Ed Process Int J

www.edupij.com

ISSN 2147-0901 (Print), 2564-8020 (Online)

EDUCATIONAL PROCESS
INTERNATIONAL JOURNAL

Research Article

Cite this article: Taha, S. (2026). Challenges in the Implementation of Smart and Virtual Systems in Higher Education: The Case of Saudi University. *Educational Process: International Journal, 22*, e2026050. https://doi.org/10.22521/edupij.2026.22.50

Received September 23, 2025
Accepted December 5, 2025

Keywords: Smart applications, Virtual environments, Higher Education.

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Challenges in the Implementation of Smart and Virtual Systems in Higher Education: The Case of Saudi University

Safa Taha

Abstract

Background/purpose. The study aimed to identify the challenges of using smart and virtual systems in university education, the theoretical and applied foundations, and the challenges that faculty members in Saudi Arabian universities face when using these systems.

Materials/methods. The study employed a descriptive-analytical approach and administered a questionnaire to a sample of 371 faculty members to assess the current situation.

Results. The indicators for the dimension related to personal learning challenges (M=2.63), the indicators for the dimension related to organizational challenges (M=2.61), and the indicators for the dimension related to technical challenges (M=2.58). In addition, the indicators for the dimension related to educational efficiency challenges (M = 2.54). These results indicate that technical infrastructure and individualization processes are the most critical problem areas for faculty members. The lack of significant differences by gender, academic title, faculty type, and years of experience ($p>0.05$) suggests that the problems are structural and systemic.

Conclusion. The study is valuable for its comprehensive analysis of the multifaceted challenges facing higher education, particularly in digital infrastructure and teacher competencies. Research indicates that faculty members in Saudi Arabian universities face challenges when using smart and virtual systems. However, there is limited understanding of the components of a system for using smart and virtual systems in education and how these components interact to contribute to the development of a smart education system.

1. Introduction

Virtual learning and the use of intelligent systems are considered forms of distance learning, effectively carried out in the absence of the traditional physical educational institution environment. In this context, the roles of faculty members shift to guiding students in interacting and learning, encouraging individual and group participation through virtual technology, rather than teaching the prescribed curriculum.

The advancement and spread of smart and wireless technologies are transforming the educational process into an intelligent system that provides a seamless learning experience. It has been found that smart education supports students' needs and learning styles, offering opportunities for adaptive, personalized, collaborative, and self-directed learning. However, despite its increasing use to support the learning process, there is limited understanding of the components of a system that uses smart and virtual systems in education, and how these components interact to contribute to the development of an intelligent education system. This requires research to understand these limitations and to provide a broader, more comprehensive definition that captures the components supporting the development and use of smart and virtual systems (Yusufu & Nathan, 2020).

In Saudi Arabia, e-learning began to emerge in 1954, when Imam Muhammad bin Saud Islamic University launched a distance-learning program at the Faculty of Religious Sciences, followed by the Arabic Language Faculty a year later (Alturki, 2014). Saudi Arabia has taken on the responsibility of providing the necessary infrastructure for e-learning, including internet access, electricity, and other essential services.

On a global level, many educational institutions are seeking to benefit from virtual e-learning systems and develop sustainable intelligent systems to adopt new technologies, including the modern Internet of Things, interactive smart learning environment systems based on (new IoT, virtual reality, and augmented reality) technologies found in smart learning environments. However, all of this requires an improved solution for classroom use that enables practical experience with interactions between smart digital devices. This necessitates analyzing the effects of intelligent learning systems in teaching to identify the minimum training time and the optimal solution for real-time control cases, to engage students in sustainability efforts and address past negative effects by recognizing intelligent e-learning tools and qualified infrastructure to improve learning experiences (Setiawan et al., 2022).

In recent years, educational researchers have been actively investigating the use of smart learning environments. As of March 2021, a simple search for the keyword "smart learning environment" on Google Scholar and Scopus yielded 1990 and 1773 results, respectively. More than 80% of these results were published within the past five years, and almost all focus on actions and measures taken in higher education settings, including higher education, further education, and open education. These studies aim to uncover educational and technological perspectives, report on the latest research findings, and share best practices for creating entirely new learning environments that emphasize the effectiveness, efficiency, flexibility, and engagement of learning. They also aim to identify the limitations and challenges after a rigorous and highly selective review process, which would provide a valuable reference for researchers and educational practitioners in their pursuit of the best learning environments (Cheung et al., 2021)

As a result of recent transformations, education has shifted from the traditional system to Smart and Virtual Systems. Various models and strategies have emerged, emphasizing that integration serves as a framework for utilizing traditional education—an essential part of the teaching and learning process—while exploring the opportunities presented by smart and traditional education.

https://doi.org/10.22521/edupij.2026.22.50 Published online by Universitepark Press

Many studies have examined the feasibility of transitioning to smart and virtual systems in terms of design and implementation, and have identified the key challenges hindering their implementation. A study by Chukwuemeka (2023) confirmed that smart education leverages advanced technologies such as artificial intelligence, virtual reality, and the Internet of Things to enhance the learning experience, making it more personalized, interactive, and accessible.

However, integrating smart education into traditional systems is not without challenges, including privacy concerns, the need for teacher training, and other obstacles that have not been fully considered. The study provides insights into how these challenges can be addressed to maximize the effective integration of smart education with traditional education using various strategies.

A study by Chukwuemeka & Garba (2024) also confirmed the impact of smart technology on education, focusing on learning, forgetting what we have learned, and continuous adaptation in our dynamic society. The study highlights the pivotal role of technology in enhancing access to education for diverse backgrounds by breaking barriers through adaptive learning platforms, immersive technologies, and language accessibility features.

In-depth research is required to uncover the challenges in how technology facilitates personalized and adaptive learning experiences, customizes content to meet individual needs, and accommodates diverse learning styles. A comprehensive understanding of technology's potential in shaping a dynamic, adaptable, and inclusive educational environment is essential, with an emphasis on its transformative impact on education.

A study by Jabr (2022) confirmed that, despite the advantages offered by e-learning systems, including smart and virtual components, they also present certain drawbacks and challenges. These require efforts to develop training programs for teaching staff and students on modern technological tools and their usage. Additionally, collaboration among institutions, universities, and schools is necessary, along with fostering young leadership and providing administrative support to prepare educators.

The study also emphasizes the importance of implementing continuous assessment techniques to evaluate the effectiveness of the technology and curriculum, ensuring alignment with ongoing advancements. Moreover, classrooms should be equipped with the necessary infrastructure to integrate smart and virtual systems, including high-speed internet networks and modern computer labs. Governments should also work on establishing efficient communication networks with comprehensive coverage across all regions of the country.

