A systematic review and framework for digital leadership research maturity in higher education☆

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ABSTRACT

Digital leadership in higher education is a sub-field of research that rapidly evolved from e-leadership studies. The practice of effective digital leadership in higher education is urgently needed to keep up with changing demands and opportunities. Yet limited knowledge exists of how it is defined, how it operates and relates to institutional leadership, including both administration and teaching. An updated review of prior empirical studies is overdue, given system-wide digitalization. This article systematically reviews empirical studies on digital leadership in higher education between 1999 and 2022, its value, focus and the research methods involved. The review combined descriptive synthesis and textual narrative synthesis, applying a data-based convergent synthesis design adhering to PRISMA and ENTREQ reporting guidelines. From 231 records, 36 studies remained following application of exclusion criteria. Research has increased, but is still limited in theory, maturity, and evidence. Definitions and theories of digital leadership are varied in scope and how far they are considered in the reviewed studies. Functional rather than critical perspectives predominate. The quality of most research is low, lacking rigour in research questions and methods, rendering findings inconclusive. The review recommends a digital leadership research maturity framework and further research on theoretical definitions and digitalization to address gaps in the literature identified in the review.

1. Introduction

A global digital transformation (DT) is affecting higher education, massively intensified by COVID-19 [48,65,80]. Digital leadership (DL) maturity is essential to develop the capabilities needed to lead organizations in every sector [3–5,29,48,56,57,60,71,99]. This includes higher education institutions (HEIs) undergoing digitalization, which tend to be slower to develop advanced digital maturity than organizations in some other industries [7–9,33,50,59,60,62,65,80,84,99,101,109]. As Puckett et al. [99] note, 'higher education is digitally far behind most other industries'. Rapid day-to-day digital transformation in higher education urgently calls for advanced digital leadership of vision,

strategy, power distribution, staff, pedagogy, culture, and technological resources for online and blended operations [7,20,31,34,40,53,59]. Yet relatively little robust theoretical or empirical research from any field informs digital leadership practice and skills development, despite an increase in recent research [39,94,116]. This applies to higher education organizational, administrative, and faculty leadership responses to technological change. It also applies to digital leadership capacity building for future challenges that may arise in the technical infrastructure, cultural and social fabric of HEIs from technological innovations.

Prior studies identified 'e-leadership' as an adapted form of leadership involving advanced information technology [16,17,20,22,23,62,

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94,121,16] and marked out some key features of this field. Building on these studies, researchers such as Klus and Müller [77] argue that 'e-leadership' and 'digital leadership' are synonymous, while others omit to identify any distinction [116]. Adie et al. [5] cite 21 different definitions in their information systems review of prior digital leadership papers across all industries, concluding that 'Digital Leadership (DLS) definitions are not consistent' (2022:1), and seeking to clarify this. However, unfortunately Adie et al. (ibid.) do not include 'e-leadership' definitions. They also do not consider the significance of wider leadership and ICT (Information and Communications Technology) leadership literature prior to 2012, limiting the significance of their proposed conceptual review.

Eberl and Drews [48] propose that, despite variability and unclarity of prior definitions, digital leadership is more extensive than 'e-leadership', involving fundamental organizational change at three levels of leader, organization, and individuals [48]. In this view, the addition of an 'e' to identify an augmented form of 'electronic' leadership has been integrated and expanded into a wider concept of 'digital leadership' involving the holistic large scale systemic digital transformation of institutions. Simultaneously, the concept of *'digitization'* as a limited ICT-based change process has evolved into an expanded conception of *'digitalization'* in which the entire institution, and all its functions, become part of a digital transformation [71]. This rapid evolutionary change process has been spurred on by the COVID pandemic in 2020–22. Yet despite the considerable growth of digitalization in all industries and more recently in higher education, conceptual and empirical research of this phenomenon is still emergent, patchy, and relatively undeveloped, particularly in application to higher education [84].

A strategic disconnect between top-down senior higher education institutional management and grass-roots individual classroom innovation has been identified in e-research, blended and e-learning adoption [8,33,59,81,87]. Critical literature on academic resistance to digitalisation in HE highlights significant discontent amongst faculty resulting from such disassociated top level leadership practices [49] and points to potential negative consequences for HEIs if left unexplored and unchanged. Yet despite some earlier recognition of a gap in digital strategy at organizational levels [33,34,81], and the potential adverse impact of this on the social fabric of higher education, there remains a troubling lack of identification and conceptualisation of the role of institutional digital leadership in higher education. Critique of detrimental consequences of digitalization tends to be situated in different subsets of literature focusing primarily on critical educational technology, digital labour, and academic resistance that do not address leadership in particular [21,25,41,49,119,126]. This literature has remained mostly separate from discussions of digital leadership theory and practice that would generate more enabling and sustainable approaches to digital leadership.

Ehlers [50] is amongst those attempting to clarify the concept of 'digital leadership', although he perhaps too readily equates this with existing concepts of 'transformational leadership'. A more nuanced approach is provided by Eberl and Drews [48], who observe that 'fuzzy' definitions of digital leadership have 'impeded DL [Digital Leadership] theory development'. Van Wart et al. [116] similarly argue that 'the study of how the digital revolution has changed leaders' interactions with followers via information and communication technologies (ICTs) has been modest, and the theory building in organizational studies and public administration has been, for the most part, non-existent' (ibid.: 80). To address the considerable challenge of conceptual, theoretical and empirical omissions in the field of digital leadership in higher education, a formal structured review of prior empirical evidence is therefore urgently needed. This is required to provide clarity and recommendations for research and development on digital leadership at a generalized macro institutional higher educational level to inform further detailed *meso* and *micro* level research relating to specific groups of staff, drawing from empirical literature where possible. The unique contribution of this article is to provide that review.

2. Literature review

Digital Leadership and e-Leadership definitions

Digital leadership is a relatively new interdisciplinary sub-field of research that evolved from prior studies on e-leadership and related concepts in technology management and administration. The field draws from research in educational technology, leadership, business, and information sciences. Within a business context, Avolio et al. [22] provided the first comprehensive definition of 'e-leadership', defined in their updated 2014 article as:

> ``a social influence process embedded in both proximal and distal contexts mediated by AIT (Advanced Information Technology) that can produce a change in attitudes, feelings, thinking, behaviour and performance'' [23].

The terms e-leadership, virtual or online leadership, e-governance, technology leadership and ICT (Information and Communications Technology) leadership have many similarities to digital leadership, as discussed by Jameson [20], Brown et al. [31]; Cortellazzo et al. [39]; De Waal et al. [44], and Arnold and Sangrà [16,17]. De Waal et al. [44] cite Hüsing et al. [69] report on e-leadership skills required in Europe, which defines e-leadership in this way:

> "*E-leadership is the accomplishment of a goal that relies on ICT through the direction of human resources and uses of ICT.* E-Leadership is a type of leadership, distinguished by the type of goal that needs to be accomplished and what resources a leader must coordinate and align. In the case of e-leadership both the goal and the resources involve using ICT." ([69]: p.13).

The emergence of e-leadership is therefore intricately linked with ICT, as a leadership channel and substantive part of organizations. Yet the above definitions do not tend directly to address e-leadership in relation also to the non-digital. Van Wart et al. [116] observe that, in practice, e-leaders need to use *both* electronic and traditional leadership styles and methods. They argue that the blended nature of work needs to be recognised. They also note that Avolio et al. [23] definition is highly abstract, suggesting a more concrete definition:

> "E-leadership is the effective use and blending of electronic and traditional methods of communication. It implies an awareness of current ICTs, selective adoption of new ICTs for oneself and the organization, and technical competence in using those ICTs selected.'' Thus, as we define the effective use of e-leadership abstractly, it does not necessarily imply greater use of ICTs per se but does imply (1) using ICTs when they are advantageous for several reasons, (2) using the best and most appropriate ICTs available relative to value of various resources, (3) using physically present communication channels when most appropriate, and (4) using ICTs with competence.' ([116]: p.83).

