

Original Article

# Identification and Comparative Analysis of Metaverses Developed in Peruvian Universities

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**Abstract** - Peruvian universities' limited adoption of immersive technologies focuses on implementing seven educational metaverses. The main objective was to identify and compare these platforms to assess their impact on higher education. A methodology based on documentary review, interviews and comparative analysis was applied, considering criteria such as accessibility, functionalities and level of immersion. Among the metaverses evaluated are UchVerse (UCH), ContiVerso (Continental) and VR Engineering (UNSA), among others. The results show that the UchVerse obtained the maximum score (19/19), standing out for its functionality and accessibility, followed by the UDEP Metaverse (14/19). 57% of platforms include simulation of experiments, while only 29% support virtual reality headsets. In addition, 71% allow 360-degree mobility and avatar customization. However, the UNSA metaverse remains inaccessible, and the USMP metaverse has been inactive since 2018. In conclusion, Peruvian university metaverses have a high potential to improve teaching through collaborative and immersive experiences. However, challenges related to accessibility, sustainability, and academic production remain, emphasizing the need for greater investment and research to maximize their impact on higher education.

**Keywords** - Metaverse, VRChat, VR, Higher education, Peru, Immersive technologies.

## 1. Introduction

The United Nations Cultural, Scientific and Educational Organization (UNESCO) reports that, globally, less than 10% of educational institutions and universities have implemented institutional policies for the use of applications based on Artificial Intelligence (AI), such as the metaverse [1]. In this sense, research related to the metaverse in education is scarce and dispersed since it has been identified that there are only 29 scientific research documents oriented to this topic, which means that it is in its initial phase [2]. The metaverse has aroused considerable interest in the technology industry and academia, establishing itself as an innovative horizon for digital interaction. This emerging technology is progressively incorporated into different sectors of society, including education, where it provides transformative perspectives and poses significant challenges. Its constant development promises to revolutionize the traditional dynamics of interaction with knowledge and information, generating new opportunities for learning and teaching. This breakthrough suggests a future in which physical barriers are overcome through immersive virtual experiences [3]. In countries such as the United States, prominent institutions such as the Johns Hopkins hospital use virtual reality in teaching, creating

immersive environments for the practice of medical activities, such as surgical procedures [4]. In contrast, Latin America is in the early stages of adopting and developing these emerging technologies. This situation underscores the need to strengthen training in techno-pedagogical competencies to close gaps and take advantage of these tools' potential to improve educational and professional processes in various fields, including health. Several higher education institutions in Peru have begun exploring and developing their metaverses, designing virtual environments that provide new educational resources and foster innovation in the academic field.

These initiatives drive significant and positive changes in teaching and learning processes, offering opportunities to transform traditional education. However, implementations are not without challenges, as they require overcoming technological, pedagogical, and structural barriers to ensure their effective adoption and long-term sustainability in the national educational context [5]. The metaverse is an innovative technology that allows for creating immersive and shared environments, overcoming geographical barriers, and enabling simulated interactions with the physical environment



[6]. Education involves ethical considerations, especially in accessibility and inclusion, and adopting universal design principles that include tools such as screen readers, subtitles, adaptive controls, and adjusted reality. In addition, ensuring technological fairness through access to inclusive resources, protecting privacy, and moderating content is essential. Representing diversity and encouraging continuous assessments are key to developing ethical and inclusive educational environments.

