Augmented Reality Experiences in Graphic Design

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Abstract: *This paper explores the integration of Augmented Reality (AR) in the field of graphic design, highlighting its diverse applications and transformative potential. By blending digital overlays with physical environments, AR offers novel avenues for enhancing user experiences and storytelling in graphic design. The research focuses on the practical application of AR in developing a mobile user interface for e-commerce in the real estate sector and creating an interactive poster with AR effects within the same domain. Through a mix of literature review, hands-on experimentation, and user feedback, the efficacy and challenges of integrating AR into graphic design are discovered. The insights gained not only contribute to advancing the understanding of AR's role in graphic design, but also provide practical guidance for designers seeking to leverage this innovative technology.*

Keywords: *augmented reality, graphic design, UX design, UI design, mobile user interface, print design, usability evaluation*

1. Introduction

In the last decades, technological progress has fundamentally redefined the way people interact with the world around them, communicate ideas

and information. One of the most exciting developments in this regard is the emergence of new realities such as virtual reality (VR), augmented reality (AR) and mixed reality (MR). Augmented reality involves superimposing virtual elements onto the real world, which allows users to see both the real world and computer-generated objects simultaneously using mobile devices (i.e., smartphones, tablets, and smartwatches), head-mounted displays (HMDs), computers or even projectors (Oun et al., 2024).

Graphic design takes ideas, concepts, text and images and presents them in a visually engaging form through print, electronic or other media. It imposes an order and structure to the content to facilitate and ease the communication process, while optimising the likelihood that the message will be received and understood by the target audience. A designer achieves this goal through the conscious manipulation of elements (Ambrose & Harris, 2009).

As technology continues to evolve at an unprecedented pace, the fields of graphic design and augmented reality (AR) begin to intersect in fascinating ways. Augmented Reality is transforming the landscape of graphic design, allowing designers to break free from the constraints imposed by traditional two-dimensional environments and empowering them to create immersive, interactive, and captivating experiences. From enhancing product visualisation to revolutionising print media and brand engagement, AR opens a new realm of creative possibilities (Singh, 2023).

2. Research methods

The primary aim of this study is to thoroughly investigate effective strategies and best practices for integrating augmented reality experiences into the field of graphic design. This investigation is grounded in a comprehensive literature review and insights from graphic design communities.

In this paper, the following research questions will be answered:

Q1: What are the main application areas of augmented reality?

Q2: What are the best practices for integrating augmented reality experiences in graphic design?

To address research question Q1, an analysis was conducted on scientific papers relevant to the chosen field, following the steps outlined in the subsections: Data Collection Methods, Selection Procedure, and Identification.

Data collection methods

The following data collection method was selected:

Search terms: "Augmented Reality in Graphic Design," "Augmented Reality Mobile Application," and "Create a realistic AR environment with Figma."

Publication date: 2018 – 2024

Database: Google Scholar

Selection Procedure

For this particular method, only scientific papers and books were selected, while reviews and PowerPoint presentations were excluded. Titles, keywords, and abstracts of the papers were examined, and a preliminary screening of the articles was conducted using the inclusion and exclusion criteria outlined in Table 1.

Table 1: Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Conference papers/books and journals	Irrelevant papers and with no keywords specific to graphic design in association with augmented reality
Papers/books including keywords for graphic design in association with augmented reality	
	Papers lacking examples of graphic products that could incorporate augmented reality experiences
Papers/books including screenshots of applications using augmented reality in different domains	

Identification

The search for relevant scientific papers began on Google Scholar, utilizing a range of keywords and examining results across the first eight pages. This initial search yielded 240 potential research papers. Zotero was employed as a research assistant to collect, organize, and remove duplicates, resulting in 162 papers for further consideration.

After reviewing titles, keywords, and abstracts, and applying inclusion and exclusion criteria, a final set of 21 papers remained (Ahmadi Dehrashid, 2021); (Ambrose & Harris, 2009); (Amin et al., 2022); (Arena et al., 2022); (Criollo-C et al., 2021); (Dargan et al., 2023); (Deng & Wu, 2020); (Divya Udayan et al., 2020) ; (Kollárová, 2021); (Koumpouros, 2024); (Margaritopoulos & Georgiadou, 2019); (McNally & Koviland, 2024); (Mohamed Gamee Kamel El-Saidy & Mohamed Abolnaga, 2021); (Oun et al., 2024); (Parras-Burgos et al., 2020); (Pochtoviuk et al., 2020); (Saragih & Suyoto, 2020); (Tan et al., 2022); (Vert et al., 2021); (Vorobchuk & Pashkevych, 2023); (Weking et al., 2020)

These 21 papers were carefully examined to address the Q1 research question and, additionally, to complete the introduction part of the dissertation paper.

