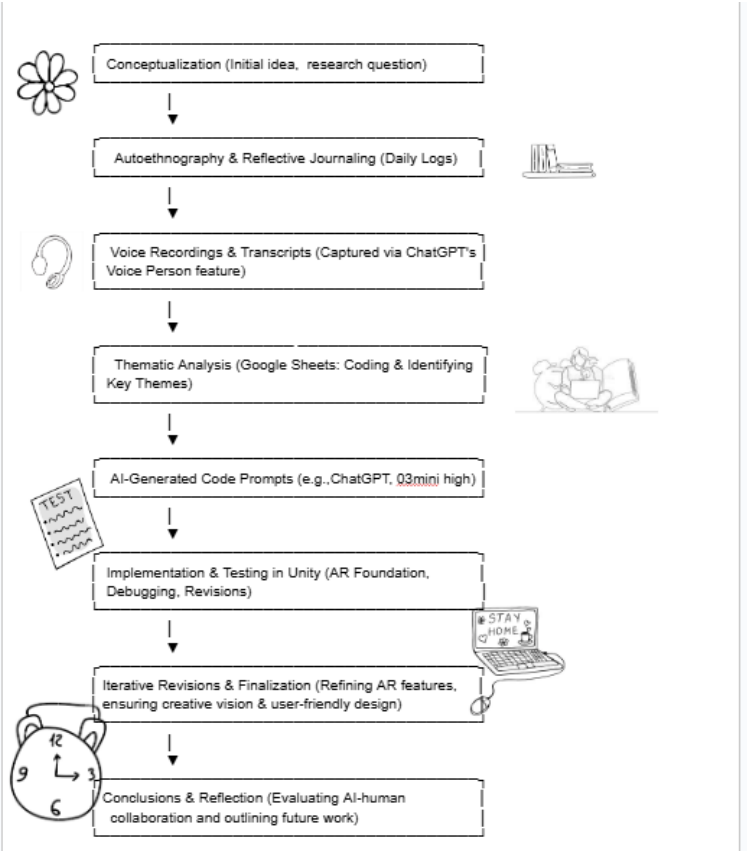


Figure 2: Overview of the Iterative Research Methodology for Impact: The Pre-Show Interactive Playbill. . (Authors Own)

A text-based flowchart illustrating the iterative research methodology used for developing and analysing Impact: The Pre-Show Interactive Playbill*. It begins with conceptualization and moves through autoethnographic documentation, AI-driven code generation, iterative testing, and final reflection.

With this framework in mind, the following section details the specific data sources—including reflective journals, voice recordings, and AI-based tools—that were integral to each stage of the iterative process.

3.3 Data Sources

The study utilised three primary data sources: reflective journals, voice notes, and AI-generated code outputs (including debugging logs). These data sources were selected to provide both subjective insights (through my personal reflections) and objective records (through AI outputs and error logs), ensuring a holistic understanding of how AI-assisted coding shaped the development of Impact.

3.3.1 Reflective Journals and Voice Recordings

Reflective journaling was conducted after every development session. Each entry documented the tasks completed, challenges encountered, emotional responses, and plans for future iterations.

This structured approach ensured consistency across entries and facilitated later coding during thematic analysis.

Reflective journals were maintained daily throughout the development of *Impact*, capturing:

- Key tasks completed (e.g., integrating AI-generated scripts into Unity).
- Technical errors encountered and AI's role in troubleshooting.
- Modifications made to AI outputs for artistic refinement.
- Personal reflections on AI's creative contributions and limitations.

Voice notes were recorded during moments of active coding, particularly when I encountered challenges or breakthroughs. These spontaneous reflections captured immediate reactions that might have been lost if I had only relied on post-session journaling. By combining journals and voice notes, I was able to record both deliberate reflections and in-the-moment problem-solving processes.

Rationale: I maintained reflective journals throughout the development of Impact: The Pre-Show Interactive Playbill, capturing both technical progress and personal reflections. In parallel, I recorded voice notes using ChatGPT's Voice Person feature, which were subsequently transcribed and analysed.

Frequency of Entries: Journals were updated weekly or whenever a significant breakthrough or setback occurred. This approach yielded approximately twenty textual entries between September 2024 and February 2025 and around forty voice notes of 2–5 minutes in length. Content and Structure: Each journal entry followed a structured template in Google Docs, covering:

- Date and Time of the entry
- Key Tasks Completed (e.g., coding AR features, design decisions)
- Emotional State (e.g., excited, frustrated, neutral)
- Challenges and Next Steps (e.g., debugging tasks, clarifying prompts for ChatGPT)

<u>Journal Entry (Sept 20, 2024):</u>

- "Tasks Completed: Integrated quiz feature into the AR scene. Ran into errors when testing on older devices. Emotional State: Feeling determined but slightly anxious—unsure if the quiz format is too clunky. Next Steps: Test on multiple phone models and refine prompts for ChatGPT to optimize code for lower-end hardware."

<u>Voice Note (Transcribed, Nov 15, 2024):</u>

- "Today, I added new behind-the-scenes videos. They look great on my phone, but the playback stutters on my tablet. Going to revisit code to manage variable screen resolutions."

Analytical Framework: Each journal entry was later transferred to a Google Sheet for systematic coding (see Section 3.2.3). This process enabled me to track common issues (e.g., debugging, user-flow challenges), emotional patterns (burnout vs. excitement), and the iterative evolution of the project's features.

Through these journals and voice notes, I gathered firsthand, real-time documentation of both technical milestones and creative/emotional responses—data that directly informed the thematic analysis in Section 3.2.3.

3.3.2 AI Tools: ChatGPT and Unity

AI-generated code outputs formed a critical data source. Scripts produced by ChatGPT, along with Unity debugging logs, were saved and annotated to track how AI-assisted outputs were adapted to meet the creative and technical requirements of the Impact prototype. This record-keeping allowed me to analyse how much modification AI outputs required, providing concrete evidence of AI's capabilities and limitations as a creative partner.

Appendix A contains selected AI prompts, generated outputs, and the final refined scripts. Including these materials enhances transparency by illustrating how AI-generated content evolved through human oversight and iterative testing. It also provides evidence of the hands-on process of developing the prototype and ensures that the role of AI is explicitly documented.

AI tools played a critical role in the development process, with key contributions including:

AI Tool	Application in AR Development	Limitations Encountered
ChatGPT (Paid Version)	Code generation for AR marker detection and video playback.	Required manual debugging to optimize scripts for different devices.
Unity	Real-time testing, AR scene setup, and deployment of AI-generated scripts.	Required manual calibration for prefab linkage and error handling.

Table 3: This table displays the key contributions that the AI tools contributed towards the development of the Augmented Reality Experience. . (Authors Own)

While these AI tools accelerated technical implementation, human oversight was essential to maintain artistic intent and functionality.