In Saudi Arabia, smart learning has witnessed rapid growth in recent years, with the education sector shifting toward a new system that relies on electronic devices. This transition involves using mobile phones and computers to communicate between faculty members and students (Siemens, 2013). This transformation has significantly impacted higher education in Saudi universities, leading to an education system that increasingly depends on the internet. This shift aligns with the rapid advancements in information technology, including software and hardware innovations (Alajmi, Sadiq, Kamaludin, & Al-Sharafi, 2017).

Focusing on the interaction between education and technology and on their integration to develop smart, virtual learning environments is a multifaceted process. This interaction comprises several components, including learning and assessment models, social and policy factors, emerging technologies, the innovative application of mature technologies, curriculum transformation, changes in teaching behavior, administrative transformation, best integration practices, and the introduction of new ideas.

Therefore, it is essential to establish an archival resource for researchers, academics, practitioners, and industry professionals interested in or engaged in reforming teaching and learning methods through the enhancement of smart and virtual learning environments. This resource would help stakeholders understand the limitations of current learning environments, the need for reform, and the innovative applications of emerging educational approaches and technologies. Additionally, it would facilitate the sharing and enhancement of best practices by highlighting constraints and challenges, ultimately contributing to the development, design, and implementation of smart and virtual learning environments aligned with their intended purposes (Chang et al., 2018).

On the other hand, smart learning may have limitations that could hinder the learning process. Since smart learning, or virtual e-learning, relies on internet access and electronic devices, the absence of either would pose a significant challenge. Consequently, the use of smart learning has been constrained by the currently available infrastructure for learning components and maintenance in Saudi Arabia (Xanthidis et al., 2013). To validate this, numerous studies, including Hartati, Nurdin, and Suryana (2023), have confirmed that universities face significant technological challenges in establishing smart campuses to enhance the efficiency, productivity, quality, and innovation of higher education. This requires an analysis of universities' efforts to leverage technology across adoption, implementation, integration, and improvement.

However, the greatest challenge lies in integrating and enhancing the systems used in educational, research, and service functions. Additionally, improving policies that set objectives and goals for technological integration, sustainability, and the enhancement of the learning environment remains a critical aspect of this transformation.

As education continues to grow in Saudi Arabia, many researchers remain concerned about the educational system. Among these concerns are: how smart learning balances the focus between learners, educators, learning data, and the devices used; to what extent a country’s communication and information technology infrastructure must be advanced to achieve optimal smart learning outcomes; and what the right balance is between virtual learning and real-life learning (Fayez Ghabban & Ameerbakhsh, 2021).

The study by Fayez et al. (2021) confirmed that higher education institutions are adopting a unique technology-based learning approach, as information and communication technology (ICT) is experiencing rapid growth. Smart learning, a technology-supported approach, provides a convenient educational environment that meets individual learners' needs and enhances education in a smarter, more streamlined way.

Since this has become a global educational issue, the Saudi government has carefully considered implementing smart learning since 2007. However, students may face challenges in adopting a smart learning environment in higher education institutions in Saudi Arabia. As education continues to grow in the country, many researchers still have concerns regarding this educational system.

The use of these devices enables smart learning technologies, including formal and informal, personalized and contextual, and social and collaborative learning. However, the transition from traditional to smart learning poses numerous challenges in developing countries such as Saudi Arabia. Awareness and understanding of smart learning among students, educators, and service providers remain very limited (Picciano, 2012).

The study by Chukwuemeka (2023) emphasized that smart education leverages advanced technologies, including artificial intelligence, virtual reality, and the Internet of Things, to enhance the learning experience, making it more personalized, interactive, and accessible. However, integrating smart education into traditional systems is not without challenges, such as privacy concerns and the need for teacher training, which many institutions have not addressed. The study by Chukwuemeka & Garba (2024) highlighted the ongoing need to examine the impact of smart

https://doi.org/10.22521/edupij.2026.22.50 Published online by Universitepark Press

technology on education. Additionally, Jabr's (2022) study clarified that, despite the benefits of e-learning systems with smart and virtual components, inherent disadvantages and challenges remain.

Previous studies, including Xanthidis et al. (2013), indicate that a lack of reliable internet connectivity or access to electronic devices leads to an overreliance on technological infrastructure. Furthermore, Hartati, Nurdin, and Suryana (2023) highlighted the significant challenges universities face in building smart universities. Fayez et al. (2021) also noted ongoing concerns regarding the balance between learners' and teachers' roles, data and devices, and the development of infrastructure to achieve effective smart learning outcomes. Picciano (2012) demonstrated that the transition from traditional to smart learning presents numerous challenges. These include the technical and human challenges of smart and virtual learning, as demonstrated by studies such as Chukwuemeka (2023), Chukwuemeka & Garba (2024), and Jabr (2022), which show that smart education in higher education still faces significant issues.

Despite existing studies, most have focused on the technical aspects (devices, networks, infrastructure), while neglecting the personal (such as individual learning experiences and participation), organizational (content production and management), and instructional design (learning planning and evaluation) dimensions. Furthermore, there is a lack of integrated, multidimensional analysis. Previous studies have failed to integrate these challenges into a comprehensive framework encompassing personal, technical, organizational, and educational efficiency challenges. Often, each study addresses only one dimension or aspect in isolation.

Similarly, studies within the Saudi context are limited. Despite the importance of technological development in the Kingdom, most studies on smart learning have addressed it in general terms, without an in-depth analysis of Saudi faculty members' experiences in public universities. Methodological tools for measuring challenges are also weak. Many studies rely solely on general questionnaires or technical indicators. In contrast, no studies have provided detailed measurement tools, from an educational technology perspective, that connect the challenges to actual teaching practices. The absence of a faculty perspective is a significant issue, as most studies have focused on students or technological infrastructure. In contrast, the faculty voice—the active element in the use and application of smart systems has remained weak or marginalized in the analysis. A review of the literature reveals that research on smart and virtual learning still lacks a comprehensive study that integrates the multiple dimensions of these challenges, particularly in the Saudi context. Therefore, the current study presents a more comprehensive, in-depth analytical model that focuses on the faculty perspective and employs rigorous measurement tools, thereby helping to bridge a significant knowledge and methodological gap in the field of educational technology and the application of smart systems in universities.

1.1. Problem Statement

Based on the above, the problem of the current study is defined by the limitations in the use of smart and virtual systems in higher education within the broader e-learning framework in Saudi Arabia. Therefore, there is a clear need to conduct this study to explore and address these challenges.

