

Interactive business card prototype: promoting brands with augmented reality on social networks

Prototipo de tarjeta de presentación interactiva: impulsando marcas con realidad aumentada en redes sociales

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Abstract

This project aims to develop prototypes of interactive cards using augmented reality (AR) to support SMEs and microenterprises in promoting and disseminating their products, goods, or services on social media. These interactive cards will offer an immersive and personalized experience, incorporating elements such as 2D and 3D objects, videos, images, sound, animations, and direct links to social media and websites, as well as other features like location and action buttons. With these capabilities, the project seeks to enhance brand visibility and reach in the digital environment, providing companies with an innovative and effective tool for their marketing strategy.

Goals	Methodology	Contribution
1.Develop a prototype of an interactive business card with augmented reality technology. 2.Evaluate the impact of augmented reality on brand promotion on social networks. 3.Improve the visibility and engagement of MSMEs through augmented reality.	Prototype development and implementation. 1. Development in Unity 2019.3.4f1 with Vuforia integration for image recognition. 2.Programming language: C# using MonoBehaviour in Visual Studio 2022. 3.Testing on Android devices starting with Lollipop version.	1.Innovation in business cards. Augmented reality allows for personalized interactive experiences. 2.Improvement of digital marketing. Increase visibility and engagement on social networks. 3.Technological accessibility. Works on Android devices from previous versions.

Resumen

Este proyecto tiene como objetivo desarrollar prototipos de tarjetas interactivas con realidad aumentada (RA) para apoyar a las MIPYMES y PyMES en la promoción y difusión de sus productos, bienes o servicios en redes sociales. Estas tarjetas interactivas ofrecerán una experiencia envolvente y personalizada, incorporando elementos como objetos 2D y 3D, videos, imágenes, sonido, animaciones, y enlaces directos a redes sociales y páginas web, además de otras funcionalidades como ubicación y botones de acción. Con estas características, se busca potenciar la visibilidad y el alcance de las marcas en el entorno digital, proporcionando a las empresas una herramienta innovadora y eficaz para su estrategia de marketing.

Objetivos	Metodología	Contribución
1.Desarrollar un prototipo de tarjeta de presentación interactiva con tecnología de realidad aumentada. 2.Evaluar el impacto de la realidad aumentada en la promoción de marcas en redes sociales. 3.Mejorar la visibilidad y engagement de MIPYMES a través de la realidad aumentada.	Desarrollo del prototipo y su implementación. 1.Desarrollo en Unity 2019.3.4f1 con integración de Vuforia para el reconocimiento de imágenes. 2.Lenguaje de programación: C# utilizando MonoBehaviour en Visual Studio 2022. 3.Pruebas en dispositivos Android a partir de la versión Lollipop.	1.Innovación en tarjetas de presentación. La realidad aumentada permite experiencias interactivas personalizadas. 2.Mejora del marketing digital. Incrementa la visibilidad y engagement en redes sociales. 3.Accesibilidad tecnológica. Funciona en dispositivos Android desde versiones anteriores.

Prototypes, Interactive cards, Augmented reality

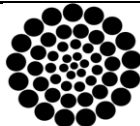
Prototipos, Tarjetas interactivas, Realidad aumentada

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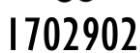


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Introduction

In an increasingly digital and competitive world, businesses face the constant challenge of capturing the attention of consumers and differentiating themselves in the marketplace. This challenge is particularly relevant in the context of micro, small and medium-sized enterprises (MSMEs and SMEs), which often have limited resources but a strong need for visibility. In this context, innovation in promotion and dissemination strategies becomes a key factor in achieving business success, and this is where interactive business cards, powered by augmented reality (AR) technology, come into play.

The importance of this topic lies in AR's ability to transform traditional business cards into interactive digital tools that not only capture the user's attention (Azuma, 1997), but also strengthen the connection between brands and their audiences. In a market where digital interactions dominate, traditional business cards (Wiederhold & Riva, 2019) have begun to lose relevance. However, by integrating AR technology, it is possible to revitalise this medium, offering an immersive and personalised user experience that can distinguish a brand in an information-saturated environment.

The added value of interactive AR business cards over other techniques lies in their ability to combine the tangibility of a physical card with the interactivity of digital media. Unlike other digital marketing strategies, which can be impersonal or easily forgotten, these cards allow for direct and memorable interaction, facilitating a deeper and more lasting connection with the consumer. In addition, they offer synergistic integration with social media and other digital platforms, amplifying their reach and effectiveness in brand promotion.