This kind of pragmatic recognition of the wider implications of e-leadership in relation to both the digital and non-digital arguably has led to an evolution in thinking about the limitations of 'e-leadership' conceptions. This resulted in the gradual emergence of a more transformational concept of 'digital leadership' as a whole organization process. Eberl and Drews [48] build on prior definitions of e-leadership to differentiate e-leadership from digital leadership in terms of its wider range of scope. They observe that '…. DL is more extensive than E-leadership. While E-leadership uses technology to support existing business…, DL is an instrument to achieve the target of digitally enabled business models…, digital organization…, and employee management.' They seek to redress the lack of a complete definition of digital leadership in prior literature, defining digital leadership thus:

'Digital leadership is a complex construct aiming for a customer-centred, digitally enabled, leading-edge business model by (1) transforming the role, skills, and style of the digital leader, (2) realizing a digital organization, including governance, vision, values, structure, culture, and decision processes, and (3) adjusting people management, virtual teams, knowledge, and communication and collaboration on the individual level.' ([48]: p.5).

The need for a broad organization-wide definition of digital leadership is recognised by several other authors, including those from business such as El Sawy et al. (2016), who describe the decade-long transformation in thinking, strategy and culture involved in the digital transformation of the LEGO company:

'We define digital leadership as doing the right things for the strategic success of digitalization for the enterprise and its business ecosystem. Digital leadership means thinking differently about business strategy, business models, the IT function, enterprise platforms, mindsets and skill sets, and the workplace.' (El Sawy et al. [123], p.141).

El Sawy et al. (2016) also note a lack of consensus and clarity about definitions of digital leadership. They cite a 2015 survey of 4800 management professionals in the USA who 'confirmed that the keys to successful digital transformation… are concerned more with strategy, culture and talent development than with technology issues.' ([123] ibid., p. 142).

From an educational perspective, Sheninger [108] defines digital leadership in an equally wide-ranging way in relation to digitalization in schools, identifying this as 'establishing direction, influencing others, initiating sustainable change through access to information, and establishing relationships in order to anticipate changes pivotal to schools' success in the future.' ([108], p.20) As regards definitions of digital leadership in higher education, Brown et al. [31] focus on digital literacy and inclusion. They apply a critical lens to technological adoption and tailor this to higher education within a wider socio-cultural teaching and learning context, introducing a new specific term, 'digital education leadership' to distinguish this from business and Ed Tech perspectives of 'e-leadership' that they argue are more focused on technology within education:

'… "e-leadership" is primarily concerned with the successful implementation of technology in teaching and learning practices. It emphasises leadership in educational technology. Our concern goes beyond this to the fostering of leaders who have the qualities to lead in a digital culture. They must have not only the means to provide knowledge in the effective use of educational technology but also the capacity to foster a culture of collaboration, innovation and lifelong learning in evolving, digitally mediated societies. … To mark this shift in focus, the preferred term is "digital education leadership." (Brown et al.[31] p.8).

Also writing from an educational perspective, but in more generalised organizational terms, Ordu et al. [96] agree that 'there is no clarity on what digital leadership means and what skills it requires', reflecting on the 'confusion' between the 'concepts of digital leadership and technology leadership' and concluding that 'digital leadership is a broader concept'. Following a review of 13 studies in the field, Ordu et al. (ibid: 69) propose that 'digital leadership can be defined as creating an innovative vision by using technology effectively in managerial processes in order to create a sustainable change culture in the organization'. Regrettably, however, the full text of Ordu et al. (ibid.) is in Turkish only, limiting its accessibility to a wider international readership.

Hence, building on these definitions from selected background literature, this review identifies that digital leadership involves significantly more than technical expertise in leading the purposes, people and structural systems involved in ICTs and their relation to the non-digital

in organisations [29,96,116]. Digital leadership is as wide-ranging in demands and functions as any other kind of leadership. In the digital transformation of higher education, the need for digital leadership therefore exists in all formal and informal levels of functioning, whether in classrooms, boardrooms, administration, marketing, or facilities.

2.1. Challenges and potential of increase in higher education digitalization

Amidst fast-moving uncertainties, the paradoxical complexities of autonomy and control involved in digitalization [43] are radically overturning former traditions in higher education organizations. This includes massive increases in online and blended learning coworking practices and spaces [42], precarious digital academic labour, power relations [119], and managerial practices [37] involving learning, teaching, research, and administration. Such changes disrupt relationships and raise ethical questions around the erosion of academic well-being [68], including stress, overwork, surveillance, employment security, legal rights, and a potential lack of professional autonomy involved in working practices such as 'lecture capture' [70]. Yet more positive opportunities of digital transformation also co-exist, including increased flexibility, creative learning potential and accessibility for students and staff, digital democratisation of power relations, cost reductions, easing of travel and 'virus safe' delivery during COVID-19 [84].

To indicate the current importance of this, Benavides et al. [27] reported in their systematic review of research on digital transformation in HE that since 2016, publication numbers in this field, though still small, were increasing annually by at least 200%. Building on this, Benavides et al. [28] further discuss the kinds of processes and behavioural changes needed to cope with digital transformation in higher education (ibid.), observing that 'DT should be an integral and holistic transformation of the HEI… Research on conceptualization and methodologies to adopt DT in HEIs should be deepened.' (ibid., p.19). Evidence from wider literature confirms that digitalization in higher education is a vital current topic [7,57,84,109,124].

2.2. Troubling lack of attention to digital leadership

Yet, increased digitalization in practice and massive growth in research investigating higher education digitalization has not been paralleled by an increased attention to *digital leadership* within this research [9,50,65]. This includes a lack of consistent and clear theorization, criticality, and reflexive awareness of the urgent need for digital leadership capacities at overall institution-wide level to handle rapid educational technology changes involving disruption to higher education, to academics, students, job roles, and employment security, working practices and human resources. Furthermore, there are differing views about whether digital leadership is a unique form of leadership or simply a variation of existing leadership approaches. This confusion possibly results from the complex interdisciplinary tensions arising from the need to combine prior 'leadership', ICT and 'EdTech' and business research traditions, which have each developed in parallel without much reference to the other [16,17,20,31,121]. As Ordu and Nayır [96] observe, 'there is no consensus on the definition of digital leadership' (p.69). This problem of a deficit in understanding and development regarding institutional leadership of educational technology was perhaps identified best by Laurillard fourteen years ago:

"The education system is run by leaders who are not comfortable with either the detail or the implications of the technology potential, and those who are comfortable with them are not powerful enough within the system. However there has been significant and successful change in some institutions, demonstrating the importance of leadership." [81]

This 'lack of comfort' has affected both professional practice and

research on digital leadership. Deficits in coherent digital leadership strategy and operations may be accompanied by increases in online learning and working that remove personal face-to-face interaction, increasing risks of problematic internet usage, including aggressive, shy, passive, rebellious, or withdrawn behaviours [93]. A lack of institutional leadership strategies for behavioural management may be accompanied by an inadequate critique of unrealistic institutional expectations of the competence of lecturing staff and students to utilise digital skills confidently to access digital interfaces and systems with minimal training [7, 84].

2.3. Minimal critique of technological determinism

Furthermore, there has been relatively little research critique of enthusiastic technologically deterministic prioritisation of technological drivers of change, despite a few notable exceptions [21,25,31,51,76,95, 104,105]. Critical educational technology research [21,95,106,125] challenges such issues as over-optimistic technology adoption, expensive upgrades to data storage, superfluous software, hardware, and connectivity developments over the needs and user requirements of students, staff, employers, and organizations. At times, such misuse of technology has resulted in public scandals of data breaches and fines imposed on educational institutions by regulators (e.g., EDPB, [127]), leading to direct reputational harm and reversal of benefits of digitalization. Such instances may be accompanied by secretive cover ups creating highly problematic spirals of distrust (President of the Personal Data Protection Office, [128]).