1.2. Research Questions

The problem of the study is defined by answering the following questions:

1. What challenges do faculty members in higher education face or encounter when using smart and virtual systems in education?

2. Are there statistically significant differences among the study sample members in their use of smart and virtual systems in higher education, based on the variables mentioned?

3. What is the reality of using smart and virtual systems in higher education from the perspective of faculty members?

1.3. Significance of the Study

1. Theoretical Significance

The importance of this study lies in its provision of a framework to describe the challenges that hinder the use and application of smart and virtual systems in higher education.

2. Practical Significance

This study is important as it clarifies the extent to which faculty members in Saudi universities, whether in scientific or humanities colleges, use smart and virtual systems in their work. It also identifies any key challenges that hinder their use. The study results will help analyze these challenges and lead to suggestions for addressing faculty members' needs for these essential skills.

1.4. Terminology and Definitions

Smart Systems: The concepts of intelligence and smart systems have been applied across various fields. In fact, the term "smart" has become widely used to label products (e.g., smartphones, smart TVs, smartwatches) as well as methods, applications, frameworks, and proposed technologies in the scientific literature (Crow et al., 2011).

In educational institutions, smart systems are methods that simulate a human teacher's behavior, actions, and decisions across various teaching situations. They mimic the teacher's thought processes in dealing with issues and problems related to a specific subject. These systems rely on modeling and representing the teacher's subject knowledge, the teaching method, and the learner receiving instruction (Al-Hadi, 2018).

The researcher defines it operationally as an electronic educational system in which communication occurs between the learner and the system via a client/server architecture. It simulates human teaching by processing the learner's capabilities, diagnosing deficiencies, addressing them, guiding the lesson, varying teaching methods, and tracking the learner's cognitive level while diversifying interaction methods.

Virtual Systems: Virtual systems are technologies that allow educational institutions to have better access to virtual technologies, making it possible to teach in virtual environments that are impossible to imagine in physical classrooms, such as access to virtual laboratories, visualization machines, industrial factories, or even medical scenarios that break the boundaries of formal education (Martín-Gutiérrez et al., 2017).

Virtual systems are also defined as a set of systems that incorporate several new concepts, while others represent a reimagining of existing ideas in a new context. These include distance learning, e-learning, virtual laboratories, virtual reality, virtual worlds, avatars, dynamic-based virtual systems, and the comprehensive new concept of immersive education that integrates many of these ideas (Potkonjak et al., 2016).

The researcher defines it operationally as Virtual technologies that enable participation in realistic simulations or virtual explorations that may be impractical or too dangerous to conduct in reality. These technologies enable students to explore content without leaving their classrooms, using interactive devices such as game controllers or applications like augmented reality, which let users freely explore objects, examine their contents, and interact with them.

1.5. Study Boundaries and Limitations

1. Subjective Limitations: The study focuses on the challenges and obstacles that hinder the use and application of smart and virtual systems in higher education.

2. Geographical Limitations: The study is conducted in universities in the Kingdom of Saudi Arabia.

3. Human Limitations: The study includes faculty members as the target group.

4. Time Limitations: The study was conducted during the second semester of the academic year 2023/2024.

2. Literature Review

With the rapid expansion of smart and virtual systems in higher education, faculty members face a range of challenges that affect the effective use of these technologies. These challenges include technical aspects related to infrastructure and digital platform use, as well as pedagogical difficulties associated with redesigning courses and adapting teaching methods for virtual learning environments. Organizational and skills-based challenges also arise, requiring ongoing training and institutional support to ensure the optimal use of these systems.

2.1. Smart and Virtual Systems

Although the concept of smart and virtual systems in online environments is not difficult to understand, it pertains to software used in terms of its equipment and usage. It also refers to a specific community that relies on tools, devices, and the internet, formed when a group of individuals is online, sharing an environment that enables interaction within a digital framework.

Hijab provides the following definition: A community consisting of individuals geographically distant but communicating through electronic networks, leading to a sense of belonging, loyalty, and participation (Hijab, 2004, p. 470). Fejlaoui (2010, p. 9) defines it as: Social groups formed through the internet, where users can initiate and create discussions to form a collective consciousness and personal relationships in the virtual space.

It includes modern methods to enhance educational efficiency, encompassing the development, implementation, and use of learning environments such as virtual reality systems, information design, interactivity, training, games, and other learning technologies (Odrekhivskyy et al., 2019, p. 359).

Therefore, virtual learning environments, or Learning Management Systems (LMSs), are considered the heart of e-learning. They serve as the launch pad and portal where teachers and learners meet. E-learning requires an application system to register students in the program, provide access to the platform, present and manage e-learning content, manage learners, track educational processes, evaluate learning, and generate reports. These systems or applications are referred to as virtual learning environments. They are also known by other names that can be used interchangeably with this term (Khamis, 2014, p. 1).

2.2. Levels and Types of Smart and Virtual Systems

Learning environments based on smart and virtual systems provide spaces for students to learn without barriers in time and place. They include information about learners, courses, and content, and consist of various levels and types of smart and virtual systems, such as:

A. Learning Content Management System (LCMS): This is an integrated platform for managing, authoring, and delivering content with multiple users. It allows administrators to host, schedule, manage, assess, test, and track online training activities. These systems enable instructional designers to create and store course materials, and learners to access course schedules, register for training, complete assessments, and manage versions. The tools may be based on content management or learning content management. Currently, a combination of Learning Management System (LMS) and Content Management System (CMS) is used in e-learning. Understanding the core functions of Learning Management Systems, Content Management Systems, and Learning Content Management Systems (LCMS) and how they contribute to e-learning is important (Anand & Eswaran, 2018).

B. Learning Management System (LMS): Another term for LMS is Integrated Learning System (ILS), which refers to specific functions related to educational content, such as tracking, managing, and integration with the system and personalized instructions (Szabo, 2002). The Learning Management System has the following functions (Ninoriya, Chawan, & Meshram, 2011): automation and a focus on administration; use of self-guided services; rapid delivery of educational materials; enhancement of training initiatives.; Scalable web application; Support for standards and portability; Enables reusability of knowledge and customization of materials.

C. Course Management System (CMS): A review of the literature shows that the term Course Management System (CMS) is often used improperly as Learning Management Systems. These systems are primarily implemented for blended or online learning, supporting course materials in online environments, linking learners to resources, tracking student performance, storing student submissions, and facilitating communication between students and instructors (Watson & Watson, 2007).

