

## Identifying Dimensions and Components for the Enhancement of Virtual Educational Leadership in the Islamic Azad University Branches of Tehran Province Using Thematic Analysis

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### ABSTRACT

**Purpose:** The primary objective of this article is to identify the dimensions and components for the enhancement of virtual educational leadership in the Islamic Azad Universities of Tehran province using thematic analysis.

**Methodology:** The research method employed is mixed (qualitative-quantitative). In addition to document analysis, the thematic analysis technique with MAXQDA12 software was used to identify factors and components. The study population included all faculty members with at least an assistant professorship in educational management, higher education management, and educational technology, as well as administrators of Islamic Azad Universities, with theoretical saturation achieved after 15 interviews. Ultimately, base, organizing, and comprehensive themes were extracted, and in the quantitative section, structural equation modeling was used to determine the impact and ranking of the dimensions and components.

**Findings:** Based on semi-structured interviews, four dimensions (knowledge of educational leadership in virtual environments, performance management and coaching in virtual environments, team leadership ability in virtual environments, ethical behaviors in virtual environments) and 24 components (organizing themes) were identified for virtual educational leadership in the Islamic Azad Universities of Tehran province. Subsequently, based on a researcher-made questionnaire, it was determined that the dimension of ethical behaviors in virtual environments with a coefficient of 0.905, team leadership ability in virtual environments with a coefficient of 0.879, performance management and coaching in virtual environments with a coefficient of 0.877, and knowledge of educational leadership in virtual environments with a coefficient of 0.805 are prioritized from first to fourth, respectively.

**Conclusion:** The findings underscore the significance of adaptability, digital proficiency, and effective communication as pivotal traits for successful virtual leaders. Notably, the study also sheds light on the potential for gender to influence leadership effectiveness in virtual environments, with female leaders possibly having an edge in fostering collaboration and inclusivity.

**Keywords:** Leadership, Educational Leadership, Virtual Educational Leadership, Islamic Azad Universities

## 1. Introduction

The rapid evolution of higher education landscapes, accelerated by global crises like the COVID-19 pandemic, has spotlighted the crucial role of leadership in navigating through turbulent times. The shift to virtual platforms has not only transformed the traditional pedagogical approaches but also demanded a reevaluation of leadership roles and competencies within academic institutions (Moiri et al., 2022; Vahdati et al., 2023). This transformation brings into focus the concept of virtual leadership (Keshavarz Afshar et al., 2022; Mirzaaghaei et al., 2023), which, as suggested by Alward and Phelps (2019), is distinct in its demands and impacts from traditional face-to-face leadership settings (Alward & Phelps, 2019).

Virtual leadership in higher education encompasses a range of competencies and challenges that are uniquely tailored to the digital context. According to Azukas (2022), successful virtual leaders in higher education require competencies that adapt to the absence of physical presence, which necessitates a higher reliance on communication technologies and digital engagement strategies (Azukas, 2022). This shift has profound implications on how leadership is perceived and enacted within the virtual realms of universities, particularly under the pressures and constraints introduced by unexpected shifts to online learning environments.

Literature on leadership within virtual environments highlights several essential traits that significantly impact the efficacy of leadership practices. Purvanova and Kenda (2018) emphasize the paradoxical nature of virtual leadership, where the absence of physical presence can both hinder and enhance certain leadership functions. For instance, while virtual environments may impede spontaneous communication, they can also foster a more structured and recorded form of interaction that enhances clarity and accountability (Purvanova & Kenda, 2018).

Furthermore, leadership in higher education has been traditionally challenged by gender disparities, particularly in leadership roles. Research by Alsubaie and Jones (2017) and Watton, Stables, and Kempster (2019) highlights the underrepresentation of women in senior leadership positions within universities and proposes virtual environments as potential levelers for gender imbalances. They argue that the virtual format can obscure traditional gender biases that often hinder women's ascent in leadership hierarchies, potentially offering a more equitable platform for leadership development and visibility (Alsubaie & Jones, 2017).

