

Digital Leadership in Higher Education: Challenges and Barriers from a Systematic Review

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ABSTRACT

Digital transformation has increased the importance of digital leadership (DL) in higher education (HE), yet the challenges and barriers that constrain its development and implementation remain fragmented across the literature. This systematic review synthesizes existing evidence on these challenges and examines how they interrelate across studies. The literature search was conducted in Scopus, Web of Science, ERIC, and Google Scholar for studies published between 2017 and 2025. Following the study-selection process, 17 studies were included in the final synthesis. Thematic synthesis identified six overarching barrier themes: human capability and psychological readiness, organizational and cultural barriers, technological and resource constraints, strategic and governance barriers, coordination and change-implementation barriers, and ethical, security, and equity challenges. Human capability and psychological readiness was the most recurrent theme, appearing in 16 of the 17 studies. Study-level co-occurrence analysis further showed that barriers frequently occurred together, with the strongest proportional overlap observed between strategic and governance barriers and coordination and change-implementation barriers. Based on these patterns, the review proposes an Integrated Barrier Ecosystem for DL in HE, comprising three interconnected nexuses: the Institutional Transformation Nexus, Leadership and Digital Capacity Nexus, and Responsible Digital Governance Nexus. The findings suggest that DL challenges in HE extend beyond individual competence or technological provision and are embedded within interconnected human, organizational, technological, strategic, governance, and ethical conditions. The review provides an integrated perspective for understanding and addressing DL barriers in contemporary HE.

Keywords: digital leadership; higher education; digital transformation; barriers; digital governance

INTRODUCTION

Digital technologies are changing HE. Universities increasingly use digital platforms, artificial intelligence (AI), data-based systems, and other technologies in teaching, research, administration, and communication. These changes are not only technological. They also require changes in institutional strategy, organizational processes, staff capabilities, and ways of working. Digital transformation has therefore become an important issue for higher education institutions (HEIs) (Gkrimpizi et al., 2023; Onan, 2024).

Leadership plays an important role in this process. DL involves more than the use of digital technologies by leaders. It concerns how leaders respond to digital change, support institutional transformation, develop digital

capabilities, and connect digital initiatives with organizational goals. However, DL in HE is still a developing research field. Its definitions, research focus, theoretical development, and empirical evidence remain relatively limited (Jameson et al., 2022). A systematic review by Ratajczak (2022) also identified digital competence development and digital transformation as important themes in university DL research.

DL in HE faces many challenges. These challenges are not limited to technology. Previous research on HE digital transformation has identified barriers related to people, organizational culture, strategy, resources, infrastructure, and institutional processes. For example, Gkrimpizi et al. (2023) identified 20 barriers and grouped them into environmental, strategic, organizational, technological, people-related, and cultural categories. Onan (2024) also identified inadequate technological infrastructure, limited digital skills, financial constraints, and resistance to change as major challenges in HE digital transformation.

Despite this progress, important gaps remain. First, previous reviews have mainly examined DL as a broad research field or barriers to digital transformation in general. Jameson et al. (2022), for example, systematically reviewed the maturity, focus, theoretical development, and methods of DL research in HE, while Gkrimpizi et al. (2023) focused on classifying barriers to HE digital transformation. Less attention has been given specifically to synthesizing the challenges and barriers associated with DL in HE.

Second, existing research often presents barriers as separate categories. This approach is useful for classification, but it provides less understanding of how barriers occur together. Human, technological, cultural, strategic, and implementation problems may be closely connected within the same institutional context. Examining these relationships may therefore provide a more integrated understanding of the conditions that constrain DL.

Third, the literature is spread across different years and geographical contexts. It remains unclear how the reported barriers are distributed across publication periods and geographical contexts. Such analysis should be interpreted cautiously because the available evidence is still limited and uneven across regions. Jameson et al. (2022) similarly concluded that DL research in HE remains limited in theoretical maturity and empirical evidence.

Therefore, this study systematically reviews the literature on challenges and barriers to DL in HE. Rather than only identifying individual barriers, it also examines their temporal and contextual patterns and their co-occurrence across studies. The study has three objectives:

1. To identify and synthesize the major challenges and barriers to DL in HE.
2. To examine the temporal and contextual patterns of these barriers across publication periods and geographical contexts.
3. To examine how the barriers co-occur and to develop an integrated conceptual framework based on their interrelationships.

Accordingly, the study addresses the following research questions:

RQ1: What are the major challenges and barriers to DL in HE?

RQ2: What temporal and contextual patterns can be observed in these challenges and barriers?

RQ3: How do the identified barriers co-occur, and how can their interrelationships inform an integrated conceptual framework?

By addressing these questions, this review aims to provide a more integrated understanding of DL barriers in HE. It moves beyond the identification of individual barriers by examining how they occur across contexts and how they are interconnected. The findings may help researchers better understand the interconnected conditions that shape DL in HE and may also help HE leaders identify areas that require coordinated attention during digital

transformation.

LITERATURE REVIEW

Digital Leadership in Higher Education

Digital transformation has changed the way HEIs operate. Digital technologies are increasingly used in teaching, learning, research, communication, and administration. However, digital transformation involves more than the adoption of new technologies. It also involves changes in people, organizational processes, institutional culture, and leadership (Gkrimpizi et al., 2023; Onan, 2024). Leadership is therefore an important part of digital transformation. DL generally refers to leadership in contexts shaped by digital technologies and digital change. In HE, it involves guiding institutional change, supporting digital capabilities, and connecting digital initiatives with institutional goals. A systematic review by Ratajczak (2022) identified three main areas in university DL research: digital competence development, digital transformation, and the characteristics of digital leaders.

DL should therefore not be understood only as the ability of leaders to use technology. It also involves guiding people and institutions through digital change. This is particularly important in universities because digital transformation affects different academic and administrative areas and requires leadership across organizational levels. Despite its importance, DL in HE is still a developing field. Jameson et al. (2022) found that existing research remains limited in theory, maturity, and evidence. Definitions and theoretical approaches also vary across studies, and the relationship between DL and wider institutional leadership remains insufficiently understood. These limitations indicate the need for further research on DL within the complex context of HE.