D. Managed Learning Environments (MLE): In an attempt to understand the modern learning environment (MLE) that supports learning in the era of big data, it is essential to explore how students engage with online resources using their mobile devices, laptops, and other digital devices. The concept of MLE is an integrated term that combines digital technology tools and learning skills. A well-facilitated MLE includes sections designed to support learning patterns that can precisely create a modern learning environment. Understanding the opportunity to apply this model to design big data-based learning environments can facilitate online learning of information and knowledge in a university educational environment (Huda et al., 2018).

E. E-Learning Platforms (ELP): An e-learning platform provides cost-effective and efficient channels for sharing and learning knowledge online without time and location restrictions. Previous studies have identified factors influencing students’ intention to use new technologies in various educational contexts. However, few have investigated the impact of satisfying students' basic psychological needs during the adoption process (Deng et al., 2024). A fundamental barrier is insufficient infrastructure, as learning with smart systems requires a computer connected to the internet to complete tasks, explore other parts of the student assessment program, and assess how well-equipped educational institutions are with the necessary technology. The readiness of educators to engage their students in online learning also plays a significant role (Sälzer & Roczen, 2018).

Therefore, it is not surprising that crises may pose various challenges that education systems were not prepared for (Kong, 2020). Although there is some evidence supporting the use of virtual learning in higher education, its practical implementation remains somewhat limited, a significant weakness (Sobaih et al., 2016). While virtual learning addresses some of the technological limitations of traditional education, research on its use in higher education is inconsistent, with some questioning its suitability for the university education context (Lau, 2017). Previous research suggests that students can achieve their university education goals with or without technology, raising doubts about the extent to which digital tools support students' efforts to achieve their educational objectives.

This type of technology has made it possible to disseminate knowledge anywhere in the world, turning it into a fundamental tool for schools and universities. As a result, students are no longer required to live near the educational institution to benefit from its services. Despite the existence of various virtual learning environments that offer open online courses, such as Absorb, Schoology, or Blackboard (Rivas et al., 2018), much of the research in the education field has focused on identifying external factors that affect students' academic performance, such as age, gender, education level, geographic location, disabilities, among others (Oproiu, 2015). Many studies have identified virtual learning environments as among the most positive factors in students' achievement, as their use encourages and accelerates the learning process by facilitating access to a wide range of online learning resources (Masci, Johnes, & Agasisti, 2018). Therefore, research in this field helps universities and colleges eliminate or reduce negative factors affecting their students while maximizing the positive ones

2.3. Attributes and Characteristics of Smart and Virtual Systems

The emergence of new technologies provides new ways to compete amid changing, unpredictable market demands. As one of the most promising transformative technological concepts, it requires the basic principles for creating virtual systems for computer-aided design. These systems are characterized by features that reduce the requirements and costs of designing computers and systems, and define the essential requirements for their activation. A list has been identified in the literature that outlines the attributes and characteristics of smart and virtual systems (or Learning Management Systems), as identified by Mittal et al. (2019):

Table 1. Characteristics of Smart and Virtual Systems

1. Digital Presence	6. Autonomy	11. Self-awareness of Assets	16. Sustainability	21. Resilience	26. Distribution
2. Modularity	7. Adaptability	12 Interoperability	17. Configuration	22. Responsiveness	27. Survivability
3. Variance	8. Robustness	13. Network Connectivity	18. Configurability	23. Accuracy	
4. Scalability	9. Flexibility	14. Information Relevance	19. Initiative	24. Reusability	
5. Context Awareness	10. Full Automation	15. Integration	20. Reliability	25. Decentralization	

The study by Lv et al. (2016) confirms that online virtual reality technology still faces significant challenges related to data, network bandwidth limitations, high demands, and managing collaboration among multiple users. To improve modeling accuracy, the demand for realistic system presentation in virtual environments during planning is high, which will inevitably lead to increased data transfer.

2.4. Technologies and Applications of Smart and Virtual Systems

When non-specialists think of "smart technology," they tend to envision consumer electronics such as smartphones and tablets. However, the applications of this technology extend much further to combine traditional manufacturing principles with advanced digital technologies, making organizations more efficient by using new technologies such as data analytics, the Internet of Things (IoT), automation, and cloud computing to make core learning processes more efficient (Jwo, Lin, & Lee, 2021).

The importance of research work stems from the growing interest in applying smart and virtual systems technologies and applications to the educational process. This is because of the special focus on the technological impact of these systems in shaping the digital component of professional competence, which serves as an intermediate indicator of the effectiveness of implementing innovative teaching technologies. The design of modern smart technologies in education aims to make education contemporary, affordable, and effective. This requires an understanding of these technologies and necessitates that future research focuses on studying the details of applying smart technologies to address challenges in training specialists across various educational fields. It also requires researchers' special attention to analyze the effectiveness of common tools for smart technologies (Koval-Mazyuta et al., 2023). These technologies can be integrated, as some elements are closely related. Some of the most important of these systems and applications include (Mittal et al., 2019).

The study by Alshammari, Bilal Ali, and Rosli (2018) confirms that, with the tremendous development in educational technologies, most educational institutions and colleges have implemented at least one e-learning platform to enhance teaching, learning, and management activities. Common e-learning platforms include Learning Management Systems (LMS), Course Management Systems (CMS), and Learning Content Management Systems (LCMS).

Although these smart and virtual system applications have been widely implemented in educational institutions, the terms used to refer to them are often misunderstood and misused, leading to confusion, especially regarding the challenges of their application, implementation, design, and core functions. Additionally, there are critical issues to consider before implementing any of these applications, along with their advantages and barriers.

2.5. Challenges of Smart and Virtual Systems

Educational technology continues to evolve rapidly, changing daily standards and affecting every aspect of human existence. Even just being aware of the latest technological innovations can be overwhelming, and applying technology is often more challenging. The field of education adapts to change more slowly than other sectors, but it is inevitably moving toward embracing or accommodating change. An analytical framework for applying smart and virtual systems to help faculty use them successfully in classrooms is important in higher education institutions. However, there is still a need to implement these frameworks in ways that support the proper educational and technological use of such environments. More research is needed to clearly understand the educational needs that smart and virtual systems can meet more effectively than other teaching methods (Lege & Bonner, 2020).

Despite the benefits of using smart and virtual systems in education, some challenges and limitations lead to the ineffectiveness or misuse of this technology. Therefore, identifying potential challenges related to smart and virtual systems may be useful in the strategic decision-making process for implementing and developing this technology. These challenges may include reduced face-to-face communication, cost constraints, user attitudes, design issues, safety considerations, side effects of smart and virtual systems, and the evaluation and validation of their applications. Identifying each of these helps find solutions to each challenge (Baniasadi, Ayyoubzadeh, & Mohammadzadeh, 2020).