Despite the growing body of research on virtual leadership in higher education, several gaps remain. Most studies have concentrated on the transition phases from traditional to virtual settings without a long-term perspective on the sustainable practices and impacts of virtual leadership (Alward & Phelps, 2019). Additionally, there is a lack of comprehensive frameworks that integrate the multifaceted dimensions of virtual leadership, including technological, psychological, and social competencies (Bell & Kozlowski, 2002).

Schmidt and Dellen (2021) elaborate on the leadership of place in virtual environments, suggesting that effective virtual leaders must be able to create a sense of place and belonging, despite the lack of a physical shared space. This capability is crucial as it directly impacts the motivation and engagement of both students and staff in a virtual setting (Schmidt & Dellen, 2021). The impact of leadership traits on the success of virtual educational environments has been examined with a focus on the specific leadership competencies that promote effective online learning and institutional management. Alward and Phelps (2019) identify several impactful traits of virtual leaders in higher education, such as decisiveness, technical proficiency, and the ability to foster trust and teamwork remotely (Alward & Phelps, 2019). These traits align with the findings of Bell and Kozlowski (2002), who offer a typology of virtual teams that highlights the importance of trust, communication, and the management of cross-cultural differences within virtual teams (Bell & Kozlowski, 2002).

On the technological front, Azukas (2022) points out that the competencies required for virtual leadership extend beyond traditional leadership skills to include technological savviness and the ability to leverage digital tools for leadership practices. This includes not only the use of platforms for virtual meetings and communication but also the strategic use of data and online resources to make informed decisions and to promote a culture of innovation and continuous improvement (Azukas, 2022).

However, despite the growing understanding of these essential traits and skills, there remains a significant gap in the research concerning the long-term impact of virtual leadership on organizational culture and employee well-being in higher education. Most studies have tended to focus on immediate or short-term adaptations to virtual learning without fully addressing how these changes affect the deeper layers of institutional culture and personal interaction over time (Purvanova & Kenda, 2018).

Additionally, the literature on leadership in higher education often overlooks the nuanced differences in leadership styles between male and female leaders in virtual settings. Maheshwari, Nayak, and Ngyyen (2021) provide a comparative analysis of women's leadership in higher education around the world, highlighting significant variances in leadership styles and effectiveness. Their research suggests that virtual environments might offer unique opportunities for women leaders by reducing physical workplace barriers and potentially altering traditional gender dynamics (Maheshwari et al., 2021).

The present study aims to bridge these gaps by investigating how virtual leadership impacts the long-term organizational culture of higher education institutions and how it may differ between male and female leaders. By focusing on these aspects, the study will contribute to a more comprehensive understanding of virtual leadership dynamics in higher education. This is crucial for developing effective leadership training programs and for informing policy decisions that will enhance the quality of leadership and, consequently, the educational outcomes in virtual learning environments.

In conclusion, the shift to virtual leadership in higher education presents both challenges and opportunities. By understanding the complexities and nuances of virtual leadership, including its impact on organizational culture and gender dynamics, this study aims to provide valuable insights that will help shape future leadership models in higher education. The ultimate goal is to foster an environment where virtual leadership is as effective, inclusive, and empowering as traditional leadership has been perceived to be. This study is not only timely but essential in the context of the ongoing evolution of higher education.

## 2. Methods and Materials

### 2.1. Study Design and Participants

This study employs a mixed (qualitative and quantitative) methodology. In the qualitative phase, initial components were identified through thematic analysis using research literature and semi-structured interviews. The participants in the study were faculty members of the Islamic Azad University, Tehran, who had relevant academic degrees or had published articles, books, and had teaching experience in this field. Entry criteria included experts with at least three years of university experience in educational management, higher education management, and educational technology, as well as administrators of Islamic Azad Universities, and

specialists with at least a doctoral degree in fields related to virtual educational leadership and related research topics. The sampling method was snowball sampling.