Each of the features of these interactive cards brings specific value to the user experience. The inclusion of 2D and 3D objects, videos, images, sound, animations and direct links to digital platforms not only enriches the content presented, but also allows for customisation that can be tailored to the specific needs of each brand. These cards not only attract attention, but also facilitate an emotional bond with the user, which can translate into greater customer loyalty and conversion.

The problem to be solved with this study focuses on the need for MSMEs and SMEs to improve their visibility and promotion in an increasingly digital and competitive market. The central hypothesis of this research is that the implementation of interactive AR business cards will allow these companies to significantly improve their visibility and promotion on social networks, providing a more engaging and memorable user experience. The article is structured in several sections to comprehensively address the development of this innovative prototype. First, a theoretical framework is presented that contextualises the evolution of business cards and AR in the field of digital marketing. Next, the methodology used to design and test the prototype is detailed, followed by an analysis of the results obtained and their potential impact on brand promotion. Finally, conclusions and recommendations for future research and practical applications of this technology in digital marketing are offered.

Methodology

Preliminary considerations

Assessment of the State of the Art

Before starting with the design and development of the AR interactive business card prototype, a thorough assessment of the state of the art in terms of available technologies and tools for integrating AR into mobile devices was carried out, specifically with the aim of improving the connection with social networks and facilitating access to the companies' website.

The analysis included the study of existing platforms and solutions that use AR for brand promotion, as well as integration with social networks through mobile devices. In this regard, the research revealed that while there are several AR solutions on the market, few are optimised for business cards with direct access to social media. This gap in the market reinforces the need and feasibility of a prototype that offers an effective solution for MSMEs and SMEs looking to improve their digital visibility.

Compatibility with Mobile Devices

To ensure accessibility and wide use of the prototype, it was decided to focus the development on mobile devices with Android operating system, starting from version Lollipop (5.0 - 5.1.1), released on 12 November 2014.

This version was chosen because it is still used on a wide variety of mobile devices, both mid-range and low-end, ensuring that the prototype can reach a wider audience without being limited by the technical capabilities of newer devices.

The selection of Android also responds to its high global market share, especially in regions where small and medium-sized businesses operate most frequently.

Using Vuforia for Image Scanning

The choice of Vuforia as the SDK for image recognition and AR implementation was key in the development of the prototype. Vuforia was selected due to:

- Previous experience: The development team had already worked with Vuforia in other AR prototypes, which guarantees a deep knowledge of its capabilities and its integration with Unity.
- Free version: The free version of Vuforia is a stable and reliable solution for projects of this type, especially for small companies looking to minimise costs without compromising quality.
- Stability and accuracy: Vuforia offers 98% accuracy in scanning images and objects, ensuring a smooth and uninterrupted user experience. This is essential to ensure that the interactive business card works quickly and efficiently when users scan the physical card image with their mobile devices.

Technical Considerations

Vuforia was chosen not only for its image recognition accuracy, but also for its ability to adapt to a wide range of mobile devices, ensuring that the scanning and activation of the AR experience is efficient on low to mid-range devices, which represent a significant part of the target market.

Prototype Design

The design of the interactive business card prototype starts with the conceptualisation of the desired functionalities and user experience.

The objective is to create a card that, when scanned with a mobile device, displays interactive content such as 2D models, videos, animations, and direct links to digital platforms.

Box 1

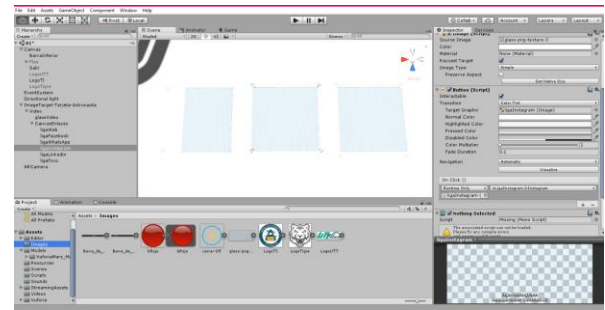


Figure 1
Interactive model content

Source: Own elaboration

Tools and Software Used

- Unity Game Engine 2019.3.4f1: This version of Unity was selected for its compatibility with the AR Foundation, a framework that facilitates the development of augmented reality applications for iOS and Android. Unity allows the creation, management and visualisation of 3D and 2D elements to be integrated into the business card.
- Vuforia SDK: This development kit is used for image detection and tracking, which is essential for the physical card to be recognised and ‘augmented’ by the mobile device. Vuforia integrates with Unity, allowing AR elements to be precisely fitted onto the scanned card.
- Blender/3ds Max: 3D modelling tools like Blender or 3ds Max are used to create the objects and animations that will be displayed in the AR experience. These models are imported into Unity to be integrated into the augmented reality scene.
- Adobe Photoshop/Illustrator: these are used to design the physical business card, ensuring that the design is not only attractive, but also compatible with Vuforia's requirements for image tracking.