In light of the use of educational technology to support student learning and provide opportunities for faculty members in universities to use smart and virtual systems in education, challenges are classified into device-related challenges, software-related challenges, organizational and educational challenges, device costs, physical side effects, software design, and the amount of training required. These are common challenges that slow down the adoption of smart and virtual systems, and these challenges can be highlighted as follows (Abadia et al.,2024):

a. Software-related challenges: These are limitations imposed on virtual reality programs, which include inadequate quality, development time/cost, software design, and security issues.

b. Device-related challenges: These are issues related to the limitations of virtual reality devices, such as access to technology, the current network, costs, and physical side effects.

c. Organizational and educational process challenges: These challenges refer to the complexity of designing processes, training, required resources/costs, and organizational support

The study by Kavanagh et al. (2017) emphasized the major challenges associated with using smart and virtual systems, outlining a set of challenges, including overhead costs. Overhead refers to the problems related to both monetary and non-monetary costs associated with designing or using virtual reality programs in education. Training is another challenge, specifically the time required for faculty training. Input-related challenges refer to all the issues involved in providing inputs to the virtual reality system. This includes usability codes for input devices, recognition inaccuracies, and the lack of feedback. Similarly, output-related issues arise with the different technologies available for displaying outputs to users. These range from immersive head-mounted displays to interaction tools.

Previous research has indicated that implementing smart and virtual systems is costly. This is one of the challenges that must be addressed before widespread adoption, and it may require the creation and development of high-quality software and hardware, high-speed computers, effective graphics cards, precise tracking systems, high-resolution screens, and highly specialized peripherals. Early virtual environment tools face problems such as their large size, irregularity, difficulty in use, and the high costs of design and implementation, all of which slow down the adoption process. Additionally, these tools require higher programming skills than traditional 2D tools (Srivastava, Das, & Chaudhury, 2014).

In order to integrate Smart and Virtual Systems into classroom learning, trainers must be trained on the necessary hardware and software to transform traditional classrooms and laboratories into environments that support Smart and Virtual Systems. However, it is extremely difficult to train teachers from non-IT backgrounds who have no prior experience in information technology (Alnagrat, Ismail & Idrus, 2022).

Recently, the applications of Smart and Virtual Systems, including augmented reality (AR) and virtual reality (VR), have gained unprecedented interest from educational, industrial, and other sectors. However, the success of immersive intelligent and virtual system experiences depends on addressing a wide range of major challenges that intersect multiple disciplines. Therefore, it is essential to explore research avenues and the key challenges underlying them (Bastug et al., 2017).

Despite the numerous studies addressing the use of smart and virtual systems in university education, a review of the literature reveals a clear gap in the balanced focus on the various challenges faced by faculty members. Most previous studies have concentrated on a single aspect of these challenges, often technical or infrastructural, without comprehensively integrating the personal, organizational, and instructional design dimensions within a single framework. Furthermore, the "personal challenges related to individualized learning and participation" have been under-researched, despite their direct impact on the adoption of smart and virtual technologies in the classroom. In addition, previous studies have shown limitations in addressing the interrelationships between these challenges and lack a comprehensive measurement tool to determine which challenges are most influential from the faculty members' perspective. This current study aims to bridge this gap by analyzing multiple levels of challenges within a comprehensive model and using measurement tools that consider the local context of public universities in Saudi Arabia. This provides a more accurate and in-depth perspective on the factors hindering the adoption of smart and virtual systems, thereby supporting institutional planning and improvement efforts to ensure their more effective use.

3. Methodology

This section presents a description of the study population, sample, methodology, research instrument, procedures for verifying the validity and reliability of the instrument, and the statistical methods used to analyze the data and extract findings using the SPSS program.

3.1. Research Design

The study relied on the descriptive analytical approach to achieve the objectives of the study

3.2. Research Participants

The study population consists of university faculty members. The study was conducted on a sample drawn from this population, specifically faculty members at Saudi universities, through an electronic questionnaire in the second semester of the 2023/2024 academic year, totaling 371 faculty members.

3.3. Sample

A convenience sample of 371 responses was collected. The following table presents the distribution of the sample members according to the study variables. The final version of the questionnaire was administered during the second semester of the 2023/2024 academic year, from February 26, 2024, to the end of April 2024. It was randomly distributed to 410 faculty members at Saudi universities. However, only 371 questionnaires were fully completed and returned, with 39 questionnaires being incomplete and excluded. Thus, the final sample size consisted of 371 valid questionnaires

Table 2. Distribution of Demographic and Professional Characteristics of the Study Sample

Variable	Category	Frequency	Percentage
Gender	Male	196	53%
	Female	175	47%
	Total	371	100%
Academic Rank	Professor	60	16%
	Associate Professor	118	32%
	Assistant Professor	98	27%
	Lecturers and Language Instructors	95	25%
Experience Level	Less than 5 years	86	23%
	More than 5 but less than 10 years	121	33%
	10 to 15 years	109	29%
	More than 15 years	55	15%
College Type	Practical Colleges	156	42%
	Theoretical Colleges	129	35%
	Combined (Theoretical – Practical) Colleges	86	23%

Analysis of Table 2 shows that the total number of male and female participants was 371, with 196 males (53%) and 175 females (47%). This indicates a balanced distribution of the sample members in alignment with the study's intended objectives.

From Table 2, it is evident that the total number of Associate Professors is 118, representing 32%. The number of Assistant Professors is 98, accounting for 27%. The Lecturers and Language Instructors total 95, making up 25%. Lastly, the Professors number 60, representing 16%. These figures appear logical, as they align with the essential requirements of academic employment.

By analyzing the results in Table 2, which presents the distribution of sample members by years of experience, it is evident that the largest group falls within the "More than 5 but less than 10 years" category, with 121 participants (33%). The "10 to 15 years" category follows, with 109 participants accounting for 29%. The "Less than 5 years" group consists of 86 participants, making up 23% of the sample. Finally, the "More than 15 years" category includes 55 participants, representing 15% of the total sample.

Table 2 presents the distribution of sample members according to the nature of their colleges and fields of study. It is evident that the highest number of participants comes from practical colleges, with 156 respondents, representing 42% of the sample. Theoretical colleges follow, with 129 respondents, making up 35%. Lastly, combined (theoretical – practical) colleges include 86 respondents, accounting for 23% of the total sample.

