



ORIGINAL RESEARCH ARTICLE

Policymakers' Accessibility Model for the Development of Metaverse Universities and Development of an Artificial Intelligence-Based Protocol

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ABSTRACT

The main gap currently is the lack of a comprehensive AI-based policymakers' accessibility model that can provide key information to decision-making institutions in a transparent and real-time manner. Without such a model, the development of metaverse universities in the Iran will not only be slow and fragmented, but there is also a risk of increasing the digital divide and reducing the quality of higher education. Hence, the fundamental question is how to design an AI-based model for policymakers' accessibility to enable the sustainable and effective development of metaverse universities? The research method was a mixed qualitative research (synthesis research and conversation with GPT chat), the research field included all articles published in the period 2020-2025), as well as the information domain of artificial intelligence and the method of purposive sampling to the point of data saturation, respectively, 33 articles and 23 conversations with artificial intelligence were selected for the study by screening. The method of collecting information was by referring to reputable scientific databases and conversation with GPT chat. Data analysis was based on the classification of open concepts, subcategories and main categories. The triangulation method was used to ensure the validity and validation of the data. In general, the results showed that the accessibility model of policymakers based on artificial intelligence for the sustainable and effective development of metaverse universities consists of five dimensions: "providing infrastructure", "strategic planning", "empowering university presidents", "monitoring education quality", and "information processing". The final protocol based on artificial intelligence includes 5 sections: "needs identification", "resource improvement", "decision support", "trend prediction", and "continuous monitoring". ©authors

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Introduction

Technological developments in the last decade, especially the expansion of the metaverse as a new generation of cyberspace and artificial intelligence as a driving force for decision-making, have created new opportunities and challenges in the field of higher education (Shwede, 2024). Universities, as centers of knowledge production and human resource development, are forced to adapt to these changes. By providing three-dimensional, interactive, and simulated learning environments, the metaverse can improve the quality of education, educational justice, and student skill development. However, utilizing these capacities is not possible without the support of policymakers, the development of upstream documents, and the creation of specific protocols (Abdulmuhsin, Owain, & Alkhwalidi, 2024). On the other hand, the lack of a clear legal and strategic framework in the field of intellectual property, data security, privacy, as well as the lack of fair infrastructure for access by all students, can lead to educational gaps and social harms. Also, without the use of data-based decision-making and artificial intelligence, policymakers will not be able to predict educational trends in the metaverse, monitor problems, and ensure the quality of education (Al-Kfairy, et al, 2024). In such circumstances, it is necessary to design a model for the accessibility of policymakers so that they can continuously use reliable data, intelligent analysis, and feedback from stakeholders (professors, students, and university administrators) and make scientific, fast, and effective decisions in line with the development of metaverse universities (Hadi Mogavi, 2023). One of the most important prerequisites for the development of metaverse universities is the existence of technological infrastructure and equitable access to them. The lack of indigenous metaverse platforms, lack of bandwidth, high cost of equipment (headsets, virtual reality glasses, servers), and inequality in access for students from disadvantaged areas hinder the realization of educational justice and balanced development of the academic metaverse. If policymakers do not have access to accurate information, analytical data, and technological solutions, their decisions will be fragmented and inefficient (Singh, 2024). The main challenges for the development of metaverse universities are their dependence on foreign and non-native platforms. In addition to creating security problems (leakage of educational data, threat to intellectual property), this prevents the adaptation of educational content to the culture, language, and local needs of the Iran. At the same time, public metaverse platforms are designed more for entertainment and games and are not optimized for higher education. Therefore, creating a native three-dimensional and interactive learning platform is not only a technological necessity, but also a strategic need for the country's scientific and educational independence. With the expansion of digital technologies and the metaverse, universities need to move their interactive, research, and laboratory education to virtual environments. Virtual laboratories allow students to gain hands-on and research experience without geographical and physical constraints. However, the development of these infrastructures requires smart decision-making and high accessibility from policymakers to provide appropriate resources, funding, regulations, and standards. Metaverse universities require a transformation in the role and skills of human resources. Faculty, administrators, support staff, and even students must be empowered to work in interactive 3D environments, artificial intelligence, and virtual learning. Without a human resource empowerment program, the development of the metaverse will lead to the creation of an "infrastructure without content" (Burnett, Harvey, & Kay, 2022).

According to (Butvilas, & Kołodziejski, 2024), metaverse and artificial intelligence have provided unprecedented opportunities for the transformation of higher education. Metaverse universities can realize 3D interactive education, simulated research, and educational equity at the national and transnational levels. Despite these potentials, the development of metaverse universities faces significant challenges: lack of adequate infrastructure, lack of educational standards, unequal access of universities and students, and lack of coordinated

strategic policies. According to (Hendartho, D., & Flores, 2025), with the advancement of metaverse technologies and 3D interactive education, universities need to expand their education and research beyond physical limitations. The National Academic Metaverse Network Design is an infrastructure that connects universities and research centers into a unified network to enable secure and fast access to educational resources, virtual laboratories, and research data. With the development of metaverse universities, it is essential to create sustainable, secure, and scalable digital and 3D infrastructure. Infrastructure deficiencies such as insufficient bandwidth, insufficient server capacity, lack of interactive equipment, or simulation software can reduce the quality of education and research. Artificial intelligence can identify infrastructure deficiencies and bottlenecks by analyzing operational data, network traffic, platform usage, and user feedback, and provide optimal solutions for the sustainable development of metaverse universities (Radanliev, De Roure, Novitzky, & Sluganovic, 2024). Entering the metaverse requires creativity and innovation, which is possible through the integration of new technologies such as artificial intelligence, blockchain, virtual reality, augmented reality, and other technologies with teaching and learning, but for this purpose, those involved in education and related systems must have the necessary capabilities (Lantri, Esposito, & Capucio, 2025). Metaverse universities, as a new generation of higher education, require technological infrastructure, legal frameworks, and policy strategies. One of the key challenges is the availability of data, analytics, and smart scenarios for policymakers to make effective decisions for the development of these universities. The lack of strategic planning based on artificial intelligence leads to fragmentation, parallelism, and inefficiency in policymaking (Oladokun, 2025).