To address research question Q2, examples of best practices recommended within the graphic design community were analyzed. Using Figma, Vectary, Adobe Express, and Artivive, the following graphic products were created: a mobile user interface for e-commerce in the real estate sector and an interactive poster featuring AR effects within the same domain. Based on the experience gained, a set of best practices was proposed.

Augmented Reality Application Areas

The examination of the 21 academic papers underscores the application of augmented reality across various domains primarily via mobile apps, and to a lesser degree, via web apps. This technology is employed in sectors including education, hospitality, tourism, gaming, medicine, and retail, thereby yielding considerable advantages within each respective sector.
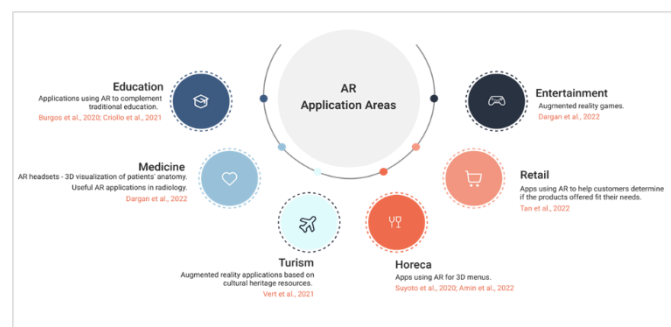

Fig. 1. AR Application Areas

The augmented reality applications described in the reviewed articles employ various types of AR technology. Marker-based AR, using QR codes, is predominant, followed by Markerless AR, which

scans the environment without a trigger image, and Location-based AR, leveraging GPS to deliver location-specific information.

Additionally, the developers have prioritised optimising augmented reality applications for Android devices, while ensuring strong support for iOS users. This strategic approach reflects a deep understanding of market dynamics and user preferences, ensuring broad accessibility and functionality of cutting-edge AR technology across diverse platforms. This inclusive strategy allows users, regardless of their choice of operating system, to enjoy and leverage the remarkable potential of augmented reality in innovative and immersive ways.

Furthermore, popular software tools like Adobe Aero, Blender, Figma, Unity 3D, Vectary, and Vuforia are consistently utilised for developing augmented reality applications. This underscores the widespread adoption and effectiveness of these platforms among AR developers, valued for their robust functionality and resource capabilities.

These insights highlight augmented reality's significant advantages and its increasing integration into daily life, driven by collaborative efforts and standardised approaches in application development and implementation.

3. Results

Integration of AR into graphic design

The integration of AR experiences into graphic design introduces new possibilities for engaging and innovative visual interactions, fundamentally transforming the way users perceive and interact with digital content.

Best practices within the graphic design community

Numerous graphic designers propose and showcase innovative methods for integrating augmented reality experiences into graphic design. These demonstrations provide concrete examples of best

practices, highlighting the exciting potential of this technology in modern visual communication.

Table 2: Examples proposed by graphic designers

Domain	Graphic designer	Graphic product	AR Experience	Link
Tourism	Adrián Řezníček, Stanislav Bagin, Lukas Stranak	Mobile UI	Points a traveller's route through the airport to check-in, security, gates, restaurants and to the taxi or bus stop.	https://www.behance.net/gallery/73623109/Improvedairportexperience-through-AR
Tourism	Pixel Ravi Nickelfox Design	Mobile UI	Guides a traveller's direction to cafés, restaurants, shops or supermarkets.	https://www.youtube.com/shorts/fxzMB--MV0o
E-commerce	Nagaredesign studio	Mobile UI	Allows the user to visualise coffee expressors or furniture objects in the real environment.	https://creativemarket.com/nagaredesignstudio/10302875-Augmented-Reality-Metaverse-App
E-commerce	Kostya Stepanov	Mobile UI	Allows the user to try on a pair of sneakers and check every detail by rotating the chosen 3D shoe model.	https://uxplanet.org/2023mobile-ui-trends-2a44873102d
Multiple domains	Artivive	Printing material	Allows viewers to see posters come to life.	https://www.youtube.com/watch?v=8Uta3XOd4Ps
Multiple domains	abdz.do	Printing material	Facilitates understanding of design principles in a fun and engaging way by scanning posters.	https://abduzeedo.com/node/87156

Upon reviewing the examples proposed within the graphic design community, it becomes evident that designers can animate static images, crafting compelling and interactive user experiences. Mobile UI design stands out as the predominant medium for integrating AR experiences, while the adoption of print AR experiences remains limited.