3.4. Data Collection Instruments

The questionnaire was used as the primary tool for collecting data and information from the study sample. Previous studies were consulted in the development of the questionnaire, which consisted of three main sections aimed at identifying the challenges of Smart and Virtual Systems. The following procedures were followed in preparing the instrument:

- Defining the purpose of the questionnaire: The objective was to identify the challenges faced in using Smart and Virtual Systems from the perspective of faculty members at Saudi universities.
- Determining the nature of the instrument: The Likert scale was used for measuring responses, with three rating options: Agree, Neutral, Disagree, as it was deemed suitable for this research.
- Sources of questionnaire statements: The questionnaire was developed using various sources, including previous studies related to the research topic and input from curriculum, teaching methods, and educational technology experts.
- Response intensity measurement: Each item in the questionnaire had three response options, based on the three-point Likert scale.

Validity of the Research Instrument

The questionnaire initially contained 40 items and was reviewed by a panel of experts specializing in educational technology, curricula, and teaching methods, and the number was reduced to 9. The experts provided feedback, including rewording some items and merging others. After making the necessary modifications, the final version of the questionnaire consisted of 35 items, distributed across the main sections and the number of items included in each dimension: Technical challenges (9 items); Educational efficiency (9 items); Organizational challenges (9 items); Personalized learning (8items).

Reliability of the Research Instrument

The reliability of the questionnaire was tested using the Cronbach's Alpha coefficient through SPSS software. The reliability scores for individual sections ranged from 0.716 to 0.902, and the

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overall reliability coefficient for the questionnaire was 0.895, indicating high reliability and making the instrument suitable for practical use.

Questionnaire Scoring and Criterion for Challenge Level

- A list of questionnaire sections was established, and weights were assigned to responses for each item as follows:
  - Agree → 3 points
  - Neutral → 2 points
  - Disagree → 1 point
- For statistical analysis, the following criterion was adopted:
  - The range of the three-point Likert scale was calculated by subtracting the lowest value from the highest value: 3−1=23 - 1 = 23−1=2
  - This range was then divided by the highest value on the scale to determine the cell length: 2÷3=0.662 ÷ 3 = 0.662÷3=0.66
  - This value (0.66) was then added to the lowest value (1) to determine the upper limit for each category.
  - Based on this, the following scoring interpretation was applied:
    - 1.00 – 1.66 → Low challenge level
    - 1.67 – 2.33 → Moderate challenge level
    - 2.34 – 3.00 → High challenge level

3.5. Data Analysis

After administering and collecting all the questionnaires, the data were compiled into tables to record frequencies and were statistically analyzed using the Statistical Package for the Social Sciences (SPSS), version 24. The researcher employed various statistical methods, including percentages to calculate frequencies, relative weight, independent samples t-test, One-way ANOVA (Analysis of Variance) to interpret the results.

The homogeneity of variance was tested using Levene's test to verify the equality of variances between variables. The results of the t-test showed a Variance minimum value of 18.062 and a Variance maximum value of 21.236. The results of the ANOVA showed a Variance minimum value of 19.451 and a Variance maximum value of 21.950. Given this closeness in variance values, it can be concluded that the variances between groups are similar and do not indicate significant differences, which supports the assumption of homogeneity of variance.

4. Results

4.1. Results for the First Research Question

The study answered the first research question, which asked about the main challenges that hinder or obstruct university faculty members in Saudi universities from using Smart and Virtual Systems in higher education.

Table 3. Descriptive Statistics and Challenges of Smart & Virtual Systems (N = 371)

Number	Indicators	Mean	Standard Deviation	Level	Rank
1	Technical challenges (related to devices, software, and specialized equipment)	2.58	0.63	High	3
2	Educational efficiency (related to instructional design and assessment)	2.54	0.53	High	4
3	Organizational challenges (related to content creation and management)	2.61	0.56	High	2
4	Personalized learning (related to customized learning experiences and engagement)	2.63	0.54	High	1
Overall Mean	2.59	0.56	High		

The results presented in Table 3 indicate that all four types of challenges are rated as high by the faculty members; Personalized learning (Mean = 2.63) emerged as the most significant challenge, highlighting issues related to providing tailored learning experiences and engaging students effectively.

Organizational challenges (Mean = 2.61) ranked second, pointing to difficulties in content creation and management.

Technical challenges (Mean = 2.58) were third, suggesting that problems with technology, such as devices, software, and specialized equipment, are significant barriers.

Educational efficiency challenges (Mean = 2.54) ranked fourth, indicating concerns with instructional design and assessment strategies.

The overall mean score of 2.59 indicates that faculty members face high challenges across all aspects of using Smart and Virtual Systems in universities.

Based on the table, it is evident that the indicators of challenges in using Smart and Virtual Systems in university education, from the perspective of faculty members in public universities, are high. Despite the technological improvements that Saudi universities have adopted in recent years, the differences in the technologies used to activate and employ Smart and Virtual Systems in higher education extend beyond mere digital transformation, according to their view. The indicators, according to the ranking and the highest challenges, are as follows:

The indicators for the challenges dimension related to personalized learning experiences and engagement ranked first, representing the most significant challenge faced by faculty members in public universities, from an educational technology perspective. The average was (2.63) with a standard deviation of 0.56.

The indicators for the dimension of organizational challenges related to content creation and processing ranked second, representing a challenge faced by faculty members in public universities from an educational technology perspective. The average was (2.61) with a standard deviation of 0.54.

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The indicators for the dimension of technical challenges related to specialized devices, software, and equipment ranked third, reflecting challenges faced by faculty members in public universities from an educational technology perspective. The average was (2.58) with a standard deviation of 0.63.

The indicators for the dimension of educational efficiency challenges related to instructional design and assessment ranked fourth, representing a challenge faced by faculty members in public universities from an educational technology perspective. The average was (2.54) with a standard deviation of 0.53.

4.2. Results Related to the Second Research Question

The study answered the second research question, which asked whether there are statistically significant differences in the study sample's use of Smart and Virtual Systems in university education across the specified variables. To answer this question, the responses of the study sample were reviewed based on the variables of gender, job position, nature of the college, and years of experience as follows:

A. Do the indicators of weak efficiency in using Smart and Virtual Systems in university education in Saudi universities differ from the perspective of the study sample based on the gender variable (Male - Female)?

To answer this question, an independent-samples t-test was used to assess the significance of differences in the study sample's responses to items in each dimension by gender. Table 6 illustrates this.

Table 4. Results of the T-Test on the Survey Items According to the Gender Variable.

Gender	Sample	Mean	Standard Deviation	df	t-value	Significance Level
Male	196	80.86	4.72	369	1.92	0.06 Not Significant
Female	175	79.96	4.25			

The results of Table 4 indicate that, by analyzing the results of the table, it is clear that there are no statistically significant differences at the 0.05 level between the mean scores of the study sample based on gender (male-female) on the indicators of weak efficiency in using Smart and Virtual Systems in university education at Saudi universities. This shows that the sample participants agree that there are challenges in using these systems.