The sampling method in the quantitative section was stratified random sampling, and the sample consisted of approximately 357 faculty members from 15 universities. In this study, obtaining informed consent, preserving identity information, and maintaining confidentiality in the implementation of interview content were considered as ethical considerations.

### 2.2. Data Collection

Data collection for gathering quantitative data involved a researcher-developed questionnaire to examine the impact of dimensions and components using structural equation modeling from the entire faculty of the humanities departments of the Islamic Azad Universities in Tehran Province. Sampling in the qualitative section was also done through snowball sampling. Interviews were conducted during the summer and autumn of 2021, with an average duration of 73 minutes. After transcribing the interviews, thematic analysis was used concurrently with data collection, starting with transcription of the tapes followed by sending a copy of the extracted codes for confirmation by the interviewees. To familiarize with the data and ensure immersion, the data were read multiple times, allowing for the identification of initial themes which were grouped together in initial categories. These categories were then merged to form themes. To ensure the accuracy of the collected data, there was prolonged and in-depth engagement with the data. Additionally, two other researchers, besides the principal investigators, participated in the data analysis. The researcher read the manuscripts for coding verification and category confirmation. To increase the confirmability, participants were re-consulted. Having maximum diversity in sampling and prolonged interactions were other ways to enhance data validity.

### 2.3. Data Analysis

From the initial interviews, sub-categories were formed and data reduction continued throughout all units of analysis (themes) until themes emerged. Interviews continued until data saturation was reached. Qualitative content analysis was conducted using MAXQDA12 software. Ultimately, base, organizing, and comprehensive themes were extracted, and in the quantitative section, structural equation modeling was

used to determine the impact and ranking of the dimensions and components.

### 3. Findings and Results

First Question: What are the dimensions and components of enhancing virtual educational leadership in the Islamic Azad Universities of Tehran province?

To answer this question, interviews were designed with semi-structured questions and conducted with experts and

senior managers from the Ministry of Education. All 15 participants in this research were faculty members and deputy heads of Islamic Azad Universities. The qualitative content analysis process was used to identify the dimensions and components of virtual educational leadership. In this process, 167 initial codes were extracted. Through multiple reviews and merging of codes based on similarities over several stages, eventually 24 components for virtual educational leadership and 4 main themes (main dimensions) (as per Table 1) were extracted.

**Table 1**

*Dimensions and Components of Enhancing Virtual Educational Leadership in Islamic Azad Universities of Tehran Province*