Digital Leadership and Institutional Digital Transformation

DL and digital transformation are closely related but are not the same concept. Digital transformation refers to broader changes in institutional activities, structures, processes, and practices that are enabled or influenced by digital technologies. DL concerns the leadership capabilities and processes needed to guide these changes. In HE, digital transformation requires alignment between technology and institutional goals. Leaders need to support digital initiatives while also addressing staff capability, organizational structures, resources, and change processes. Onan (2024) emphasizes the importance of managing digital transformation because it affects HE management processes, operational functions, and educational practices.

The human dimension is particularly important. Ratajczak (2022) notes that successful digital transformation depends not only on technology but also on the human factor, with leaders playing an important role in guiding organizational change. DL therefore connects technological change with people and institutional processes. This relationship is especially important in HE because universities are complex organizations. Digital initiatives may involve institutional leaders, academic staff, administrative staff, IT units, students, and other stakeholders. Digital transformation therefore requires more than a formal strategy. It also requires coordination and institutional support.

Challenges and Barriers in Higher Education Digital Transformation

Previous research has identified many barriers to digital transformation in HE. These barriers extend beyond technological problems. Gkrimpizi et al. (2023) conducted a systematic review of barriers to digital transformation in HEIs. They identified 20 barriers and classified them into six categories: environmental, strategic, organizational, technological, people-related, and cultural barriers. Among the most common barriers were limited digital literacy, resistance to change, inadequate IT infrastructure, and budget constraints. Human-related barriers are particularly important. Academic and administrative staff may lack the knowledge, skills, or confidence needed to use digital technologies effectively. Resistance may also occur when digital change affects

established practices or creates uncertainty. Gkrimpizi et al. (2023) identified lack of digital literacy and resistance to change as recurring barriers in HE digital transformation.

Technological and resource limitations also remain important. HEIs may experience inadequate infrastructure, limited access to technology, insufficient funding, and limited technical support. Onan (2024) similarly identified technological infrastructure deficiencies, limited digital skills and competencies, financial limitations, and resistance to change as major barriers to HE digital transformation. Organizational and strategic conditions can also restrict digital transformation. Digital initiatives may be difficult to implement when institutional strategies are unclear, organizational structures are inflexible, or institutional cultures do not support change. Overall, these findings show that digital transformation barriers are multidimensional and involve human, technological, organizational, strategic, and cultural conditions (Gkrimpizi et al., 2023).

Gaps in Existing Research

Although previous research provides useful knowledge, several gaps remain.

First, existing reviews have different areas of focus. Jameson et al. (2022) examined the maturity, theories, definitions, focus, and methods of DL research in HE, while Ratajczak (2022) examined the development and main areas of university DL research. In contrast, Gkrimpizi et al. (2023) focused on identifying and classifying barriers to digital transformation in HEIs. Less attention has been given specifically to the challenges and barriers associated with DL in HE. This distinction is important because digital transformation is a broad institutional process, whereas DL concerns the leadership processes and capabilities involved in guiding and responding to digital change.

Second, previous research has mainly identified and classified barriers, while less attention has been given to how different barriers occur together. Human, technological, organizational, strategic, and cultural barriers may be interconnected within the same institutional context. Examining their co-occurrence may therefore provide a more integrated understanding of DL challenges.

Third, existing evidence comes from different publication periods and geographical contexts, but the temporal and contextual patterns of DL barriers remain insufficiently understood. Examining how reported barriers are distributed across periods and study contexts may provide further insight, although such patterns need to be interpreted cautiously when the evidence base is small or uneven.

Finally, DL research in HE remains relatively limited in theoretical maturity and empirical evidence (Jameson et al., 2022). A systematic synthesis focused specifically on barriers, their temporal and contextual patterns, and their interrelationships can therefore provide a more integrated understanding of DL in HE. These gaps provide the basis for the three research questions presented in the Introduction. The present study therefore moves beyond identifying individual barriers by examining their temporal and contextual patterns, co-occurrence, and interrelationships.

METHODOLOGY

Review Design

This study used a systematic review design to examine the challenges and barriers to DL in HE. The review followed the PRISMA 2020 guidelines to support transparent reporting of study identification, screening, eligibility assessment, and inclusion (Page et al., 2021). The analysis involved three main stages. First, thematic coding and synthesis were used to identify and organize recurring barriers across the included studies. Second, descriptive analyses were conducted to examine the distribution of the themes across publication periods and geographical contexts. Third, theme co-occurrence analysis was used to examine the relationships among the

identified barriers. These analyses were then integrated to develop a conceptual framework of DL barriers in HE.

Search Strategy

A systematic literature search was conducted using Scopus, Web of Science (WoS), ERIC, and Google Scholar, covering publications from 2017 to 2025. These databases and sources were selected to provide broad coverage of research related to education, leadership, management, and digital transformation. The search terms covered three main concepts: DL, HE, and challenges or barriers. The main search strategy combined the following terms:

("digital leadership" OR "e-leadership" OR "technology leadership") AND ("higher education" OR university OR universities OR "higher education institution") AND (challenge OR barrier OR constraint* OR obstacle* OR limitation*)*

The search terms were adjusted as necessary to accommodate the search functions and syntax of the different databases and sources. The bibliographic database searches identified 53 records, comprising 29 from Scopus, 19 from Web of Science, and 5 from ERIC. Google Scholar was used as a supplementary search source and returned approximately 828 relevance-ranked results. Given the large volume of results, the Google Scholar results were examined sequentially to identify potentially eligible studies rather than all returned results being treated as records entering formal screening. The subsequent study-selection process is described in the Study Selection subsection and presented in Figure 1.

Eligibility Criteria

Studies were selected according to predefined inclusion and exclusion criteria.

Studies were included if they: (1) focused on DL or leadership related to digital transformation; (2) were conducted in HE or provided clearly identifiable HE evidence; (3) reported challenges, barriers, constraints, or related difficulties relevant to DL; (4) provided sufficient information for coding and synthesis; (5) were published between 2017 and 2025; and (6) were available in English. Studies were excluded if they: (1) focused on K–12 or other non-HE educational contexts; (2) examined digital transformation without a clear leadership dimension; (3) provided descriptive accounts without relevant evidence on challenges or barriers; (4) did not provide clearly identifiable HE evidence; (5) were duplicates; or (6) did not provide sufficient information for analysis. For studies covering more than one educational sector, only those with clearly identifiable HE evidence were retained. Studies in which HE findings could not be separated from other educational contexts were excluded. This criterion ensured that the final synthesis focused specifically on HE.