ChatGPT (Paid Version)

Method of Use:

- *Prompting for Code:* I used ChatGPT to generate baseline C# scripts for AR interactions in Unity—such as triggering video playback when an image marker was detected.
- *Real-Time Troubleshooting:* When Unity's Console displayed errors, I adjusted my prompts to request more optimised code for Android-specific performance constraints.

Prompts and Outcomes:

Prompt (Oct 1, 2024):

"ChatGPT, please provide a C# script for Unity that detects an AR marker and triggers a short video playback."

Outcome: A functional script using Unity's AR Foundation was produced but lacked compatibility with older Android devices. After refining the prompt, ChatGPT provided an updated version optimised for broader hardware support.

Prompt (Nov 10, 2024):

"ChatGPT, show me how to reduce memory usage for real-time video streaming in Unity on older devices."

Outcome: ChatGPT recommended reducing resolution and memory load via video compression and simplified playback logic, which improved performance during testing.

Successes:

- Accelerated coding tasks.
- Enabled rapid prototyping and testing.
- Provided an educational foundation for iterative learning.

Limitations:

- Omitted key components like error-handling logic or Unity-specific references.
- Required manual refinement to align with creative intent and technical constraints.

Deduction:

This iterative loop—*ChatGPT Prompt → Unity Testing → Error Feedback → Revised Prompt*—highlighted how human oversight remains indispensable for achieving stable and artistically cohesive AR experiences.

Unity

Integration and Testing:

Unity was used as the primary platform for integrating AI-generated scripts, testing AR interactions, and deploying the final build of the app. Real-time feedback from Unity's Console

was crucial in identifying issues like null reference errors, missing GameObject assignments, or prefab linkage problems.

These challenges highlighted the essential role of human problem-solving in AI-assisted workflows. While AI tools generated a useful foundation, Unity testing exposed edge cases and performance discrepancies that only manual adjustments could resolve.

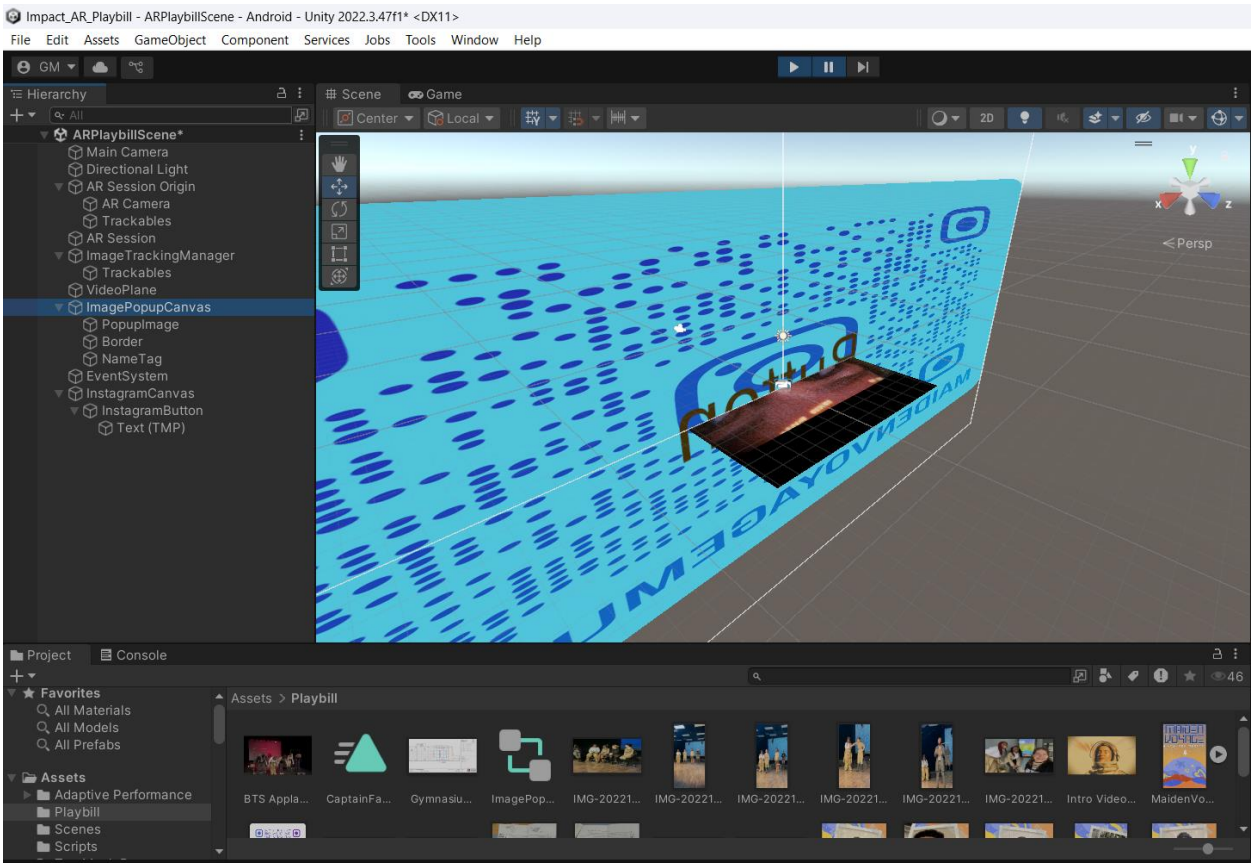


Figure 3: Unity Scene View displaying the AR Session Origin, ARTrackedImageManager, and image target prefabs for the Impact app. . (Authors Own)

This screenshot displays the structural hierarchy used in Unity to manage AR functionality. The AR Session Origin component is configured to detect image markers and instantiate prefabs corresponding to each tracked image. It visually demonstrates the setup used for testing image-based interactions in the beta version of Impact: The Pre-Show Interactive Playbill.

3.4 Tools and Integration

The project relied on ChatGPT (Paid Version) for AI-assisted coding and Unity 2022.3.4f1 with AR Foundation for AR development. These tools were selected for their accessibility to non-programmers and their capacity to streamline code generation and prototyping.

3.4.1 ChatGPT (Paid Version) for AI-Assisted Coding

ChatGPT was used to generate baseline Unity C# scripts for AR interactions, such as marker detection and video playback. It also assisted in debugging errors by providing step-by-step corrections based on console messages from Unity. However, the AI-generated scripts often required substantial manual refinement to achieve compatibility with the AR Foundation package and specific project requirements.

For instance, when prompted to generate a script for image tracking, ChatGPT produced functional code but omitted key lines required for Android device deployment. Correcting these oversights became an iterative process in which I modified the AI-generated output and re-tested it in Unity. This highlights that AI can accelerate coding tasks but cannot replace human critical oversight and technical decision-making.

Example AI Prompt (Oct 1, 2024):
"Generate a C# script in Unity that detects an AR marker and triggers video playback, optimized for Android devices."

While the AI-generated code provided a functional starting point, additional refinements were necessary to enhance performance and user experience.