To become a sustainable and equitable educational platform, metaverse universities require technical infrastructure (hardware, software, network) and support services (educational, research, management). If these infrastructures and services are not designed in an integrated and intelligent manner, the development of metaverse universities will face problems such as slowness, lack of security, lack of educational justice, and high costs (Ajani et al, 2024). From a research perspective, this study helps to fill the gap in the scientific literature on the dimensions of policymakers' accessibility in the development of metaverse universities and provides a new model based on synthetic research and artificial intelligence data. From a theoretical perspective, by combining the concepts of educational policymaking, technology governance, and digital learning, it provides a conceptual framework for analyzing and explaining the role of policymakers in the development of metaverse universities. From a practical perspective, this model can be a guide for policymakers, university presidents, and educational administrators in designing digital transformation programs, improving the quality of education, developing infrastructure, and ensuring educational equity. Regarding the research gap, it should be noted that some studies such as (Hendartho, D., & Flores, 2025; Burnett, Harvey, & Kay, 2022) have addressed the metaverse from the perspective of learning space and environment, while others such as (Radanliev, De Roure, Novitzky, & Sluganovic, 2024) have pointed to the advantages of metaverse education/learning in terms of creativity and innovation. Another group of studies (Butvilas, & Kołodziejwski, 2024) have studied the metaverse and the education associated with it from the perspective of the necessary infrastructure, a group such as (Ajani, 2024) have studied the financial costs that make up metaverse education and learning, and some studies (Oladokun, 2025) have made suggestions in terms of the necessary technologies that the metaverse education system requires. Also, another group of studies (Hassanzadeh, 2022) have addressed the future of metaverse-based higher education.

Accessibility in the literature of digital policy and education means the provision of equal conditions, resources, infrastructure and opportunities for all stakeholders to benefit from services, information and facilities without discrimination and barriers. In the context of metaverse universities, accessibility means that policymakers, managers and stakeholders

can access data, tools, infrastructure, educational content, innovative services and strategic decisions in an easy, transparent and timely manner (Chadli, Gretete, & Moumen, (2021). Accessibility in the development of metaverse universities is an indicator of educational equity, inclusiveness, inclusive participation, transparency, and the ability to effectively utilize digital opportunities and artificial intelligence in policymaking (Acosta-Vargas, et al., 2022).

However, the effort of the present study has been to provide an accessibility model for policymakers for the development of metaverse universities, for which purpose it has developed an artificial intelligence-based protocol. Therefore, the main issue of the present study is what model and protocol can ensure the accessibility of higher education policymakers in the development of metaverse universities and, by using artificial intelligence, provide the basis for evidence-based decision-making and improving the quality of education?

Literature Review

According to the study by Lee, et al. (2025) titled “A Framework for Developing University Policies on Managing Generative Artificial Intelligence: A Cross-Country Comparative Study”, a systematic and consistent framework is needed to evaluate and optimize university metaverse policies in different educational contexts. By identifying key policy features, enhancing policy effectiveness, and striking a balance between technology, ethics, and education, it enables universities to develop sustainable and relevant policies that enhance their digital competitiveness and institutional readiness for AI-based education. The study by Haytham, and Goetter (2024) titled “Factors Affecting Attitudes toward the Use of Metaverse Technology” showed that metaverse is a three-dimensional virtual world that relies on reality simulation to represent real-life experiences and can be classified as the next generation of Internet use. Perceived enjoyment significantly positively influences the use of metaverse technology. Furthermore, perceived curiosity and perceived self-efficacy positively influence the metaverse transfer of technology application. Furthermore, perceived ease of use and perceived usefulness have a positive effect on attitudes towards using the metaverse technology/application, meaning that all the previous factors have an overall positive effect on attitudes towards using the metaverse technology application. The study by Osman, et al. (2024) titled “The Accessible Metaverse: A Theoretical Framework for Accessibility and Inclusion in the Metaverse” found that accessibility is incorporated into its fundamental design. Ethical and legal considerations, such as privacy, non-discrimination, and evolving legal frameworks, are identified as critical factors shaping an inclusive metaverse. The emerging discourse on the metaverse and digital accessibility helps provide a detailed understanding of its complexities and a roadmap for future exploration and development. This emphasizes the need for a multifaceted approach that encompasses technological innovation, user-centered design, ethical considerations, regulatory compliance, and ongoing research to create an inclusive and accessible metaverse.

The study (Hassanzadeh, 2022) entitled “Metaverse, Metaversity, and the Future of Higher Education” showed that the metaverse, as an ever-expanding virtual reality, is creating dramatic changes in all social structures. On the one hand, it has provided unprecedented challenges for universities and higher education, and on the other hand, it has offered unparalleled opportunities for academic growth and excellence. The degree of success in facing the challenges and making the most of the available capabilities depends on how higher education administrators face and accept this virtual reality. In this article, parallel generational changes among citizens and universities are explained and the characteristics of each are briefly explained. Then, focusing on the developments ahead of university systems, the concept of the metaverse as an emerging reality is outlined to provide a framework for the effective presence of universities in the metaverse environment. This

article is a starting point for a discussion on the transformation of universities into virtual worlds and is recommended for higher education administrators.

