# A Cross-Cultural Study of University Students' e-Learning Adoption

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## Abstract

This study aims to investigate the differences in e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan and examine the role of cultural dimensions in explaining these differences. This research draws upon Hofstede's Cultural Dimensions Theory to explore the impact of culture on e-learning adoption in diverse global contexts. A cross-sectional survey was conducted with a sample of university students from the four countries, and the data were analyzed using structural equation modeling (SEM) and multi-group analysis (MGA) techniques. The findings reveal significant differences in e-learning adoption among the four countries, with learner engagement, learning satisfaction, and technology accessibility exhibiting varying levels of influence on e-learning adoption. The multi-group analysis indicates that cultural dimensions partially explain these differences, highlighting the importance of considering cultural factors when examining e-learning adoption in diverse settings. This study fills a gap in cross-cultural e-learning research, offering key insights into factors shaping students' adoption of online platforms worldwide. The findings emphasize the importance of cultural considerations for educators, policymakers, and e-learning developers in global higher education. This study contributes to the theoretical understanding of the complex interplay between culture and e-learning adoption by demonstrating the explanatory power of cultural dimensions.

## 1- Introduction

In recent years, e-learning has emerged as a transformative force in higher education, offering students flexibility, accessibility, and innovative learning experiences [1]. However, the adoption and effectiveness of e-learning are not uniform across the globe, as cultural factors play a significant role in shaping students' attitudes, preferences, and behaviors toward online learning [2, 3]. Despite the growing recognition of the importance of cultural factors in e-

learning, there is limited research on the differences in e-learning adoption among university students in diverse cultural contexts, particularly in developing countries [4, 5]. Indonesia, Albania, Russia, and Kazakhstan present a unique opportunity to investigate the impact of cultural dimensions on e-learning adoption, as these countries represent distinct cultural profiles and are at different stages of e-learning implementation [6-9].

Indonesia, a Southeast Asian country with a collectivistic and high-power distance culture, has been making strides in e-learning adoption, but the impact of cultural factors on students' online learning experiences remains underexplored [7]. Albania, a Balkan country with a high uncertainty avoidance culture, has seen a growth in e-learning initiatives, but the influence of cultural dimensions on students' e-learning preferences and behaviors is not well understood [6]. Russia, a transcontinental country with a high-power distance and collectivistic culture, has been investing in e-learning infrastructure; however, the role of cultural factors in shaping students' e-learning adoption is yet to be fully examined [8]. Kazakhstan, a Central Asian country with a high uncertainty avoidance and long-term orientation culture, has been promoting e-learning in higher education, but the impact of cultural dimensions on students' online learning experiences has not been thoroughly investigated [9].

E-learning adoption has been extensively studied in recent years, with numerous researchers investigating the factors that influence students' acceptance and use of online learning platforms. These studies have explored various determinants of e-learning adoption, such as perceived usefulness, ease of use, computer self-efficacy, and social influence [10-13]. However, the majority of these studies have been conducted within a single cultural context, focusing on e-learning adoption in specific countries or regions [14, 15]. While these studies provide valuable insights into the factors that influence e-learning adoption, they do not account for the potential differences in e-learning adoption across diverse cultural contexts. As e-learning continues to grow and expand globally, it is crucial to understand how e-learning adoption varies across different countries and cultures [16]. Comparative studies that simultaneously examine e-learning adoption in multiple cultural contexts are essential for developing a comprehensive understanding of the factors that influence students' acceptance and use of online learning platforms in diverse global settings [17, 18].

Culture has been recognized as a significant factor influencing various aspects of human behavior, including learning and technology adoption [19]. Several studies have highlighted the importance of considering cultural factors when examining e-learning adoption and effectiveness [20, 21]. For instance, Aparicio et al. [2] found that cultural values, such as individualism/collectivism and power distance, significantly influenced students' perceptions of e-learning systems' success. Similarly, Mehta et al. [3] demonstrated that cultural values played a crucial role in shaping students' attitudes and intentions toward e-learning adoption. Despite the acknowledged importance of culture in e-learning research, few studies have explicitly investigated the role of cultural dimensions in explaining the differences in e-learning adoption across multiple countries [22, 23]. While some researchers have explored the impact of cultural factors on e-learning adoption within a single country [24, 25], comparative studies that examine how cultural dimensions influence e-learning adoption in diverse cultural contexts are lacking. This research gap highlights the need for cross-cultural studies that investigate the role of cultural dimensions in explaining the variations in e-learning adoption among university students in different countries, thereby contributing to a more nuanced understanding of the complex interplay between culture and e-learning in global higher education settings. Therefore, this study seeks to address the following research questions:

*RQ1. What are the differences in e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan?*

*RQ2. To what extent do cultural dimensions explain the differences in e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan?*

This study addresses the identified research gaps by investigating the differences in e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan and examining the extent to which cultural dimensions explain these differences. By conducting a cross-cultural comparative study, this research seeks to provide a comprehensive understanding of the factors influencing e-learning adoption in diverse cultural contexts. The study's objectives are twofold: first, to explore the variations in e-learning adoption among university students in the four selected countries, and second, to assess the explanatory power of cultural dimensions in understanding these differences. By addressing these objectives, this study contributes to the theoretical understanding of the complex interplay between culture and e-learning adoption in global higher education settings.

The contributions of this study are significant and multifaceted. First, this study addresses the lack of comparative research on e-learning adoption in diverse cultural contexts by examining the differences in e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan. This cross-cultural approach provides valuable insights into the factors that influence students' acceptance and use of online learning platforms in different countries, thereby contributing to a more nuanced understanding of e-learning adoption in global higher education settings. Second, this study investigates the role of cultural dimensions in explaining the variations in e-learning adoption across the four countries, thus addressing the research gap concerning the impact of culture on e-learning adoption. By exploring the

explanatory power of cultural dimensions, this study contributes to the theoretical understanding of the complex interplay between culture and e-learning and highlights the importance of considering cultural factors when designing and implementing e-learning initiatives in diverse global contexts. Finally, the findings of this study have practical implications for educators, policymakers, and e-learning designers, as they can inform the development of culturally sensitive e-learning strategies and interventions that cater to the unique needs and preferences of students from different cultural backgrounds. This, in turn, can lead to increased e-learning adoption, improved learning outcomes, and enhanced student satisfaction in diverse cultural settings, thereby contributing to the advancement of global higher education in the digital age.