Prototype Development:

1. Components: Interactive elements that would compose the business card were defined, such as 2D models, animations, images, videos and interactive links. These components were chosen with the aim of creating an immersive and engaging experience.

Box 2

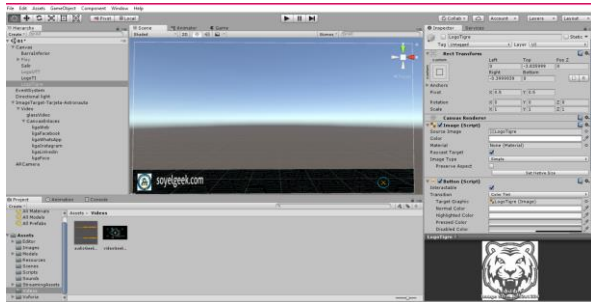


Figure 2

Embedded video and audio

Source: [Own elaboration]

Box 3



Figure 3

Integrated business card

Source: [Own elaboration]

2. Creation of the Physical Card: The business card is designed in Adobe Photoshop or Illustrator, incorporating graphic elements that will facilitate the recognition of the image by Vuforia (Vuforia, 2022).

Box 4



Figure 4

Final card design

Source: [Own elaboration]

Box 5

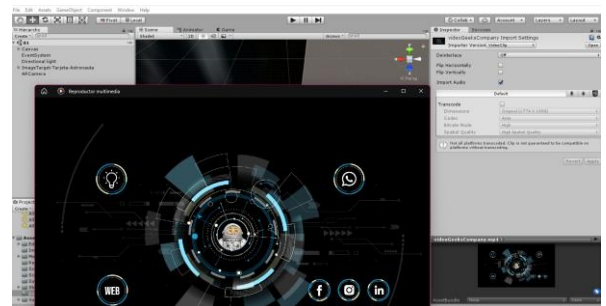


Figure 5

Card presentation with embedded social media images

Source: [Own elaboration]

Box 6



Figure 6

Card animation test

Source: [Own elaboration]

1. Setup in Unity: A new project is created in Unity 2019.3.4f1, Vuforia is integrated and a 2D scene is set up. 2D models and other previously created multimedia elements are imported.

Box 7

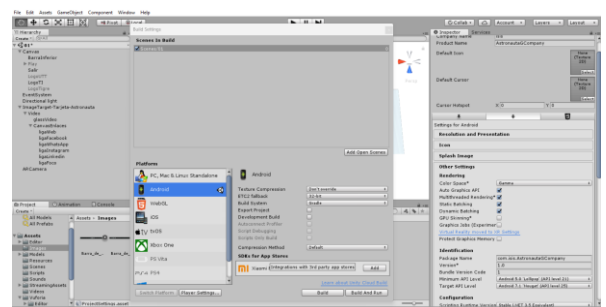


Figure 7

General configuration of Unity

Source: [Own elaboration]

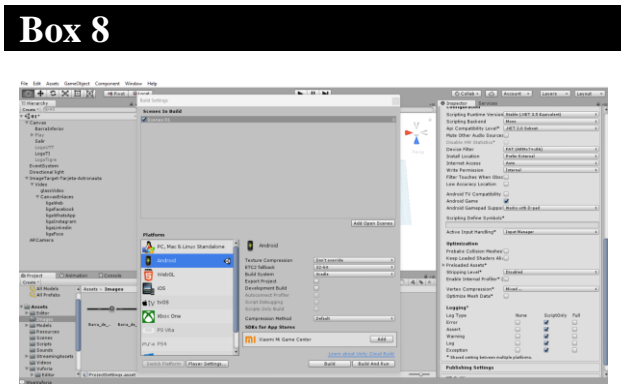


Figure 8

Configuring Unity for Android

Source: [Own elaboration]

1. Vuforia configuration: In Unity, the card image is added as an "Image Target" in Vuforia. 3D models and other interactive elements are positioned relative to this image target, ensuring that they display correctly when the card is scanned.