Study Selection

The study-selection process followed the PRISMA 2020 framework (Page et al., 2021). The database searches identified 53 records, including 29 from Scopus, 19 from Web of Science, and 5 from ERIC. The supplementary Google Scholar search returned approximately 828 results ranked by relevance. Given the large number of results, these were examined sequentially to identify potentially eligible studies rather than treating all returned results as records entering formal screening. Records retained from the searches were consolidated, and two duplicate records were removed. Following consolidation and preliminary relevance assessment, 77 records proceeded to formal title and abstract screening. Of the 77 records screened, 35 were excluded, leaving 42 reports for full-text assessment. All 42 reports were successfully retrieved and assessed for eligibility. Of these, 25 were excluded: five focused on K–12 education, seven addressed digital transformation without a clear leadership dimension, eight provided no relevant evidence on challenges or barriers, four addressed broader educational contexts without clearly identifiable HE-specific evidence, and one examined a mixed educational context without separately identifiable HE findings. The final synthesis therefore included 17 studies. The complete study-selection process is presented in Figure 1.

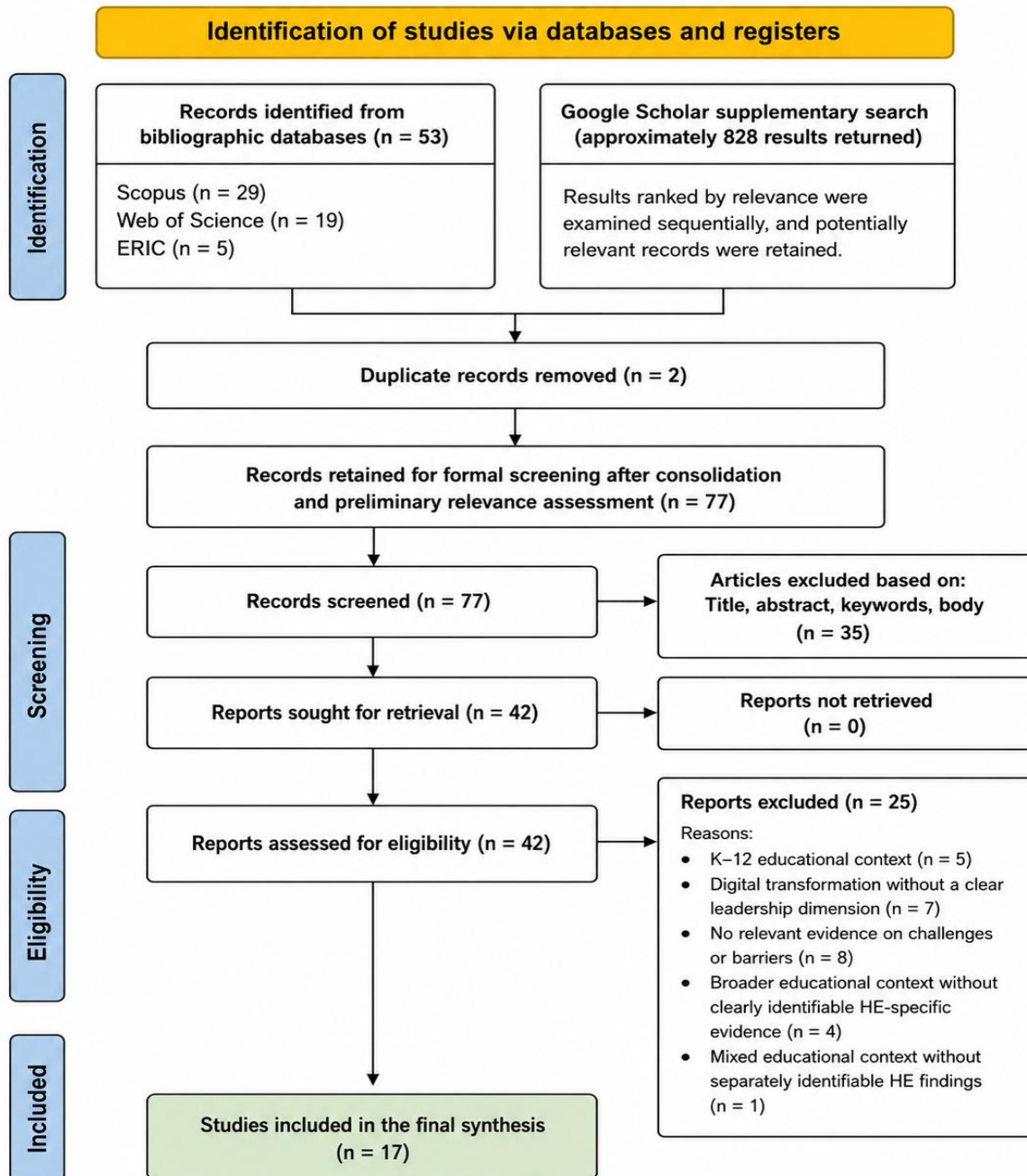


Figure 1. PRISMA flow diagram of the study selection process

Quality Appraisal

Quantitative, qualitative, and mixed-methods empirical studies were appraised using the Mixed Methods Appraisal Tool (MMAT) 2018 (Hong et al., 2018). Systematic reviews were assessed using the relevant JBI critical appraisal checklist, while conceptual and textual evidence was assessed using JBI criteria for textual evidence (McArthur et al., 2025). The appraisal focused on the clarity of research aims, appropriateness of study design, sampling or evidence selection, data collection and analysis, methodological transparency, and the extent to which conclusions were supported by the reported evidence. Each applicable criterion was rated as Yes (Y), No (N), Cannot tell (CT), or Not applicable (N/A). Because the included studies represented heterogeneous forms of evidence, no overall numerical quality score or universal cut-off was applied. The appraisal was used to assess the credibility of the evidence and to inform interpretation rather than as an exclusion criterion. Therefore, studies were not excluded solely because individual appraisal criteria were rated N or CT. Detailed study-level assessments are provided in Supplementary Table S1.