At the university level, this tool redefines education by opening up new opportunities for teaching and learning, fostering research and strengthening global collaboration [7]. In addition, it promotes transformative educational methodologies that transcend traditional limitations, favoring an inclusive and globalized education. In this sense, various studies have shown that university teachers perceive the metaverse as an exceptional tool for hybrid and remote teaching, highlighting its multiple possibilities, such as creating interactive environments, simulation of practical scenarios and improving student participation. Integrating metaverses in universities represents a significant advancement in the educational field, combining innovative technologies with traditional methods to generate more immersive and accessible learning experiences. However, this progress poses the challenge of evaluating its development and implementation in Peruvian universities. This analysis is essential to understand the metaverse's current state in Peru's higher education, identifying opportunities and limitations. Despite their potential, comparative studies on metaverses developed by higher education institutions have not yet been conducted in the country [8]. Therefore, this work aims to identify and compare the metaverses developed in Peruvian universities. This study offers a detailed perspective on the current state of these technologies in higher education in Peru, highlighting the progress made and the pending challenges. This approach seeks to contribute a deeper understanding of its impact on academia. The research paper is organized as follows: section I contains an introduction, section II contains the metaverse and universities in which we will talk about the current situation, section III contains the description of the assessment and the metaverse environment, section IV the description of the functionality of the learning system, section V presents the comparative analysis, and finally, section VI contains the discussion and section VII the conclusions.

## 2. Literature Review

In [9], a comparative analysis explored collective perceptions and knowledge about the metaverse among media, academics, and the general public. The study identified key characteristics between different metaverses, showing that the academic field has addressed various related topics through varied methodologies. In contrast, the media and the public focused mainly on trends, commercial platforms and specific sectors of the metaverse. The results highlighted similarities and discrepancies in how the metaverse is

described and conceptualized between academic publications, journalistic reports, and comments on social networks, providing a comprehensive view of this emerging technology. In [10], a review was carried out to identify the applications and potentialities of the metaverse in the educational field. Using the PRISMA methodology, 44 relevant scientific articles were analyzed. The results indicated that augmented reality and metaverse-based avatars can significantly improve teaching and learning processes by encouraging active interactions with content and facilitating remote collaboration.

The authors highlighted that the metaverse offers valuable opportunities to simulate complex and real situations, especially benefiting health sciences, engineering, and architecture through effective practices. In [11], the potential of educational methodologies such as gamification, blended learning, and game-based learning within the metaverse was examined. Through a bibliographic review, 166 publications extracted from various databases were analyzed, using keywords and the snowball technique to select the sample. The results indicated that metaverses could significantly transform the teaching-learning process in formal education by combining technological capabilities with innovative pedagogical approaches. It was highlighted that metaverses provide rich and versatile environments that encourage interaction, participation, and active learning. In [12], metaverses' advantages and disadvantages were explored, focusing on Second Life as an educational platform. The methodology combined the author's experience in Second Life with a documentary analysis of relevant sources. The results highlighted that this platform provides an immersive environment that promotes interaction and collaborative learning, although it faces challenges such as technological dependence and limitations in non-verbal communication.

It was concluded that metaverses could transform educational spaces by fostering participatory, student-centered practices if existing technical barriers are overcome. In [13], it was analyzed how emerging technologies, including the metaverse, can transform education in the region, identifying current challenges and limitations. The authors employed a methodology based on an academic literature review and interviews with experts to examine educational experiences in extended realities. The results revealed growing interest and promising initial applications but highlighted obstacles such as inequality in technological access. The findings underscored the need to develop inclusive strategies that address these inequalities, ensuring that educational applications of the metaverse promote equitable and effective adoption.

## 3. Methodology

### 3.1. Identifying Metaverses

The metaverses currently implemented in the main universities in Peru were identified through a structured research process.