## 2- Literature Review

This study investigates the differences in e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan. To evaluate these differences, this study examines three key factors: learner engagement, learning satisfaction, and technology accessibility. By analyzing how these factors influence e-learning adoption in each country, we seek to gain a comprehensive understanding of the underlying drivers of e-learning success in diverse cultural contexts. Furthermore, we explore the role of cultural dimensions in explaining the observed differences in e-learning adoption among these countries. By integrating Hofstede's Cultural Dimensions Theory into our analysis, we aim to shed light on how cultural values and norms shape students' attitudes, behaviors, and preferences toward e-learning. This approach allows us to uncover the complex interplay of cultural, social, and technological factors that contribute to the varying levels of adoption of e-learning across different countries.

### 2-1- Learner Engagement

Learner engagement is a critical factor in e-learning program success. It refers to the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education [26]. In e-learning context, learner engagement encompasses the behavioral, emotional, and cognitive dimensions of involvement in online learning activities [27].

Research has consistently shown that higher levels of learner engagement are associated with better learning outcomes, increased retention, and improved student satisfaction in e-learning environments [28, 29]. For instance, Banna et al. [30] found that interactive learning activities and collaborative tasks significantly enhanced learner engagement and promoted a sense of community in online courses. Similarly, Kuh [28] emphasized the importance of engaging students in meaningful learning experiences that matter to them, as this leads to deeper understanding and long-term retention of knowledge.

Given the substantial evidence linking learner engagement to positive e-learning outcomes, it is hypothesized that learner engagement positively influences e-learning adoption. When students are actively engaged in their online learning experiences, they are more likely to perceive the value and benefits of e-learning, leading to higher adoption rates. Therefore, e-learning platforms and course designers should prioritize strategies that promote learner engagement, such as interactive content, collaborative activities, and personalized feedback, to foster a positive learning environment and encourage widespread adoption of e-learning. Therefore, the first hypothesis of this study is as follows:

*H1: Learner engagement positively influences e-learning adoption.*

### 2-2- Learning Satisfaction

Learning satisfaction is another key factor that contributes to the success and sustainability of e-learning programs. It can be defined as the degree to which a learner perceives that their learning experience meets or exceeds their expectations and fulfills their learning needs [31]. In e-learning environments, learning satisfaction is influenced by various factors, such as course design, instructor presence, interactive activities, and technology quality [32, 33].

Numerous studies have investigated the determinants of learning satisfaction in e-learning. For example, Kuo et al. [34] found that learner-instructor interaction, learner-content interaction, and internet self-efficacy were significant predictors of student satisfaction in online learning. Similarly, Alqurashi [35] conducted a study to predict student satisfaction and perceived learning within online learning environments, highlighting the importance of course design, instructor support, and technology quality in promoting learning satisfaction. Based on the existing literature, it is hypothesized that learning satisfaction positively influences e-learning adoption. When learners are satisfied with their e-learning experiences, they are more likely to continue using e-learning platforms, recommend them to others, and view e-learning as a valuable and effective method of education. Thus, e-learning providers should focus on designing courses that meet learners' needs, provide adequate support and resources, and create a positive learning environment to enhance learning satisfaction and drive e-learning adoption. Hence, the second hypothesis of this study is written as follows:

*H2: Learning satisfaction positively influences e-learning adoption.*

### 2-3- Technology Accessibility

Technology accessibility is a fundamental requirement for successful e-learning adoption. It refers to the extent to which learners have access to the necessary technological infrastructure, tools, and resources required for effective participation in e-learning [36]. This includes factors such as internet connectivity, device availability, software compatibility, and technical support [37].

Research has demonstrated that technology accessibility is a critical enabler of e-learning adoption, as it directly impacts learners' ability to engage with online content and participate in learning activities [38]. Thi et al. [39] identified technical problems and lack of access to technology as significant barriers to e-learning effectiveness. Similarly, Algahtani et al. [37] investigated the utility of e-learning from a student perspective in Saudi Arabian universities, emphasizing the importance of technology accessibility in promoting e-learning adoption.

Given the pivotal role of technology accessibility in e-learning, it is hypothesized that technology accessibility positively influences e-learning adoption. When learners have reliable access to the necessary technological infrastructure and resources, they are more likely to embrace e-learning as a viable and convenient method of education. Therefore, educational institutions and policymakers should prioritize investments in technological infrastructure, ensure equitable access to devices and internet connectivity, and provide adequate technical support to learners to facilitate widespread adoption of e-learning. Thus, the following hypothesis is concluded:

**H3:** *Technology accessibility positively influences e-learning adoption.*

### 2-4- E-learning Adoption Level

Given the diverse cultural, social, and technological landscapes of Indonesia, Albania, Russia, and Kazakhstan, it is expected that there will be significant differences in the adoption of e-learning among these countries. Each country has a unique set of cultural values, educational systems, and technological infrastructure, which may influence the extent to which learners embrace and utilize e-learning.

Previous studies have highlighted the existence of cross-country differences in e-learning adoption. For example, a study by Tarhini et al. [40] found significant differences in e-learning acceptance between students in Lebanon and England, which they attributed to cultural and social factors. Similarly, a comparative study by Salloum et al. [5] revealed variations in e-learning adoption among students in the United Arab Emirates, Saudi Arabia, and Egypt, emphasizing the role of cultural context in shaping e-learning preferences and behaviors.