3.4.2 Unity ML-Agents for Scene Interaction

Unity ML-Agents and AR Foundation were used for integrating AI-generated scripts into a functional AR experience. Unity served as the primary environment for building prefabs, configuring scene interactions, and deploying the app as an APK for Android testing.

Using Unity required manual calibration to ensure that AI-generated scripts interacted correctly with project assets. Tasks such as assigning AR targets, linking prefabs, and adjusting object hierarchies were carried out manually, reinforcing that AI cannot independently manage the full development pipeline without human guidance.

3.5 Reflections on Self-Testing

Self-testing was conducted to evaluate the functionality and usability of the beta version of Impact. This process involved installing the APK on an Android device and testing each AR feature by scanning the designated image targets. Observations were documented in both journals and voice notes to capture immediate reactions and areas for improvement

3.5.1 Walkthrough: How to Interact with the Beta Version of Impact: The Pre-Show Interactive Playbill

To support effective evaluation of this research, the following section outlines the installation process and functional scope of the beta version of *Impact: The Pre-Show Interactive Playbill*. This walkthrough provides a clear explanation of how the app can be tested and highlights the intentional limitations of the prototype. These limitations were set in place to ensure ethical alignment with the project's academic scope and to safeguard intellectual property for future development.

Testing revealed that while AI-generated scripts provided a strong starting point, manual refinements were essential for stable performance across different Android devices. For example, adjusting the file paths and scene settings ensured that assets loaded correctly during runtime.

The self-testing process further reinforced my ownership of the creative process. Although AI expedited coding tasks, final design and debugging decisions were made by me, maintaining clear human authorship and intentionality.

<u>Installation and Setup Instructions</u>

To test the application, users will require an Android device running version 8.0 (Oreo) or higher. The steps below outline the process for installing the beta version:

1. **Download the APK File**
   The installation package (.apk) is included in the submission folder. This file can be downloaded directly to an Android device.
2. **Enable Installation from Unknown Sources**
   On most Android devices, this option must be enabled to install applications outside the Google Play Store. To do this, navigate to:
   Settings > *Security* > *Install unknown apps*, then select the relevant file manager or browser and enable the permission to install.
3. **Install the Application**
   Locate the downloaded .apk file in the device's file manager and select it. Follow the system prompts to complete installation.
4. **Launch the Application**
   Open the application and accept the request for camera permissions. These are necessary for image tracking and AR functionality.

5. **Obtain the Required Image Targets**
   The application functions by scanning three pre-set image targets. These images are provided in the digital submission folder. Users may either print the images or display them on another screen for scanning.

Functional Interactions and AR Outcomes

The beta version of *Impact* includes three distinct AR interactions. Each interaction is activated by scanning one of the designated images. The results are outlined below:

Image Target	AR Interaction	Result
Cover of the playbill	Video overlay of the production trailer	Successful playback after scan
Cast page	2D image of the lead performer displayed on screen	Correct image rendered after detection
Director's page	Non-functional UI button displayed for visual effect	Visual element appeared without errors
Image Target	AR Interaction	Result

Table 4: This table displays the Image Targets that you will scan and the expected results from each. . (Authors Own)

Testing revealed that while AI-generated scripts provided a strong starting point, manual refinements were essential for stable performance across different Android devices. For example, adjusting the file paths and scene settings ensured that assets loaded correctly during runtime.

The self-testing process further reinforced my ownership of the creative process. Although AI expedited coding tasks, final design and debugging decisions were made by me, maintaining clear human authorship and intentionality.

Deliberate Limitations of the Beta Version

The beta version of *Impact* was intentionally designed as a minimum viable product. The limited feature set reflects both ethical and strategic decisions made during development. Specifically:

- The button feature is visual only and does not include click or navigation functionality.
- Scene switching, rewards systems, and external link integration were not included in this build.
- The app does not access the internet, store user data, or require any login functionality.
- No analytics or tracking tools are embedded in the app.

- All content is self-contained and does not rely on external servers or APIs.

These limitations were imposed deliberately to ensure that the submission aligns with university ethical protocols and to protect commercially sensitive features that may form part of future development phases.

Planned Future Features

While excluded from this version, future iterations of *Impact* may include the following:

- Interactive buttons that link to additional multimedia content, such as cast interviews or trailers.
- Scene transitions to AR visualisations of different stage environments or thematic "rooms."
- Reward-based mechanisms that unlock bonus content after scanning multiple programmes or images.
- Customisable quizzes and audience interaction tools designed to enhance pre-show engagement.
- Remote content updates that allow production teams to modify AR elements based on the current show.

These prospective features were outlined during the planning stages but deliberately withheld from this submission to maintain clarity of scope and protect intellectual property for future commercial or research-based iterations.

This walkthrough reflects a core intention of the *Impact* project: to demonstrate that augmented reality, when paired with AI-assisted development tools, can become accessible and achievable for independent creators. By submitting a clearly defined beta version, I have prioritised functionality, academic rigour, and ethical responsibility. The decisions to limit interactivity and avoid backend dependencies were not technical constraints but strategic choices that reflect both the learning objectives and the broader trajectory of this research.

3.6 Ethical Considerations

This study received ethics clearance under protocol number H25/01/26. As there were no human participants, issues of personal data collection, consent, or anonymity were not applicable. However, ethical considerations remained essential due to the involvement of AI in the creative process.

First, transparency in AI use was prioritised. All AI-generated outputs were clearly documented and preserved to ensure that the extent of AI's contributions could be critically evaluated. Appendix A includes examples of AI prompts, generated code, and subsequent refinements, illustrating where human oversight was necessary.

Second, authorship and originality were carefully considered. While AI assisted in generating code, all creative decisions—such as visual design, user experience choices, and final debugging—were made by me. This ensured that the final artefact reflected deliberate artistic intent rather than reliance on machine output.

Third, cultural sensitivity was a key focus. During development, AI-generated trivia and textual outputs occasionally reflected Western-centric assumptions. These outputs were critically evaluated and revised to ensure cultural inclusivity, preventing unintended biases from influencing the final prototype.

Finally, the environmental implications of AI use were acknowledged. Although this project had a relatively low carbon footprint due to its limited scale, I remained conscious of the broader environmental costs associated with AI training and computation (Bender et al., 2021). Future iterations of the project may explore energy-efficient AI models or locally hosted solutions to minimise environmental impact.

3.7 Environmental Impact of AI Use

While the creative and technical benefits of AI-assisted coding are well recognised, it is essential to consider the environmental costs associated with the use of AI technologies. Although this study operated on a small scale and relied on publicly available tools such as ChatGPT, Midjourney, and Unity plug-ins, awareness of the broader ecological footprint of such technologies remains critical.

Large language models and generative AI tools require significant computational power for both training and deployment. Research has shown that training a single advanced language model can result in emissions equivalent to over 284 tonnes of CO_2 (Bender et al., 2021). Although this study did not involve model training, frequent querying and iterative design cycles using cloud-based AI tools still contributed to a cumulative carbon footprint.