Technological determinism has sometimes ruled demand for change, characterised by idealistic rhetoric about education being 'on the brink of being transformed through learning technologies' [81]. Mature digital leadership of change has tended to lag behind technological enthusiasm in higher education and other industries, echoing the deficiencies of idealistically naïve conceptions of 'heroic' leadership to cope with current workplace ambiguities [1,38]. Global research by MIT (Massachusetts Institute of Technology) Sloane Management Review and Deloitte involving 4800+ senior participants in 129 countries and 27 industries reported a lack of preparedness to implement digital leadership effectively [73], although by 2018 some progress towards digital maturity had been made [75]. Yet despite progress, and the emergence of digital leadership business programs (at Harvard, INSEAD, Warwick, Deloitte, MIT, and others), there is still a relative dearth of criticality about digital leadership of organizational capacities to handle the complex, risky, uncertain challenges of digitalization [31]. Paralleled by a scarcity of academic research literature on the subject, this difficulty is acute in complex higher education environments in which digitalization gives rise to volatility, uncertainty, complexity, and ambiguity (VUCA), with significant challenges for leadership [117]. Tolerance of risk and failure, flexibility of mind and adaptive speed are essential in uncertain situations [118]. Yet little surety exists about rapid digitalization processes such as lecture capture, an example of unreflective top-down digital change involving ethical and legal concerns that generate new uncertainties [70], in themselves signalling a lack of mature leadership.

To achieve effective, ethical solutions to complex problems, digital leaders in HE need to know how to handle conflicts of interests between different stakeholders. Leaders also need to support staff alienated by digital initiatives that challenge professional autonomy and job security. Digital leaders need more than just competence in strategic vision and ICT skills. Digital leadership expertise is needed in trust-building [3,4, 122], through communication that acknowledges and addresses the vulnerabilities presented by digitalization. There is also a need for emotional and social intelligence to anticipate and appreciate newly emerging apprehensions, and critical thinking for discernment, equalities and diversity awareness, cultural tolerance, and authenticity to handle shifting power dynamics as well as anxiety-provoking changes to staff working conditions and student learning. Highly skilled capabilities

are essential to build trust [3,122] to undertake innovations involving complex digital transformation processes in ways that achieve multi-stakeholder dialogue, buy in and cooperation, as illustrated in the concept of 'digital maturity', recognised in numerous digital maturity models and frameworks [46,57,74,84,98,107,124].

2.4. Need for a systematic review of literature and digital maturity framework

To inform the development of mature digital leadership in higher education, it is vital to consider and evaluate prior research literature systematically. Given earlier exploratory e-leadership scoping studies and prior reviews in closely related fields such as e-leadership in technology-enhanced learning in HE and digital education leaders [16, 17,20,31,121], our aim was to conduct an updated systematic review solely focused on digital leadership in higher education rather than a scoping review [110], and to propose a digital leadership maturity framework for higher education, building on prior work on digital maturity in other disciplines [57,58,74,98,107], and early exploratory work in higher education [57,84,109,121,124]. Given that this review of empirical work included all categories of staff in higher education, notably amongst management, administration and teaching staff, the focus of the review was to identify findings on digital leadership that were able to be generalised at an institution-wide level across staffing groups, on which the digital leadership maturity framework could be built.

The unique contribution of this review is to lay the foundations for the terminology and scope to develop greater awareness of and capability for research and development in institution-wide digital leadership in higher education. Digitalization innovations are so speedy that effective digital leadership needs to combine many different strengths [7,31,50,122]. It needs to achieve wider buy-in through building trust, to lead ethically, whilst remaining morally engaged with situations of failure [24], ensuring accountability and fair access, while also being efficient, swift, and thoughtfully reactive [3,4]. It needs to be functionally effective, for example in pedagogy and skills development, while also proactive in policy, human wellbeing and living with VUCA. In other words, digital leaders need to allow for their own transformation along with the digital changes to the institution, moving away from heroic leadership assumptions to more inclusive, self-reflective, and mature conceptualisations of digital leadership and systems.

3. Methodology

3.1. Aim of the study

The aim of this study was to synthesise and review the empirical literature on digital leadership in higher education, addressing the following research questions.

3.2. Research questions

The overarching research questions for this investigation were:

1) what is the nature and extent of prior empirical research investigating the concept and operation of digital leadership in higher education institutions?
2) what methodologies were involved in this empirical research, and what outcomes examined?
3) to what extent did such research meet the established quality thresholds of the Mixed Methods Appraisal Tool (MMAT), Version 2018 [66], and what were the benefits and shortcomings of this literature?
4) what were the summative results of overall narrative themes and recommendations for a digital leadership capabilities maturity

framework to inform research and policy that emerged from these studies on digital leadership in higher education?

3.3. Design

Given the above aims, a systematic review methodology was utilised to examine the extent, range, and nature of research activity in this field and to identify research gaps in existing literature [15]. In view of earlier reviews scoping the field of e-leadership and technology-enhanced learning [16,17,20], our aim was to conduct a more focused updated systematic review, not a scoping review, on digital leadership in higher education, with reference to the Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [110]. This involved the following steps: 1) identification of area of interest; 2) systematic literature search; 3) data extraction; 4) data synthesis and write-up. This review follows a results-based convergent synthesis design. That is, qualitative, quantitative and mixed-methods studies were identified in a single search, and integrated throughout analysis, synthesis, and presentation [92]. PRISMA and ENTREQ reporting guidelines were followed [97,113].

3.4. Search strategy

A systematic search was undertaken on 27th November 2020 and updated on 5th July 2022 using PsycInfo, Academic Search Premier, Education Research Complete, Web of Science, Scopus, and ERIC (Education Resources Information center). In addition, the resulting papers were hand searched for specific references, which may have been missed. Search terms were developed to reflect the concepts in question. The final search terms were: "digital leadership" OR e-leadership OR "online leadership" AND university OR college OR "higher education" OR HEI (Higher Education Institutions) OR HE (Higher Education). No limiters were placed on this search. A summary of these results is presented in Fig. 1.

3.5. Inclusion and exclusion criteria

The search returned 231 articles, reduced to 158 after duplicates were removed. After the first screen, the full text of the 66 remaining articles was conducted, and their reference lists searched, from which a further 59 papers were found. While this may seem a high number, this was done out of an abundance of caution due to differences in terminology requiring the full text of papers to be reviewed to determine if they fell within the scope of our inclusion/exclusion criteria. Notably no papers found in reference lists were included in the final papers in this review, suggesting our initial search was comprehensive. In total, 124 papers were therefore reviewed against the inclusion/exclusion criteria below, which left 36 papers. Given the breadth of our research question and the exploratory nature of this paper, we feel that 36 papers were adequate to answer our research questions:

Inclusion:

- Studies published between 1999 and 2022
- Studies with a substantive focus on digital leadership as applied to higher education
- Studies that were primary research and had empirical data that could be extracted related to digital leadership in higher education
- Studies that were published in peer reviewed sources with a full text available in English
- Studies that had a substantive focus on e-leadership where this could be identified as an evolutionary precursor to digital leadership.

Exclusion:

- Dissertations and conference papers

- Studies that examined leadership, but did not focus specifically on digital leadership
- Studies that focused on digital leadership but were not conducted within higher education
- Studies that examined other concepts related to digital leadership, but did not have a substantive focus on digital leadership or e-leadership as an evolutionary precursor to digital leadership (for example, on the management of technology enhanced learning)
- Studies that were not published in English or peer reviewed

The reference lists of the above 66 articles were also searched for relevant papers; the 59 further papers also assessed against the above criteria yielded no further results. After applying the above criteria, 36 articles were included in our review and analysis.