**Table 1. Definition of the evaluation criteria**

No	Term	Definition
1	Free access	Access is free without restrictions or the need for payment.
2	State	What state is the environment in if it is active, inactive, inaccessible, or private.
3	VR headset support	It is possible to use virtual reality devices for a more immersive experience.
4	Cross-platform (Meta Quest – desktop)	Compatibility with different platforms, such as Meta Quest and computers.
5	Total user immersion	Feeling of being completely immersed in the virtual environment.
6	Reproducibility of real university environments	Ability to accurately recreate the physical environments of a university.
7	Participation in the race	Integration of aspects related to various university careers.
8	360 Degree Freedom Walk	Freedom of movement in all directions within the virtual environment.
9	Multi-user online	Ability to interact with multiple users simultaneously online.
10	Object handling	The ability for users to interact with and modify virtual objects.
11	Simulation of experiments and career-related experiences	Ability to simulate experiments and experiences relevant to the academic career.
12	Instant Mobility (Teleportation)	Ability to instantly move between locations within the metaverse.
13	Avatar customization	Ability to customize the appearance of the user's virtual character.
14	Communication dimension (chat and/or voice)	Communication channels available within the metaverse, such as voice chat, text, etc.
15	Developed by students or third parties	Created by students or other third-party developers.
16	Scientific publication (Scopus)	If they have research oriented to their metaverse in Scopus.
17	Year of elaboration and publication	The year the metaverse was created and launched.
18	Free tour	Freedom for users to explore the metaverse according to their interests.
19	Real textures	Using realistic textures to represent objects and environments within the metaverse.

As a first step, an exhaustive search was carried out in the Scopus database, using the keywords “metaverse”, “university”, and “Peru”, connected by the Boolean operator “AND”. Due to the limited number of results obtained on this platform, the search in Google Scholar was replicated, which allowed the database to be significantly expanded and access to a more diverse set of information. This approach made it possible to consolidate a more complete overview of the development of the metaverse in the Peruvian educational context.

### 3.2. Comparative Analysis

Various carefully selected evaluation criteria will be used to carry out the comparative analysis of the data collected. These criteria will allow for a detailed and accurate comparison of the identified metaverses' specific characteristics, highlighting their similarities and differences.

This methodological approach aims to provide a comprehensive and structured view of the distinctive elements of each metaverse, covering key aspects that reflect the particularities and commonalities between the universities that are part of the universe of this research, thus guaranteeing a comprehensive and coherent analysis. Table 1 details the criteria selected for the analysis of metaverse-related data.

These include free access, which excludes any financial payment, and metaverse status, which can be classified as active, inactive, inaccessible, or private. Support for virtual reality headsets and multiplatform platforms (Meta Quest-computer) is also considered to enrich the immersive experience. The reproducibility of educational environments, freedom of movement with 360-degree views and interaction with multi-users are evaluated. Other aspects are the simulation of activities related to university careers, the customization of avatars, communication channels (chat or voice), the participation of external developers or students, the indexing of publications in Scopus, the year of elaboration and the application of realistic textures in virtual environments.

## 4. Results

### 4.1. Identifying Metaverses

#### 4.1.1. Continental University

The Universidad Continental, founded on June 30, 1998, in Huancayo, Peru, has established itself as a prestigious educational institution offering a wide range of 28 professional careers. In August 2018, it received the institutional license granted by the National Superintendence of University Higher Education (SUNEDU), which certifies its compliance with the quality standards required for higher education in the country [14].



Fig. 1 Continental university logo

Figure 1 shows the Universidad Continental logo, presenting the institution’s name in modern typography, highlighting a stylized “C” formed by horizontal lines to the left of the text. The design, entirely in black, evokes a formal and contemporary style.

#### 4.1.2. ContiVerso

Contiverso is the name that identifies the metaverse developed by the Universidad Continental, inspired by its main campus in Huancayo. This virtual environment allows students, through the use of virtual reality devices such as computers and smartphones, to immerse themselves in simulated spaces designed specifically for academic activities. User avatars can explore various areas, such as virtual classrooms, auditoriums, Gesell chambers, and rooms for interactive collaboration.

Figure 2 illustrates the infrastructure of the Continental University in the Contiverse, whose design is inspired by the architecture and layout of its main headquarters in Huancayo. This virtual environment replicates distinctive elements of the physical campus, allowing users to experience an immersive connection to educational spaces [15-18]. Figure 3 graphically represents the interactions that can be carried out within the Continent. In this space, users can actively participate in various academic activities, including interacting with other participants and presenting papers.