| Row | Codes                 | Components                                                                    | Dimension                                            |
|-----|-----------------------|-------------------------------------------------------------------------------|------------------------------------------------------|
| 1   | I4, I8, I5, I6, I3    | Specialized knowledge about the application of virtual educational programs   | Knowledge of Educational Leadership in Virtual Space |
| 2   | I5, I11, I4, I3       | Familiarity with virtual education systems in the real world                  |                                                      |
| 3   | I1, I2, I9, I7, I5    | Skills in using specialized software and hardware in their fields             |                                                      |
| 4   | I8, I7, I11, I15      | Ability to set performance goals and develop strategy                         |                                                      |
| 5   | I7, I3, I9, I10, I11  | Ability to establish criteria for team performance                            | Performance Management and Coaching in Virtual Space |
| 6   | I10, I6, I5, I1, I7   | Ability to provide and receive informal and formal performance feedback       |                                                      |
| 7   | I10, I3, I5, I8       | Ability to develop strategies for equitable distribution of rewards           |                                                      |
| 8   | I13, I14, I11, I5     | Ability to plan according to the task, type, and experience of the team       |                                                      |
| 9   | I10, I8, I3           | Ability to manage team members and organizational complexity                  | Team Leadership Ability in Virtual Space             |
| 10  | I1, I2, I9, I7, I5    | Selection and use of appropriate technology                                   |                                                      |
| 11  | I6, I8, I10, I13, I4  | Ability to organize virtual meetings and plan their agendas                   |                                                      |
| 12  | I10, I8, I1, I13, I14 | Knowledge of using virtual technologies in university education               |                                                      |
| 13  | I1, I2, I9, I7, I5    | E-leadership skills and methods                                               | Ethical Behaviors in Virtual Space                   |
| 14  | I11, I12, I10, I14    | Use of technology in collaborative virtual learning                           |                                                      |
| 15  | I11, I9, I14, I4      | Creation of a technology-based learning environment for students and peers    |                                                      |
| 16  | I6, I1, I2            | Adherence to ethical values and principles in virtual space                   |                                                      |
| 17  | I11, I7, I10, I3, I1  | Ethics and professional norms in virtual space                                | Community Support and Engagement in Virtual Space    |
| 18  | I8, I3, I5, I4, I2    | Attention to the interests of faculty in virtual space                        |                                                      |
| 19  | I1, I2, I9, I7, I5    | Attention to the meaning and content of educational material in virtual space |                                                      |
| 20  | I3, I9, I5, I4, I2    | Community of care and support for faculty and students                        |                                                      |
| 21  | I4, I8, I15, I6       | Attention to the welfare and health of colleagues and faculty                 | Responsibility towards assigned duties in            |
| 22  | I5, I11, I4, I3       | Community supporting trade rights for instructors and staff in virtual space  |                                                      |
| 23  | I1, I2, I9, I7, I5    | Engagement of family and community in the application of virtual space        |                                                      |
| 24  | I8, I7, I11, I15      | Responsibility towards assigned duties in                                     |                                                      |

Based on the results obtained from Table 1, 4 dimensions and 24 components were extracted for the enhancement of virtual educational leadership in the Islamic Azad Universities of Tehran province.

Second Question: How are the dimensions and components of enhancing virtual educational leadership in

the Islamic Azad Universities of Tehran province prioritized?

To answer this question, we first examined the current status of the dimensions and components of enhancing virtual educational leadership in the Islamic Azad

Universities of Tehran province, and the results were analyzed using a one-sample t-test.

**Table 2**

*Descriptive Statistics for Paired t-Test of Current and Desired States for Enhancing Virtual Educational Leadership in Islamic Azad Universities of Tehran Province*

| Test          | Mean   | Sample Size | Standard Deviation | Mean Difference Estimate |
|---------------|--------|-------------|--------------------|--------------------------|
| Current State | 2.595  | 359         | 0.8927             | 0.7558                   |
| Desired State | 4.4563 | 359         | 0.77               | 0.04205                  |

According to Table 2, it is evident that there is a difference between the means of the two groups, and the mean in the desired state is higher than the current state, but to confirm this difference, the paired t-test is used.

**Table 3**

*Paired t-Test for Current and Desired States for Enhancing Virtual Educational Leadership in Islamic Azad Universities of Tehran Province*

| Paired Differences | Mean   | Standard Deviation | Mean Error Estimate | 95% Confidence Interval of the Difference |             | t      | df  | Sig. (2-tailed) |
|--------------------|--------|--------------------|---------------------|-------------------------------------------|-------------|--------|-----|-----------------|
|                    |        |                    |                     | Lower Limit                               | Upper Limit |        |     |                 |
| Desired – Current  | 1.8613 | 1.58849            | 0.092               | 1.37806                                   | 1.81883     | 4.4979 | 186 | 0.000           |

The current state has a mean of 2.595, and the desired state has a mean of 4.4563, with upper and lower limits that are both significant, and a t-value of 4.4979, which is higher than 1.96, and a significance level of 0.000, which is less than 0.05 (research hypothesis), thus rejecting the null hypothesis and confirming the research hypothesis based on the existence of a difference between the current and desired states. This indicates a need to revise and develop

mechanisms to enhance virtual educational leadership in the Islamic Azad Universities of Tehran province from the current to the desired state. The current state, with a mean of 2.595, shows that the capability of virtual educational leadership in the Islamic Azad Universities of Tehran province is low compared to the desired state with a mean of 4.4563.