Data Extraction

A structured form was used to extract information from the 17 included studies. The extracted information included authors, publication year, study context, geographical setting, research design, evidence type, participants or data sources where applicable, digital leadership focus, and reported challenges or barriers. Evidence type was retained throughout the synthesis so that primary empirical findings, systematic review evidence, and conceptual or textual evidence could be distinguished during interpretation. Secondary reviews and conceptual sources were included because the review sought to synthesize the broader range of reported barriers to digital leadership in HE, including barriers that had been consolidated or conceptually examined in prior reviews. These sources were used to identify, corroborate, and contextualize recurring barrier dimensions and were not treated as equivalent to primary institutional observations. Potential overlap in the underlying evidence represented by secondary reviews was recognized as a methodological consideration. However, because the analysis was conducted at the included-source level rather than at the level of primary samples, each included source contributed only one binary observation per theme, irrespective of the number of primary studies represented within a review. This source-level approach reduced the possibility that larger reviews would receive greater numerical weight solely because they contained more primary studies, although potential overlap in underlying evidence was considered when interpreting theme frequencies and co-occurrence patterns.

Thematic Coding and Synthesis

The full texts of the 17 included studies were examined to identify statements related to challenges and barriers to digital leadership in HE. Relevant barrier statements were coded and compared across studies. Similar codes were grouped into broader themes based on their shared meanings, and theme labels were refined during this process to improve clarity and reduce conceptual overlap. The themes were developed through comparison and synthesis across the included studies rather than imposed as fixed categories before coding. After the themes were finalized, a binary study-by-theme coding matrix was created. Each theme was coded as 1 when it was clearly present in a study and 0 when it was absent. A theme was counted only once within each study, regardless of how many related statements were identified. This binary approach was deliberately used to provide a consistent study-level representation across methodologically heterogeneous sources. It was not intended to measure the intensity or severity of a barrier, the frequency with which it was discussed within a source, or its causal influence.

Temporal and Contextual Analysis

Two descriptive analyses were conducted to examine patterns in the identified themes. First, a Year $\times$ Theme analysis was conducted. Studies were grouped into publication periods based on their publication years. Theme frequencies and percentages were then compared across these periods. All 17 included studies had identifiable publication-year information and were included in the temporal analysis.

Second, a Region $\times$ Theme analysis was conducted. Studies were grouped according to their study contexts. Theme frequencies and percentages were calculated for each geographical group. Both analyses were descriptive and illustrative. They were used to characterize the distribution of the available evidence rather than to test statistical differences, establish temporal trends, or make generalizable regional comparisons. Because some geographical groups contained only a small number of studies, particularly Africa and the cross-regional category, the findings were interpreted cautiously.

Theme Co-occurrence Analysis

A theme co-occurrence analysis was conducted using the final binary coding matrix. Each included source was treated as one unit of analysis, and two themes were considered to co-occur when both were coded as present in

the same source. Pairwise co-occurrence counts were calculated for all themes. Because the themes differed in their overall frequencies, the Jaccard coefficient was used to measure proportional overlap between each pair of themes. The Jaccard coefficient is appropriate for binary presence–absence data because it measures similarity based on joint presence relative to the total number of cases in which either feature is present (Choi et al., 2010; Real & Vargas, 1996).

$$J(A, B) = \frac{|A \cap B|}{|A \cup B|}$$

where A and B represent the sets of included sources in which two themes were present. The coefficient ranges from 0 to 1, with higher values indicating greater proportional overlap. The Jaccard coefficients were used as descriptive measures of co-occurrence rather than as tests of statistical association or evidence of causal relationships. They also do not capture differences in barrier severity, salience, or evidentiary emphasis within individual sources.

Development of the Integrated Conceptual Framework

The final stage integrated the results of the thematic coding and co-occurrence analysis. Themes showing strong conceptual connections and recurrent co-occurrence were examined together. Broader configurations were then developed to represent the relationships among the major barriers. This process resulted in the Integrated Barrier Ecosystem for DL in HE presented in the Results section. The framework was developed from the synthesis of the included studies rather than adopted before the analysis. The relationships shown in the framework represent recurring co-occurrence patterns and conceptual connections. They do not represent causal relationships.

RESULTS

Characteristics of the Included Studies

Following full-text eligibility assessment, 17 studies were retained for the final synthesis. The included studies comprised quantitative, qualitative, and mixed-methods empirical research, as well as review and conceptual studies, and represented Asian, European, Middle Eastern, African, cross-regional, and global or non-region-specific settings. Given the uneven geographical distribution of the included studies, regional patterns were interpreted descriptively rather than as generalizable differences.

Table 1. Characteristics of the Studies Included in the Final Synthesis (n = 17)

No	Study	Context	Design/method	Sample or data source	Main relevance to the review
1	Rocha et al. (2022)	International HE	Thematic synthesis literature review	HE leadership literature	Leadership challenges in University 4.0
2	Ghamrawi & Tamim (2023)	Gulf-region HEI	Qualitative case study	6 leadership-team members	Digital competence, culture, governance, resistance
3	Pu et al. (2025)	Chinese HEIs	Quantitative survey study	607 respondents	DL and institutional change

No	Study	Context	Design/method	Sample or data source	Main relevance to the review
4	Zawacki-Richter et al. (2019)	International HE	Systematic literature review	146 studies	AI ethics, privacy, and data protection
5	Onan (2024)	International HE	Systematic literature review	HE literature	Digital skills, infrastructure, resources, resistance
6	Chiriac & Tap (2018)	European HE	Literature-based analysis and case survey	Selected literature, case studies, and case-survey evidence	Competence, strategy, collaboration, culture
7	Sukandi (2024)	HE	Systematic literature review	HE literature	Culture, competence, resources, security
8	Qayyum et al. (2025)	Pakistani HE	Mixed methods	150 respondents + interviews	Capability, infrastructure, culture, strategy
9	Hamdoun (2021)	Lebanese HE	Quantitative survey study	117 university instructors	Digital skills, resources, and infrastructure
10	Ros & Prak (2024)	Cambodian HE	Qualitative study	45 HE stakeholders and policymakers	Strategy, resources, readiness, implementation
11	Jing et al. (2025)	Chinese HEIs	Mixed-methods study with sequential explanatory design	78 survey respondents + 7 administrators	Governance, culture, resources, implementation
12	Kovacevic et al. (2025)	Croatian HE	Theoretical position paper with exploratory mixed-methods evidence	95 students + 5 HE leaders	Resistance, regulation, AI ethics
13	Elkington & Ruttenberg-Rozen (2023)	Cross-regional HE	Qualitative study using phenomenological and grounded theory approaches	18 HE leaders	Capability, inertia, funding, equity
14	Zhu et al. (2024)	Chinese universities	Quantitative survey study	402 teachers from 25 universities	University DL and teacher digital competence
15	Loglo (2024)	Ghanaian public HE	Qualitative multiple-case study	Senior administrators from 3 public universities	Resources, policy, coordination, digital divide