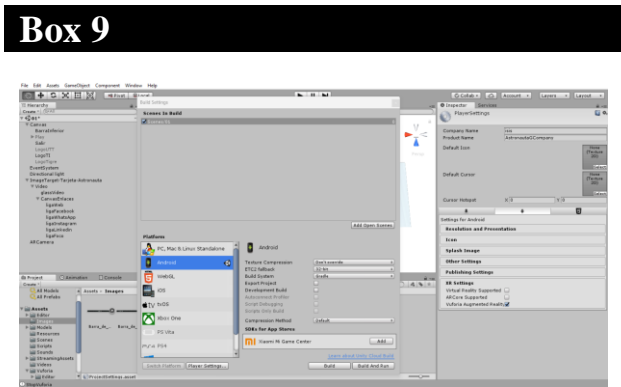


Figure 9

Configuring Unity to use Vuforia for Augmented

Source: [Own elaboration]

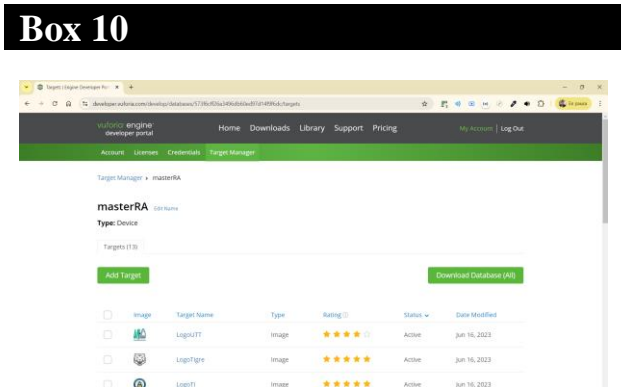


Figure 10

Downloading the scoreboards from Vuforia

Source: [Own elaboration]

1. Interactivity programming: Using C# in the Unity IDE (Unity Technologies, 2022), user interactions with AR elements are programmed, such as touching an object to play a video or animation, or clicking a button to open a direct link to a social network.

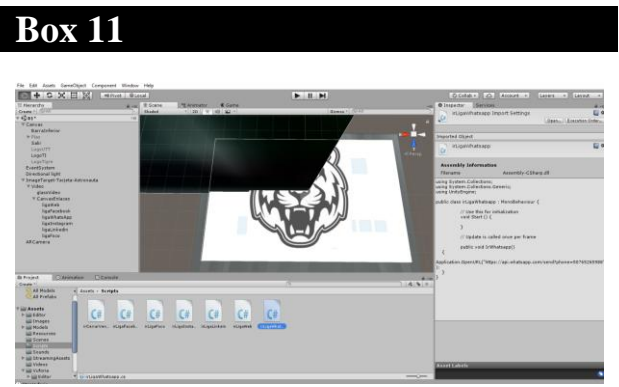


Figure 11

Incorporation of the marker

Source: [Own elaboration]

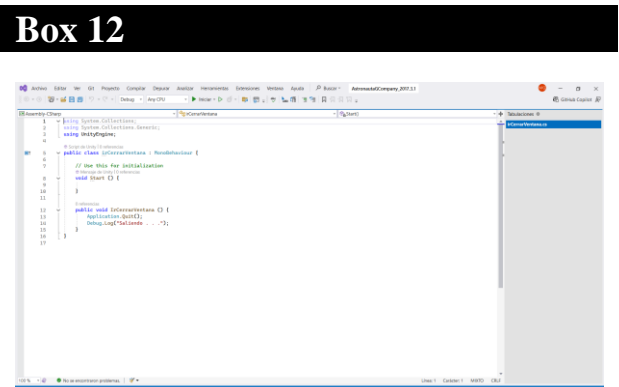


Figure 12

C# Scripts

Source: [Own elaboration]

2. Links and Calls to Action (CTAs): Interactive CTAs are incorporated into the AR experience, allowing users to share their experience on their own social networks with a single click, or to visit the company's page on specific platforms. These links are designed to be accessible directly from the AR experience, enhancing integration with social networks. Links to platforms such as Instagram, Facebook, LinkedIn, Whatsapp, company website, etc. are created.