**Table 4**

*Descriptive Statistics for Paired t-Test of Current and Desired States by Dimension for Enhancing Virtual Educational Leadership in Islamic Azad Universities of Tehran Province*

| Comparison        | Dimension                                                        | Mean   | Sample Size | Standard Deviation | Mean Error Estimate |
|-------------------|------------------------------------------------------------------|--------|-------------|--------------------|---------------------|
| First Comparison  | Educational Leadership Knowledge in Virtual Space (Desirable)    | 4.8356 | 187         | 0.7581             | 0.43511             |
|                   | Educational Leadership Knowledge in Virtual Space (Current)      | 2.639  | 187         | 1.03219            | 0.34465             |
| Second Comparison | Performance Management and Coaching in Virtual Space (Desirable) | 4.4983 | 187         | 0.81590            | 0.05741             |
|                   | Performance Management and Coaching in Virtual Space (Current)   | 2.77   | 187         | 1.57070            | 0.11051             |
| Third Comparison  | Team Leadership Ability in Virtual Space (Desirable)             | 4.4354 | 187         | 0.98443            | 0.06926             |
|                   | Team Leadership Ability in Virtual Space (Current)               | 2.35   | 187         | 1.60331            | 0.11281             |
| Fourth Comparison | Ethical Behaviors in Virtual Space (Desirable)                   | 4.3291 | 187         | 0.86911            | 0.06115             |
|                   | Ethical Behaviors in Virtual Space (Current)                     | 2.54   | 187         | 1.71212            | 0.12046             |

According to Table 4, it can be understood that the means between the two groups in the desired state differ from the current state, and the mean in the desired state is higher than

the current state, but to confirm this difference, the paired t-test is used.

**Table 5**

*Paired t-Test of Current and Desired States for Enhancing Virtual Educational Leadership in Islamic Azad Universities of Tehran Province*

| Paired t-Test        | Mean Difference                                                          | Standard Error | Standard Deviation | Lower Limit | Upper Limit | t-value  | Degrees of Freedom | Significance (2-tailed) |
|----------------------|--------------------------------------------------------------------------|----------------|--------------------|-------------|-------------|----------|--------------------|-------------------------|
| First Paired t-Test  | Educational Leadership Knowledge in Virtual Space (Desired - Current)    | 2.1966         | 0.03768            | 0.2438      | 2.34947     | 2.846973 | 54.1547            | 186                     |
| Second Paired t-Test | Performance Management and Coaching in Virtual Space (Desired - Current) | 1.7283         | 0.02629            | 0.12925     | 2.25947     | 2.72973  | 65.73924           | 186                     |
| Third Paired t-Test  | Team Leadership Ability in Virtual Space (Desired - Current)             | 2.0854         | 0.026698           | 0.13329     | 2.34435     | 2.83056  | 78.11085           | 186                     |
| Fourth Paired t-Test | Ethical Behaviors in Virtual Space (Desired - Current)                   | 1.7891         | 0.026035           | 0.12675     | 2.48019     | 2.99281  | 68.71973           | 186                     |