3.6. Data extraction

Data from the included studies were extracted by four authors (RE, NR, MM, MC) and categorised according to the source, country of where the research took place, study aims and objectives, research methods/ design and sample information, included participants, measures of analysis, main outcomes, and quality appraisal scores and issues. Categories were kept broad due to methodological differences within and between studies and therefore summary measures were not possible (see Table 1 for the list of included studies).

3.7. Quality appraisal

Two researchers (MM and MC) independently assessed all of the included articles together by category, using the Mixed Methods Appraisal Tool (MMAT), Version 2018 [66]. Classifying empirical studies into the category of quantitative (descriptive; non-randomized; randomized), qualitative, and mixed-methods design, this tool assesses the quality of empirical studies with two screening questions and five assessment criteria for each of these categories. The sample in this review consists of 36 studies in total, of which 18 are qualitative studies, 11 non-randomised quantitative, three mixed methods and four descriptive quantitative studies.

3.8. Data summary and synthesis

Due to the heterogeneity of the data emerging across diverse studies in different higher education institutions (HEIs), even within similar study methodologies, a meta-analysis combining quantitative data for further analysis or meta-synthesis for qualitative data was not possible. Instead, studies were combined to summarise descriptive statistics of study characteristics, followed by a textual narrative synthesis. This approach arranges disparate study types into more homogenous subgroups, which aids in synthesising diverse types of evidence. Study characteristics, context, quality, and findings are reported according to a standard format, with similarities and differences compared across studies [83]. Lucas et al. (ibid.) argue that the textual narrative synthesis approach is likely to be more appropriate for reviews aiming to describe the scope, robustness of evidence, and research lacuna in a prior body of literature.

4. Results

In response to the research questions, the review found:

4.1. RQ1: what is the nature and extent of prior empirical research investigating the concept and operation of digital leadership in higher education institutions?

The search identified 231 articles investigating the concept and operation of digital leadership in higher education institutions, reduced
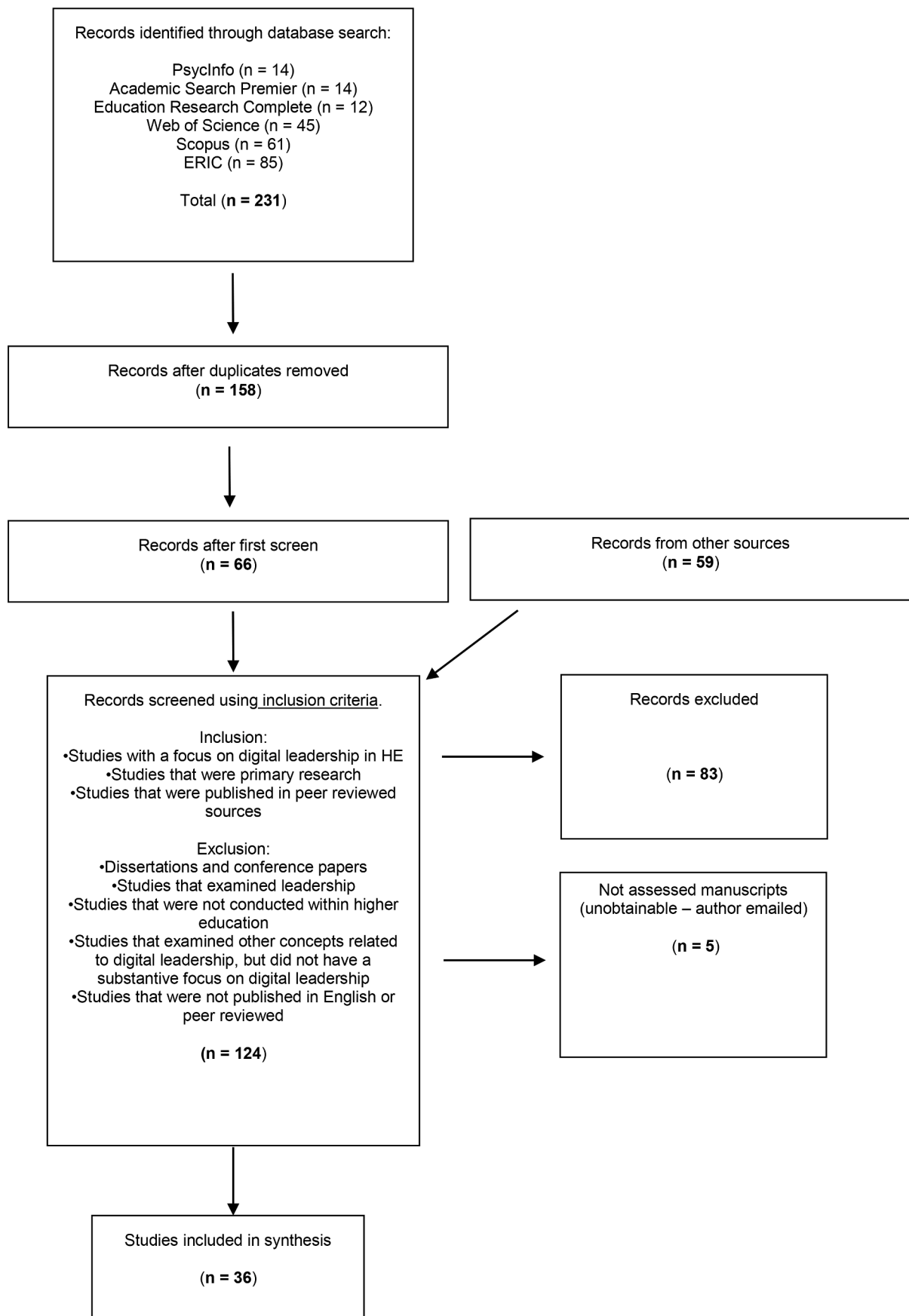
Fig. 1. PRISMA Flow Diagram: Search methods, inclusion criteria and results.

Table 1
Summary of included studies ($n = 36$).