Fig. 2 Continental university infrastructure in the contiverse



Fig. 3 Classroom within the contiverse

#### 4.1.3. National University of San Agustín

The National University of San Agustín (UNSA) was founded on November 11, 1828, in Arequipa by order of the Liberator Simón Bolívar, under the original name of Universidad del Gran Padre San Agustín of the Department of Arequipa. However, it was only in 1832 that it obtained its official recognition. Subsequently, SUNEDU granted this university the institutional license, consolidating it as one of the leading higher education entities in the country [19].



Fig. 4 Logo of the national university of san agustín

Figure 4 presents the official logo of the UNSA, a design that symbolically combines tradition and institutional identity. In the logo, the initials are highlighted in large, prominent letters, complemented by the university’s coat of arms, a heraldic element that reflects history.

#### 4.1.4. VR Engineering

It is the metaverse designed by graduates and students from the same university whose purpose is to offer advanced solutions through virtual reality technology. Its main advantage lies in the ability to visualize machinery and projects in development on an absolute scale within virtual environments. In addition, it allows detailed evaluations and testing of prototypes, which contributes significantly to reducing operating costs and optimizes project planning and execution [20]. Figure 5 provides a comprehensive representation of the virtual environment called “VR Engineering”, which essentially functions as a virtual store and allows you to visualize all the objects created for experimentation.





Fig. 5 Report on the creation of the VR engineering



Fig. 6 Demonstration inside the VR engineering

Figure 6 presents a detailed illustration of the team during a demonstration conducted at VR Engineering. In this representation, the experience offered by the virtual space stands out.

#### 4.1.5. University of Sciences and Humanities

The University of Sciences and Humanities (UCH) was created on December 16, 2006, in Lima by Resolution 0411 issued by the National Commission for University Authorization and Operation (CONAFU). Subsequently, on November 21, 2017, it obtained the institutional license granted by SUNEDU, as stipulated in Resolution No. 071-2017, published in the official gazette El Peruano. Figure 7 shows the official logo of the university, characterized by a simple but representative design. In it, the initials in large capital letters and blue color stand out, which gives it a professional and modern appearance. This design is complemented by an emblem, which adds a distinctive and symbolic element to the whole.



Fig. 7 University of sciences and humanities logo

#### 4.1.6. UchVerse

The UchVerse is a virtual space created by students using the VRChat platform. This digital environment allows users to explore an interactive representation of the university campus, including its laboratories and key areas. It offers immersive experiences related to the various careers taught by the institution. One of the outstanding elements is a viewpoint that allows the entire contour of the campus to be viewed from above, providing a comprehensive perspective of the design [21].

Figure 8 details the infrastructure of the UCH's front façade on its campus in Los Olivos. This image provides a clear and comprehensive view of the architectural elements that make up the building's design. The three main pavilions, strategically distributed, stand out, as well as the grilles that delimit the space, along with other key components that reflect the structure and organization of the university.

Figure 9 shows a graphical representation of the male avatar used in the UCHVerse, located in the INTILab laboratory at the UCH headquarters. In this illustration, you can see not only the detailed design of the avatar but also the main components that make up the laboratory environment [22].



Fig. 8 UCH infrastructure in the uchverse



Fig. 9 INTILab lab at the uchverse

#### 4.1.7. University of Piura

The University of Piura (UDEP) was born as a project promoted by the Association of Piura Students between 1955 and 1956 to materialize the dream of establishing the first higher education center in the north of the country. After decades of development and consolidation, the institution received its institutional license from SUNEDU on January 27, 2017, certifying its commitment to the academic quality standards required at the national level. Figure 10 shows the official logo of the University of Piura, composed of the full name of the university written in blue letters and its emblematic coat of arms, which is placed as a distinctive and symbolic element.