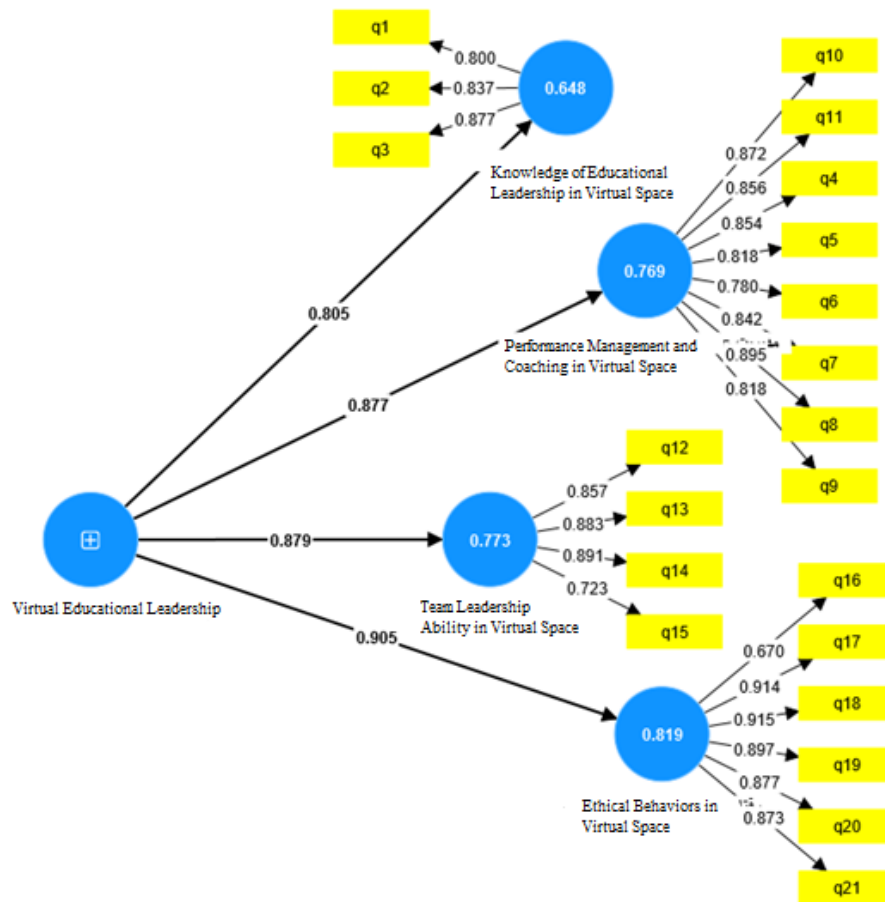
The mean differences in the current and desired states for the dimension of educational leadership knowledge in virtual environments were found to be 2.1966, with both upper and lower limits being significant, and a t-value of 54.1547, which is higher than 1.96, and a significance level of 0.000, which is less than 0.05 (research hypothesis), thus rejecting the null hypothesis and confirming the research hypothesis based on the existence of a difference between the current and desired states in the dimension of educational leadership knowledge in virtual environments. The mean differences in the current and desired states for the dimension of performance management and coaching in virtual environments were found to be 1.7283, with both upper and lower limits being significant, and a t-value of 65.73924, which is higher than 1.96, and a significance level of 0.000, which is less than 0.05 (research hypothesis), thus rejecting the null hypothesis and confirming the research hypothesis based on the existence of a difference between the current and desired states in the dimension of performance management and coaching in virtual environments. The mean differences in the current and desired states for the dimension of team leadership ability in

virtual environments were found to be 2.0854, with both upper and lower limits being significant, and a t-value of 78.11085, which is higher than 1.96, and a significance level of 0.000, which is less than 0.05 (research hypothesis), thus rejecting the null hypothesis and confirming the research hypothesis based on the existence of a difference between the current and desired states in the dimension of team leadership ability in virtual environments. The mean differences in the current and desired states for the dimension of ethical behaviors in virtual environments were found to be 1.7534, with both upper and lower limits being significant, and a t-value of 66.90133, which is higher than 1.96, and a significance level of 0.000, which is less than 0.05 (research hypothesis), thus rejecting the null hypothesis and confirming the research hypothesis based on the existence of a difference between the current and desired states in the dimension of ethical behaviors in virtual environments.

In the second step to answer the second question, the structural equation modeling method should be used as described below.