Mobile User Interface

Following the analysis of examples within the graphic design community, focus shifted to developing a mobile graphical user interface (GUI) for real estate e-commerce, enhanced with augmented reality (AR) elements.

This initiative is designed to enhance the furniture shopping experience provided by a fictional brand, with an emphasis on accessibility, convenience, and an aesthetically pleasing interface. The incorporation of AR technology enables users to preview furniture items within their own spaces prior to making a purchase, thereby increasing brand engagement and influencing purchasing decisions.

The GUI design and prototyping were executed using Figma, while the integration of AR technology was facilitated through Vectary.

The process began with an exploration of domain-specific inspiration within the graphic design community. A detailed visual sketch was then created to align with the intended information display and navigation structure of the mobile UI. Next, a visual guide was developed to define the logo, font, colors, and iconography to be used. Finally, the mobile pages were designed in Figma.

Using the Vectary platform, a 3D chair model downloaded from CGTrader (https://www.cgtrader.com) was imported. The chair's appearance was enhanced by selecting colors, materials for the upholstery and legs, and adding effects. To enable augmented reality features, a premium account was activated, and the link was copied for further use.

The following step required integrating the 3D element as a 2D image within the Figma prototype, necessitating the installation of the Vectary 3D plugin. After accessing the plugin and inserting the previously copied URL from Vectary, an attempt was made to embed the 3D element into the Figma prototype. However, despite extended processing time, the 3D element could not be integrated, as the "Processing" message persisted.

Upon investigating this issue in the Figma Community, the Vectary 3D Plugin comments section, and Vectary's Discord channel, it became clear that this bug affects all users attempting to insert custom 3D products. Vectary's developers have acknowledged the problem and are actively working on a fix, although the timeline for resolution remains uncertain.

Given these limitations, an alternative approach was taken to simulate the integration of augmented reality (AR) technology in the mobile GUI designed with Figma. This simulation involved using a background image of a living room, with the furniture object positioned within this setting. Users could interact with the 3D object by resizing it and selecting colors that best complemented their existing decor, aiming to closely replicate an authentic AR experience.
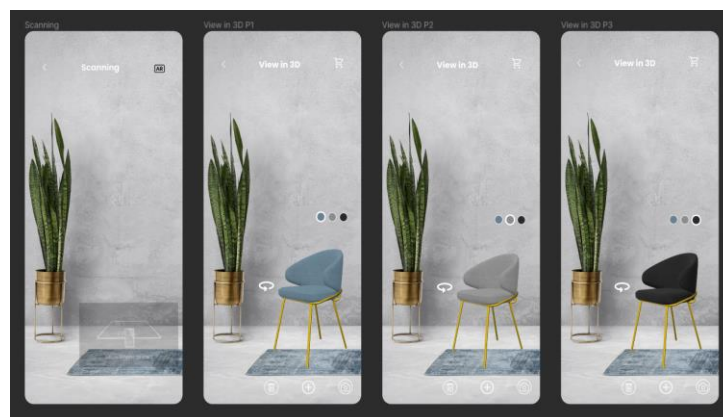

Fig. 2. AR Simulation

To evaluate the augmented reality functionality of the 3D model, a workaround was implemented by linking an interaction to the "View in 3D" button. This directed users to an intermediate screen in Vectary displaying an AR indicator.
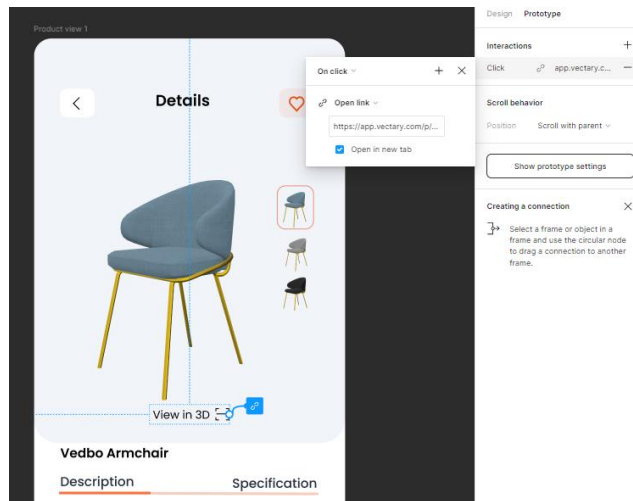
Fig. 3. "View in 3D" button interaction