B. Do the indicators of weak efficiency in using Smart and Virtual Systems in university education at Saudi universities differ from the perspective of the study sample based on the job position variable (Professor, Associate Professor, Assistant Professor, Lecturers and Language Teachers), nature of the college variable (Practical Colleges, Theoretical Colleges, and Mixed Theoretical-Practical Colleges), and the years of experience variable? To answer this question and assess the significance of the differences, the researcher used a one-way analysis of variance (ANOVA), as illustrated in Table 5.

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Table 5. Results of One-Way Analysis of Variance (ANOVA Variable

Variable	Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F-value	Significance Level
Job Position	Between Groups	23.529	3	7.843	0.38	0.77
	Within Groups	7529.603	367	20.517		
	Total	7553.132	370			Not Significant
College Nature	Between Groups	70.544	3	35.272	1.73	0.18
	Within Groups	7482.588	368	20.333		
	Total	7553.132	370			Not Significant
Years of Experience	Between Groups	4.905	3	1.635	0.08	0.97
	Within Groups	7548.227	367	20.567		
	Total	7553.132	370			Not Significant

Based on the analysis of the table, the F-value shows no statistically significant differences at the 0.05 level regarding the indicators of the efficiency of using Smart and Virtual Systems in university education in Saudi universities, according to the job position variable (Professor, Associate Professor, Assistant Professor, Lecturers and Language Teachers), the nature of the college variable (Practical Colleges, Theoretical Colleges, and Mixed Theoretical-Practical Colleges), and the years of experience variable. This indicates that, despite variations within the sample, all participants agree that there are requirements to support intelligent and virtual system technologies to bridge gaps and achieve their intended goals.

4.3. Results Related to the Third Research Question

The study addressed the third research question regarding the reality of using Smart and Virtual Systems from the perspective of faculty members in higher education. To answer this question, the responses of the sample were reviewed to identify how higher education institutions in Saudi Arabia can enhance the quality and efficiency of using their available resources to activate Smart and Virtual Systems in their ideal form as follows:

Smart and virtual environments, as a new approach, encompass collaboration, selection, and the gathering of electronic resources to support a successful online educational experience using available educational tools in classrooms. This success will not be achieved without identifying the challenges within the environment and supporting the best solutions to overcome them, ensuring the success of both faculty members and students. In the conducted interviews, the challenges of using smart and virtual systems were identified, and it was concluded that these are requirements that need to be addressed to achieve education supported by intelligent and virtual learning models, which are:

1. Technical challenges related to (devices, software, and specialized equipment) as observed from the study sample's views:

- The use of Smart and Virtual Systems solutions can result in high overall costs.
- Lack of devices that support Smart and Virtual Systems, such as cameras used for gesture recognition with markers.
- Difficulty in using display devices for user interfaces with some objects that allow remote interaction.
- Limited variety of devices and headsets used with virtual and augmented reality technologies that can provide a realistic 3D experience.
- Scarcity of devices and touch vibration sensors that support the functioning of intelligent virtual systems.
- Absence of visual tools like glasses that allow information to be projected and then projected onto the user's eyes to activate intelligent virtual systems.
- Lack of devices that integrate the virtual world into the real world, allowing interaction with virtual objects in the real world.
- Weak internet connectivity.
- Insufficient information and communication technology infrastructure required to activate intelligent virtual systems tools.
- The costs of software and hardware, in addition to the need to train both students and faculty members on using Smart and Virtual Systems.

2. Educational competency related to (instructional design and evaluation) as observed from the study sample's views:

- Limited experience in researching the alignment of educational content design theories as a guide to facilitate immersive learning environments for virtual reality, and how to benefit from the constructivist learning principles model as a new model for future design and development.
- There was no clear pedagogical model available that could serve as a guide for designing an immersive educational environment for virtual reality.
- Learning performance is affected due to difficulties with instructional design strategies supported by virtual systems.
- The lack of assessment data in the authentic educational process is also an issue that reflects in the analysis.
- Limited attention to the learner's ability to recall knowledge or skills within a specific time frame during the authentic learning process.
- Good assessments contradict their perception of their digital competence.

3. Organizational challenges related to (content creation and processing) as observed from the study sample's views:

- There is a lack of development of educational organizational categories that could be used to assist in content analysis from a variety of open-source materials.

- Concerns that the learning environment through Smart and Virtual Systems is unable to meet learners' needs, as the tasks and educational activities are designed with an unsuitable instructional approach.
- Limited differentiation between educational teaching methods for Smart and Virtual Systems applications.
- Based on the theoretical model, the educational theories applied to the educational content for virtual reality applications are classified as experiential learning, constructivism, discovery learning, situated cognition, unclassified approaches, or direct instruction.
- Limited guidance for designing educational content based on the application of pedagogical theories that have proven effective with Smart and Virtual Systems.
- Weak comparison of educational theories for the content of intelligent virtual systems applications in both theoretical and scientific colleges.

4. Personalized learning challenges related to (customized learning experiences and engagement) as observed from the study sample's views:

- Difficulty in providing learning platforms that analyze student performance data and customize lesson plans according to individual needs, which increases the burden on faculty members.
- Current systems' inability to guide students when they face difficulties with a particular topic, as the system cannot recommend additional resources or lessons to help them improve, leaving the usual role of the faculty member.
- Challenges with the personalized approach in ensuring each student receives the attention they need in managing their time.
- Limited availability of devices to provide real-time feedback on student performance to control the quality of the learning experience.
- Insufficient training was provided to faculty members to manage resources and materials, leading to reduced interest and motivation from both students and faculty in using the system.
- Faculty members' limited experience with technological resources for Smart and Virtual Systems reduces operational efficiency.

5. Discussion

The findings of this study indicate that, by analyzing the challenges of using Smart and Virtual Systems in university education from the perspective of faculty members in public universities, the dialogue reveals that diverse technological environments enhance student participation when immersive, hands-on experiences are provided. These experiences capture their attention and encourage active participation, making complex concepts more tangible, leading to deeper understanding and better retention. It also promotes interactive learning, allowing members to engage with 3D objects and tools, making abstract theoretical and practical topics more tangible. Participants emphasized that if such technologies and tools were fully available, students could virtually dissect living organisms, explore historical, geographical, and artistic sites, or even conduct scientific experiments without leaving the classroom, thereby enhancing the practical aspects of learning.