Author	Year	Country	Aims & Objectives	Method/design and sample information	Measurement/ analysis	Outcomes
1. Akcil et al. [6]	2017	Cyprus	This study sought to investigate the relationship between open leadership, digital citizenship, technology acceptance and self-efficacy in technological leadership.	Quantitative - cross sectional survey. Educational administrators ($n = 153$)	The open leadership scale, technology acceptance scale and self-efficacy in technological leadership scale	Results suggest that technology acceptance and self-efficacy in technological leadership positively influences digital citizenship at medium level and that self-efficacy in technological leadership and digital citizenship positively influences open leadership.
2. Ann & Aziz [10]	2022	Kenya	This study sought to explore the perceptions of online vs face to face learning leadership amongst lecturers and students.	Qualitative interviews with $n = 6$ students and lecturers	Thematic analysis	This study suggests that the leadership ideals of participants often synthesised Afrocentric and Western ideals of "transformational and servant leadership". Students preferred learning online while lecturers preferred face to face or blended methods of learning.
3. Antonopoulou et al. [11]	2019	Greece	This study sought to explore e-leadership skills amongst senior staff in higher education, exploring the presence of three leadership styles (transformative, transactional, avoidance) and whether this translated into e-leadership.	Quantitative - cross sectional survey. Senior higher education staff ($n = 15$)	Researcher designed questionnaire, including the Multifactor Leadership Questionnaire (MLQ) scale	Results suggest that leadership outcomes have a strong positive correlation with transformational leadership and a large negative correlation with passive - to avoid leadership, it was confirmed that the higher degree of transformational leadership implies greater efficiency and satisfaction for workers, and the high degree of transformational leadership co-exists with the great degree of implementation of digital leadership.
4. Antonopoulou et al. [12]	2020	Greece	This study sought to investigate the leading skills of heads of university departments analysing their point of view in the digital leadership, to analyse the leadership types that they adopt and the associations with leadership outcome and also to describe profoundly the views of participants as far as the basic components of leadership types such as transformational and transactional.	Quantitative - cross sectional survey. Heads of Dept. ($n = 28$)	Researcher designed questionnaire, including the multi-factor Leadership Questionnaire (MLQ)	Results suggest that leadership outcome has a strong positive correlation with transformational leadership and a large negative correlation with passive - to avoid leadership, it was confirmed that the higher degree of transformational leadership implies greater efficiency and satisfaction for workers, and the high degree of transformational leadership co-exists with the great degree of implementation of digital leadership.
5. Antonopoulou et al. [13]	2021a	Greece	To detect the types of leadership associated with digital skills and their relationship with digital leadership.	Quantitative surveys focused on the degree of three forms of leadership (transformational, transactional leadership, and leadership avoidance) by members of the Senate of the University of Peloponnese ($n = 20$).	Multifactor Leadership Questionnaire (MLQ) and e-skills questions. Descriptive and inductive (Fisher's exact, Non-parametric Mann-Whitney, Wilcoxon Signed Ranks Tests) statistical analysis applied.	The findings indicate that leadership outcome has a strong positive correlation with transformational leadership and negative correlation with passive-to avoid leadership, confirming that higher transformational leadership implies greater efficiency and satisfaction for employees.
6. Antonopoulou et al. [14]	2021b	Greece	To identify the types of leadership associated with digital skills and their relationship with digital leadership	Quantitative: two questionnaires distributed to members of the senate of three (3) Universities: a) University of Patras, b) University of Peloponnese and c) Technological Educational Institute of Western Greece. ($n = 73$)	Multifactor Leadership Questionnaire (MLQ) and e-skills questions. Descriptive statistics using the parametric t-test and the non-parametric Mann-Whitney statistical test, linear correlations, and linear regression.	The findings suggest that participants demonstrate a high transformational and transactional leadership level. Additionally, they demonstrated a high level of Digital Leadership while avoiding Passive - To Avoid Leadership. Male respondents exercised Transactional and Digital Leadership to a greater extent than female respondents. Participants demonstrate less transformational and

Table 1 (*continued*)

Author	Year	Country	Aims & Objectives	Method/design and sample information	Measurement/ analysis	Outcomes
						digital Leadership as participants age. Additionally, the leadership outcome is strongly associated with transformational ($R = 0.625$) and Transactional Leadership ($R = 0.422$), implying that a high degree in exercise in these leadership types coexists with leadership performance and satisfaction. Finally, Passive to Avoid Leadership seems to have a detrimental effect on Leadership Outcome, implying that the more successful its execution, the less effectiveness, and satisfaction.
7. Ashbaugh [18]	2013	USA	This study explores current perceptions related to improving the quality of online courses, drawing on the voices of an international group of instructional designers were captured and analysed for common themes of significance to the ID community.	Qualitative - Interviews, email conversations, personal documents, and institution-generated student evaluations. Online higher education learning/instructional designers ($n = 6$)	Grounded theory	Results provide a framework of leadership characteristics that were positively associated with high quality pedagogies—strategy, vision, personality (interpersonal skills), productivity, emotional/psychological strength, values, and duties.
8. Burnette [32]	2015	USA	This study uses a critical theory lens to understand how online education administrative leaders in higher education institutions negotiate political challenges to promote effective practice.	Semi structured Interviews via telephone or Skype with a purposeful sample of 12 higher education online education administrators ($n = 12$)	Critical theory is applied in an interpretive qualitative approach	The study found that online education administrative leaders work to build relationships, build credibility and trust, find common ground, use data to drive change, and empower faculty. Negotiation tactics are situational and contextual endeavors to seek meaning and understanding of a phenomenon.
9. Bogler et al. [30]	2013	Israel	The study investigated whether students perceive their university instructors in a virtual learning environment as leaders. Referring to the full range leadership theory (FRLT), we examined the effects of transformational and passive leadership styles of university instructors on students' satisfaction and learning outcomes.	Quantitative - cross sectional survey. Students ($n = 1270$)	Researcher designed questionnaire including the multifactor leadership questionnaire (MLQ).	Results suggest that leadership styles correlated with student satisfaction: the more the students attributed transformational leadership style to the instructor and the less they attributed a passive leadership style, the more satisfied they were. The attributed leadership style was not related to the actual participation of the students in the virtual discussions or to their academic achievements. The authors concluded that student satisfaction might be tied more strongly to their perception of the leader than to the actual tangible benefits the leader can provide.
10. Chewen-Li et al.	2022	Indonesia	This study sought to identify digital leadership processes and examine whether they led to more effective learning throughout the COVID-19 pandemic.	Qualitative semi-structured interviews with ($n = 24$) rectors, deans, junior and senior high school principals	Thematic analysis	The results of this study suggest that digital leadership played a role in HE (Higher Education) throughout the pandemic in a number of ways including in implementing remote working and disseminating information in an "accurate manner".
11. Ciabocchi et al. [36]	2016	USA	This study explores the perceptions of faculty governance leaders to online and blended learning. While there have been many studies on the perceptions of students, faculty, and administrators, there has been very little research on the	Mixed methods - cross sectional survey. Faculty governance leaders ($n = 129$)	Researcher designed questionnaire with a mix of open and closed questions.	Results suggest that despite the fact that the demand for blended and online courses continues to increase in higher education institutions, along with faculty participation in blended and online teaching and learning, faculty governance

Table 1 (*continued*)

Author	Year	Country	Aims & Objectives	Method/design and sample information	Measurement/ analysis	Outcomes
			perceptions of faculty governance leaders who hold critical positions in colleges and universities.			leaders remain generally sceptical about the academic quality and rigour of blended and online courses as compared to courses offered in a traditional format at their respective institutions.
12. Dimitriadi [45]	2019	UK	This study examines how universities can respond to technology-driven change by engaging students further and support their awareness of digital citizenship	Qualitative - survey and semi-structured group interviews. Eleven students (pre-service teachers) and nine lecturers ($n = 20$)	Researcher designed questionnaire, which included eight free-text questions and one closed question. Qualitative analysis not described.	Results suggest that the informal learning that students had capitalised upon outside the classroom can be used to scaffold their development of digital citizenship through offline community engagement. This study highlights the advantage of using such opportunities to encourage citizenship practices amongst university student communities and the positive impact that such synergies can have on all the participants
13. Falkenthal & Byrne [52]	2020	USA	This study examined elements of distributed leadership claimed amongst collegiate esports teams and whether esports play contributed to distributed leadership development.	Qualitative - semi-structured focus groups. Collegiate e-sports players ($n = 14$).	Phenomenological deductive analysis.	Results suggest that findings from interviews corresponded with the leadership theory and found that the more static influence of credibility seemed to mediate team-based communications and behaviours.
14. Falkenthal, & Byrne	2021	USA	To identify elements of distributed leadership claimed amongst collegiate esports teams and whether esports play contributed to distributed leadership development.	Qualitative, study Focus-group interviews with 14 participants on three competitive collegiate esports teams	A deductive coding process using five themes from distributed leadership theory, including: situation / context, agency, innovation ambidexterity, knowledge sharing, and connectedness.	The findings support the themes predicted by the distributed leadership model. Participants indicated that these games are information-heavy environments that demand high levels of both independent and group decision making whereby leadership roles are dynamically passed from one team member to another based on situational context. Team success is partly predicated on how effective members are at filtering unnecessary feedback in real time from information that offers immediate benefit if responded to quickly. While leadership roles may be flexible and distributed, power within the organization of a team may not necessarily be distributed similarly.
15. Garrison & Vaughan [53]	2013	Canada	In two case studies, this study documents the institutional change and leadership associated with blended learning innovation in higher education.	Qualitative - case studies ($n = 2$ case studies: participant $n =$ not known)	Not stated	Results show how transformational institutional change related to blended teaching and learning approaches is predicated upon committed collaborative leadership that engages all levels of the institution
16. Garst et al. [54]	2021	USA	To explore benefits and challenges non-traditional students associate with participating in a graduate degree program in youth development delivered through a blended online instruction mode	Quantitative surveys with 59 graduates representing 95 students enroled in an online youth development leadership degree programme at a state university	47-item survey questions about changes in competency using a retrospective format, challenges associated with degree completion, and time since participation in the degree program. Descriptive statistics using means and SD and exploratory analysis including paired samples t-tests and bivariate correlational analysis	The findings indicate benefits of blended learning for youth development, including improvements in skills, competencies, and higher-order learning objectives as well as applications of knowledge. Challenges are also identified in terms of low confidence in academic skills due to online learning, time management stress, and work-family conflict.