Accessing the AR indicator allowed users to place the furniture object within their home environment.
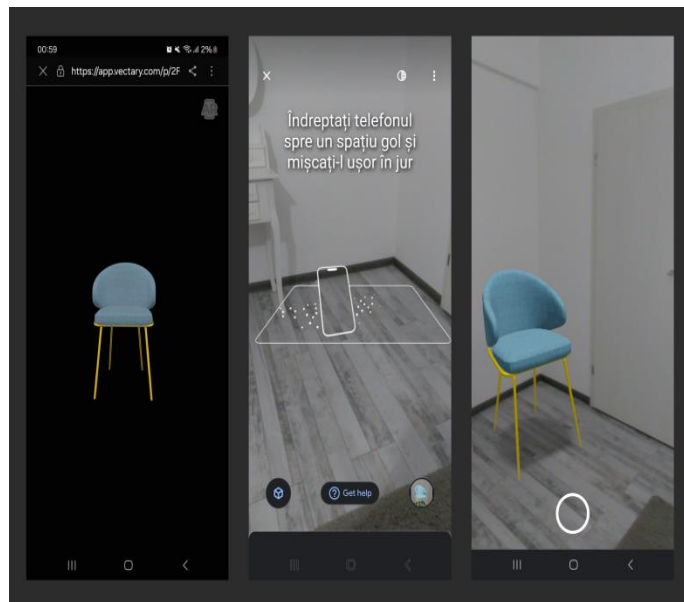

Fig. 4. Space scanning and chair placement in personal home

Despite the constraints of the Vectary 3D Plugin, leveraging an augmented reality (AR) workaround enabled successful placement and visualization of the 3D element in real space. Furthermore, simulating AR integration within the Figma-created mobile GUI closely approximated the authentic AR experience. Both the practical AR implementation and the simulated approach underscored the advantages augmented reality brings to the retail sector.

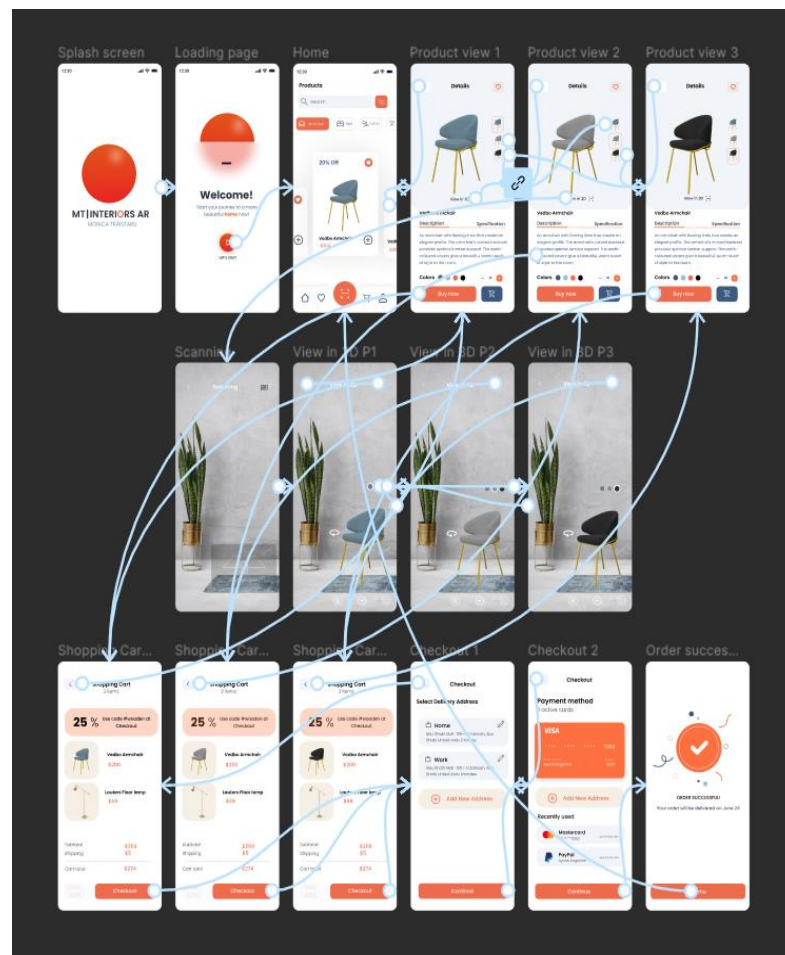The final prototype is illustrated in Figure 5:

Fig. 5. Final prototype

Poster

Motivated by a passion for interior design and the exploration of augmented reality integration within the graphic design community, an augmented reality-enhanced poster was created, targeting interior design enthusiasts and individuals involved in home design. This poster presents five tips for transforming a home into a welcoming space.