#### 4.1.8. UDEP Metaverse

Developed in collaboration with Manifiesto Estudio and hosted on the Spatial.io platform, it is a virtual space designed to facilitate various academic and administrative activities. This metaverse integrates several functional areas, including an area dedicated to customer service in admissions and academic programs, a digital auditorium for holding live events, and a virtual meeting room with interactive screens and advanced technology for online meetings. Its design is inspired by the emblematic Government Building of the Piura campus, faithfully replicating its aesthetics and functionality in a digital environment [23]. Figure 11 offers a detailed representation of the structure of the UDEP Government Building within the metaverse, allowing us to appreciate both the architectural elements and the general design of the building.



Fig. 10 Logo of the university of piura



Fig. 11 UDEP government building in the UDEP metaverse



Fig. 12 Reception in the UDEP metaverse

This visual representation provides a comprehensive understanding of its construction, highlighting the complexity and precision of digital recreation and the aesthetic and functional aspects that characterize it [24]. Figure 12 presents a detailed image of the reception area inside the UDEP Government Building, recreated in the UDEP Metaverse. This representation allows us to observe the layout and elements of this space, highlighting its practical and functional design.

#### 4.1.9. San Martín de Porres University

The University of San Martín de Porres (USMP) was founded on May 17, 1962, by the Reverend Father Vicente Sánchez Valer, who established it on solid principles of philosophy and theology, promoting an integral formation based on values and knowledge. Over the years, the university has demonstrated a firm commitment to educational quality, and in 2017, it obtained its institutional license, which SUNEDU granted.

Figure 13 presents the USMP logo, composed of the initials of the institution, highlighted in large red letters, which convey strength and visual recognition and the symbolic shield that reflects the university's history, values and academic mission.



Fig. 13 Logo of the san martín de porres university

#### 4.1.10. Second USMP

The Second USMP, the metaverse created in 2008 by the University of San Martín de Porres, represented a highly innovative project at the time, standing out for incorporating educational elements and cultural and tourist elements.



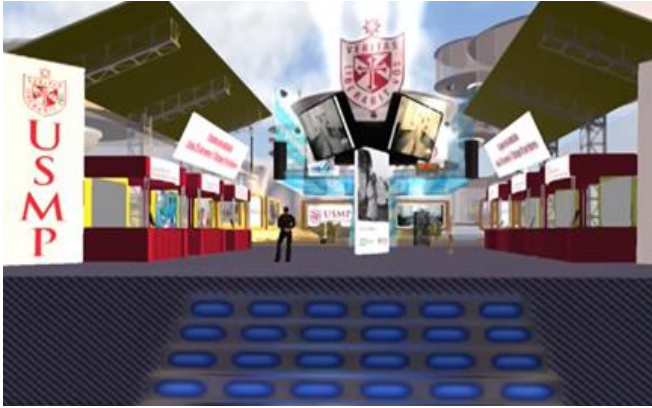


Fig. 14 Fair at the second USMP

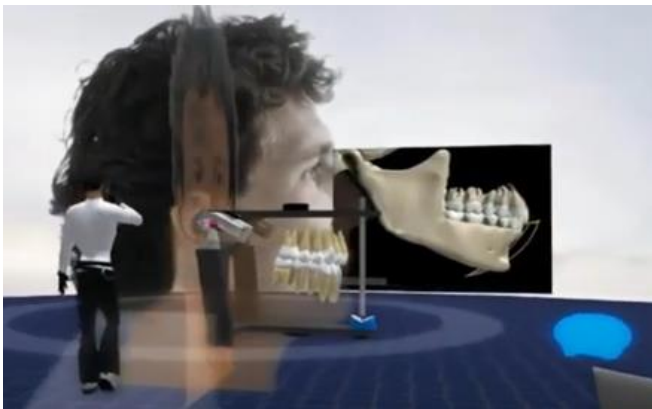


Fig. 15 Virtual dentistry class at the second USMP

One of its most iconic achievements was the virtual design of places such as Machu Picchu, allowing users to explore this important archaeological site interactively. This project remained active until 2018, when, due to various factors, it had to be closed. However, the virtual surroundings of Machu Picchu remained an architectural and cultural legacy [25]. Figure 14 illustrates a scene that captures the celebration of a fair on the virtual platform Segunda USMP. During this fair, participants could present and share their projects, creating a dynamic space for the exhibition of creative achievements.