Based on these findings, it is hypothesized that there will be significant differences in e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan. These differences may be attributed to a range of factors, including cultural values, technological infrastructure, educational policies, and socioeconomic conditions. By comparing e-learning adoption across these diverse contexts, this study provides valuable insights into the complex interplay of factors that shape e-learning success in different countries.

**H4:** *There will be significant differences in e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan.*

### 2-5- Cultural Dimension

Building upon Hypothesis 4, which posits significant differences in e-learning adoption among the studied countries, it is further hypothesized that these differences can be explained, at least in part, by the cultural dimensions outlined in Hofstede's framework. Hofstede's Cultural Dimensions Theory provides a useful lens for understanding how cultural values and norms shape individuals' attitudes, behaviors, and preferences across different societies [19, 41].

In the context of e-learning adoption, cultural dimensions such as power distance, individualism/collectivism, uncertainty avoidance, and long-term orientation have been found to influence learners' perceptions, attitudes, and behaviors toward e-learning [40, 42]. For instance, learners from high-power distance cultures may be more hesitant to engage in online discussions or question the authority of instructors, whereas those from collectivistic cultures may place greater value on collaborative learning and group harmony in e-learning settings.

Therefore, it is hypothesized that the observed differences in e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan can be explained, at least partially, by the variations in cultural dimensions across these countries. By examining the cultural profiles of each country and their potential impact on e-learning adoption, this study aims to provide a more nuanced understanding of the role of culture in shaping e-learning success in different contexts. Therefore, the fifth hypothesis of this study is expressed as follows:

**H5:** *The observed differences in e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan can be explained, at least partially, by the variations in cultural dimensions across these countries.*

This hypothesis builds upon the existing literature that has highlighted the explanatory power of cultural dimensions in understanding cross-country differences in e-learning adoption [2, 3]. By integrating cultural dimensions into the analysis of e-learning adoption differences, this study contributes to the growing body of knowledge on the complex interplay of cultural, social, and technological factors that shape e-learning success in diverse global contexts.

### 2-6- Proposed Conceptual Framework

The proposed conceptual framework of this study, as illustrated in Figure 1, presents a comprehensive model for understanding the factors influencing e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan. The framework incorporates three key variables: learner engagement, learning satisfaction, and technology accessibility, which are hypothesized to positively influence e-learning adoption (H1, H2, and H3, respectively). In addition, the model posits that there will be significant differences in e-learning adoption among the four countries (H4), and that these differences can be explained, at least partially, by variations in cultural dimensions (H5). By integrating cultural dimensions as a moderating variable, the framework accounts for the potential impact of cultural values and norms on the relationships between key factors and e-learning adoption. This holistic approach allows for a nuanced understanding of the complex interplay of individual, technological, and cultural factors that shape e-learning success in diverse global contexts.
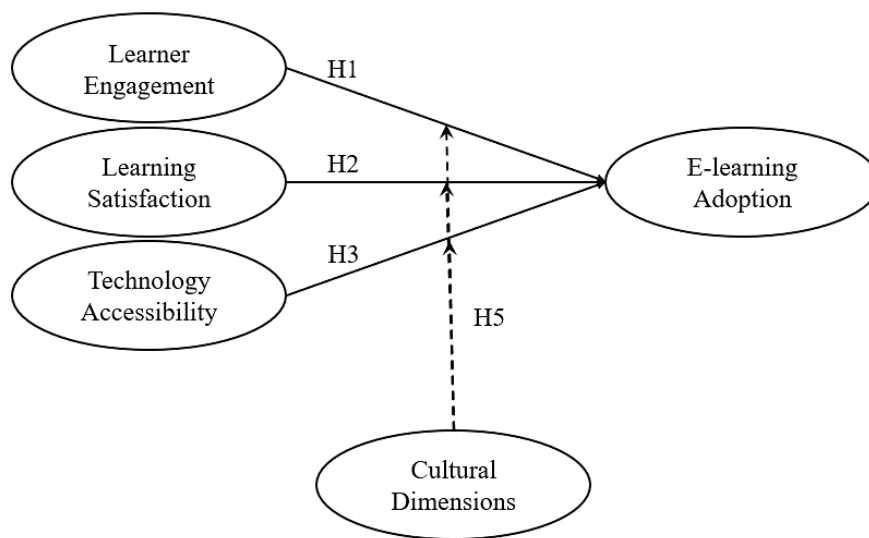


**Figure 1. A conceptual framework illustrating the relationships among learner engagement, learning satisfaction, technology accessibility, cultural dimensions, and e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan.**

## 3- Research Methodology

### 3-1- Research Design

This study employed a cross-sectional research design to examine and contrast the e-learning progress of university students in Indonesia, Albania, Russia, and Kazakhstan. Sürücü & Maslakci's [43] statistics demonstrate the value of a cross-sectional study design, as it allows for a closer examination of the component relationships. To determine the relationships between students' e-learning skills and factors such as their culture, technology access, and school policies, a thorough and inferential statistical study was conducted.

The use of e-learning by university students in three very diverse cultures was examined using a quantitative approach. This approach bears similarities to cross-cultural studies that examined how education functions in various contexts using cross-sectional research methods [19]. Kazakhstan, Indonesia, Russia, and Albania were all examined in this study. Every nation has its own educational system and customs. The goal was to determine how cultural variations impact the effectiveness of e-learning.