No	Study	Context	Design/method	Sample or data source	Main relevance to the review
16	Ehlers (2020)	Global / non-specific HE	Conceptual/theoretical analysis	HE literature and conceptual evidence	Strategy, culture, participation, competence
17	Olcott et al. (2023)	European HE	Conceptual and descriptive study	HE theory, practice, and leadership experience	Culture, strategy, resources, ethics, equity

The quality appraisal indicated generally acceptable methodological quality across the included studies, although several limitations were identified. These mainly concerned sample representativeness, methodological reporting, the reporting of some mixed-method procedures, and critical appraisal procedures in the included systematic reviews. These limitations were considered when interpreting the findings rather than used as criteria for study exclusion. Detailed study-level assessments are provided in Supplementary Table S1 (see Appendix).

Major Challenges and Barriers to Digital Leadership

The thematic synthesis identified six overarching categories of challenges and barriers to DL in HE: human capability and psychological readiness, organizational and cultural barriers, technological and resource constraints, strategic and governance barriers, coordination and change-implementation barriers, and ethical, security, and equity challenges. As shown in Table 2, human capability and psychological readiness emerged as the most recurrent theme, appearing in 16 of the 17 studies (94.1%), followed by organizational and cultural barriers (13, 76.5%) and technological and resource constraints (12, 70.6%). Strategic and governance barriers were identified in 11 studies (64.7%), while coordination and change-implementation barriers and ethical, security, and equity challenges each appeared in 10 studies (58.8%).

Table 2. Distribution of Major Challenges and Barriers to DL in HE (n = 17)

Theme	n	%
Human Capability and Psychological Readiness	16	94.1
Organizational and Cultural Barriers	13	76.5
Technological and Resource Constraints	12	70.6
Strategic and Governance Barriers	11	64.7
Coordination and Change-Implementation Barriers	10	58.8
Ethical, Security, and Equity Challenges	10	58.8

Human capability and psychological readiness encompassed digital competence, professional development, confidence, readiness, and resistance to digital change. Organizational and cultural barriers included institutional inertia, hierarchy, traditional practices, trust, and innovation culture, whereas technological and resource constraints involved infrastructure, connectivity, technical support, funding, and specialist personnel. Strategic and governance barriers concerned vision, policy, regulation, accountability, and strategic alignment; coordination and change-implementation barriers included communication, stakeholder engagement, cross-unit collaboration, and change management; and ethical, security, and equity challenges encompassed privacy, cybersecurity, AI ethics, academic integrity, digital inequality, and inclusion.

Themes were coded at the study level, with each theme counted once per study. The frequencies therefore indicate the recurrence of each theme across the included studies rather than its relative importance, severity, or causal influence.

Temporal Patterns of Barriers

Temporal analysis was conducted for all 17 studies included in the final synthesis. For descriptive comparison, studies were grouped into three publication periods: 2018–2021, 2022–2023, and 2024–2025. These periods were used to illustrate the distribution of the identified themes across the available literature, rather than to establish statistically supported temporal trends.

Table 3. Distribution of Barrier Themes across Publication Periods

Period	n	Human	Culture	Technology/ Resources	Strategy/ Governance	Coordination/ Implementation	Ethics/ Equity
2018–2021	4	3 (75.0%)	2 (50.0%)	2 (50.0%)	2 (50.0%)	2 (50.0%)	1 (25.0%)
2022–2023	4	4 (100%)	4 (100%)	3 (75.0%)	3 (75.0%)	3 (75.0%)	3 (75.0%)
2024–2025	9	9 (100%)	7 (77.8%)	7 (77.8%)	6 (66.7%)	5 (55.6%)	6 (66.7%)

Human capability and psychological readiness were identified across all three publication periods, occurring in three of the four studies published during 2018–2021 (75.0%) and in all studies published during 2022–2023 and 2024–2025. Among the nine studies published between 2024 and 2025, organizational/cultural and technological/resource barriers each occurred in seven studies (77.8%), while strategic/governance and ethical/security/equity challenges each occurred in six (66.7%). Coordination/change-implementation barriers were identified in five studies (55.6%). Overall, the temporal pattern suggests multidimensionality rather than a simple chronological shift from technological toward strategic or ethical challenges.

Contextual Patterns across Geographical Settings

Studies were classified according to the geographical contexts examined in the studies rather than the institutional affiliations of the authors. Because the number of studies differed substantially across geographical categories, the regional analysis was used to illustrate contextual patterns in the available evidence rather than to establish generalizable regional differences.

Table 4. Distribution of Barrier Themes across Geographical Contexts

Region/ context	n	Human	Culture	Technology/ Resources	Strategy/ Governance	Coordination/ Implementation	Ethics/ Equity
Asia	5	5 (100.0%)	3 (60.0%)	4 (80.0%)	3 (60.0%)	2 (40.0%)	2 (40.0%)
Europe	3	3 (100.0%)	3 (100.0%)	2 (66.7%)	3 (100.0%)	3 (100.0%)	2 (66.7%)
Middle East	2	2 (100.0%)	1 (50.0%)	1 (50.0%)	1 (50.0%)	1 (50.0%)	0 (0.0%)
Africa	1	1 (100.0%)	1 (100.0%)	1 (100.0%)	1 (100.0%)	1 (100.0%)	1 (100.0%)
Cross- regional	1	1 (100.0%)	1 (100.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)
Global/ non-specific	5	4 (80.0%)	4 (80.0%)	3 (60.0%)	3 (60.0%)	3 (60.0%)	4 (80.0%)

Human capability and psychological readiness appeared in all five Asian studies, while technological and resource constraints were identified in four (80.0%). Organizational and cultural barriers and strategic and governance barriers were each identified in three Asian studies (60.0%), whereas coordination and change-implementation barriers and ethical, security, and equity challenges were each identified in two (40.0%). In the

three European studies, human capability and psychological readiness, organizational and cultural barriers, strategic and governance barriers, and coordination and change-implementation barriers were identified in all studies, while technological and resource constraints and ethical, security, and equity challenges were each identified in two (66.7%). These patterns suggest that barriers to DL were multidimensional across geographical contexts, although their distribution varied across the included studies. However, given the small and uneven number of studies within each geographical category, particularly in the African and cross-regional categories, these patterns should be interpreted descriptively rather than as evidence of systematic regional differences.