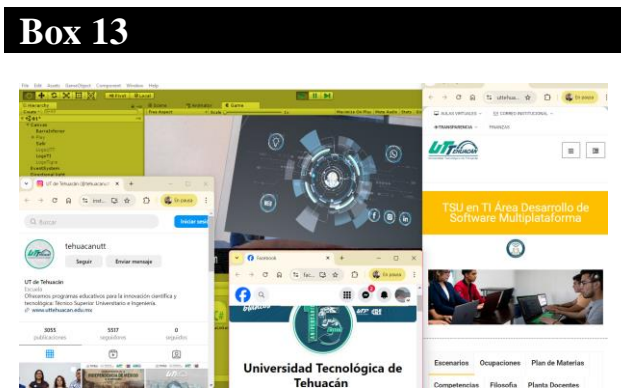


Figure 13
Visualisation of social media
Source: [Own elaboration]

3. Initial Testing and Adjustments: Preliminary tests are performed on mobile devices to adjust the position, scale and behaviour of interactive elements, ensuring a smooth and accurate user experience.



Figure 14
Tests on a PC
Source: [Own elaboration]



Figure 15
Testing on mobile devices
Source: [Own elaboration]

Social Media Implementation

One of the main features of the prototype is its ability to seamlessly integrate with social media platforms. Two methods of interaction were designed for this purpose:

1. Direct Links. Buttons are included which, when tapped, redirect users to the brand's social media profiles (Facebook, Instagram, Twitter). These links were created through embedded external URLs.

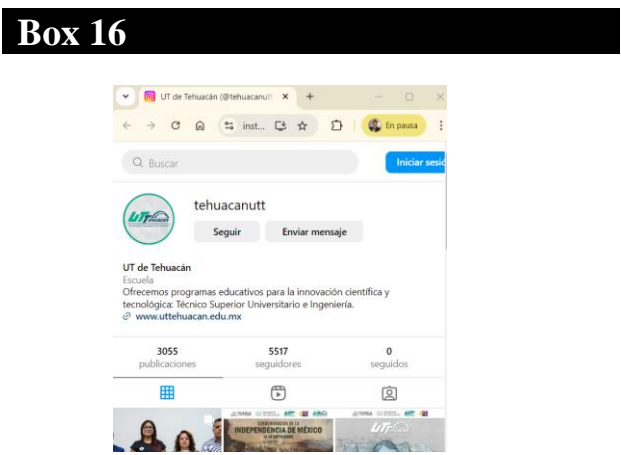


Figure 16
Instagram league
Source: [Own elaboration]

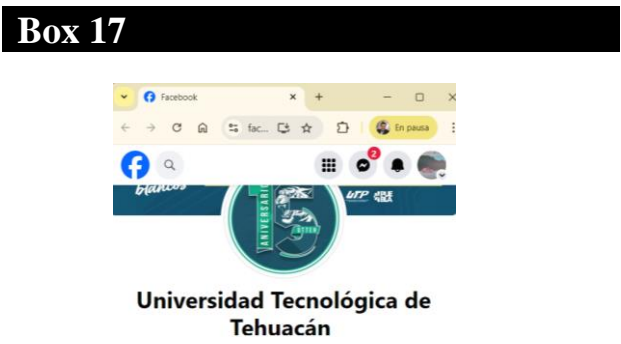


Figure 17
Facebook league
Source: [Own elaboration]

2. Multimedia content. Promotional videos are loaded directly from the business card, allowing users to view content without leaving the AR experience.

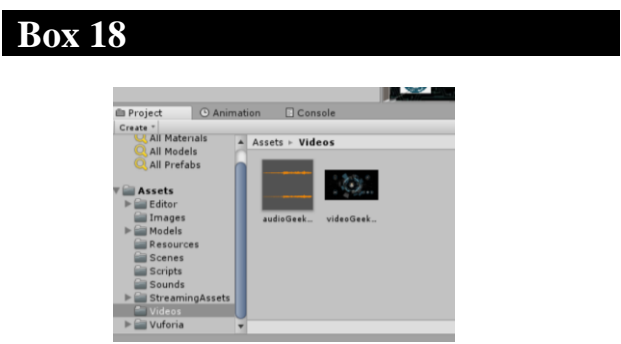


Figura 18
Project-integrated multimedia
Source: [Own elaboration]

Interactive Features

- Promotional videos: Videos integrated into the experience allow brands to tell stories or promote products.
- 2D Animations: Custom animations reinforce the brand's visual identity, providing a dynamic and engaging experience.
- Social Media Buttons: These buttons redirect to official profiles, facilitating the connection between the user and the brand.

Testing and Validation*Testing Phase*

To evaluate the effectiveness of the prototype, tests were carried out with a group of users divided into two categories:

1. Experimental group: Users who interacted with the interactive AR business card.
2. Control group: Users who received a traditional business card.