The creation of the AR poster involved three primary steps. First, the poster was designed and downloaded using Figma. Second, a short video was produced to showcase the augmented reality features of the poster. Utilizing Adobe Express, an animated poster template from Adobe Stock was selected and customised, incorporating media content and enhancing it with text, design elements, and animations to add dynamism to the presentation. Finally, a thorough review of the material was conducted, with necessary adjustments made to ensure quality.
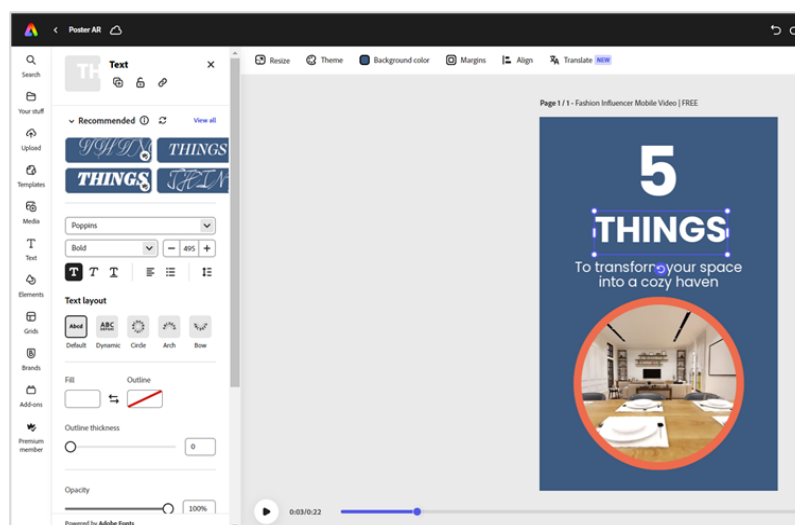

Fig. 6. Adobe Express video

To complete the creation of the augmented reality-enhanced poster, the Artivive platform was used. Within the Bridge by Artivive interface, the image poster from Figma was uploaded on the left side, and the video from Adobe Express was placed on the right. After

selecting the preferred display method for the video, the project was saved using the "Save" button. Within moments, the project appeared on the Bridge home page, from which it was downloaded using the "Download Artwork" option.
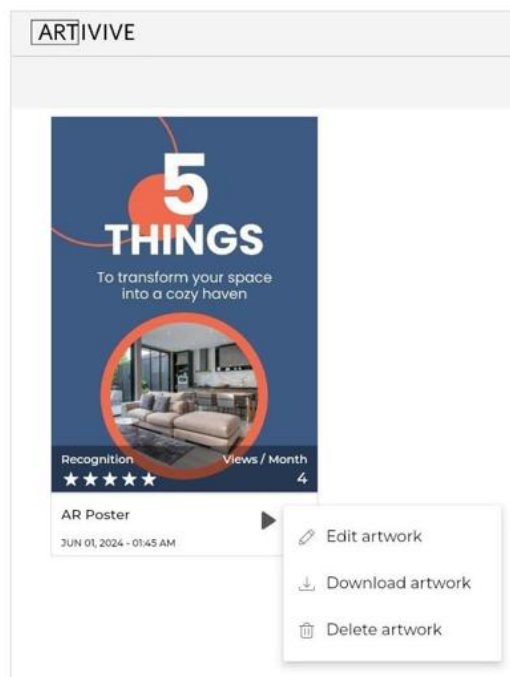

Fig. 7. Download AR poster from Artivive

To view the augmented reality-enhanced poster, the Artivive app was installed from the Google Play Store, which is also available on the Apple App Store. Upon opening the app and pointing the phone's camera at the poster, the app activated the AR features, overlaying a video that presented five tips for transforming a home into a cozy space.

In summary, integrating AR technology into print design enhances interactivity and immersion, converting static viewing into dynamic interaction. While the implementation process demands technical expertise and several crucial steps, the outcomes can profoundly enhance user engagement and experience.