Co-occurrence Patterns among Barrier Themes

The study-level co-occurrence analysis showed that the six barrier themes frequently appeared together across the included studies rather than as isolated categories.

Table 5. Theme $\times$ Theme Co-occurrence Matrix (n = 17)

Theme	HC	OC	TR	SG	CI	EE
HC	16	13	12	11	10	9
OC	13	13	10	11	10	9
TR	12	10	12	8	7	8
SG	11	11	8	11	10	7
CI	10	10	7	10	10	7
EE	9	9	8	7	7	10

Note. Values represent the number of studies in which each pair of themes co-occurred. Diagonal values (in bold) indicate the total number of studies in which each individual theme was identified. Themes were coded once per study. HC = human capability and psychological readiness; OC = organizational and cultural barriers; TR = technological and resource constraints; SG = strategic and governance barriers; CI = coordination and change-implementation barriers; EE = ethical, security, and equity challenges.

Because the themes differed in their overall frequencies, Jaccard coefficients were calculated to assess proportional overlap in their occurrence across studies. The highest proportional overlap was observed between strategic and governance barriers and coordination and change-implementation barriers ($J = .91$), followed by organizational and cultural barriers and strategic and governance barriers ($J = .85$), human capability and psychological readiness and organizational and cultural barriers ($J = .81$), organizational and cultural barriers and coordination and change-implementation barriers ($J = .77$), and human capability and psychological readiness and technological and resource constraints ($J = .75$). These co-occurrence patterns suggest that DL barriers may be interconnected rather than isolated, particularly across strategic and governance, organizational and cultural, and coordination and change-implementation dimensions.

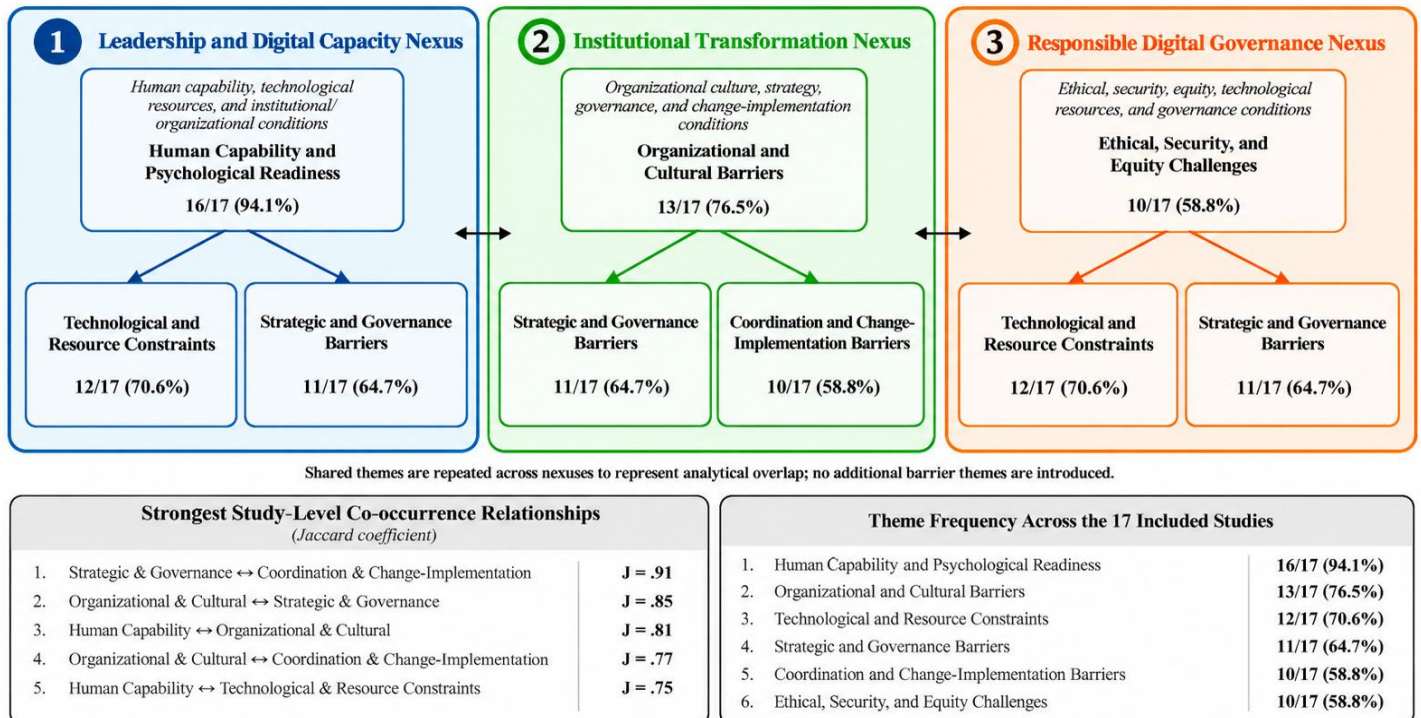
Integrated Barrier Ecosystem for Digital Leadership in Higher Education

Based on the thematic synthesis and study-level co-occurrence analysis, an Integrated Barrier Ecosystem for Digital Leadership in Higher Education was developed (Figure 2). The framework synthesizes the six barrier themes into three interconnected analytical nexuses: the Institutional Transformation Nexus, the Leadership and Digital Capacity Nexus, and the Responsible Digital Governance Nexus. The Institutional Transformation Nexus brings together strategic and governance barriers, organizational and cultural barriers, and coordination and change-implementation barriers, among which some of the strongest co-occurrence patterns were observed. The Leadership and Digital Capacity Nexus integrates human capability and psychological readiness with technological and resource constraints and strategic and governance barriers, highlighting the combined

importance of leadership capacity, digital resources, and institutional direction. The Responsible Digital Governance Nexus connects ethical, security, and equity challenges with technological and resource constraints and strategic and governance barriers, reflecting the intersection of responsible digital practices, institutional governance, and technological conditions. Together, the three nexuses conceptualize DL barriers as an interconnected institutional ecosystem rather than a set of isolated constraints. The framework integrates recurring thematic and co-occurrence patterns and does not imply causal relationships.