Wang, Yu, Bell, and Chou (2022) study titled “Metaverse: A New and Innovative Framework for Building a New Education Ecosystem” showed that best practices in designing metaverse learning environments require providing a new and innovative theoretical framework. This ecosystem consists of four main poles: 1) Technology Pole of Educational Design and Performance; 2) Knowledge Pole; 3) Research and Technology Pole; and 4) Talent and Education Pole. Common factors across all four poles are: 1) Infrastructure, Business Industry, and Communications; 2) Technology Access and Equity; and 3) User Rights, Data Security, and Privacy Policy

Research questions

- Q1. What are the dimensions and components of policymakers’ accessibility for developing metaverse universities?
- Q2. What is the accessibility Model of policymakers for the development of metaverse universities?

Method

This study was conducted with a mixed qualitative approach and using two main methods, namely synthesis research and conversation with artificial intelligence (ChatPT). The research field included all scientific articles published in the field of metaverse university and artificial intelligence in the period from 2020 to 2025, as well as data extracted from the information domain based on artificial intelligence.

The sampling method in this study was purposeful and until theoretical saturation of the data was reached. Based on the determined criteria (topical relevance, source originality, scientific validity, and alignment with the research objectives), finally 33 valid scientific articles and 23 in-depth conversations with ChatPT were selected and studied. The selection of sources and data was based on a multi-stage screening process including initial identification, review of abstracts, elimination of duplicates, and finally selection of relevant and valid sources.

The data collection method was carried out through two main routes: 1. Referring to reputable international scientific databases such as Scopus, Web of Science, Springer, IEEE, and Google Scholar in order to access research articles. 2. Conducting structured and semi-structured conversations with Chat HiPT as an interactive resource based on artificial intelligence to identify new dimensions and categories.

After recording and coding, the collected data were analyzed using content analysis and through the classification of open concepts, subcategories, and main categories. In this process, an attempt was made to extract key themes and provide a conceptual framework to explain the dimensions of accessibility for policymakers in the development of metaverse universities based on artificial intelligence. To ensure the reliability and validity of the data, the three-way method was used. In this regard, data overlapped from three different sources (scientific articles, interactive conversations with artificial intelligence, and review by experts in the field of higher education and technology). This approach increased the reliability, accuracy, and comprehensiveness of the findings.

Findings

Research Question 1: What are the dimensions and components of policymakers’ accessibility for developing metaverse universities?

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Table 1. Policymakers' accessibility for developing metaverse universities: Providing infrastructure

Inclusive category	Central category	Open concepts
Providing infrastructure	Creating native 3D and interactive learning platforms	Possibility of holding simulated classes with live interaction between teacher and student (M1 G3), Persian user interface and educational content appropriate to Iranian educational culture (M5 G2), virtual laboratories (M2 G3), medical and engineering simulators (M1 G3), technical workshops, integrated artificial intelligence for analyzing learning behavior (M2 G2), providing intelligent feedback and personalizing education (M2 G5), data security and ownership (M5 G3), observing privacy principles and storing data on national servers (M2 G2)
	Development of virtual laboratories	Access to research data, student needs (M3G4), statistics on the use of laboratories and educational quality indicators (M4G3), designing legal frameworks and standards for metaverse and virtual laboratories, (M2G4), training university administrators (M5G3), professors and students for the effective use of metaverse infrastructure (M2G5), creating technical infrastructure, interactive platforms (M2G3), simulation software and virtual laboratories (M3G2), performance monitoring (M2G2), quality of education (M4G1), student satisfaction and feedback from policymakers to modify and improve the system (M3G2), data analysis, forecasting needs and providing optimal solutions for the development of virtual laboratories (M5G1), providing operational guidelines and standards for universities and policymakers (M5G2), collecting opinions from students and professors and updating policies and infrastructure accordingly (M3G4)
	Designing a National Academic Metaverse Network	Connecting universities to a single metaverse network for knowledge and resource exchange (M6G3), equal access for students across the country to educational resources and virtual laboratories (M4G2), facilitating inter-university projects and joint research (M5G2), intelligent policy decision-making, university integration (M4G3), increasing educational equity (M5G3), supporting research and innovation (M6G1)
	Using artificial intelligence to identify infrastructure deficiencies	Network and infrastructure data analysis, identifying bottlenecks in bandwidth and servers (M3G5), monitoring the performance of cloud systems and storage (M5G3), monitoring platform usage (M4G7), analyzing user behavior (M7G2), volume of interactions and traffic in 3D environments (M3G4), identifying peak hours and points that need optimization, (M2G7), simulation and forecasting needs (M25G4), modeling user growth and educational content (M3G7), predicting future hardware and software needs (M3G7), intelligent feedback from users (M5G3), analyzing student and professor feedback using NLP (M4G2), identifying common problems and educational needs (M7G3), intelligent allocation of processing (M24G3), memory and bandwidth (M8G1), prioritizing infrastructure upgrades based on data Analytics (M7G2), Connecting Metaverse University Management Systems, Servers (M4G2), Network and Educational Software (M2G8), Machine Learning to Identify Shortages and Predictive Algorithms for Future Needs (M7G2), Providing Visual Dashboards for Managers and Policymakers (M7G3), Using New Data to Improve Models and Resource Planning (M7G1)

Based on the findings in Table 1, one of the dimensions of policymakers' accessibility to the development of AI-based metaverse universities is the provision of infrastructure, which was based on four core categories (creating native three-dimensional and interactive learning platforms, designing a national academic metaverse network, developing virtual laboratories, and using AI to identify infrastructure deficiencies).