Figure 15 shows a detailed representation of a dentistry class held on the Segunda USMP virtual platform. In this scene, the teacher uses an interactive virtual model to deliver the teaching, offering students an innovative and dynamic educational experience.

#### 4.1.11. University of Engineering and Technology

The University of Engineering and Technology (UTEC) is a private institution in Lima. It was founded in August 2011 to offer academic training in engineering and technology. Recognizing its commitment to the highest educational standards, the university was accredited by SUNEDU, obtaining its institutional license through Resolution of the Board of Directors No. 015-2016-SUNEDU/CD.



Fig. 16 UTEC logo

Figure 16 presents the official logo of UTEC, a modern and professional design that reflects the university's institutional identity. In the logo, the initial initials stand out in a combination of blue and black letters.

#### 4.1.12. Meta Waka

Meta Waka is a metaverse developed on the Decentraland platform and created in collaboration with Manifiesto Studio. This virtual environment is distinguished by integrating an interactive screen that allows the transmission of videos, offering a dynamic space for the presentation of audiovisual content. In addition, its floors are decorated with paintings that highlight the achievements achieved, allowing visitors to appreciate both the creative process and the results obtained.



Fig. 17 UTEC infrastructure in meta waka



Fig. 18 Meta waka project gallery

These paintings include layout designs of projects and exhibit the works made, carefully distributed throughout the different levels, highlighting the milestones and innovation represented in this virtual space [26].

Figure 17 provides a detailed view of the imposing UTEC building, highlighting the meticulous attention to detail that characterizes its architectural design. In this representation, the precise lines of its structure can be appreciated, as well as the careful selection of materials used in its construction.

Figure 18 presents an overview of the most outstanding projects developed by the university within the Meta Waka, providing a broad and detailed representation of the most significant achievements achieved by the institution. The arrangement of the elements in this representation facilitates a comprehensive understanding of the university's contributions.

#### 4.1.13. Peruvian University of Applied Sciences

The Peruvian University of Applied Sciences (UPC), founded on January 5, 1994, in Lima, has established itself as a private institution of reference in higher education. Currently, it offers 13 careers that cover various areas of knowledge, standing out for its focus on innovation and the comprehensive training of its students. In 2022, the UPC obtained the institutional license granted by SUNEDU, a recognition that certifies the quality of its educational proposal.

Figure 19 shows the official UPC logo, which stands out for its clean, modern, and professional aesthetic. It comprises an iconic red symbol representing three stylized flames, providing a distinctive visual element that reinforces the university's identity. In addition, the initials are presented in red text, followed by the institution's full name.

#### 4.1.14. UPC Cultural

In 2022, the UPC conducted an innovative experiment in the metaverse by creating a gallery as part of an internal competition organized by the university. This gallery simulates an art space in an immersive environment that allows users to explore and enjoy virtual exhibitions interactively.

Although not directly based on the university's physical infrastructure, this initiative reflects UPC's creative and innovative spirit and commitment to integrating digital technologies into education. Figure 20 highlights the modern and sophisticated architectural design of the virtual gallery developed by UPC Cultural.