Integrated Barrier Ecosystem for Digital Leadership in Higher Education

Evidence from a Systematic Review of 17 Higher Education Studies



Note. The framework was developed based on the thematic synthesis and study-level theme co-occurrence analysis of the 17 included studies. Connections represent recurring patterns of co-occurrence across studies rather than empirically established causal relationships.

Figure 2. Integrated Barrier Ecosystem for Digital Leadership in Higher Education

DISCUSSION

Key Findings

This systematic review synthesized 17 studies addressing challenges and barriers related to DL in HE. Six overarching themes were identified: human capability and psychological readiness, organizational and cultural barriers, technological and resource constraints, strategic and governance barriers, coordination and change-implementation barriers, and ethical, security, and equity challenges.

Three findings are particularly important. First, human capability and psychological readiness emerged as the most frequently identified theme, appearing in 16 of the 17 studies (94.1%). Second, the highest proportional co-occurrence was observed between strategic and governance barriers and coordination and change-implementation barriers ($J = .91$), supporting the interpretation of institutional transformation as a key nexus within the broader barrier ecosystem. Third, ethical, security, and equity challenges were identified in 10 studies (58.8%) and co-occurred with several technological, governance, and implementation-related barriers, indicating their cross-cutting relevance to contemporary DL. These findings are consistent with evidence that HE digital

transformation involves human, organizational, technological, strategic, and cultural challenges (Gkrimpizi et al., 2023), while extending previous research by revealing recurring patterns of co-occurrence among these barriers and integrating them into a broader barrier ecosystem.

The Central Role of Human Capability and Psychological Readiness

Human capability and psychological readiness was the most frequently identified barrier theme across the reviewed studies. Across the reviewed studies, this theme encompassed limitations in digital competence and professional development, low confidence and readiness, and resistance or reluctance to engage with digital change. This finding is consistent with Ghamrawi and Tamim (2023), who identified digital competence and digital culture as central dimensions of DL in an HE digital initiative characterized by faculty resistance.

Importantly, the synthesis suggests that digital competence and psychological readiness represent related yet conceptually distinct dimensions of human readiness for digital transformation. This distinction implies that institutions may possess adequate technological resources while academics remain uncertain about or resistant to changing established practices. Conversely, willingness to engage with digital technologies may have limited practical impact without sufficient competence and institutional support. From a DL perspective, these findings suggest the need to move beyond a narrow focus on technology provision and isolated training initiatives toward continuous professional development, communication, participation, and institutional support that jointly strengthen digital capability and psychological readiness.

Institutional Transformation as the Core Interconnected Nexus

Although human capability and psychological readiness were the most frequently identified barrier theme, the co-occurrence analysis revealed that the strongest patterns of thematic overlap clustered within what this review conceptualizes as the Institutional Transformation Nexus. Strategy/governance showed particularly high co-occurrence with coordination/change implementation ($J = .91$) and organizational culture ($J = .85$), while organizational culture also frequently co-occurred with coordination/change implementation ($J = .77$). These co-occurrence patterns suggest that a central challenge lies not simply in developing digital strategies, but in translating them into coordinated institutional practice. HEIs are complex organizations involving multiple faculties, departments, administrative units, and relatively autonomous academic communities. Digital transformation in such settings therefore depends on alignment among strategic direction, governance arrangements, organizational culture, stakeholder participation, and implementation processes.

This interpretation extends previous classifications of HE digital-transformation barriers by suggesting that strategy, culture, and implementation should not be viewed merely as parallel categories, but as elements of a closely interconnected institutional configuration (Gkrimpizi et al., 2023). It also contributes to the broader effort to develop a more mature conceptualization of DL in HE and its relationship with institutional digital transformation (Jameson et al., 2022). From this perspective, DL may be conceptualized not solely as an attribute of individual leaders, but also as an institutional capacity for enabling digital transformation. Such a perspective emphasizes the capacity to align strategy, governance, organizational culture, people, resources, and implementation across institutional levels.

Responsible Digital Governance as a Cross-Cutting Challenge

Ethical, security, and equity challenges were identified in 10 of the 17 studies (58.8%), encompassing concerns related to privacy, cybersecurity, data governance, AI ethics, academic integrity, digital inequality, and inclusion. Their recurrence across the reviewed studies indicates that responsible digital governance constitutes an important dimension of DL in HE. Although less frequently identified than human capability or organizational/cultural barriers, these concerns are particularly salient as HEIs increasingly engage with AI-

enabled and data-intensive technologies. Importantly, these concerns should not be treated solely as technical risks, because decisions concerning AI use, student data, academic integrity, privacy, accessibility, and equitable access also involve institutional policy, accountability, and leadership responsibility.

Taken together, these findings provide the basis for what this review conceptualizes as a Responsible Digital Governance Nexus, linking ethical, security, and equity concerns with technological and governance conditions. This interconnectedness is also illustrated in resource-constrained HE contexts, where digital-divide and equity concerns may coexist with limitations in infrastructure, human capacity, and institutional coordination (Loglo, 2024). From this perspective, DL in contemporary HE involves not only enabling digital innovation but also fostering transformation that is responsible, secure, inclusive, and aligned with institutional and academic values.

Theoretical and Practical Implications

The findings contribute to DL research by extending existing barrier classifications toward an interconnected ecosystem perspective. The *Integrated Barrier Ecosystem for DL in HE* conceptualized in this review comprises three interconnected nexuses: the Institutional Transformation Nexus, the Leadership and Digital Capacity Nexus, and the Responsible Digital Governance Nexus. This perspective highlights that DL barriers should be understood not only as separate constraints but also as interconnected challenges embedded within institutional contexts.

Practically, the three nexuses provide a structure for translating the synthesized evidence into institutional action. For the Institutional Transformation Nexus, university leaders can align digital initiatives with institutional strategy, clarify governance roles and accountability, strengthen cross-unit coordination, and establish participatory mechanisms for change implementation. For the Leadership and Digital Capacity Nexus, leaders can provide differentiated professional development, coaching and peer-learning opportunities, address confidence and psychological readiness for change, and ensure that academic and administrative staff have access to appropriate digital resources and technical support. For the Responsible Digital Governance Nexus, leaders can strengthen procedures for AI and data governance, privacy and cybersecurity, academic integrity, accessibility, and equitable access to digital resources. These recommendations are evidence-informed responses to recurring barrier configurations rather than empirically tested causal interventions.