Table 2. Policymakers' accessibility to the development of AI-based metaverse universities: strategic planning

Inclusive category	Central category	Open concepts
Strategic planning	Data-driven decision-making	Policymakers using AI analytics to access accurate data on educational and infrastructure needs (12 8 G7), creating a national university metaverse data bank (M 8 G6), monitoring data and identifying infrastructure deficiencies with the help of AI. (M 9 G11), mapping the future of metaverse universities within the framework of a higher education roadmap (M 8 G3), continuously refining strategies with new data (M 23 G3), predicting different policy outcomes in the short term, (M 6 G10), medium term and long term (M 11 G9), data generated by professors and students (M 8 G3),
	Policymaking and legislation	Developing metaverse regulations and standards (M11G8), data ownership frameworks (M10G9), privacy and security (M10G8), setting standards for accreditation of metaverse courses and certificates (M13G10), a framework for assessing the quality of interactive teaching and learning (M12G9), creating national protocols for the development of metaverse platforms (M10G7), ensuring compatibility with global technologies (M9G10), legislation in the field of intellectual property of metaverse content (M26G7).
	Empowerment and human resources	Training policymakers (M11G8), managers and professors to use artificial intelligence tools (M13G5), creating specialized hubs for policy advice (M9G7), training teaching skills in the metaverse environment (M13G10), the ability to design interactive and multimedia content (M12G10), using artificial intelligence tools to personalize learning (M11G8), training data analysis and data-driven decision-making with the help of AI (M10G12), developing skills in managing digital and remote universities (M12G6),

	Infrastructure and services	Developing national metaverse platforms (M12G10), creating virtual laboratories and integrated university networks (M27G6), user interactions in the metaverse environment (M14G11), national investment and private sector participation to provide hardware and networks (M12G3), creating a consortium of metaverse universities to share resources and services (M12G4), using AI to optimize resources and identify infrastructure deficiencies (M28G8), standardizing metaverse educational and research services to maintain quality (M13G9), designing security and legal protocols to protect data and interactions (M11G5),
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Based on the findings in Table 2, one of the dimensions of policymakers' accessibility to the development of AI-based metaverse universities is policy and strategy, which was based on four core categories (data-driven decision-making, policy and legislation, empowerment and human resources, infrastructure and services).

Table 3. Accessibility of policymakers for the development of AI-based metaverse universities: Empowering university presidents

Inclusive category	Central category	Open concepts
Empowering university presidents	Data-driven Hebraism and Metaverse Strategy	Developing a "metaverse vision" and a 3-year roadmap with key performance indicators (M16G14), creating a metaverse project management office (M27G14), designing a "metaverse balanced scorecard", indicators (example): acceptance rate of comprehensive metaverse classes for higher education managers (M16G14), holding virtual courses on leadership strategies, familiarizing managers with optimizing student retention rates (M16G14),
	Metaverse and AI Literacy for Senior Managers	Data-driven decision-making, legal-ethical literacy (M18G16), regulatory scenario writing workshop for managers (M19G15), AI decision-making lab (M19G15), indicators for making decision-making modules available (M19G14), using decision-making tools (M17G18), optimizing decision-making quality (M20G19), familiarization with information privacy (M29G22), familiarization with information and data dashboard literacy (M24G22), familiarization with data budgeting (M23G21), data standardization literacy (M30G14), metaverse data roadmap literacy (M17G15)
	Metaverse Leadership Competencies	Improving the managerial, technological (M31G23), legal and scientific diplomacy competencies of university senior managers for effective interaction with policymakers. (M29G22), Creating mechanisms and protocols that enable policymakers to understand evidence (M30G20), data and needs of universities and provide the necessary legal/financial support (M30G21),

Based on the findings in Table 3, one of the dimensions of policymakers' accessibility to the development of AI-based metaverse universities is university presidents, which was based on three core categories (data-driven leadership and metaverse strategy, metaverse and AI literacy for senior managers, and metaverse leadership competencies).

Table 4. Policymakers' accessibility to the development of AI-based metaverse universities: monitoring the quality of education

Inclusive category	Central category	Open concepts
Monitoring the quality of education	Education/ Learning	Student attendance and participation in face-to-face and online classes (M 31G22), Academic performance analysis with predictive artificial intelligence models (M 31G22), Early identification of academic dropout (M 31G22), Learning quality data in the metaverse (attendance, participation, effectiveness) (M 31G22), Professors' research reports as evidence packages for policymakers (M 31G22),
	Teacher/Education Processes	Intelligent feedback on teachers' teaching methods (M31G20), Measuring the effectiveness of classroom strategies in improving engagement and learning (M31G20), Designing an inclusive learning experience (M31G20), Analyzing learning data with AI (M31G20), Educational innovation (M31G22), Teachers generate real evidence and data (M31G18), Joint meetings to present findings from metaverse classes (M31G18), Teachers' participation in the Ministry of Science advisory working groups (M31G21),
	Policymaking and governance	Management dashboards for education heads and policymakers (M30G16), providing real-time reports on health and quality indicators of education (M30G15), establishing supportive laws and regulations (M31G18), allocating financial and infrastructure resources (M30G16), setting standards and criteria (M30G17), supporting innovation and research (M30G13), creating legal sandboxes for testing new technologies without legal risks (M30G14), developing national standards for the quality of education in the metaverse (M30G16), enabling digital certificates to be

		validated, budgeting for a high-capacity network (M31G16), artificial intelligence servers, and virtual reality equipment (M31G19),
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Based on the findings in Table 4, one of the dimensions of policymakers' accessibility for the development of metaverse universities is monitoring the quality of education, which was based on three core categories (teaching/learning, professor/educational processes, policymaking, and governance).