This structure has two levels connected by an imposing wooden staircase, which includes black railings that add a touch of sobriety and style. On the second level, minimalist railings allow you to enjoy panoramic views of the first floor,

offering a sense of spaciousness and spatial continuity. Recessed lighting reinforces the elegance of the design, creating an immersive atmosphere that enhances the visual experience in the virtual environment. Figure 21 highlights the interior view of the gallery in which the lighting is distinguished, provided by strategically installed recessed spotlights, which create a contemporary and warm atmosphere, highlighting the exhibitions. Works featured include black-and-white images of landscapes and urban scenes, colour photographs that capture the beauty of natural landscapes, and pieces of modern art, both figurative and abstract, that bring diversity and depth to the exhibition space.



Fig. 19 UPC logo



Fig. 20 Gallery infrastructure at UPC cultural

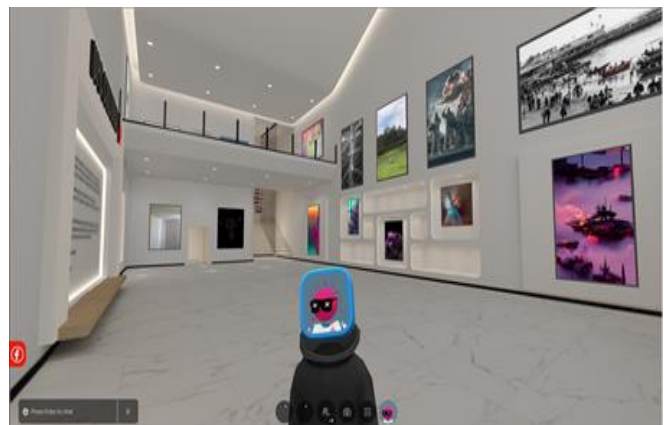


Fig. 21 Interior view of the gallery at UPC cultural



4.2. Comparative Analysis

Table 2. Comparative analysis between university metaverses

University	Continental University	UNSA	UCH	UDEP	USMP	UTEC	UPC	
Environment Name	Possess	Possess	VRChat	Spatial.io	Second life	Decentraland	OnCybe	
Metaverse Name	Contiverse	VR Engineering	UCHVERSO	UDEP Metaverse	Second USMP	Meta Waka	UPC Cultural	
1	Free access	-	-	x	x	-	x	x
2	State	Private (only use of the university community)	Not accessible	Active	Active	Inactive	Active	Active
3	VR headset support	-	x	x	x	-	-	x
4	Cross-platform (Meta Quest and PC)	-	x	x	x	-	-	x
5	Total user immersion	-	x	x	x	-	-	x
6	Reproducibility of real university environments	x	-	x	x	x	-	-
7	Participation in the race	x	-	x	-	x	-	x
8	360 Walk - Degrees of Freedom	x	x	x	x	x	x	x
9	Multi-user online	x	-	x	x	x	x	x
10	Object handling	-	x	x	-	x	-	-
11	Simulation of experiments and career-related experiences	x	x	x	-	x	-	-
12	Instant Mobility (Teleportation)	x	-	x	-	x	x	-
13	Avatar customization	x	-	x	x	x	x	x
14	Communication dimension (chat and/or voice)	x	x	x	x	x	x	x
15	Developed by students or third parties	Third	x	x	Third	Third	Third	Third
16	Scientific publication (Scopus)	x	-	x	-	-	-	-
17	Year of elaboration and publication	2022	2022	2023	2023	2008	2022	2022
18	Free tour	x	x	x	x	x	x	x
19	Real textures	x	x	x	x	x	-	-

Table 2 presents a comparative analysis of university metaverses based on specific evaluation criteria. Free access is enabled only in the metaverses of the UCH, UDEP, UTEC and UPC, while the active metaverses correspond to these same institutions, in contrast to that of the Universidad Continental, which is private; that of the UNSA, which is not accessible; and that of the USMP, which is inactive. Features like VR headset support, cross-platform functionality (Meta Quest and PC), and full user immersion are available only in the UNSA, UCH, UDEP, and UPC metaverses. The reproducibility of real university environments is present in the metaverses of the Continental University, UCH, UDEP and USMP. At the same time, participation in career-related activities occurs at Continental University, UCH, USMP, and UPC.