Table 1 (*continued*)

Author	Year	Country	Aims & Objectives	Method/design and sample information	Measurement/ analysis	Outcomes
						Time does not play a role in shaping how participant perceive challenges. The faculty may have not yet successfully addressed the primary challenges faced by working-professionals in a blended program (i.e., finding balance between degree requirements and other responsibilities and transitioning back into the academic life).
17. Ghafur [55]	2021	Indonesia	To determine E-learning in the development of ICT in the field of education at two private universities namely the Islamic University of Malang (UNISMA) and Nadhatul Ulama University Surabaya (UNUSA).	Qualitative: observations and interviews with academics, written field notes and relevant documents. $n = 66$ participants consisting of: (1) 33 UNUSA participants (28 lecturers and 5 PPPTIK managers); and (2) 33 UNISMA participants (53 teaching lecturers and 13 PPPTIK).	Qualitative data analysis was carried out by conducting data reduction in the form of abstractions, arranging them in units which were then categorized while coding and checking the validity of the data.	The findings suggest that the role of e-learning in Islamic universities under the leadership of Nadhatul Ulama Indonesia is still hampered by a number of challenging issues. Interestingly, the problem of internet data connection constraints is not found in the two Nadhatul Ualam Islamic Colleges, which are generally found on other campuses, the main obstacle is the lack of support from human resources and decision-makers in terms of management support. The expected implication is for universities to evaluate and improve in terms of technology management. In addition, the Government supports facilities and policies in enhancing the development of ICT with more modern features in the future.
18. Gupta et al. [61]	2022	India	To 1) investigate the various determinants influencing the VCT adoption by educational leaders; To 2) ascertain the nature and robustness of relationship amongst the various determinants and clarify the most influential determinant in adoption of VCT by educational leaders; and 3) to make appropriate recommendations to educational leaders to effectively use the VCT to develop e-leadership effectiveness.	Quantitative: online survey responses from 380 educational leaders in India through a convenience sampling procedure.	Measures adopted from previous studies, including predictive variable: Performance Expectancy, Effort Expectancy, Social Influence, Hedonic Influence, Habit, Facilitation conditions, and Personal Innovativeness Data analysis: descriptive statistics; Confirmatory factor analysis, structural equation modelling	The findings revealed that performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating conditions (FC) and personal innovativeness (PI) have positive and significant effects on intention to use VCT (ITUVCT) and actual use of VCT (AUVCT), i.e., e-leadership communication adoption. There is also a significant and positive effect of ITUVCT on the actual usage of VCT by the educational leaders.
19. Guthrie et al. [63]	2022	USA	This study sought to develop an understanding of the fundamental characteristics of leadership programmes offered online by higher education institutions.	Qualitative case study of ($n = 51$) online academic leadership programmes	Content analysis	Along with providing information about the nature of these programmes, four themes emerged when examining the goals of the programmes: career development focus, faith-based focus, and specific industries.
20. Hapha & Somprach [64]	2019	Thailand	This study explored the components of creative leadership and digital leadership for educators in Thai higher education	Qualitative - document study, interviews ($n = 7$) and consultation with experts in the field	Not stated	Results of this study suggest that digital leadership in HE has three components: 1) Incremental Innovation. Which the authors described as consisting of a clear action plan, improvements from past operations, and selection and allocation of resources are in accordance with the specified criteria, proceed according to plan, and understand about low risk. 2) Radical Innovation which was described as comprising several subcomponents

Table 1 (*continued*)

Author	Year	Country	Aims & Objectives	Method/design and sample information	Measurement/ analysis	Outcomes
						such as study of needs beyond normal operation plans, create things that have never been seen before, continuous, clearly defined framework to change according to the environment, understand high risk. and 3) Process Innovation which was described as having several subcomponents, including determination of administrative processes within the new organization, establishing a new organizational structure, using new technology to create innovation, using new concepts, having quality control of innovation, and reducing work procedures.
21. Hornor [67]	2021	USA	To analyse a 10-year process of designing, implementing, and continuously improving an e-Leadership portfolio required of all undergraduate students.	Qualitative: Case study based on information about a 10-year process of designing, implementing, and continuously improving an e-Leadership portfolio required of all undergraduate students. within a single Institution.	Continuous review of the data collected during the 10-year including the assessment data to improve students' e-Leadership Portfolio learning experiences, which were a central focus after initial implementation	The findings from suggest that integrating e-portfolios in institutional strategic planning and assessment processes, fostering ePortfolio collaboration between academic and student affairs, and expanding the use of ePortfolio assessment results can strengthen and expand the use of ePortfolios within the learning environment.
22. Kolb et al. [78]	2009	New Zealand	The study seeks to investigate how leadership development experience in the traditional face to face classroom setting compares to its long distance online equivalent for a group of participants enroled over the period of 18th months.	Quantitative cross-sectional survey. In this study, face-to-face residential workshops were matched with online sessions over an 18-month period. ($n = 75$)	Researcher designed questionnaire	Data from 75 participants, ranging from 18-year-olds to senior corporate executives, suggest that levels of online communication are positively correlated to perceptions of closeness amongst peers and that the relationship between peer closeness and leadership outcomes is moderated by online activity.
23. Kotula et al. [79]	2021	Multi-national: 43 countries	To identify the framework of e-leadership practices implemented by rectors and deans of business schools during the first year of the COVID-19 pandemic.	Quantitative analysis of ($n = 216$) business school leaders' communication activities on Twitter and LinkedIn during the COVID-19 pandemic, specifically practices adopted from March 2020 to March 2021.	Descriptive statistical analysis of the frequency of social media posts and whether the posts were original text written by the leaders themselves.	The findings show that there is no universal strategy of communication amongst leaders of business schools, however, there are some patterns of social media use in different world regions.
24. Liu et al. [82]	2018	Korea	This study provides a model of e-leadership as communication adoption at the individual level (ECAMi).	The survey instrument was tested in four different stages: 1 80 business students 2 26 graduate students in professional fields 3 323 American municipal employees & 500 county employees 4 318 Korean public employees The article reports on the 4th stage.	Structural equation modelling was used to test a previously published model by Van Wart et al. [115]. The model included select traits and skills (as antecedent conditions), awareness of ICTs, evaluation of ICTs, willingness to expend effort in learning about ICTs, intention to use ICTs, and facilitating conditions.	The overall model demonstrates a good fit. It can be concluded that the ECAMi represents a valid model for understanding e-leaders' technological adoption. It is also found that while all select skills and traits are significant – energy, responsibility and analytical skills stand above the others.
25. Maruyama & Inoue [85]	2020	Japan	To report on the implementation of the designed online leadership education to help students train leadership behaviour.	90 students rated their own teams formation and reflections within the virtual environment.	Rating assigned based on the Tuckman model (Forming, storming, norming, performing).	Results confirmed the maturity of team formation in virtual teams i.e., students can learn about virtual team leadership and apply this to project-based learning (PBL) exercises.
26. Masrur [86]	2021	Indonesia	Aim of the study is to investigate the impact of digital leadership on pedagogical competency.	Proportional random sampling of 130 English lecturers in HE (of a pool of 162) for a digital leadership survey.	Descriptive statistics and linear regression analysis of the data, which encompassed four dimensions for digital leadership and 17 indicators. The pedagogic competence research instrument entailed four dimensions and 16 indicators.	Digital leadership therefore does have a great impact (56.4%) on the pedagogic competency of lecturers at Samarinda's universities. Digital leadership, in the form of leaders providing subordinates