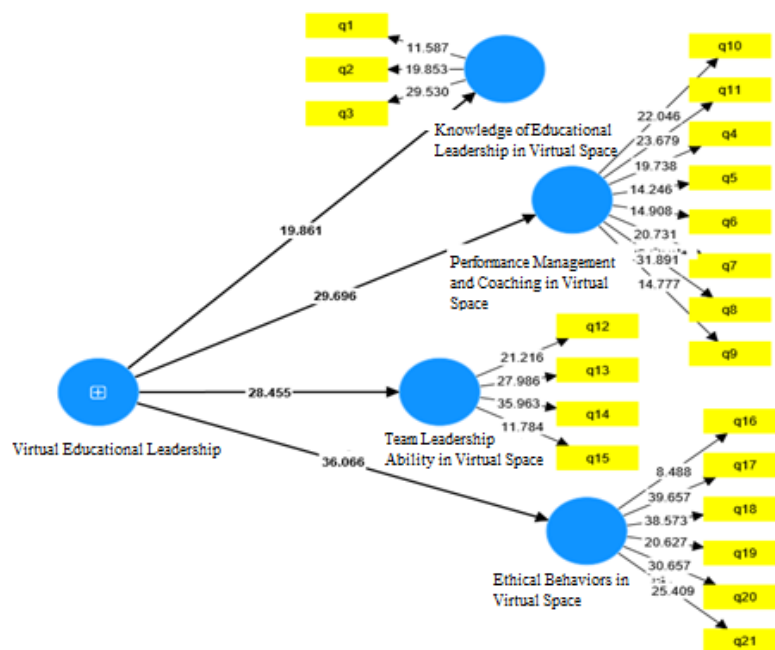
**Figure 1**

*Model with Beta Coefficient*



**Figure 2**

*Model with Beta Coefficient*



According to Figure 1, based on the obtained coefficients, it can be seen that the knowledge of educational leadership in virtual environments has the least impact on virtual educational leadership with a coefficient of 0.805, and the dimension of ethical behaviors in virtual educational leadership has the most impact with a coefficient of 0.905.

According to Figure 2, to confirm the obtained coefficients, the bootstrap test is used. In this section, all the obtained coefficients must be compared with the number 1.96 (null hypothesis). In Figure 2, it can again be observed that ethical behaviors in virtual environments with a number of 36.066 indicate a very high difference.

#### 4. Discussion and Conclusion

In the current study, the findings have illuminated several crucial aspects of virtual leadership in higher education, notably the significant role of leadership competencies, the impact of leadership on organizational culture, and the potential differences in leadership effectiveness based on gender. These findings are not only in line with existing literature but also extend our understanding of the nuanced dynamics of virtual leadership.

Firstly, the competencies identified as critical for successful virtual leadership in this study, such as adaptability, technical proficiency, and strategic communication, echo the insights provided by Azukas (2022), who emphasized the need for leaders in virtual environments to possess a robust set of digital skills and a flexible approach to leadership (Azukas, 2022). The importance of these competencies has been further corroborated by the work of Alward and Phelps (2019), who identified similar traits that contribute to effective virtual leadership in higher education settings (Alward & Phelps, 2019).

Moreover, our findings regarding the impact of virtual leadership on organizational culture align with Schmidt and Dellen (2021), who discussed how virtual leaders could effectively create a sense of place and belonging remotely (Schmidt & Dellen, 2021). Our study extends this by showing that effective virtual leadership can foster a supportive and inclusive organizational culture, which is crucial for maintaining staff motivation and commitment in a non-physical workspace. This is particularly relevant given the findings from Bell and Kozlowski (2002), which suggest that virtual teams require strong relational practices facilitated by effective leadership to thrive (Bell & Kozlowski, 2002).

Another significant aspect of our findings is related to the differences in leadership effectiveness between male and female leaders in virtual environments. The current study suggests that female leaders might be particularly effective in virtual settings, potentially due to their stronger emphasis on communication and team collaboration, which are vital in remote leadership scenarios. This observation is supported by Maheshwari, Nayak, and Ngyyen (2021), who noted that women's leadership style tends to be more collaborative and inclusive (Maheshwari et al., 2021). Additionally, the research by Watton, Stables, and Kempster (2019) proposed that virtual environments could provide a more level playing field for women, reducing physical workplace barriers and potentially altering traditional gender dynamics (Watton et al., 2019).