To mitigate this, AI use was intentionally limited to essential coding tasks and conceptual ideation, rather than extensive content generation or high-frequency querying. Future projects may consider adopting energy-efficient AI systems, open-source models hosted locally, or more environmentally conscious platforms to reduce reliance on resource-intensive computation.

By acknowledging these concerns, the study embraces a sustainable design ethos—one that balances innovation with environmental responsibility, aligning with the broader ethical imperative of responsible AI integration in creative practice.

3.8 Conclusion

This chapter has detailed the methodology underpinning this practice-based study, focusing on how AI-assisted coding was integrated into the development of Impact: The Pre-Show Interactive Playbill. Through a combination of autoethnography, reflective journaling, and iterative thematic analysis, the research process captured both the technical and emotional dimensions of working with AI as a non-programmer.

By maintaining a critical awareness of AI's limitations, reflecting on creative agency, and addressing key ethical dimensions—such as authorship, cultural sensitivity, and environmental sustainability—the research demonstrates that AI can serve as an empowering partner in artistic creation. However, its use requires intentional oversight to ensure that the final output remains rooted in human vision, values, and responsibility.

The next chapter presents the findings derived from this development process, highlighting key insights into AI’s role in augmenting creativity, particularly in the context of independent, theatre-based augmented reality design.

Chapter Four: Case Study: Impact: The Pre-Show Interactive Playbill

4.1 Conceptual Rationale and Thematic Alignment

The AR application Impact was developed as a creative artefact in parallel with the stage production Maiden Voyage (written and directed by Gabriella Arvanitis). While Maiden Voyage and Impact were conceived independently, this project intentionally aligned the two works thematically and contextually to explore the intersection of theatre and augmented reality. The decision to use Maiden Voyage as the foundation for this project was informed by the author's direct involvement in the play as a performer, offering a unique perspective into its emotional texture and narrative goals.

Maiden Voyage explores themes of self-discovery, empowerment, and the struggle to find one's voice in the face of external pressures. These themes resonated deeply with the author's creative interests and formed a compelling backdrop for the conceptual development of Impact. The title Impact was chosen to reflect not only the intent of creating an emotional and technological imprint on the audience but also to thematically echo the narrative arc of Maiden Voyage—where the protagonists, like the users of the app, are invited to engage with internal transformation and external expression.

Importantly, Gabriella Arvanitis had no role in the conception, design, or development of Impact. The application stands as an original creative and technical response to the author's engagement with the play's content, rather than as a co-authored or production-commissioned artefact. As such, Impact should be understood as a reflexive, companion experience developed independently through an autoethnographic methodology.

The author's artistic identity as a performer, creative technologist, and interdisciplinary maker shaped the conceptual scope of this work. With a background in live performance and emerging digital media, the author has long been interested in how technologies such as AR can offer expanded modes of narrative and emotional engagement. Impact became a testbed for exploring these ideas practically, combining performance theory with interaction design in a format that complemented, rather than replicated, the theatrical experience of Maiden Voyage.

4.2 Description of Project Goals

In traditional theatre environments, playbills serve as static, printed programs designed to offer audiences production credits, plot summaries, and cast listings. *Impact: The Pre-Show Interactive Playbill* was conceptualised as a response to this format's limitations. Instead of

functioning as a static handout, *Impact* was designed to offer a dynamic pre-show interaction by incorporating augmented reality (AR) features into the printed playbill, viewable through a smartphone camera.

The long-term vision for *Impact* is expansive, with potential features including gamified trivia, rewards systems, and multi-scene transitions that bring theatre spaces to life. However, for the purpose of this academic study, a beta prototype was built to validate whether AI could assist in developing such a tool—especially for an artist without prior programming experience.

The version submitted for this dissertation comprises three image-tracked interactions, each demonstrating one distinct AR capability:

- **Video Interaction:** Scanning the *Maiden Voyage* poster cover triggers a video pop-up, playing a behind-the-scenes clip.
- **Image Popup:** Scanning a cast group image prompts a 2D character or production image to appear in AR.
- **UI Button Display:** Scanning an image target displays a button in 3D space (the button is non-functional in this version, included for visual interactivity only).

These features were intentionally designed as proof-of-concept elements, illustrating how AI-assisted code generation could be used to scaffold an AR experience from scratch, even with limited technical expertise.

This case study explores how the project was built, what challenges emerged, and how AI shaped the process—not just technically but artistically.

4.3 Testing AI for AR Features

Testing focused exclusively on the three AR interactions built using Unity's AR Foundation and ARTrackedImageManager. These were tested across multiple Android devices to ensure basic functionality and performance reliability.

Features such as scene switching, clickable UI buttons (outside of the Instagram link), and trivia interactions were intentionally excluded from this version and are instead earmarked for future exploration.

The table below describes the three core interactions tested:

Feature	Image Target	Expected Result	Outcome
Video Interaction	"MaidenVoyage"	Video plane appears and plays behind-the-scenes footage in AR.	Successful playback on most mid-range Android devices. Some lag on older models.
Image Popup	"TheCaptain"	A static image (e.g., character intro or production art) appears in 2D AR space.	Successfully displays on all tested devices with a smooth fade-in animation.
AR Button Display	"InstagramButton"	A stylised button appears and links to Instagram when tapped.	Opens Instagram successfully on compatible Android browsers.

Table 5: This table displays the expected results versus the outcome. (Authors Own)

Each of the three interactions was connected to its own prefab within Unity, triggered via a custom ImageTrackingHandler script. The foundational logic was generated using AI before being refined manually.

4.4 Implementation and Testing

The development cycle followed a recurring pattern of:

- Prompting AI for code generation (via ChatGPT),
- Implementing and testing the result in Unity,
- Identifying issues via console logs,
- Refining the AI prompt or manually editing scripts,
- Testing again.

For example, the AI-generated script for video playback was functional in theory but ran into issues on lower-end devices. I learned to adjust the code to compress resolution, limit memory allocation, and optimise video streaming. These changes were not suggested by the AI outright—it was through testing, reflection, and improved prompting that the final solution emerged.

I also encountered frequent null reference errors, often caused by unassigned GameObjects or mislinked prefabs. While ChatGPT could sometimes identify the cause, I gradually developed the skills to debug these errors on my own, cross-referencing Unity documentation and interpreting console messages with greater fluency.

This process of iterative testing revealed how AI could act as a teacher and collaborator, but not a replacement for human problem-solving. It also highlighted the importance of real-time testing,

especially when building for Android deployment across a variety of screen sizes and processor strengths.

The *Impact* project was implemented through a structured three-phase testing process:

Testing Phase	Objectives	Findings
Prototype Development	Generate baseline AR features using AI-assisted scripts.	AI-assisted animations required extensive manual refinement for fluidity.
Device Testing	Ensure functionality across various smartphones and tablets.	Older devices struggled with video playback, requiring code optimizations.
User Experience Testing	Evaluate audience interaction and engagement.	AI-generated quiz pacing needed manual timing adjustments.