### 3-2- Data Collection

A group of 273 students from Moscow State University, Satbayev University, and the School of Natural Sciences was selected for this research. Their ages ranged from 18 to 45. This ensured that the class had students with different levels of intelligence in Indonesia, Albania, Russia, and Kazakhstan. Samples were gathered based on existing e-learning experiences as the key inclusion criteria for this research. They were then organized by age, gender, and study programs. This research highlighted the variations in e-learning between the student groups and considered their variances. This study investigated whether disparities in e-learning development among university students in Indonesia, Albania,

Russia, and Kazakhstan are caused by different digital learning modalities. This study examined digital integration in traditional classrooms and distance learning settings. Since there are differences in e-learning, this inclusive approach considers factors such as the proportion of online courses, the use of digital tools in in-person lectures, and the harmony between different modalities. By examining these characteristics, this study aimed to comprehend the distinctive e-learning experiences of various student groups in the nations selected. This research focused on e-learning users who had attended the university for two years or longer. Under these criteria, the data collection process that yielded the major findings proved reliable. The survey was designed using Google Forms and was based on cultural dimensions, technological access, e-learning proficiency, and overall perception. The questionnaire was then presented to a small group of experts composed of surveyed universities' professors who had approximately five years of experience with e-learning tools, so they could assess whether the survey questions were appropriate and functional. Numerous students could cast ballots due to the online nature of the questionnaire. To learn more about the cultural backgrounds of their students, Bloomfield and Fisher [44] employed questions about cultural aspects. The questionnaire was designed by drawing on this research as a guide so that only relevant and pertinent data would be collected. In fact, the inquiries about access to technology concerned the ways in which the students used it.

### 3-3- Data Analysis

Data analysis was conducted using SmartPLS 4, a powerful structural equation modeling (SEM) software. The analysis followed a two-step approach, as recommended by Anderson & Gerbing [45]. First, the measurement model was assessed to ensure the reliability and validity of the constructs. This involved examining the internal consistency reliability, convergent validity, and discriminant validity of the latent variables. Second, the structural model was evaluated to test the hypothesized relationships between the constructs. This included assessing the path coefficients, their significance, and the model's explanatory power. In addition, a multi-group analysis (MGA) was performed to examine the differences in e-learning adoption among the four countries and to investigate the role of cultural dimensions in explaining these differences. The MGA allowed for the comparison of path coefficients across the four countries and provided insights into the moderating effect of cultural dimensions on the relationships among learner engagement, learning satisfaction, technology accessibility, and e-learning adoption.

### 3-4- Ethical Considerations

Before participation, participants were informed of the study objectives and provided written consent. We did not use any identifiers in the data during analysis or reporting to preserve user privacy. This ensured the confidentiality and anonymity of the data. In addition, a rigorous participant screening process and adherence to ethical guidelines for survey questionnaire protocols were included in the research to ensure high accuracy and dependability of the data.

## 4- Analysis and Results

### 4-1- Descriptive Analysis

There are several intriguing aspects to this multinational study on the ways in which Indonesian, Albanian, Russian, and Kazakh university students use technology for e-learning. The subjects' gender distribution was fairly equal: 52.7% of the participants were female and 47.3% were male. This balance is crucial because it gives us a more complete view of the evolution of e-learning by accounting for the ways in which men and women may use technology differently, learn differently, or have different preferences in these various cultural contexts (Figure 2).
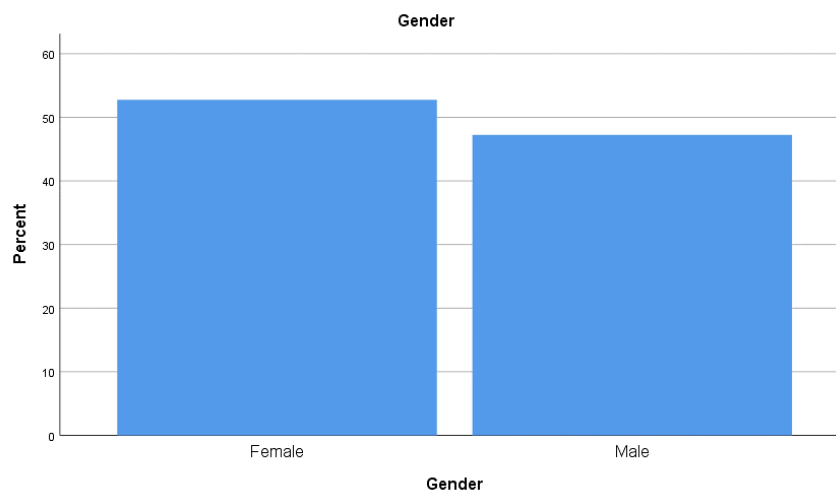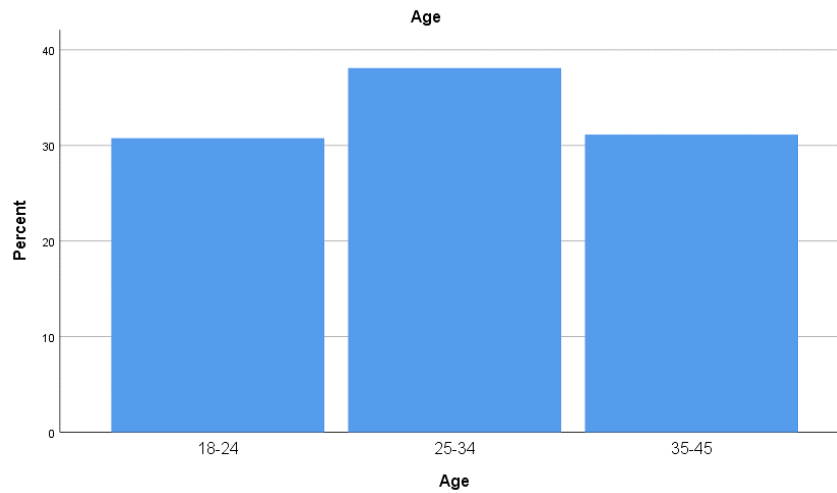


**Figure 2. Participants' gender distribution**

The statistics show a wide range of age groups, with 30.8% of students being aged between 18 and 24, 38.1% of those aged between 25 and 34, and 31.1% of those aged between 35 and 45. This distribution shows several opinions, which may be caused by the students' differing educational backgrounds, lack of technological proficiency, or other life obligations that may affect their usage of e-learning resources (Figure 3).