Table 5. Policymakers' accessibility to the development of metaverse universities: information processing

Inclusive category	Central category	Open concepts
Information processing	Educational and learning information	Student participation rates in inclusive classes (M 31G20), academic achievement data and potential dropout (M 31G23), analysis of learning styles and individual needs (M 31G19), data related to individual student achievement (M 32G23), learning styles (M 30G23), interaction with inclusive content, educational outcomes in the metaverse environment (M 31G17), transforming raw educational data into applied knowledge for policymakers (M 33G19),
	Research and innovation information	Knowledge production indicators in the metaverse (articles, patents, spin-offs) (M30G18), data on the creation and application of new ideas (M32G19), interdisciplinary projects (M31G20), commercialization of knowledge and development of new educational technologies in the metaverse environment (M31G16), transformation of research and innovative data into understandable and operational information for policymakers (M31G14), research output information (M32G19), patent and intellectual property information (M30G17), innovation and technology development information (M30G19), impact and networking information (M33G15),
	Economic and financial information	Cost-benefit of implementing a metaverse university (M33G21), the amount of capital attracted (M33G19), government support and revenue generation from virtual courses (M32G20), the amount of budget allocated to the development of the metaverse and artificial intelligence infrastructure (M30G21), resource allocation between the educational (M30G21), research and technology sectors (M31G22), reducing the costs of in-person classes or traditional infrastructure (M32G20), comparing investment costs with the productivity of learning and knowledge production (M32G19), revenues from online courses (M31G23), selling metaverse content or services (M31G22), creating educational and technological startups and spin-offs (M32G19),
	Governance and policy information	Compliance with national and international laws (privacy, intellectual property, standards) (M31G22), Level of acceptance of stakeholders (professors, students, families) (M31G22), Governance information (M31G22), Political information, data and evidence related to laws (M31G22), National and international standards, policies and strategies for the development of metaverse universities (M31G23), Status of compliance with national and international laws in the field of education (M31G22), Technology and intellectual property (M31G22), Transparency and standardization of regulations for inclusive environments (M31G22), University strategies for developing metaverse content, innovation and collaboration with industry (M31G22), Management structures of metaverse universities (M31G22), Transparency and accountability in resource allocation and unit performance (M31G22), Effectiveness indicators Network Management and Governance (M31G22),
	Information output	Understandable and timely information (not bulky raw data) (M32G23), comparative reports (before and after the implementation of the metaverse) (M33G23), performance indicators (M30G23), participation and quality of learning (M31G19), research reports (M31G22), innovation indicators (M33G19), cost-benefit analysis (M33G22), ROI and revenue generation indicators (M33G18), educational key performance indicators (M33G20), financial key performance indicators (M33G23), research key performance indicators (M33G23),

Based on the findings in Table 5, one of the dimensions of policymakers' accessibility for the development of metaverse universities is information processing, which was based on four core categories (educational and learning information, research and innovation information, governance and policy information, and information output).

Research Question 2: What is the accessibility pattern of policymakers for the development of metaverse universities?

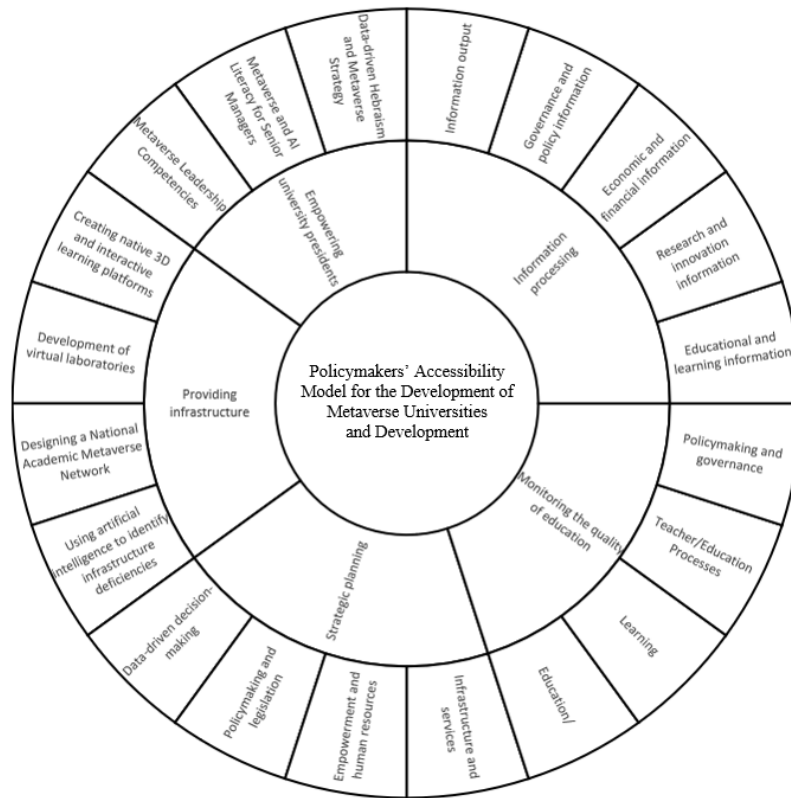


Figure 1. Policymakers' accessibility model for developing metaverse universities

Research Question 3: What is the proposed protocol for policymakers' accessibility for developing artificial intelligence-based metaverse universities?