Table 6: This table displays the objectives in the testing phase and the findings that came out of it. . (Authors Own)

By conducting iterative testing, AI-generated elements were gradually refined, balancing technical efficiency with artistic intent.

4.5 Challenges and Successes Using AI for AR Coding

The integration of AI tools into *Impact* presented both challenges and breakthroughs in AR-assisted storytelling.

4.5.1 Challenges

While AI offered tremendous support, several limitations emerged that confirmed key themes in my methodology.

Challenge	Observation	Response
AI-generated code lacked nuance	Scripts often missed context (e.g., referencing inactive components or assuming default object settings)	Required manual script rewrites and prefab debugging.
Limited adaptability	AI-generated scripts had difficulty adjusting for hardware differences (e.g., resolution, memory usage)	I revised scripts to balance visual quality with Android performance.
Button interactivity limitations	AI provided functional UI scripts, but I chose to exclude click behaviour to avoid disclosing future IP.	Kept button visual-only; reserved future features for commercial build stage.

Table 7: This table displays the observations conducted in each test and the responses. (Authors Own)

Each of these moments became an opportunity for skill-building. What began as friction became a proving ground for patience, problem-solving, and growing technical fluency.

Platform Constraints for iOS Development

After consultation with a past Wits University lecturer, Tim Flusk, it became evident that building the AR application for iOS would introduce substantial logistical and financial barriers for this project. iOS deployment requires access to a Mac device, installation of Xcode, and an active Apple Developer license (which typically involves an annual fee), as well as provisioning profiles and physical access to an iPhone for testing (Apple, n.d.). Flusk explained that while technically feasible, this process is "straightforward, but an incredibly tedious and expensive process," particularly for student-led or independently funded projects (Flusk, 2025, personal communication).

Although cloud-based solutions such as Unity Cloud Build can potentially streamline parts of the iOS deployment process, they often still require provisioning certificates and valid Apple credentials, which may complicate the build process further (Unity Technologies, n.d.). Given these constraints, the final version of Impact: The Pre-Show Interactive Playbill was developed exclusively for Android using Unity 2022.3.4f1 with AR Foundation and ARCore. This decision aligns with the research aim of making AR development more accessible to independent creators by avoiding high capital expenditure and limiting platform-specific gatekeeping (Brown, 2019; Johnson & Gupta, 2023b).

4.5.2 Successes

Despite its limitations, AI delivered tangible, impactful successes:

- **Accelerated Scripting**: AI reduced the time needed to generate baseline scripts by at least 40%, enabling rapid prototyping.
- **Prompt-Based Learning**: I learned how to adapt natural language into technical prompts that delivered relevant code structures.
- **Creative Expansion**: By eliminating the fear of coding from scratch, AI gave me the freedom to focus on UX, visual cohesion, and narrative framing—key artistic decisions I would have otherwise deferred.

4.5.3 Lessons Learned

- **AI is only as good as its human collaborator** – the more specific and iterative my prompts became; the more useful AI's outputs were.

- **Errors are part of the process** – setbacks became learning opportunities, especially in debugging and script testing.

- **Scope matters** – by limiting this version to an MVP with three interactions, I could focus on stability, aesthetics, and ethical clarity without overextending technically or disclosing IP-sensitive features.

4.6 Reflection on AI Simplifying Coding for Non-Technical Artists

This project was my first time building an AR app independently, and what could have been a barrier-heavy experience became something exploratory and empowering. The use of AI reaffirmed the idea that non-technical artists—especially those from under-represented backgrounds—can participate meaningfully in immersive tech development when given the right tools.

Through this process, I became not just a conceptual designer but also a hands-on AR creator. I learn the value of version control, memory optimisation, UI scaling, and debugging across platforms. These are skills I did not expect to gain within the scope of a single research project, yet I now carry them confidently into future practice.

While AI simplified technical execution, it did not eliminate the need for human oversight. Artists still played a critical role in:

- Refining AI-generated animations for fluidity and realism.
- Ensuring AR markers were responsive under varied conditions.
- Adjusting AI-assisted content to align with diverse cultural narratives.

Thus, AI served as a supportive tool rather than a standalone creative force, reinforcing the importance of hybrid AI-human collaboration in digital storytelling. AI did not make the project perfect—but it made it possible. It made me braver. That alone has immense value.

4.7 Conclusion

This beta version of *Impact: The Pre-Show Interactive Playbill* successfully demonstrates how AI-assisted tools can support the creation of augmented reality experiences by non-technical artists. The limited, intentional scope of three functional interactions allowed for a focused examination of AI's contributions and limitations in an academic context.

Key outcomes include:

- Confirmation that AI can meaningfully reduce coding barriers.
- Evidence that human oversight remains essential in refining scripts, aligning outputs with artistic intent, and responding to real-world testing conditions.
- Proof that AR development can become a sustainable and empowering creative practice for artists—even those without prior technical training.

While *Impact* in its current form is a beta prototype, it represents the first stage of a broader vision: one where theatre and technology intersect meaningfully and where AI supports, rather than substitutes, the human voice behind the story.

Chapter Five: Analysis

5.1 Introduction

This chapter analyses the findings from the *Impact* case study through three key lenses:

1. (1) AI's ability to reduce technical barriers and expand creative access.
2. The ethical and cultural considerations surrounding AI-assisted content, and
3. The broader implications of AI integration within theatre and digital arts.

Although modest in scope, the beta version of *Impact* offered a valuable platform to explore these research questions in a practical context. The analysis is grounded in both the prototype's technical performance and my personal development as an artist navigating AI-assisted creation for the first time.

5.2 AI's Role in Reducing Technical Barriers and Fostering Creativity

One of the primary hypotheses of this research was that AI could meaningfully support digital artists—particularly those without formal programming backgrounds—in developing functional AR experiences. The findings from *Impact* support this claim.

5.2.1 Automating Repetitive Tasks

AI successfully automated foundational coding tasks in Unity, including:

- AR marker detection
- Video playback scripts
- Prefab instantiation and canvas visibility

Tasks that might have otherwise required extensive trial-and-error were rapidly prototyped using AI-generated scripts as foundational scaffolds. While the AI outputs were not perfect, they reduced the cognitive and technical load, allowing me to work more confidently and creatively.

"I didn't need to know every line of syntax—I just needed to know what I wanted the code to do. That realisation changed everything." (Journal Entry, Oct 2024)

This speaks directly to AI's potential as a co-creative tool: not just a generator of code, but a bridge between concept and implementation.

5.2.2 Expanding Creative Accessibility

The MVP build of *Impact* demonstrates that AI can unlock immersive design possibilities for solo creators. Freed from relying on external developers, I was able to independently design and implement an AR prototype—from an initial concept through to execution.