The profile of the test subjects included small entrepreneurs, freelancers and designers, who are potential users of these cards in business environments.

The results will be presented in a separate research focused on data analysis. The effectiveness of the interactive business card will be evaluated. By carrying out a series of tests with the two groups mentioned above, which are part of the brand's target audience. These tests will focus on two main aspects: the user experience and the impact on brand promotion.

Technical validation

The card was tested on several mobile devices of different ranges (high, medium, low) to ensure its performance and functionality. Testing included:

- Experience Load Time: The time from when the user scans the marker until the AR experience is deployed on their device was measured.

- Battery Consumption and Performance: Tests were conducted to verify that prolonged use of AR does not significantly affect device performance.

Results

The development of the interactive business card prototype with augmented reality has enabled the implementation of an innovative tool for the promotion and dissemination of products, goods or services of a company, contributing to brand positioning in a highly competitive environment. The results of this research and development can be divided into several key areas, covering both the design of the software and the necessary tools and technical skills.

User Experience (UX). The prototype has been designed with a focus on user experience, aiming to offer an attractive, intuitive and fluid interaction. The main objective is to ensure that the digital business card, when scanned with a mobile device, displays interactive elements that strengthen the connection between the brand and the end user.

The choice of the C# programming language was fundamental, as it is the main language used in the Unity development environment. Its ability to handle events, object-oriented programming logic and flow control allowed for a solid construction of the interactive behaviour of the prototype.

C# scripts were used to manage the interaction between AR elements and user actions, such as tapping to display animations or opening links to the company's social networks.

One of the most important elements of the Unity development was the use of the MonoBehaviour class, which provides access to methods that handle events within the Unity engine.

Microsoft Visual Studio 2022 was the tool of choice for writing and debugging Unity code. Visual Studio provides a robust and efficient environment for development, with advanced debugging and project management features, which made it easy to identify bugs and optimise code.

Vuforia Engine was used to implement the physical card scanning capability and display AR elements. Image recognition through Vuforia proved to be highly effective and accurate, with stable performance even on low-end and mid-range mobile devices.

Conclusions

The prototype proved to be a viable technical solution, offering an interactive experience that combines multimedia elements, such as animations, videos and 2D objects, with direct links to social networks and company websites. The efficiency of the prototype in terms of image recognition and interactive content display was high, using tools such as Vuforia and the Unity development engine. This ensures a stable and functional experience for users, contributing to improved engagement and brand promotion.

The interactive AR business card significantly expands the possibilities for promotion and dissemination in the digital environment. By providing a personalised and immersive experience, companies can improve brand awareness and increase interaction with their target audience. The prototype not only facilitates access to relevant digital content, but also generates higher user attention retention compared to traditional business cards.

The prototype has proven to be adaptable to a wide range of Android OS mobile devices from version Lollipop (5.0 - 5.1.1), ensuring a wider reach for companies wishing to use this technology. The choice of tools such as Vuforia for image recognition ensures broad compatibility, while the use of C# and MonoBehaviour in Unity provides flexibility in the design and implementation of interactive functionalities.

In addition, the customer has to install the application on his mobile phone in case he wants to take the application with him on his mobile phone. Therefore, it is recommended for use in promotional campaigns and dissemination of the product, good or service.

Declarations

Conflict of interest

The authors declare that they have no conflict of interest in relation to the development of the interactive business card prototype with augmented reality.

They have no competing financial interests or personal relationships that could have influenced the results, analysis or conclusions presented in this article.

Authors' contribution

Ortega Gines, Héctor Bernardo: Contributed to the project idea and development of the prototype.

Hernández Guzmán, Julieta: Contributed to the research method and technique.

Esperanza Colmenares, Esperanza: Contributed to the tests with an experimental group and a control group.

Curioca Varela, Yedid: Contributing to the testing and validation of the prototype.

Availability of data and materials

The data and materials used during the development of this research are available upon written request to the corresponding author. This includes the source code of the prototype developed in Unity, the multimedia resources integrated in the interactive presentation card, as well as the data obtained during the validation tests carried out.

Funding

The present research did not receive any funding for the prototype and research.

Abbreviations

AR	Augmented Reality
RA	Augmented Reality
UX	User Experience
CTAs	Links and Calls to Action
SDK	Software Development Kit
MIPYMES	Micro, Small and Medium Enterprises
PyMEs	Small and medium-sized enterprises
2D	Two Dimensions

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