Table 6. Practical Operationalization of the Three Nexuses

Nexus	Key barrier dimensions	Illustrative actions for university leaders
Institutional Transformation Nexus	Strategy and governance; organizational culture; coordination and change implementation	Align digital initiatives with institutional strategy; clarify governance responsibilities; strengthen cross-unit coordination; use participatory change processes and implementation feedback.
Leadership and Digital Capacity Nexus	Human capability and psychological readiness; technology and resources	Provide differentiated professional development; use coaching and peer learning; address confidence and readiness; ensure access to suitable digital tools, infrastructure, and technical support.
Responsible Digital Governance Nexus	Ethics, security, and equity; technology and governance	Strengthen AI and data-governance procedures; reinforce privacy and cybersecurity; provide academic-integrity guidance; monitor accessibility and equitable access.

Note. The actions are illustrative, evidence-informed responses derived from the synthesized barrier configurations; they are not presented as empirically tested causal interventions.

Future Research

Future research should further distinguish between digital competence and psychological readiness and examine the mechanisms connecting strategy/governance with coordination and change implementation. Greater empirical attention should also be given to responsible digital governance, particularly AI governance, privacy, cybersecurity, academic integrity, accessibility, and digital equity. Future reviews could complement binary co-occurrence coding with a transparent severity or salience coding scheme that captures the prominence or evidentiary emphasis of individual barriers within studies, using clearly defined and reproducible criteria. Where sufficient reporting is available, future evidence syntheses should also examine overlap in the primary studies represented by secondary reviews to reduce the risk of double-counting underlying evidence. Comparative and longitudinal studies are needed to examine how these barriers and their interrelationships vary across geographical contexts, institutional types, governance structures, levels of digital maturity, and stages of digital transformation.

Limitations

This review has several limitations. First, only 17 studies met the final eligibility criteria, and their geographical and temporal distributions were uneven. The regional and temporal analyses should therefore be interpreted as illustrative patterns in the available evidence rather than as generalizable regional differences or established temporal trends. Second, the included studies were methodologically heterogeneous, comprising quantitative, qualitative, mixed-method, review, and conceptual evidence. Secondary reviews and conceptual sources were included to capture broader institutional and conceptual dimensions of DL barriers, but they do not provide the same type of primary institutional evidence as empirical studies. Potential overlap in underlying evidence represented by secondary reviews cannot be entirely excluded and should therefore be considered when interpreting the synthesized patterns. The present synthesis treated each included source as one unit of analysis and did not weight a review by the number of primary studies it contained. Third, thematic frequencies and co-occurrence patterns were calculated at the study/source level using binary presence–absence coding. This approach provides a consistent basis for comparing heterogeneous sources, but it treats a clearly reported barrier as present regardless of how extensively or severely it was discussed. The reported frequencies and Jaccard coefficients therefore indicate recurrence and proportional overlap across sources rather than barrier severity, effect sizes, causal relationships, or relative importance within particular university settings. Finally, the synthesis depended on how challenges and barriers were reported in the included studies, and some relevant issues may have been underreported or described using different terminology, which may have influenced theme classification and co-occurrence patterns.

CONCLUSION

This systematic review synthesized evidence on the challenges and barriers to DL in HE and identified six interconnected barrier themes. Human capability and psychological readiness emerged as the most recurrent theme, while the co-occurrence analysis highlighted particularly strong interconnections among strategic/governance, organizational/cultural, and coordination/change-implementation barriers. Ethical, security, and equity concerns further demonstrated the importance of responsible digital governance in contemporary HE.

Building on these findings, the review conceptualized an *Integrated Barrier Ecosystem for DL in HE* comprising three interconnected nexuses: the Institutional Transformation Nexus, Leadership and Digital Capacity Nexus, and Responsible Digital Governance Nexus. The framework highlights that DL challenges extend beyond individual leaders or technological provision and are embedded within broader institutional conditions. Addressing digital transformation in HE therefore requires attention to the alignment of human, technological,

organizational, strategic, governance, ethical, security, and equity dimensions.

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APPENDIX

Supplementary Table S1 Critical Appraisal of the Included Studies

Panel A. Empirical Studies Assessed Using the MMAT

Study	MMAT design category	S1	S2	Q1	Q2	Q3	Q4	Q5
Ghamrawi & Tamim (2023)	Qualitative	Y	Y	Y	Y	Y	Y	Y
Pu et al. (2025)	Quantitative descriptive	Y	Y	Y	N	Y	CT	Y
Qayyum et al. (2025)	Mixed methods	Y	Y	CT	CT	CT	CT	CT
Hamdoun (2021)	Quantitative descriptive	Y	Y	CT	CT	Y	CT	Y
Ros & Prak (2024)	Qualitative	Y	Y	Y	Y	Y	Y	CT
Jing et al. (2025)	Mixed methods	Y	Y	Y	Y	Y	CT	Y
Elkington & Ruttenberg-Rozen (2023)	Qualitative	Y	Y	Y	Y	Y	Y	CT
Zhu et al. (2024)	Quantitative descriptive	Y	Y	Y	N	Y	CT	Y
Loglo (2024)	Qualitative	Y	Y	Y	Y	Y	Y	Y

Note. Y = Yes; N = No; CT = Cannot tell; N/A = Not applicable.

Panel B. Systematic Reviews Assessed Using the JBI Checklist

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Rocha et al. (2022)	Y	Y	Y	CT	N	N	CT	Y	N/A	Y	Y
Zawacki-Richter et al. (2019)	Y	Y	Y	Y	N	N	CT	Y	N/A	Y	Y
Onan (2024)	Y	Y	CT	Y	N	N	CT	Y	N/A	Y	Y
Sukandi (2024)	Y	Y	Y	CT	N	N	CT	Y	N/A	Y	Y

Panel C. Conceptual and Textual Evidence Assessed Using JBI Textual Evidence Criteria

Study	Q1	Q2	Q3	Q4	Q5	Q6
Chiriac & Tap (2018)	Y	Y	Y	Y	Y	CT
Kovacevic et al. (2025)	Y	Y	Y	Y	Y	CT
Ehlers (2020)	Y	Y	Y	Y	Y	Y
Olcott et al. (2023)	Y	Y	Y	Y	Y	Y