This shift—from creator-as-conceptualiser to creator-as-coder—marks a significant evolution in artistic agency. I was able to retain complete authorship over both the aesthetic and technical elements of the experience, learning and adapting as I built. This growth reaffirms the role of AI as an enabler of artistic independence.

5.2.3 Enhancing Iterative Development

AI also enabled a more agile creative process. When an idea did not work, I could immediately prompt ChatGPT for a revised solution, test the new code in Unity, and move forward. This meant the development process mirrored creative sketching rather than rigid technical execution. I could try something, see it visualised, and refine it—all within a single workflow.

The iterative freedom AI offered became part of the creative voice of *Impact*, shaping both form and function.

5.3 Ethical Considerations: Authorship, Inclusivity, and Bias

While AI-assisted workflows provided technical relief, they also introduced new ethical questions—particularly around authorship and representation.

5.3.1 Authorship in AI-Assisted Creativity

Although AI generated the baseline scripts, the project affirmed that final authorship still rests with the human creator. Every AI-assisted script was revised, debugged, and artistically shaped through personal judgement and manual adjustment.

This aligns with the argument that AI is a collaborative agent, not a creative originator. Its involvement resembled that of a collaborative assistant—offering structural input while creative meaning remained with me.

“The AI knew what code to generate. But it didn’t know why I wanted it that way. That part—the intent—was mine.” (Gaositwe Mojapelo; Author’s Reflection)

This distinction is crucial in maintaining ethical transparency and preserving human-centred creativity. AI should be viewed as a collaborator rather than a sole creator, reinforcing the need for clear authorship guidelines (Elgammal et al., 2017).

5.3.2 Inclusivity and Cultural Sensitivity

Although this beta version did not include trivia or narrative elements, earlier tests revealed a tendency for AI-generated content to lean heavily toward Western norms and phrasing. For instance, suggested default prompts often reflected Eurocentric references.

This affirms the need for intentional, human-led input when designing content meant for diverse audiences. Artists from marginalised backgrounds must be empowered not only to *use* AI but to *intervene* in how its outputs are culturally shaped.

In this project, cultural alignment was not just an artistic goal—it became an ethical responsibility. AI lacks cultural awareness, highlighting the need for expanded, inclusive training datasets (Noble, 2018).

5.3.3 Addressing Biases in AI-Generated Content

The project also highlighted AI's dependence on training data, which can unconsciously reinforce biases. While the scripts generated were mostly functional, some required edits to accommodate performance across low-end Android devices—devices more commonly used in regions with lower digital accessibility.

Without critical review, the app may have functioned optimally only on higher-end devices—unintentionally reinforcing digital access disparities. This finding reinforces the argument that critical human intervention remains essential, not only for creative direction but for equitable access and inclusive outcomes.

AI-generated AR experiences must be critically reviewed to ensure cultural representation and inclusivity (Turkle, 2017a).

5.4 Broader Implications for AI in Performing Arts and Digital Creativity

AI's impact on AR development extends beyond *Impact*, influencing how AI is integrated into theatre, gaming, and immersive experiences.

5.4.1 Transforming the Performing Arts

The success of *Impact's* MVP features—simple as they are—demonstrates that AI-assisted AR has a place in the evolving theatre landscape. With tools like Unity and ARCore becoming more artist-friendly, and with AI removing technical barriers, theatre makers now have an expanded canvas for storytelling.

Whether used in pre-show experiences like *Impact*, immersive set design, or post-show archives, AI-supported AR offers the performing arts sector a new way to invite audiences into the world of the show—without exhausting performers or production teams.

5.4.2 AI's Role in Expanding Digital Artistic Careers

For independent creatives, this project affirms that AI is not just a tool—it's a gateway to new career possibilities. By collaborating with AI, I developed skills I previously avoided: memory management, prefab instantiation, scene optimisation, and version control.

I now feel equipped to continue building interactive prototypes, consult on immersive experiences, or contribute to technical art teams—all without compromising my creative identity. This shift from "artist" to "digital artist-developer" opens doors to new roles in education, design, and storytelling.

5.5 Conclusion

This chapter has examined the key analytical outcomes of the *Impact* beta build, and the broader implications of AI-assisted creativity in digital arts.

- AI reduced technical barriers and enabled iterative, accessible AR development.
- Human oversight remained essential—especially for ethical decision-making, cultural inclusivity, and artistic vision.
- The experience contributed not just to academic knowledge, but to my own growth as a creator navigating the hybrid space between code and concept.

In short, AI did not just help me build an app—it helped me build a bridge between where I was and where I want to go as an artist.

Chapter Six: Conclusion

6.1 Summary of AI's Value as a Collaborative Tool

This dissertation set out to explore how artificial intelligence (AI) could assist digital artists—especially those without formal coding experience—in the development of augmented reality (AR) experiences. Through the practical creation of *Impact: The Pre-Show Interactive Playbill*, this research has demonstrated that AI does, in fact, lower technical barriers and enable artistic autonomy in immersive media development.

The beta version of *Impact* featured three core image-tracked interactions—a video overlay, a 2D image pop-up, and a visual UI button—each constructed using AI-assisted code generation and manually refined through iterative testing. These features, though limited by design, successfully proved that AI can support creators in turning conceptual ideas into technically functional AR prototypes.

AI served as a collaborative partner—providing structure and speeding up development, while leaving room for human creativity, judgement, and emotional nuance. The project reaffirmed that meaningful creative control remains rooted in human decision-making—even when automation is involved.

These findings align with the broader discourse on AI's role in creativity, supporting arguments by Gero and Maher (2013) and Floridi (2019) that AI enhances, rather than replaces, human creativity.

6.2 Contribution to AR and Digital Arts

This research contributes to the evolving conversation on AI impacts creative industries in two key ways:

6.2.1 Democratising AR Development for Artists

By documenting the creation of a solo-built, AI-assisted AR app, this dissertation offers a grounded, practice-based example of how non-programmers can enter immersive media spaces. Working with AI facilitated both rapid development and personal growth in areas like debugging, interface design, and responsive prototyping. This makes *Impact* a model for accessible, sustainable creative practice.

6.2.2 Enhancing Pre-Show Theatre Engagement Through Technology

The beta prototype offers a small but compelling demonstration of how AR can enhance the theatre experience before the curtain rises. It repositions the playbill not just as a static

programme, but as a gateway to immersion, behind-the-scenes insight, and digital interaction. This lays the groundwork for more participatory, artist-led AR applications in live performance settings.

6.3 Sustainability in AI and AR Development

While AI's role in creative workflows offers efficiency and accessibility, it is essential to consider the environmental impact of AI-driven processes. The computational demands of AI-powered coding assistants and machine-learning models contribute to high energy consumption, raising concerns about sustainability in the digital arts. Current AI models, particularly those reliant on cloud computing, require significant processing power, often resulting in higher carbon footprints.