The findings also underscore the potential for virtual environments to obscure traditional gender biases, as suggested by Alsubaie and Jones (2017), thereby offering a more equitable platform for leadership development (Alsubaie & Jones, 2017). This could explain the enhanced effectiveness of female leaders in the virtual academic leadership roles observed in this study.

In interpreting these results, it is essential to consider the broader context provided by Castillo and Hallinger (2017), who noted that leadership in educational settings is profoundly influenced by cultural and institutional norms. The shift towards virtual leadership, therefore, presents both challenges and opportunities to redefine these norms in ways that enhance inclusivity and effectiveness (Castillo & Hallinger, 2017). Moreover, the work of Contreras, Baykal, and Abid (2020) on e-leadership during the COVID-19 pandemic provides a contemporary framework for understanding the rapid shifts in leadership requirements in crisis situations. Their insights into the accelerated adoption of virtual leadership practices highlight the relevance of our study's findings in the current global context, where higher education institutions are increasingly reliant on virtual platforms (Contreras et al., 2020).

This study has critically examined the dynamics of virtual leadership in higher education, revealing essential competencies that enhance organizational effectiveness and promote a supportive culture in virtual academic settings. The findings underscore the significance of adaptability, digital proficiency, and effective communication as pivotal traits for successful virtual leaders. Notably, the study also sheds light on the potential for gender to influence leadership effectiveness in virtual environments, with female leaders possibly having an edge in fostering collaboration and

inclusivity. By providing a deeper understanding of these elements, the research contributes valuable insights that can inform the development of leadership training programs and support the strategic planning efforts of higher education institutions transitioning to or enhancing their virtual presence.

Despite its insights, this study faces several limitations. The primary constraint is the reliance on self-reported data, which may introduce biases or inaccuracies in how participants perceive and report their competencies and experiences. Additionally, the study's focus on institutions within a specific geographic region may limit the generalizability of the findings to other contexts with different cultural or institutional frameworks. The cross-sectional nature of the research also restricts its ability to capture the long-term effects of virtual leadership practices, potentially overlooking evolving dynamics as institutions adapt to their virtual environments.

Future research should aim to address these limitations by incorporating longitudinal studies that track the evolution of virtual leadership over time, providing a clearer picture of its long-term impacts on organizational culture and effectiveness. Expanding the geographic scope of the study to include diverse educational settings could also enhance the generalizability of the findings. Moreover, employing mixed methods research could triangulate self-reported data with observational and quantitative metrics, offering a more robust assessment of virtual leadership competencies and outcomes. Investigating the specific challenges and strategies relevant to different disciplines within higher education could also enrich the understanding of domain-specific leadership in virtual contexts.

The findings of this study have several practical implications for higher education institutions. Given the pivotal role of digital proficiency in effective virtual leadership, institutions should prioritize the development of targeted training programs that enhance the digital skills of their leaders. Additionally, fostering a supportive virtual environment that enhances communication and collaboration can be facilitated by adopting best practices identified in this research, such as regular virtual meetings and structured communication channels. Institutions should also consider policies that promote gender equity in leadership by recognizing and leveraging the unique strengths that female leaders bring to virtual settings. Implementing these suggestions can help institutions maximize the benefits of virtual leadership, ultimately

leading to improved educational outcomes and more resilient educational environments.

## Authors' Contributions

In this study, the authors collectively were responsible for data collection, analysis, and manuscript writing.

## Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

## Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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This study acknowledged all those who contributed to its completion.

## Declaration of Interest

No conflict of interest was reported.

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## Ethical Considerations

This study adhered to ethical principles such as confidentiality and voluntary participation.

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