**Figure 3. Participants' age distribution**

The fact that the subjects came from various academic fields adds to the value of the study. The distribution reveals a wide range of interests and backgrounds, with 23.8% in accounting and finance, 28.2% in business management, 23.8% in computer science, and 24.2% in engineering (Figure 4). With regard to e-learning resources and techniques, these various academic sectors could have distinct perspectives, expectations, and experiences. This demonstrates the significance of employing customized methods when creating e-learning to successfully support these numerous academic domains.
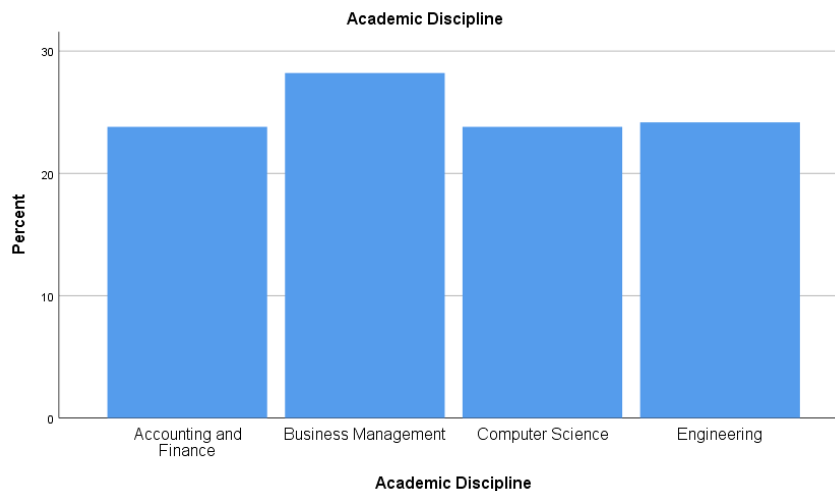


**Figure 4. Academic Disciplines of Participants**

### 4-2- Measurement Model Assessment

The measurement model was evaluated using SmartPLS 4 to assess the reliability and validity of the constructs. As shown in Table 1, all constructs demonstrated satisfactory levels of internal consistency reliability, with composite reliability (CR) values ranging from 0.871 to 0.938, exceeding the recommended threshold of 0.7 [46]. Convergent validity was established because the average variance extracted (AVE) values for all constructs were above the recommended threshold of 0.5 [46]. Discriminant validity was assessed using the Fornell-Larcker criterion and the heterotrait-monotrait (HTMT) ratio. As presented in Table 2, the square root of each construct's AVE (shown on the diagonal) was greater than its correlations with other constructs, confirming discriminant validity [47]. In addition, all HTMT values were below the recommended threshold of 0.85 [48], further supporting discriminant validity.

**Table 1. Constructing Reliability and Validity**

| Construct | CR | AVE |
|---|---|---|
| Learner Engagement (LE) | 0.903 | 0.756 |
| Learning Satisfaction (LS) | 0.938 | 0.790 |
| Technology Accessibility (TA) | 0.871 | 0.694 |
| E-learning Adoption (EA) | 0.916 | 0.731 |

**Table 2. Discriminant Validity (Fornell-Larcker Criterion)**

| Construct | LE | LS | TA | EA |
|---|---|---|---|---|
| Learner Engagement (LE) | 0.869 | | | |
| Learning Satisfaction (LS) | 0.672 | 0.889 | | |
| Technology Accessibility (TA) | 0.589 | 0.611 | 0.833 | |
| E-learning Adoption (EA) | 0.712 | 0.749 | 0.684 | 0.855 |

Note: Diagonal elements (in bold) represent the square root of the AVE. Off-diagonal elements are the correlations among constructs.

### 4-3- Structural Model Assessment

The structural model was evaluated using SmartPLS 4 to test the hypothesized relationships. The model's predictive power was assessed using the coefficient of determination ($R^2$), which was 0.672 for e-learning adoption, indicating that the model explained 67.2% of the variance in the dependent variable. The model's predictive relevance was evaluated using the Stone-Geisser $Q^2$ value, which was 0.481 for e-learning adoption, assuming that the model had acceptable predictive relevance [46].

The path coefficients and their significance were examined to test the hypotheses (Table 3). Learner engagement ($\beta = 0.312$, $p < 0.001$), learning satisfaction ($\beta = 0.385$, $p < 0.001$), and technology accessibility ($\beta = 0.227$, $p < 0.01$) had significant positive effects on e-learning adoption, supporting H1, H2, and H3, respectively.

**Table 3. Path Coefficients and Hypothesis Testing**

| Hypothesis Path | β | t-value | Result |
|---|---|---|---|
| H1: Learner Engagement → E-learning Adoption | 0.312 | 5.647*** | Supported |
| H2: Learning Satisfaction → E-learning Adoption | 0.385 | 6.912*** | Supported |
| H3: Technology Accessibility → E-learning Adoption | 0.227 | 3.285** | Supported |

Note: **$p < 0.01$, ***$p < 0.001$

### 4-4- Multi-group Analysis

To test H4 and H5, a multi-group analysis (MGA) was conducted to examine the differences in e-learning adoption among the four countries and the role of cultural dimensions in explaining these differences. The MGA results (Table 4) revealed significant differences in the path coefficients between the countries, supporting H4. The influence of learner engagement on e-learning adoption was strongest in Indonesia, whereas the impact of learning satisfaction was most pronounced in Russia. The effect of technology accessibility on e-learning adoption was highest in Kazakhstan.