The following interviews were conducted to prepare and compile the protocol for policymakers' accessibility for developing metaverse universities, as follows:

Table 6. Dialogue text for developing metaverse universities: providing infrastructure

School Counseling Expert	Interviewer
We are at a point today where traditional education alone is no longer meeting the needs of students. If we are to institutionalize the metaverse in higher education, we need three layers of infrastructure: First, 3D and interactive learning platforms that allow students to interact in virtual environments as if they were physically present in the classroom. Second, virtual labs for basic science and engineering disciplines so that students can experience complex experiments and projects in a safe and low-cost environment. Third, and much more importantly, educational equity. We don't want the metaverse to be available only to a select few; we need to provide supportive high-speed internet and virtual reality headsets to disadvantaged areas so that all students have equal opportunities.	What infrastructure do metaverse universities, as an emerging phenomenon, need in order to develop sustainably in our country?
Yes, this is a real concern. The immersive experience in a virtual world can lead to problems such as addiction to the metaverse, social anxiety, or even a decrease in human connections. That is why we need an intelligent referral system. That is, metaverse platforms should be designed in such a way that they can detect early signs of psychological problems—for example, a sudden decrease in interaction, unusual repetitive behaviors, or signs of mental burnout—and intelligently refer the student to counselors or psychologists. This is where artificial intelligence plays a crucial role: both to monitor user behavior and to suggest timely psychological interventions.	There are some concerns about the psychological problems that come with being in the metaverse for a long time. How do you see this challenge?
Exactly. If technological infrastructure is developed without regard for the mental health of students, the metaverse will become a harmful tool. But if protocols include equity in access, data security, and mental health-smart referrals from the start, then the metaverse university can become an empowering platform for all generations.	So in a way, the infrastructure protocol of the Metaverse University is not just technology, but a combination of technology and mental health?

Table 7. Dialogue text for the development of metaverse universities: strategic plans

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School Counseling Expert	Interviewer
The first step is to have a national roadmap. We cannot advance the metaverse merely at an experimental or fragmented level. We need to approve a national document on the development of metaverse universities in the Supreme Council of the Cultural Revolution or the Ministry of Science to specify the goals, financial resources, and implementation mechanisms. This document will be like a backbone.	What strategic actions should be prioritized to institutionalize the metaverse university in the higher education system?
Exactly right. In the metaverse space, educational data, research projects, and even the digital identity of students are at stake. Therefore, a comprehensive legal framework must be defined that covers three axes: 1. Intellectual property of content produced in the metaverse, whether by professors or students. 2. Privacy and protection of users' personal information. 3. Data security against cyberattacks or possible abuses. Without such a framework, the metaverse will not only not be an educational opportunity but could also become a threat to the academic system.	One of the serious challenges in the metaverse is the issue of intellectual property and data security. What solutions does this area require?
We should not see the metaverse as a mere educational platform, but rather develop it in conjunction with innovation policies and the knowledge-based economy. When digital education is integrated with the innovation ecosystem, universities will become producers of metaverse technology and services, rather than consumers. This will both contribute to the country's scientific growth and accelerate the knowledge-based economy. In fact, the metaverse university could become Iran's executive arm in the Fourth Industrial Revolution.	What role does the metaverse play in relation to macro policies of innovation and the knowledge-based economy?

Table 8. Dialogue text for developing metaverse universities: Empowering university presidents

School Counseling Expert	Interviewer
In my opinion, empowerment is the most key part. If we have the infrastructure but the human resources are not ready, the project will fail. Therefore, three main groups, namely professors, students, and university presidents, must be seriously trained.	In the development of metaverse universities, what measures are necessary to empower professors, students, and administrators?
University administrators must be able to learn how to manage teaching in the metaverse. This teaching is not simply about delivering content, but rather a combination of virtual classroom management, the use of 3D tools, and the design of interactive learning experiences. Therefore, specialized training courses for professors are essential.	What needs do university presidents have in this regard?
University administrators and deans must become active participants in the metaverse, rather than passive consumers. This requires training in digital engagement skills and metaverse literacy. This training will help them manage their digital identities, interact constructively in 3D environments, and exploit the research and entrepreneurial opportunities of the metaverse.	What approach should be taken towards university presidents and administrators?
University administrators must have a big picture. They must know how to steer the university towards the metaverse at the policy and resource management levels. They must also ensure the quality of activities through smart monitoring and evaluation. If administrators are not equipped with metaverse knowledge and skills, even capable professors and students cannot create sustainable transformation.	Finally, what is the role of university administrators in this empowerment?

Table 9. Dialogue text for the development of metaverse universities: information processing

School Counseling Expert	Interviewer
The metaverse is practically meaningless without data. When we talk about education in a 3D space, a huge amount of behavioral, interactive, and cognitive data of students is generated. This data, if properly collected and analyzed, can be the basis for macro-decision making at the university and even national level.	Why is data processing important in the development of metaverse universities?
Create a national metaverse education data bank. This bank should have clear standards for data storage, classification, and confidentiality. Only then can we use the data for research and policymaking.	What should be the first step in this direction?
AI is our primary tool for analyzing student learning behavior in the metaverse. With machine learning algorithms, we can understand what type of content or teaching methods are most effective, which students need more support, and how to personalize the learning path.	What role does artificial intelligence play in this process?
If data stays in just one university or institution, it will not be of much use. A mechanism must be created for sharing data between universities, technology companies, and research centers. Of course, this requires a legal and ethical framework to prevent abuse or privacy violations. In fact, data networking will allow experiences to be transferred faster and innovations to be spread more widely.	How necessary is data sharing?