Table 1 (*continued*)

Author	Year	Country	Aims & Objectives	Method/design and sample information	Measurement/ analysis	Outcomes
						with digital guidance, can improve pedagogic competence.
27. Mitschke et al. [88]	2021	USA	To assess the Graduate Student Leader (GSL) program, which is a peer-based leadership and mentoring intervention on whether it is helpful in addressing the needs of a large and diverse student body of approximately 1300 graduate social work students during the initial months of the COVID-19 pandemic.	Qualitative study which used focus groups of current students ($n = 20$), individual interviews with current GSLs ($n = 9$), and analysis of instant messaging responses (amongst faculty, staff, and GSLs) to document the effect of the GSL program.	Thematic analysis (Miles & Huberman 1994) and triangulation of data	Four themes developed: advocacy and information sharing; program impact on GSLs; program need; comradery. The results provide support for the GSL program during a crisis and it is likely to be beneficial in "normal" circumstances.
28. Mori et al. [89]	2022	Japan	To quantify the effectiveness of the leadership development program (LDP) in women's colleges.	Pre-and post-survey with 105 female students to investigate the change in consciousness and behaviour before and after the LDP.	Statistical regression model was applied to uncover the relationship between motivational change and behavioural change.	The change in consciousness related to the items emphasized in this leadership development, such as goal confirmation and leadership awareness, led to leadership behaviour.
29. Msila [90]	2021	South Africa	To examine the role of educational managers in sustaining effective digitalization.	Using purposive sampling 8 UNISA managers were selected (for interviews and focus groups) to understand how they perceived the role of digital leaders.	Triangulation of the interview and focus group data with further literature. Axial coding to develop 4 themes	Four themes were developed: 1) Digital leadership 2) Technology in a transforming higher education 3) Decolonization, transformation, and digitalization 4) Institutional culture and digitalization The conclusions show that a set strategy based on a new vision for a university will harness digital leadership, which implies transformation and offers an opportunity for decolonisation.
30. Quddus [100]	2020	Indonesia	The purpose of this study was to analyse the influence of ecology leadership, servant leadership and digital leadership toward universities performance.	Quantitative–Electronic questionnaires with snow balling sampling strategy. $n = 222$ lectures of several universities (number not known)	Not stated	The outcomes demonstrate that all three leadership styles had a positive effect on the university performance. No further elaboration is provided.
31. Sathithada & Niramitchainont [102]	2019	Thailand	The aim of this research was to develop scenarios for Thai HEI leaders to use E-leadership in 2027.Three scenarios for educational leaders to use E-leadership were developed for future Thai HEIs: e-leaders & international collaborations; e-leaders, innovation, & sustainable environment; & e-leaders & the current situation.	The study was conducted using scenario planning workshop. Purposive sampling was used to select 20 participants from public and private universities in Thailand. ($n = 20$)	The scenario was presented through a one-page rich contextual overview of how future research may deviate diversely. The participants were allowed to explore driving forces and future uncertainties using narratives.	Findings present three scenarios for use of e-leadership: 1) international collaborations; 2) innovation and sustainability 3) sustainable institutional improvements.
32. Seetal et al. [103]	2021	Small Island Developing States (SIDS)	To examine the impact of preparedness and other factors on the efficacy of academic staff in performing their work duties during the pandemic within two SIDS in terms of human resources, land, funding, technology, and know-how)	Mixed method: quantitative data from75 respondents who filled in a questionnaire and qualitative data from semi-structured online interviews ($n = 5$).	Survey questions concern information re. participants' demographics access to technology, technology use, integration (multimedia use & pedagogy), change management & transformational Leadership. Descriptive and inferential statistics, followed by multiple linear regressions Interview data analysed using interpretative phenomenological analysis	The findings suggest insufficient competence in using educational technologies and inadequate university support impacted academics' work efficacy significantly. This impact was less pronounced for staff who had prior online teaching experience, which suggests that their pre-pandemic experiences lessened their dependence on support for online teaching when the sudden need arose. The authors' thematic analysis similarly found academics' uneven familiarity with technology and the need for more "at-the-elbow" technological support during crises to be significant, as well as a need for more leadership to deal with complex

Table 1 (*continued*)

Author	Year	Country	Aims & Objectives	Method/design and sample information	Measurement/ analysis	Outcomes
						situations. The authors conclude that greater preparedness for online teaching – and thus improved efficacy – might be achieved through a balanced mix of independent learning (by doing) on the part of academic staff and customised and targeted formal professional learning (through training provided by the university).
33. Slykhuis & Lee [111]	2016	USA and global	Working in partnership with Microsoft, a university faculty team developed a Technology Enriched Instruction (TEI) professional development programme for the promotion of effective classroom uses of technology, aiming to explore and expand TEI and develop Faculty e-leaders through the application of two conceptual frameworks (TPACK and 21CLD).	Qualitative enquiry-based workshop exploration involving $n = 4000+$ but numbers unclear	Analysis of workshop activities, TEI usage, social network participation, and messaging	The analysis demonstrated that the TEI program provided faculty with two conceptual frameworks – TPACK and 21CLD - to support faculty decision-making and reflection by focusing on students' needs when using technology for teaching practice. The authors claimed that thousands of faculty members and tens of thousands of students had benefited from improved classroom use of technology. The paper focuses on e-leadership but provides little discussion on digital leadership.
34. Tan et al. [112]	2015	Australia	The paper demonstrates how the micro-analysis of the multimodal discourse patterns in two video texts of online leadership discourse at an Australian university reveals larger 'institutional logics' as embodied, for example, in divergent leadership styles and approaches, in the context of a university in transition.	Social semiotics and software-based multimodal discourse analysis ($n = 2$ video texts)	Measurement of visual and sonic systems, intonational systems of two video speeches by university leaders	Analysis reveals distinct patterns of choice and variation between the two videos, which appear to correspond with different approaches to leadership embodied in each. Connections are made between micro and macro level values.
35. Turner & Burnett [114]	2018	USA	This study sought to explore perceptions of learning technology and digital literacy amongst a sample of community college leaders.	Mixed methods involving $n = 41$ college employees	Online survey, interviews, and focus groups	The results of this study suggest leaders should prepare for the next generation of digital environments, this leadership should involve supporting those directly supporting these changes and regulating any accompanying distress because of these changes.
36. Zhu et al. [120]	2021	Hong Kong	To examine how students perceive the qualities and effectiveness of an online credit-bearing "Service Leadership" course that was delivered online during the COVID-19 pandemic.	Quantitative method: pre-test and post-test questionnaires ($n = 228$) students who participated and evaluated a "Service Leadership" course. The students were in different groups experiencing differences in the course content delivery and this was compared.	23-items from the "Service Leadership Knowledge Scale"; 19 items from "Service Leadership behaviour Scale", and Chinese version of Satisfaction with Life Scale; 31 items from Chinse Positive Youth Development Scale; Analysis: repeated-measures multivariate general linear modelling, descriptive and correlational analysis	The following hypotheses are supported: • 1a (H1a): Students would have improvements in post-test in comparison to pre-test scores in service leadership qualities. • 1b (H1b): Students would have improvements in post-test in comparison to pre-test scores in well-being. • 2a(H2a): Student would have positive perceptions in subject content. • 2b(H2b): Students would have positive perceptions in lecturer quality. • 2c(H2c): Students would have positive perceptions in benefits of the online course.