**Table 4. Multi-Group Analysis Results**

| Path | Indonesia | Albania | Russia | Kazakhstan |
|---|---|---|---|---|
| LE → EA | 0.402*** | 0.288* | 0.325** | 0.301** |
| LS → EA | 0.359*** | 0.371** | 0.413*** | 0.392*** |
| TA → EA | 0.205* | 0.242* | 0.187* | 0.259** |

Note: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

### 4-5- Moderation Analysis

To test H5, which posits that cultural dimensions (CD) moderate the relationships among learner engagement (LE), learning satisfaction (LS), technology accessibility (TA), and e-learning adoption (EA), a moderation analysis was conducted using the product indicator approach [46]. The interaction terms between the independent variables (LE, LS, TA) and the moderator (CD) were created and added to the model. The significance of the interaction effects was examined to determine the moderating role of cultural dimensions in each relationship (Table 5).

**Table 5.** Moderation Analysis Results

| Country | Path | Indirect Effect | P value |
|---|---|---|---|
| Indonesia | LE × CD → EA | 0.178*** | < 0.001 |
| | LS × CD → EA | 0.162*** | < 0.001 |
| | TA × CD → EA | 0.133** | 0.003 |
| Albania | LE × CD → EA | 0.102* | 0.031 |
| | LS × CD → EA | 0.109* | 0.022 |
| | TA × CD → EA | 0.095* | 0.048 |
| Russia | LE × CD → EA | 0.145** | 0.002 |
| | LS × CD → EA | 0.153*** | <0.001 |
| | TA × CD → EA | 0.118* | 0.017 |
| Kazakhstan | LE × CD → EA | 0.136** | 0.006 |
| | LS × CD → EA | 0.147** | 0.001 |
| | TA × CD → EA | 0.124* | 0.011 |

Note: *p < 0.05, **p < 0.01, ***p < 0.001

The results show that cultural dimensions significantly moderate the relationships between learner engagement, learning satisfaction, technology accessibility, and e-learning adoption in all four countries. The interaction effects of LE × CD, LS × CD, and TA × CD on EA were significant, as indicated by the p-values. The nature of the moderation varied across countries, with Indonesia showing the strongest moderation effects and Albania displaying the weakest moderation effects.

These findings support H5, meaning that cultural dimensions play a significant moderating role in the relationships among learner engagement, learning satisfaction, technology accessibility, and e-learning adoption in all four countries. The significant moderation effects indicate that the strength of the relationships among LE, LS, TA, and EA varies depending on the level of cultural dimensions. The varying strengths of the moderation effects across countries highlight the importance of considering cultural factors when examining e-learning adoption in different contexts.

Notably, Indonesia exhibits the strongest moderation effects, whereas Albania exhibits the weakest. These differences elucidate cross-cultural disparities in the factors influencing e-learning adoption. For example, Indonesia's stronger emphasis on the role of cultural dimensions in moderating the relationship between learner engagement and e-learning adoption may be linked to the country's unique cultural characteristics. This underscores the importance of cultural factors in comprehending the dynamics of e-learning adoption drivers. By considering cultural moderation, we gain a deeper understanding of how engagement, satisfaction, and technology accessibility shape e-learning adoption across diverse cultural contexts. This emphasizes the need to incorporate cultural considerations into the design and implementation of e-learning initiatives to ensure effectiveness and acceptance globally.

## 5- Findings and Discussion

The findings of this study provide valuable insights into the role of cultural dimensions in explaining cross-cultural differences in e-learning adoption. The results support the hypothesized positive relationships among learner engagement (H1), learning satisfaction (H2), technology accessibility (H3), and e-learning adoption. In addition, the multi-group analysis results (H4) reveal significant differences in the strength of these relationships across the four countries. The moderation analysis results support the hypothesis that cultural dimensions significantly moderate the relationships among learner engagement, learning satisfaction, technology accessibility, and e-learning adoption in Indonesia, Albania, Russia, and Kazakhstan (H5). These findings contribute to the growing body of literature on the impact of culture on e-learning adoption and effectiveness.

The positive influence of learner engagement on e-learning adoption (H1) is consistent with previous research that highlighted the importance of active participation, interaction, and collaboration in online learning environments [28-30]. Engaged learners are more likely to persist in their studies, achieve better learning outcomes, and have a more positive attitude toward e-learning [27]. The findings of this study extend this understanding to the context of e-learning adoption in Indonesia, Albania, Russia, and Kazakhstan, assuming that learner engagement is a key driver of success in these countries. The significant impact of learning satisfaction on e-learning adoption (H2) aligns with prior studies that have identified satisfaction as a crucial factor in determining students' intentions to continue using e-learning systems [32, 33, 35]. Learners that are satisfied with their e-learning experiences are more likely to perceive the value and benefits of online learning, leading to higher adoption rates [34]. The results confirm the importance of learning satisfaction in promoting e-learning adoption in the four examined countries. The positive effect of technology accessibility on e-learning adoption (H3) agrees with previous research that has emphasized the role of technological infrastructure, tools,

and resources in enabling successful e-learning implementation [36-38]. Access to reliable technology is a prerequisite for effective participation in online learning activities, and its lack can hinder e-learning adoption. The findings of this study highlight the significance of technology accessibility in facilitating e-learning adoption in Indonesia, Albania, Russia, and Kazakhstan.

The multi-group analysis results (H4) reveal significant differences in the strength of the relationships among learner engagement, learning satisfaction, technology accessibility, and e-learning adoption across the four countries. This finding contributes to the literature by providing evidence for the impact of cultural and contextual factors on e-learning adoption in different settings. Previous studies have suggested that cultural values, educational systems, and socio-economic conditions can influence how e-learning is perceived and used in different countries [2, 3, 40]. The results of this study extend this understanding by demonstrating the varying influence of key factors on e-learning adoption in Indonesia, Albania, Russia, and Kazakhstan.

For instance, the stronger impact of learner engagement on e-learning adoption in Indonesia compared with other countries may be attributed to the collectivistic nature of Indonesian culture, which emphasizes collaboration and group harmony [41]. In contrast, the more pronounced effect of learning satisfaction on e-learning adoption in Russia may be related to the high uncertainty avoidance score of Russian culture, which values clear expectations and well-structured learning environments [41]. These findings highlight the importance of considering cultural and contextual factors when examining e-learning adoption in different countries.