Table 10. Dialogue text for the development of metaverse universities: monitoring the quality of education

School Counseling Expert	Interviewer
Table 10. Dialogue text for the development of metaverse universities: monitoring the quality of education	Why is it necessary to monitor the quality of education in metaverse universities?
Indicators should be multidimensional; for example, the level of student interaction with the professor and peers, the depth of learning, and the level of	What types of indicators should be designed?

educational satisfaction are among the most important indicators that should be defined and monitored nationally.	
Using AI-powered analytics dashboards is a must. These dashboards can analyze classroom performance, student engagement, and even the quality of instructor feedback in real time. This means we have a live, dynamic picture of the state of learning across the country.	What is the role of artificial intelligence in this process?
Policies should not be static and unchangeable. There should be an annual review based on data and feedback from faculty and students. This ensures that policies are up-to-date and aligned with the real needs of universities and the new generation of students.	What should the policy review process be like?

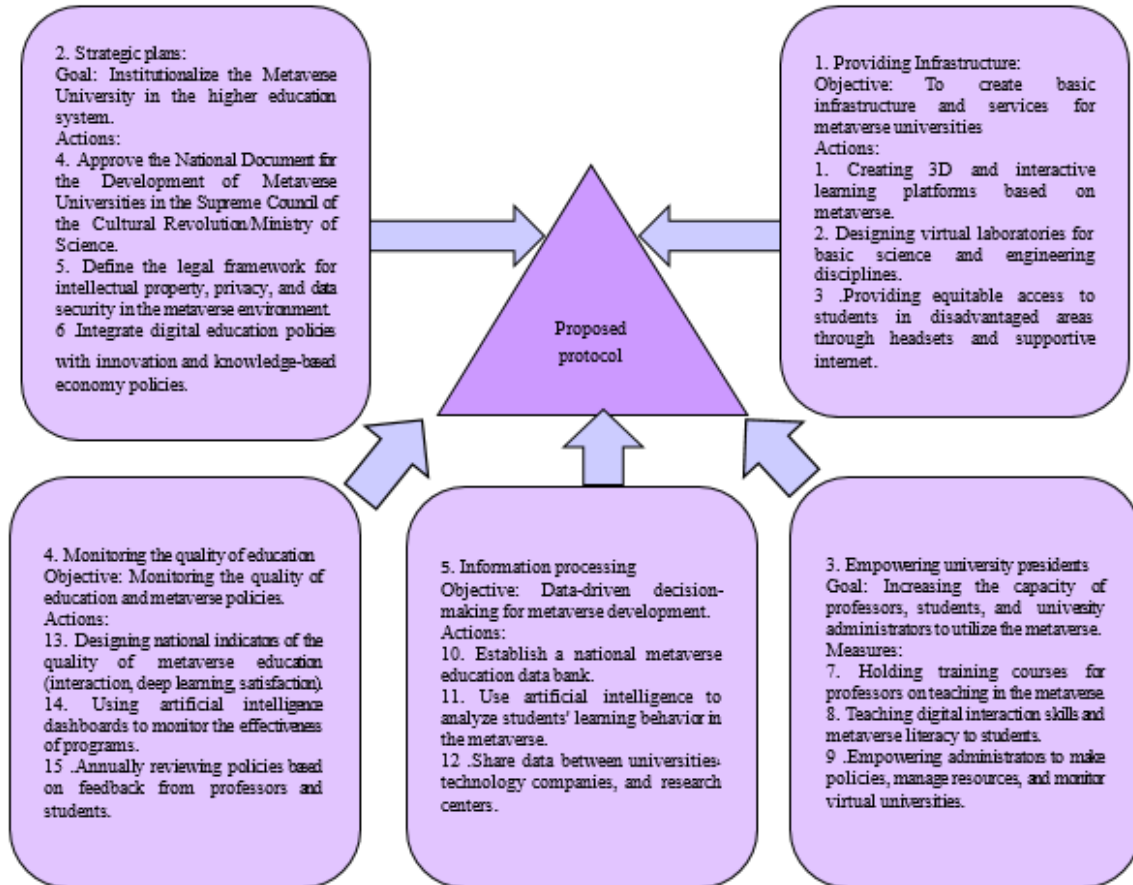


Figure 2. Proposed protocol for policymakers' accessibility to develop metaverse universities

Discussion

The metaverse university, as a new generation of higher education institutions, is a three-dimensional, interactive and intelligent environment that is formed in the context of new technologies such as metaverse, artificial intelligence, blockchain, virtual reality, augmented reality and the Internet of Things (Gurkan, 2025). By combining real and virtual space, these universities provide a platform where students, professors and policymakers can engage in education, research and scientific interaction simultaneously, online or asynchronously (Suzuki et al, 2020). The launch and development of the metaverse university requires providing a model and protocol available to policymakers, which is why this research was conducted. According to the findings, one of the dimensions of policymakers' accessibility to the development of artificial intelligence-based metaverse universities is the provision of

infrastructure. The results are consistent with studies (Wang, Yu, Bell, & Cho, 2022; Haitham, & Gutter, 2024). With the advancement of new technologies, especially artificial intelligence and metaverse environments, universities are faced with unprecedented opportunities for transformation in educational and research processes. However, the lack of appropriate infrastructure is one of the most important challenges to the development of metaverse universities. The lack of native 3D and interactive learning platforms, the absence of a national academic metaverse network, limitations in virtual laboratories, and the lack of intelligent mechanisms to identify infrastructure deficiencies can prevent universities from optimally utilizing the capacities of the metaverse. This situation prevents universities from providing an interactive and dynamic environment for learning and research, and educational and research innovation opportunities are lost (Mourtzis, D., Angelopoulos, J., & Panopoulos, 2023). Therefore, designing and developing an AI-based policy and infrastructure framework to provide the required infrastructure is essential and vital so that universities can benefit from the capabilities of the metaverse to improve the quality of education, research, and scientific interaction (Han, et al., 2023).