The results of the indicator analysis align with the personal sample's opinions that the use of Smart and Virtual Systems in education has important benefits. However, some challenges and limitations lead to the ineffectiveness or misuse of this technology, as confirmed by the study by

Baniasadi et al. (2020). The findings also align with the study of Fayez et al. (2021), which highlights that information and communication technology is growing rapidly, and smart learning is technology-supported learning that provides an educational environment. However, challenges will arise when implementing a smart learning environment in higher education institutions in Saudi Arabia. Furthermore, the study by Hartati et al. (2023) indicates that universities face challenges that require integrating and improving the systems used for education, research, and service. It also stresses the need to enhance policies on technological integration, sustainability, and the learning environment.

The previous results of the study, along with the opinions of the sample and the review of supporting studies, confirm the idea that the challenges mentioned, according to the nature of the sample from different faculties and program tracks, suggest that the use of Smart and Virtual Systems depends on addressing challenges related to simulation in the real world. These challenges can be resolved in fields such as medicine, engineering, and the sciences. For example, in theoretical colleges, the use of virtual reality, augmented reality, and mixed reality can provide a safe environment for practicing complex procedures and conducting scientific experiments, thereby enhancing practical experience and developing skills and confidence.

Furthermore, the challenges related to personalized learning paths enable Smart and Virtual Systems—such as virtual and augmented reality—to help faculty members tailor content to individual learning styles. This customization aligns with the learner's needs. It requires a review of the tools currently in use at Saudi universities, with regular assessments of materials based on need, thereby enhancing the personalized and effective learning journey.

Based on the analysis of the tables, it is clear that the use of intelligent and virtual learning systems requires the scope of new teaching and learning methods in Saudi universities to work on implementing programs, as well as evaluating the essential requirements and the preparedness of both faculty members and students for attending smart and virtual learning environments. Whether in medical, engineering, scientific, or humanities colleges, the successful implementation of intelligent and virtual learning systems as a key method for managing knowledge and addressing educational needs in Saudi universities will not be achieved without identifying the various challenges related to skills and technologies and developing strategies to overcome them. It is crucial to establish the information technology infrastructure and standards, benefit from the experiences of leading countries in the field of smart and virtual education in its various forms, which can yield educational returns, create the appropriate culture, and familiarize both learners and teachers with the development and use of educational materials necessary for achieving this goal.

In light of the findings, university officials can adopt a number of policy measures aimed at enhancing the effectiveness of using smart and virtual systems and addressing the challenges highlighted by the study. This can be achieved by establishing a clear institutional framework to support personalized learning, developing digital content, strengthening infrastructure, and improving the efficiency of teaching practices. These measures include adopting adaptive learning policies that allow for content tailored to learners' learning styles, creating specialized units for producing interactive content and periodically reviewing courses, and allocating fixed budgets for upgrading hardware and software and building virtual and augmented reality labs. The policies also include developing unified standards for instructional design and smart assessment, and linking academic promotions to the acquisition of digital teaching skills.

At the professional development level, these measures will lead to a qualitative shift in faculty members' roles. They will require ongoing training programs in instructional design, learning data analysis, and the use of simulation tools, as well as developing skills in producing digital content and working with smart systems. These actions will contribute to building an innovative educational culture, enhancing digital readiness, and enabling faculty members to provide more interactive and in-depth learning experiences, thus supporting the quality of university education and ensuring the effective use of smart and virtual systems.

6. Conclusion

(In general, and through analyzing the study's results and interpreting them to understand the challenges of using Smart and Virtual Systems in higher education, the use of these systems is essential according to the educational needs of higher education institutions. However, it creates some challenges. The discussion about how to address these challenges requires accepting a shift from traditional activities to approaches that focus on creating a safe space that facilitates collaboration and provides opportunities to use different technologies, which can bridge the digital gap by fostering a shared culture. This aligns with the study's conclusion: there is agreement among the study sample on the need to address the mechanisms that hinder the positive application of Smart and Virtual Systems in higher education as one of the important factors that encourage students to learn better and create a competitive atmosphere among faculty members to activate these systems.

However, according to various studies, good planning based on educational technologies for these approaches, without considering the factors that cause hesitation or aversion to implementing and using this technology despite its existence, results in a digital gap. This gap is defined not only by physical access to computers, smart devices, and communication tools, but also by access to additional resources that would lead to better access to technologies related to Smart and Virtual Systems.

The findings, which revealed significant challenges in the use of smart and virtual systems in Saudi universities, have important implications for the Gulf region as a whole, given the similarities in university education systems and the growing interest in applying information and communication technologies in education. The challenges related to personalized learning, digital content, infrastructure, and educational efficiency are not unique to the Saudi context; rather, they reflect the realities faced by regional universities as they adopt smart and virtual learning strategies. This makes the findings generalizable while accounting for differences in infrastructure, human resources, and technology across countries.

In terms of practical applications, the findings indicate the need to develop policies that support adaptive learning, establish specialized units to produce digital content, upgrade hardware and software, and adopt continuous training strategies for faculty members to enhance their proficiency with smart systems. Furthermore, exchanging experiences and best practices among Gulf universities can accelerate the adoption of these technologies and maximize their benefits, thereby supporting the quality of education, fostering interactive learning environments, and integrating faculty professional development with the requirements of smart education at the regional level.

7. Suggestion

Based on the results of the study, the following recommendations are proposed:

- The necessity of providing laboratories based on Smart and Virtual Systems in their latest forms, equipped with tools that align with the current era in various universities across the Kingdom.

- Work on connecting universities in the Kingdom through a work system to identify the most important projects supported by Smart and Virtual Systems, and to transfer local experiences using key technical resources that improve the performance of faculty members and students by disseminating these experiences.

- It is essential to address the challenges facing the employment of Smart and Virtual Systems, diversify support sources, and establish new policies that align with the updated tools (equipment, software, hardware, designers, experts, costs) to overcome these challenges.

- Organize workshops and training programs within universities to increase the level of faculty members in terms of utilizing the available smart and virtual devices at the university, which can have the same impact as new and contemporary tools.

Declarations

Author Contributions. Conceptualization, design, data acquisition, data analysis, drafting Manuscript, Data analysis, Critical revision of the manuscript, writing, editing/reviewing

Conflicts of Interest. The authors declare no conflict of interest.

Funding. The authors extend their appreciation to the Deanship of Research and Graduate Studies at King Khalid University for funding this work through the Small Research Project under grant number RGP1/195/46.

Ethical Approval. Ethical procedures for research, considering the participants' voluntariness, Anonymity, and informed consent, were approved by the Research Ethics Committee, Faculty of Education, King Khalid University, Saudi Arabia.

Data Availability Statement. The information utilized in this study is private and therefore cannot be disclosed to external parties.

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