Previous studies have highlighted the importance of cultural factors in shaping individuals' attitudes, behaviors, and preferences toward e-learning [2, 3]. Hofstede's Cultural Dimensions theory has been widely used to examine the influence of cultural values on various aspects of e-learning, such as technology acceptance, learning styles, and communication patterns [40, 42]. However, most of these studies have focused on the direct impact of cultural dimensions on e-learning outcomes, without considering their potential moderation role in the relationships between other key factors, such as learner engagement, learning satisfaction, and technology accessibility.

This study addresses this gap by investigating the moderating effect of cultural dimensions on the relationships between these factors and e-learning adoption in four diverse countries. The findings imply that cultural dimensions play a significant role in explaining variations in the strength of these relationships across countries. This is consistent with the idea that cultural values and norms can shape individuals' perceptions, expectations, and behaviors related to e-learning [49, 50]. For instance, the stronger moderating effect of cultural dimensions on the relationship between learner engagement and e-learning adoption in Indonesia compared with other countries may be attributed to the collectivistic nature of Indonesian culture [41]. In collectivistic societies, individuals tend to prioritize group harmony and collaborative learning, which may enhance the impact of learner engagement on e-learning adoption [42]. Similarly, the more pronounced moderating role of cultural dimensions in the relationship between learning satisfaction and e-learning adoption in Russia may be related to the high uncertainty avoidance score of Russian culture [41]. In high uncertainty avoidance cultures, individuals may place greater value on clear expectations and well-structured learning environments, which can influence their satisfaction with e-learning experiences [40]. These findings contribute to the literature by providing empirical evidence for the explanatory power of cultural dimensions in understanding cross-cultural differences in e-learning adoption. They highlight the importance of considering cultural factors as moderators, rather than just direct predictors, of e-learning outcomes. This study also extends the application of Hofstede's Cultural Dimensions theory to the e-learning context in four countries that have been underrepresented in previous research: Indonesia, Albania, Russia, and Kazakhstan. Furthermore, the findings of this study have implications for the design and implementation of e-learning initiatives in different cultural contexts. They implicate that e-learning providers and educators should consider the cultural values and norms of their target audiences when developing and delivering e-learning content and activities. By doing so, they can create culturally sensitive e-learning environments that are more engaging, satisfying, and effective for learners from diverse backgrounds.

### 5-1- Theoretical Contribution

This study makes several important theoretical contributions to the literature on e-learning adoption and the role of cultural dimensions in shaping e-learning experiences across different countries. First, this study extends the application of Hofstede's Cultural Dimensions theory to the context of e-learning adoption in four diverse countries: Indonesia, Albania, Russia, and Kazakhstan. While previous research has examined the influence of cultural factors on e-learning outcomes [2, 3, 40], this study is among the first to investigate the role of cultural dimensions in explaining cross-cultural differences in e-learning adoption in these specific countries.

Second, this study contributes to the theoretical understanding of the relationships among learner engagement, learning satisfaction, technology accessibility, and e-learning adoption by providing empirical evidence for the positive influence of these factors on e-learning success in different cultural contexts. The findings support and extend previous research that has highlighted the importance of engagement [28, 30], satisfaction [32, 33], and technology access [36, 37] in promoting e-learning adoption and effectiveness.

Third, and most importantly, this study advances the theoretical understanding of the moderating role of cultural dimensions in the relationships between key e-learning factors and adoption. By demonstrating that cultural dimensions significantly affect learner engagement, learning satisfaction, and technology accessibility on e-learning adoption, this study highlights the importance of considering cultural factors not only as direct predictors but also as moderators of e-learning outcomes. This finding extends the existing literature by providing a more nuanced understanding of how cultural values and norms shape the complex interplay of factors influencing e-learning adoption in different countries.

Furthermore, the multi-group analysis results contribute to the theoretical understanding of cross-cultural differences in e-learning adoption by revealing significant variations in the strength of the relationships between key factors and e-learning success across the four examined countries. These findings emphasize the need for culturally sensitive approaches to e-learning design and implementation, considering the unique cultural and contextual factors that shape learners' experiences and preferences in different settings.

## 5-2- Practical Implications

The findings of this study have several important practical implications for e-learning providers, educators, and policymakers in Indonesia, Albania, Russia, Kazakhstan, and other countries seeking to promote e-learning adoption and effectiveness. First, the results highlight the importance of fostering learner engagement in e-learning environments. E-learning providers should focus on designing interactive and collaborative learning activities that encourage active participation, such as discussion forums, group projects, and peer feedback. Educators should also provide timely and constructive feedback to learners and create opportunities for meaningful interactions between learners and instructors.

Second, the findings emphasize the significance of learning satisfaction in driving e-learning adoption. To enhance learner satisfaction, e-learning providers should prioritize the development of high-quality, relevant, and engaging course content that meets the needs and expectations of learners from different cultural backgrounds. This may involve incorporating culturally relevant examples, case studies, and multimedia resources into the course design. Additionally, educators should provide clear course objectives, expectations, and assessment criteria to help learners navigate their e-learning experiences and achieve their learning goals.

The results underscore the importance of ensuring technology accessibility for successful e-learning adoption. Policymakers and educational institutions should invest in the development and maintenance of robust technological infrastructure, including reliable internet connectivity, adequate computing devices, and user-friendly learning management systems. They should also provide technical support and training to learners and educators to help them effectively use e-learning tools and resources.