One of the dimensions of policymakers' accessibility to the development of AI-based metaverse universities is policy and strategy. The results are consistent with studies (Li et al., 2025; Osman et al., 2024; Duan et al., 2021). New technologies such as AI and metaverse have presented universities with vast opportunities for transformation in education, research, and scholarly interaction. However, the lack of appropriate policy and strategic frameworks is considered one of the most important obstacles to the development of metaverse universities. Weakness in data-driven decision-making, lack of specific policies and rules for managing academic metaverse environments, insufficient empowerment and human resource management, and limitations in infrastructure and support services prevent universities from optimally utilizing the capabilities of the metaverse. These challenges can lead to fragmentation of activities, inefficiency in resource management, and reduced quality of education and research (Hassanzadeh, 2022). Therefore, it is essential to design and implement a policy and strategic framework based on artificial intelligence so that policymakers can optimize infrastructure and human resources through smart and data-driven decision-making and provide the necessary rules and services for the sustainable development of metaverse universities (Chamorro-Atalaya, et al., 2023).

One of the dimensions of policymakers' accessibility to the development of AI-based metaverse universities is university presidents. The results are consistent with studies (Uzun, 2023; Lantri, Esposito, & Capucio, 2025; Jobe, 2024). University presidents play a key role in guiding and managing the digital transformation of universities and the development of metaverse environments. Despite the importance of this role, many presidents are unable to make strategic decisions and effectively guide universities in this field due to their limitations in digital knowledge and insufficient familiarity with new technologies such as AI and metaverse (Oh, 2022; Di Natale, Sin, et al., 2023;). This lack of skills and limited access to advanced information and tools can lead to inefficient decision-making, incomplete utilization of metaverse capacities, weakness in infrastructure management, and a decrease in the quality of education and research. Therefore, strengthening the capabilities of university presidents and creating appropriate access to resources, data, and smart tools is a fundamental necessity for the development of AI-based metaverse universities (Braud, Fernández, & Hui, 2022).

One of the dimensions of policymakers' accessibility to the development of metaverse universities is monitoring the quality of education. The results are consistent with studies (Mahmoud, 2024 Dudley, Yin, Garaj, & Kristensson, 2023). Monitoring the quality of education is one of the key dimensions in the development of metaverse universities based on artificial intelligence. With the introduction of new technologies, especially metaverse environments and smart educational tools, universities need accurate and intelligent mechanisms for continuous assessment of the quality of education. The absence of effective

monitoring systems can lead to a decrease in the quality of learning, inefficiency of resources, and weakness in strategic decision-making. The use of artificial intelligence in monitoring the quality of education allows educational data to be accurately analyzed and the strengths and weaknesses of educational processes to be identified, and improvement policies to be formulated accordingly (Puncreobutr, V. Dhamacharoen, A., & Tapaneeyakorn, 2022)

One of the dimensions of policymakers' accessibility to the development of metaverse universities is information processing. The results are consistent with studies (Biswas, etal, 2025 LaFosse, 2024 ;). Information and data processing is a critical dimension for the development of AI-based metaverse universities. Universities require access to a large volume of data for strategic decision-making, infrastructure management, monitoring the quality of education, and human resource empowerment. However, the lack of efficient systems for collecting, analyzing, and processing information prevents policymakers and university presidents from making accurate, data-based decisions. The inability to process data in a timely and intelligent manner can lead to resource inefficiency, poor planning, and reduced quality of education and research in the metaverse environment. Therefore, the design and deployment of AI-based information processing systems is a fundamental necessity to support intelligent decision-making and improve university performance.

Conclusion

The proposed protocol for policymakers' accessibility to develop metaverse universities consists of steps derived from the findings, as follows:

1. Providing infrastructure, which is the result of the goal: creating basic infrastructure and services for metaverse universities, and its realization requires the following actions: 1. Creating 3D and interactive metaverse-based learning platforms. 2. Designing virtual laboratories for basic science and engineering disciplines. and 3. Providing equitable access to students in disadvantaged areas through headsets and supportive internet.
2. Strategic programs that result in the goal of: institutionalizing the metaverse university in the higher education system, and its realization requires the following measures: 4. Approval of the national document for the development of metaverse universities in the Supreme Council of the Cultural Revolution/Ministry of Science. 5. Definition of the legal framework for intellectual property, privacy, and data security in the metaverse environment. 6. Integration of digital education policies with innovation and knowledge-based economy policies.
3. Empowerment of university presidents, which result in the goal of: increasing the capacity of professors, students, and university administrators to utilize the metaverse, and its realization requires the following measures: 7. Holding training courses for professors in teaching in the metaverse. 8. Training digital interaction skills and metaverse literacy for students. 9. Empowering administrators for policymaking, resource management, and monitoring of virtual universities.
4. Monitoring the quality of education, which results from the goal: Monitoring the quality of education and metaverse policies, and its realization requires the following actions: 13. Designing national indicators of the quality of metaverse education (interaction, deep learning, satisfaction). 14. Using artificial intelligence dashboards to monitor the effectiveness of programs. 15. Annual review of policies based on feedback from professors and students.
5. Information processing, which results in the goal: data-based decision-making for the development of the metaverse, and its realization requires the following measures: 10. Creating a national database of metaverse education data. 11. Using artificial intelligence to analyze students' learning behavior in the metaverse. 12. Sharing data between universities, technology companies, and research centers.

Declaration of Competing Interest

The author declares that he has no competing financial interests or known personal relationships that would influence the report presented in this article.

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