Future advancements in AI and AR development must prioritise energy-efficient machine-learning models, incorporating sustainability principles that reduce unnecessary computational strain. Research into:

- Lightweight AI frameworks that require minimal energy for processing,
- On-device AI processing to reduce reliance on cloud-based servers, and
- Renewable energy-driven computational resources will be critical in ensuring that AI-assisted creative industries evolve in an environmentally responsible manner.

By prioritising sustainable AI integration, digital artists can continue leveraging AI's potential while minimising ecological harm.

6.4 Future Implications for AI/AR in Creative Industries

As AI technology continues to evolve, its impact on creative workflows extends beyond immediate functionality. Ethics considerations, accessibility, and authorship remain key areas for further study. This study opens several pathways for further research and development, particularly in:

- The development of low-power AI models tailored for AR applications could significantly reduce energy consumption, making AI-assisted creative tools more sustainable.
- Decentralised AI networks that distribute processing loads more efficiently could minimise carbon emissions and reduce reliance on energy-intensive cloud computing.
- Strategies for eco-friendly AR development should be explored to ensure that AI's benefits do not come at a significant environmental cost.

Beyond sustainability, this study opens pathways for further exploration into AI's role in creative industries, particularly within theatre and immersive digital storytelling. While *Impact* has demonstrated the potential of AI-enhanced AR playbills, future studies should investigate:

- The effectiveness of AI-enhanced AR experiences for diverse audiences, including visually impaired users or non-traditional theatre spaces.
- Ethical AI development in digital arts, with a deeper investigation into bias in AI-generated content, transparency in AI-assisted creative work, and authorship accountability.
- Future versions of *Impact* may explore multi-scene AR transitions, audience interactivity, and gamified participation.
- Cultural sensitivity remains a concern, especially when building tools intended for diverse, global audiences.
- By advocating for low-code or no-code platforms powered by AI, more artists may enter the AR space without relying on technical collaborators.

Addressing these issues will ensure that AI remains a tool for augmentation rather than a force of homogenization within artistic fields. Importantly, while *Impact* is a contained prototype at this stage, it represents the first layer of a vision that can grow—with care, practice, and ethical awareness—into a broader tool for immersive engagement.

6.5 Final Reflection

The creation of *Impact: The Pre-Show Interactive Playbill* has been both a personal and academic turning point—one that marked my entry into a space where artistic intuition and technical innovation converge. What began as a research inquiry into whether AI could assist non-programming artists in AR development quickly transformed into a lived experience of building, problem-solving, learning, and adapting in real time. It was not just a question I answered, it was a world I entered.

The initial hesitation I felt around coding—rooted in years of identifying primarily as a storyteller, performer, and visual thinker—gradually gave way to curiosity and confidence. With each iterative prompt submitted to an AI tool, with each error message decoded in Unity, I began to shift from seeing myself as an artist constrained by technical limitations to one empowered by technological fluency. This shift did not come without challenges, but it came with meaning. I realised that I was not outsourcing my creativity to machines; I was translating it into a new language—one that required precision, patience, and trust in the process.

Though the resulting prototype includes just three AR interactions, its purpose and impact are far-reaching. The process of bringing *Impact* to life has proven that AI, when guided ethically and thoughtfully, can reduce technical barriers without compromising artistic vision. It can simplify complex systems, offer structure where uncertainty exists, and open the door to experimentation for creators who may have once felt excluded from the digital development space.

This project illuminated three key truths: First, AI is most effective when treated not as a shortcut, but as a collaborator—one that responds to human direction, not intuition. Second, the creative process does not lose its soul in the presence of automation; rather, it shifts its focus. Time once spent writing syntax was instead spent considering story, mood, pacing, and emotional tone. And third, innovation is not always synonymous with complexity or scale. Sometimes, it is about the decision to begin—to test an idea, to pursue a vision despite uncertainty, and to embrace imperfection as part of growth.

Through *Impact*, I gained tangible skills in coding, prototyping, and AR implementation. But I also gained something less measurable and more enduring: a renewed belief in my adaptability as an artist in a rapidly evolving digital world. I am no longer intimidated by technology; I am in conversation with it. I am no longer waiting for the perfect tool; I am learning how to shape the tools available to serve my creative intent. That, to me, is the most empowering outcome of this research.

As creative industries continue to experiment with artificial intelligence and immersive media, I hope this project serves as a practical example of what can be achieved when artists are given both access and autonomy. *Impact* is not a finished product—it is a prototype, a first step, and a statement of possibility. It demonstrates that with the right tools and guidance, artists do not need to wait for permission to innovate. We can build our own blueprints—ones that are rooted in our stories, values, and visions.

Looking forward, I believe that the most meaningful technological progress in the arts will come not from replacing human creators, but from supporting them. The future I imagine is not one where machines generate culture, but one where artists use intelligent systems to enhance it—where innovation amplifies authenticity, and where creativity remains not only human, but deeply humane.

In that spirit, I offer *Impact* not as a polished product, but as proof that it is possible. Possible to start small. Possible to learn something new. And possible to reimagine the spaces where art and technology meet—not with fear, but with agency, imagination, and care.

Appendix A: AI-Assisted Code Generation and Final Scripts

A.1 Introduction

This appendix outlines the AI-assisted coding process behind the beta version of *Impact: The Pre-Show Interactive Playbill*. The project's MVP (minimum viable product) included three core AR interactions—each triggered by a distinct image target and built using a combination of ChatGPT-generated scripts and manual refinements in Unity.

The AI-generated scripts provided a foundational scaffold for development. However, substantial human intervention was required to ensure stability, artistic alignment, and performance across Android devices. This appendix demonstrates how that collaboration unfolded.

A.2 Prompting AI for Script Foundations

The development process began with natural language prompts submitted to ChatGPT (Paid Version) to generate Unity C# scripts compatible with AR Foundation and ARCore.

Sample Prompt: ***Video Playback Script***

Date: November 5, 2024

"I need a Unity C# script using AR Foundation that detects an image and plays a short video in AR space. Please optimise the code for Android devices with limited memory. Include error handling and comments."

This prompt produced a working baseline script using ARTrackedImageManager and Unity's VideoPlayer component. The AI correctly included methods to instantiate a prefab on image detection and play a specified video file.

A.3 Common Issues Encountered in AI Outputs

Despite producing a working structure, the scripts required several refinements:

Issue	Cause	Resolution
NullReferenceException errors	Missing GameObject assignments in Unity	Manually linked components via inspector and added if condition checks
Inconsistent video playback on older devices	AI did not account for hardware variation	Reduced video resolution and memory footprint via Unity compression settings
Missing functionality for prefab cleanup	AR content persisted after losing image tracking	Added logic to disable or hide prefabs when tracking state was lost
Over-reliance on default event listeners	AI scripts lacked UI fail-safes	Inserted additional UI visibility toggles for smoother scene integration

Table 8: This table displays the issues I faced whilst creating the Augmented Reality Experience and how I resolved it after figuring out the cause of the issue. . (Authors Own)

These examples reflect the need for human debugging and decision-making throughout the implementation process.