In addition, 360-degree freedom scrolling is enabled in all metaverses, and online multi-user functionality is available in those of the Universidad Continental, UCH, UDEP, USMP, UTEC and UPC. On the other hand, object handling is exclusive to the UNSA, UCH and USMP metaverses, and the simulation of experiments is only present at the Continental University, UNSA, UCH and USMP. Instant mobility is enabled in the Universidad Continental, UCH, USMP, and UTEC metaverses, while avatar customization is available for all but UNSA. Chat and voice communication are features common to all metaverses analyzed. In terms of their development, the UNSA and UCH metaverses were created by students, while third parties developed the others. Only the metaverses of the Continental University and UCH have associated scientific publications.

**Table 3. College metaverse benchmarking score**

University	Metaverse	Total score
Continental University	ContiVerso	13/19
UNSA	VR Engineering	11/19
UCH	UchVerso	19/19
UDEP	UDEP Metaverse	14/19
USMP	Second USMP	13/19
UTEQ	Meta Waka	10/19
UPC	UPC Cultural	13/19

Finally, the years of creation vary from 2008 for the USMP to 2023 for the UCH and UDEP. Table 3 shows the total scores obtained in the comparative analysis between university metaverses according to the evaluation criteria. The ContiVerse obtained 13 points out of a total of 19, the VR Engineering obtained 11 points, the UchVerse obtained a score of 19 out of 19 points, The UDEP Metaverse obtained 14 points, La Segunda USMP obtained 13 points, The Meta Waka obtained 10 points and UPC Cultural obtained 13 points.

## 5. Discussion and Conclusion

This study made it possible to identify the existing university metaverses in Peru, highlighting a total of seven platforms developed by various institutions. Among them is the ContiVerso of the Continental University, VR Engineering of the UNSA, UchVerso of the UCH, UDEP Metaverse of the UDEP, Second USMP of the USMP, Meta Waka of the UTEQ and UPC Cultural of the UPC. Each of these metaverses reflects the effort of Peruvian universities to incorporate immersive technologies to enrich education and adapt to contemporary virtual learning needs. The comparative analysis revealed significant differences between the evaluated metaverses, highlighting that only VR Engineering and UchVerse were developed by students [9], highlighting their formative approach. In addition, only UchVerso and ContiVerse have studies published in recognized databases

such as Scopus, evidencing an opportunity to strengthen academic production in this field. The timeline of metaverses, from those created in 2008 to the most recent ones in 2023[11], reflects disparities in technological adoption and innovation. This context highlights the need to deepen its educational impact and potential to transform higher education [12]. On the other hand, although some of the metaverses analyzed are accessible to the public, the ContiVerse remains a private environment. At the same time, VR Engineering is not accessible, and the Second USMP is inactive. Information about the latter comes only from secondary sources, such as newspaper articles, university papers, and audiovisual material, which may limit the accuracy of the analysis [13]. This highlights the need for Peruvian universities to conduct more detailed and direct research in their own metaverses, guaranteeing complete data collection for a better understanding of these virtual environments. The analysis of the cumulative scores according to the evaluated criteria showed that the UchVerse obtained the maximum score of 19, standing out as the metaverse with the highest coverage in functionalities. The UDEP Metaverse follows it with a score of 14, while the ContiVerse, the Second USMP and UPC Cultural reached a score of 13. These results show that the UchVerse is positioned as the most complete and versatile virtual environment in evaluated capabilities, highlighting the importance of its design and development in university education. This study highlights the importance of deepening research on metaverses, as these environments offer advanced tools for simulations and collaborative activities that significantly enrich the educational experience. The exploration of this topic contributes to strengthening higher education, not only in Peru but also globally, as it is an emerging technology with a wide potential for application. Future research must analyze how these platforms can optimize teaching and learning processes, maximizing their impact on students' academic and professional training.

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