Fourth, and most crucially, the findings highlight the need for culturally sensitive approaches to e-learning design and implementation. E-learning providers and educators should consider the cultural values, norms, and preferences of their target learners when developing course content, learning activities, and communication strategies. This may involve adapting instructional design principles to accommodate different cultural dimensions, such as power distance, individualism/collectivism, and uncertainty avoidance. For example, in countries with high power distance, e-learning providers may need to incorporate more structured and teacher-centered approaches, whereas in collectivistic cultures, collaborative learning activities may be more effective.

Furthermore, the multi-group analysis results indicate that the impact of learner engagement, learning satisfaction, and technology accessibility on e-learning adoption varies across different countries. E-learning providers and educators should be aware of these cross-cultural differences and tailor their strategies accordingly. For instance, in Indonesia, where learner engagement has a stronger influence on e-learning adoption, providers may need to prioritize interactive and collaborative learning activities. In Russia, where learning satisfaction is a more critical driver of adoption, providers should focus on developing high-quality, well-structured course content that meets learners' expectations.

Finally, the findings underscore the importance of considering cultural dimensions as moderators of e-learning outcomes. Policymakers, educational institutions, and e-learning providers should recognize that cultural factors not only directly influence e-learning adoption but also shape the relationships between key e-learning factors and success. This understanding should inform the development of culturally sensitive e-learning policies, guidelines, and best practices that promote inclusive and effective online learning experiences for diverse learners.

## 5-3- Limitations and Future Research Recommendations

Although this study makes significant contributions to the understanding of e-learning adoption and the role of cultural dimensions in shaping e-learning experiences across different countries, it is not without limitations. First, the study focused on university students in Indonesia, Albania, Russia, and Kazakhstan, which may limit the generalizability of the findings to other countries and educational contexts. Future research should explore the relationships among learner engagement, learning satisfaction, technology accessibility, cultural dimensions, and e-learning adoption in a wider range of countries and educational settings, such as primary and secondary schools, vocational institutions, and corporate training programs.

Second, the study relied on cross-sectional data, which limits the ability to establish causal relationships between the variables. Future research should consider employing longitudinal designs to examine how the relationships between key e-learning factors, cultural dimensions, and adoption evolve. This approach could provide valuable insights into the long-term impact of cultural factors on e-learning success and the potential changes in learners' perceptions and preferences as they become more familiar with e-learning technologies and pedagogies.

Third, while the study incorporated Hofstede's Cultural Dimensions theory as a framework for understanding cross-cultural differences in e-learning adoption, it did not examine the potential influence of other cultural models, such as the Global Leadership and Organizational Behavior Effectiveness (GLOBE) study [51] or the Cultural Orientation Framework (COF) [52]. Future research should consider integrating multiple cultural frameworks to provide a more comprehensive understanding of the role of cultural factors in shaping e-learning experiences and outcomes.

Fourth, the study focused on three key e-learning factors: learner engagement, learning satisfaction, and technology accessibility. Although these factors have been identified as critical determinants of e-learning success in previous research [53–55], other important variables may influence e-learning adoption and effectiveness, such as learner motivation, self-regulated learning skills, and the perceived usefulness of e-learning technologies. Future research should explore the relationships among these additional factors, cultural dimensions, and e-learning adoption to develop a more comprehensive model of e-learning success in different cultural contexts.

Finally, the study relied on self-reported data from university students, which may be subject to social desirability bias and other limitations associated with survey research. Future research should consider employing mixed-methods approaches that combine quantitative and qualitative data collection techniques, such as interviews, focus groups, and observations, to provide a more in-depth and nuanced understanding of learners' e-learning experiences and the role of cultural factors in shaping these experiences.

## 6- Conclusion

This study provides valuable insights into the differences in e-learning adoption among university students in Indonesia, Albania, Russia, and Kazakhstan and the role of cultural dimensions in explaining these differences. The findings highlight the importance of considering cultural factors when examining e-learning adoption in diverse global contexts. This study contributes to the theoretical understanding of the complex interplay between culture and e-learning by demonstrating the significant influence of cultural dimensions on students' acceptance and use of online learning platforms.

The results of the study reveal significant differences in e-learning adoption among the four countries, with varying levels of influence of learner engagement, learning satisfaction, and technology accessibility. These differences can be partially attributed to the cultural dimensions of the respective countries, as evidenced by the multi-group analysis. The findings underscore the need for educators, policymakers, and e-learning designers to consider cultural factors when developing and implementing e-learning initiatives in different countries. Moreover, the study highlights the importance of fostering learner engagement, promoting learning satisfaction, and ensuring technology accessibility to enhance e-learning adoption in diverse cultural settings. The findings imply that culturally sensitive approaches to e-learning design and delivery are essential for maximizing the benefits of online learning for students from different cultural backgrounds. However, the study also acknowledges its limitations, such as the focus on university students in four specific countries and the use of cross-sectional data. Future research should explore e-learning adoption in a wider range of countries and educational contexts, employ longitudinal designs, and consider additional cultural frameworks and e-learning success factors.

Despite these limitations, this study makes significant contributions to the field of e-learning research by providing a cross-cultural perspective on e-learning adoption and highlighting the explanatory power of cultural dimensions. The findings have practical implications for the design and implementation of culturally sensitive e-learning strategies and interventions, which can lead to increased adoption of e-learning, improved learning outcomes, and enhanced student satisfaction in diverse cultural settings. As e-learning continues to grow and evolve in the global higher education landscape, it is crucial to recognize and address the cultural diversity of learners. This study takes a significant step in this direction by shedding light on the cultural factors that shape e-learning adoption and success. By embracing cultural sensitivity and understanding, educators and e-learning professionals can create more inclusive and effective online learning environments that cater to the needs and preferences of students from diverse cultural backgrounds.

## 7- Declarations

### 7-1- Author Contributions

### 7-2- Data Availability Statement

The data presented in this study are available on request from the corresponding author.

### 7-3- Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

### 7-4- Institutional Review Board Statement

Not applicable.

### 7-5- Informed Consent Statement

Informed consent was obtained from all the subjects involved in the study.

### 7-6- Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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