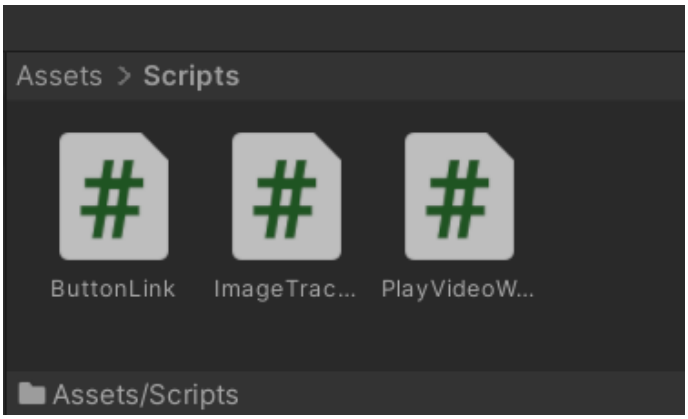
A.4 Prefabs and Tracked Image Assignments

Each interaction was linked to a specific prefab and image target:

Interaction	Image Target	Prefab Outcome	Notes
Video Interaction	“MaidenVoyage”	Plane with looping video clip	Audio playback intentionally excluded to reduce app size
Image Popup	“CastImage”	2D sprite with transparent canvas	Resized manually for visibility across screen sizes
UI Button Display	“InstagramButton”	Stylised 3D button prefab (non-clickable)	No scene-switching logic included to protect future IP roadmap

Table 9: This table displays the expected outcome along with notes when interacting with each ImageTarget. . (Authors Own)

Each prefab was assigned and tested within Unity’s AR Session Origin, using the ImageTrackingHandler script that monitored tracking state and toggled visibility accordingly.



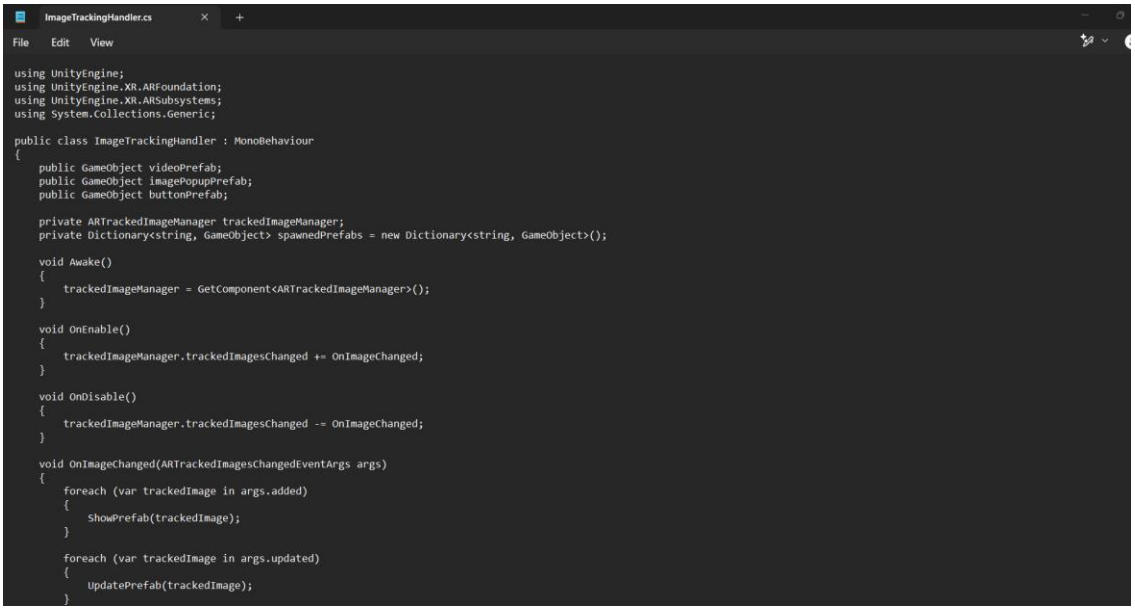


Figure 4: Unity Inspector displaying a section of the AI-generated script (ImageTrackingHandler.cs) assigned to a prefab. . (Authors Own)

This screenshot illustrates how AI-assisted code was manually attached to a GameObject within Unity. The Inspector window shows key variables linked via drag-and-drop, including the tracked image reference and visual content prefab. This highlights the collaborative role of the artist in refining and connecting AI-generated scripts during AR development.

A.5 Reflections on Prompting and Debugging

Over time, prompting became more precise. I learned to include details such as “optimise for mobile,” “include error handling,” and “trigger on image detection only once.” These refinements improved the quality of code produced and taught me how to structure problem-solving as a dialogue—with the AI as a responsive partner.

In some cases, a single prompt led to a usable script. In others, it took 2–4 rounds of iteration, bug testing, and prompt clarification. This iterative collaboration between myself and the AI shaped not only the functionality of *Impact*, but also my confidence and competence as a developer.

A.6 Closing Note

All scripts were adjusted to prioritise ethical clarity and protect the creative direction of future versions. No external web links, data tracking, or reward systems were implemented in this version. These decisions were intentional and reflect a commitment to responsible research boundaries, audience privacy, and safeguarding of future IP developments.

The final app build remains a contained prototype, designed to demonstrate that—with AI assistance—independent artists can meaningfully participate in immersive media production, without compromising artistic integrity or overextending technical risk.

Appendix B: Evaluator Reference Guide – Impact: The Pre-Show Interactive Playbill (Beta Version)

This appendix provides a concise, step-by-step reference for evaluating the beta version of *Impact: The Pre-Show Interactive Playbill*. The guide is intended for supervisors, reviewers, or examiners engaging with the app during the assessment process.

Device Requirements

- Android smartphone or tablet (version 8.0 or higher)
- Camera access must be enabled for AR functionality.

Installation Instructions

1. Download the .apk file from the submission folder.
2. On your device, enable installation from unknown sources via:
   Settings > Security > Install unknown apps.
3. Open the .apk file and follow the on-screen prompts to install.
4. Launch the app and allow camera permissions.

Image Targets to Scan

Target Name	Trigger Image	AR Result
MaidenVoyage	Poster/cover art of *Maiden Voyage*	A floating screen plays a video with audio in AR.
TheCaptain	Portrait-style image of the captain	A 2D image appears in AR space.
InstagramButton	QR-style image near cast credits	A 3D AR button appears and opens an Instagram link when tapped.

Table 10: The table displays the updated trigger images and AR results aligned with the final beta version of Impact. (Authors Own)

Important Notes:

- This is a beta version developed for academic submission.
- The app includes no interactive buttons, scene switching, reward systems, or network features.
- All content is local and ethically designed for testing purposes only.

For any technical issues or additional context, please refer to the walkthrough in Chapter 3.

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