Testing

The testing sessions were conducted in person within a group study room, comprising five participants (three females and two males) aged between 23 to 35 years. All participants were smartphone users and possessed a basic comprehension of augmented reality technology; however, none had previous experience with augmented reality applications.

The AR-based graphical user interface testing sessions lasted 55 minutes each, structured as follows: a 15-minute introduction and pre-questionnaire, 25 minutes for task execution, and a concluding 15-minute post-questionnaire.

Overall, the participants expressed positive feedback on the interface design and navigation ease. They particularly liked the initial animation and the cohesive use of colours, fonts, and icons. However, challenges were noted in accurately positioning the mobile phone camera for scanning and in returning to the "Product View 1" page, after placing the furniture object in the real environment. Thus, addressing these interaction issues is crucial for enhancing user experience in future iterations.

The following day, a focus group was conducted with five participants to examine the integration of augmented reality technology in poster design. This qualitative approach was selected to gather insights and opinions on the topic. The session lasted approximately 45 minutes, including 5 minutes for participants to share their initial impressions of the AR poster and 40 minutes dedicated to group discussion.

Based on the focus group findings, augmented reality shows potential for future poster design, despite its current limited adoption. A key barrier identified was reluctance among viewers to install third-party apps to access AR content. To address this, future research could focus on developing web-based AR technologies that enable posters to be viewed directly through a web browser, eliminating the need for apps downloads. This approach would involve optimising AR performance

and ensuring compatibility across different devices and platforms, aiming for a seamless and accessible user experience.

4. Conclusions

This paper effectively addressed the two research directions, offering pertinent insights into the primary applications of augmented reality and optimal methodologies for integrating AR experiences into graphic design field.

The present research outlines the fundamentals of emerging VR, AR, and MR technologies, explores various branches of graphic design, and examines the synergy between AR and graphic design. Two research questions were proposed to guide the study. The research was based on a review of scholarly articles sourced from Google Scholar, selected according to the identification methods and inclusion/exclusion criteria detailed in Table 1.

A systematic literature review was conducted to explore various applications of augmented reality, alongside an analysis of best practices within the graphic design community. This study facilitated the creation of the following graphic products using Figma, Vectary, Adobe Express, and Artivive software: a mobile graphic interface for e-commerce in the real estate sector featuring AR elements, and an interactive AR-enhanced poster for the same domain.

Throughout the process of developing this paper, responses to the research questions outlined in the introduction were obtained:

Q1: What are the main application areas of augmented reality?
Augmented reality technology is particularly applied in sectors such as education, hospitality, tourism, gaming, medicine, and retail, offering substantial benefits across each of these fields.

Q2: What are the best practices for integrating augmented reality experiences in graphic design?

From the two practical experiences, best practice examples and recommendations for designers were derived.

To formulate guidelines for designing mobile GUIs with AR elements, it is essential to first identify the necessary application features. These features will be depicted in a visual sketch to provide an overview of the app pages. A moodboard will then be created to refine ideas and develop a visual guide. Following the guide's specifications—such as colours, fonts, icons, and illustrations—and the visual sketch, the individual page design is crafted. Augmented reality technology will be integrated by attending tutorials or courses and using 3D elements created with programs like Adobe Aero, Blender, Unity 3D, Vectary, and Vuforia. Finally, the application prototype will be designed using tools such as Figma.

The prototype will undergo testing using methods including observations, focus groups, and A/B testing. Analysis of the results will lead to conclusions on necessary improvements for the application, guiding subsequent iterations of the UX/UI design process as needed.

On the other hand, creating posters enhanced with augmented reality elements demands specific skills and considerations. These include comprehending the poster's context and purpose, selecting suitable platforms like Figma, Adobe Express, and Artivive for creation, choosing the right trigger element and content, and testing and optimising the design for performance, usability, and accessibility.

The designer must identify the poster's target audience and its intended use, select the appropriate digital content format (2D, 3D, animation, or video), and ensure the augmentation performs effectively across various lighting and environmental conditions. The design must prioritise usability and clarity, aligning closely with the audience's needs and preferences.

Future research could focus on developing web-based AR technologies that enable posters to be viewed directly through a web browser, eliminating the need for apps downloads. This approach would involve optimising AR performance and ensuring compatibility

across different devices and platforms, aiming for a seamless and accessible user experience.

Drafting this paper has provided the opportunity to apply the knowledge gained from various subjects within the selected Master's program, while also acquiring new skills. This experience has facilitated a deeper exploration of relevant concepts and theories within the field of study.

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