Table 1 (*continued*)

Author	Year	Country	Aims & Objectives	Method/design and sample information	Measurement/ analysis	Outcomes
						Hypothesis 3 (H3): Change in the objective outcomes would be positively associated with students' subjective perceptions of the course. The effect size is small for H3 The findings suggests that 1) university students can significantly improve their leadership capacity and well-being after completing a credit-bearing Service Leadership course, and 2) student learning in virtual classrooms can be as effective as in traditional physical classrooms.

to 158 after duplicates were removed. After an initial screening, 66 articles were examined against the inclusion/exclusion criteria, following which 36 empirical research studies remained which formed the focus of this review (see Table 1).

4.2. RQ2: what methodologies were involved in this empirical research, and what outcomes examined?

4.2.1. Combined study descriptive results

The research methodologies deployed included 18 qualitative studies, 15 quantitative studies (including 11 non-randomised quantitative and four descriptive quantitative studies), and three mixed methods research studies. In geographical terms, there is evidence of growing interest in digital leadership in higher education across the globe (Fig. 2). Research carried out in the 36 included papers was based in 16 countries across five continents, with the notable absence of South America. Whilst US based samples lead the way with the nine studies, Greece and Indonesia are presented in four studies each; Japan and Thailand in two, whilst Australia, Canada, Cyprus, Hong Kong, India, Israel, Kenya, Korea, New Zealand, South Africa, and the UK are represented in a single study each. Three studies draw on multinational samples and one study focuses on Small Island Developing States (See Table 1 and Fig. 2).

4.2.2. Textual narrative synthesis results

The aims and objectives of all 36 papers were to investigate digital leadership in higher education (sometimes called 'e-leadership', 'virtual' or 'online leadership'), but, beyond this, articles varied in the extent to which they aimed to define and discuss digital leadership in a way that was clearly linked to theoretical concepts, cited prior literature or was central to research aims and objectives. Research questions were not always clear or aligned to research approaches, data collection methods were sometimes inadequate, findings were not always adequately derived from or sufficiently substantiated by the data. In some cases, there was a lack of coherence between qualitative data sources, collection, analysis, and interpretation. Within these differing perspectives, two broad thematic groups with sub-groups were identified, as discussed below.

4.3. RQ3: to what extent did such research meet the established quality thresholds of the mixed methods appraisal tool (MMAT), version 2018 [66], and what were the benefits and shortcomings of this literature?

Overall, the quality of these studies was relatively low in meeting the established quality thresholds of the Mixed Methods Appraisal Tool (MMAT), Version 2018 [66], as illustrated in Fig. 3. This was primarily due to shortcomings identified regarding a lack of clarity in research questions and justification of chosen methods.

Out of 18 qualitative studies, only four studies [18,32,52,88] met all the criteria, whereas 14 qualitative studies offered limited descriptions of research methods that rendered the connection between the presented data and conclusions implicit. Five of these studies [45,53,64, 111] failed to meet any of the criteria assigned to the qualitative category.

Similarly, out of 11 non-randomised quantitative studies only three [86,89,120] met all the criteria assigned to this category. While one of these studies [6] failed to meet any criteria, the remaining eight studies showed limited level of representativeness in the sample [61,78], incomplete reporting of data [30] and the insufficient account of confounders in design and analysis [100].

Of four descriptive quantitative studies, two [11,12] failed to meet any of the criteria due to ambiguous research questions and problematic research design. The remaining two in this category [54,79] also showed limitations in the representativeness of the sample with an elevated level of risks of non-response bias.

Only [103] of the three mixed methods studies [36,103,114] met all

the MMAT criteria and [36,114] failed to meet all the criteria in this category, showing critical limitations in the research design and execution. Although Ciabocchi, Ginsberg, & Picciano [36] and Turner & Burnett [114] were clear regarding research questions, they did not offer an adequate rationale for the research design, nor an adequately interpreted integration of components, nor considerations for divergences and inconsistencies between results.

4.4. RQ4: what were the summative results of overall narrative themes and recommendations for a digital leadership capabilities maturity framework to inform research and policy that emerged from these studies on digital leadership in higher education?

4.5. Narrative themes and discussion of findings

All studies analysed in this review focused on various forms of leadership in higher education in the context of technology. We were primarily concerned with seeing how researchers in the field have theorised and empirically studied digital leadership. On closer inspection of the empirical literature, drawing on the conceptual discussion of digital leadership, it became apparent that the disconnect between 'leadership' and 'digital' discussed in theoretical literature is mirrored in empirical studies in a less explicit fashion. Most empirical literature uncannily replicates existing, by some accounts outdated [3,31,75], patterns of thinking about leadership and technology. Such studies contribute only in minor ways to effective, innovative integration of more advanced concepts of the digital into understandings of technology in relation to leadership and vice versa.

This disconnect in research is occurring despite the backdrop of a massive growth in practices of digital leadership in higher education and beyond, where social media posts have the power to penetrate deeply and uncontrollably into the less public domains of organisational life and classroom teaching. These influences can empower democratic trends or advocate questionable truths; having power to transform but also destroy long standing educational traditions and the quality of teaching and learning. They can protect but also expose all staff and students from/to undesired external influences. Never before have digital leadership practices in higher education been as important as they currently are during and after the COVID-19 pandemic, and yet empirical research literature on the subject remains wanting both in quality as well as in depth and theoretical maturity [48].

To trace the nature of this disconnect and opportunities for improvement in pursuit of greater conceptual integration to enable future research, this review identified in each of the 36 empirical papers

three themes aligned with the key building blocks of digital leadership: (1) *leadership* and (2) *technology as* well as the integrated concept of (3) *digital leadership* as a standalone category. We evaluated the degree to which published empirical studies contributed to the development and understanding of these categories.

In answering research question 4, this narrative thematic analysis was developed alongside the MMAT quality analysis, which tested *rigour* by established quality thresholds, as a different way of evaluating the *research approach* and *conceptual maturity* of studies, particularly in contributing to digital leadership maturity research capabilities.

In summarising the narrative themes, the review drew on Collinson, Jones & Grint (2018) and Collinson [38] for deeper understanding of the category of leadership and on Laurillard [81], Selwyn [104–106], Jameson [20,21,121,122] and Oliver [95] for insights regarding the long-term evolution of educational technology research, particularly towards more advanced critical and theoretical understandings of the field. Lastly and most importantly, we draw on the conceptual discussions of 'digital leadership' and its evolution from 'e-leadership' cited in the introduction [16,17,20,22,31,39,44] and our own analytical evaluations of the published 36 studies to identify developmental categories of digital leadership research maturity. This is to be distinguished from detailed analysis of digital leadership *practice*, which is beyond the scope of this literature review. These themes are presented in Table 2 and in the discussion which follows below.

In addition to the key building blocks of 'digital leadership' as a concept, reviewed articles naturally fell into three separate categories depending on the key areas of university work involved: *a) digital leadership in teaching and for academic development* (20 studies in teaching and learning), *b) digital organisational leadership of staff or for organisational effectiveness* (16 studies in organisational leadership), and *c) digital leadership in the domain of research activities* (leadership in research). There was a notable absence of studies focusing on digital leadership in the domain of research (Fig. 4). All studies naturally fell into pre-pandemic (published 1999 –2019/2020) and pandemic periods (2020 – 5/7/2022). In temporal terms, given the strong influence of the COVID19 pandemic on digitalization processes in higher education, we have highlighted studies published before (18) and after the start of the pandemic (18 studies) (Fig. 5). We also identified the geographical data collection choices of each study for general contextual information (Fig. 2).

4.6. Discussion of narrative themes

4.6.1. Research approaches to leadership

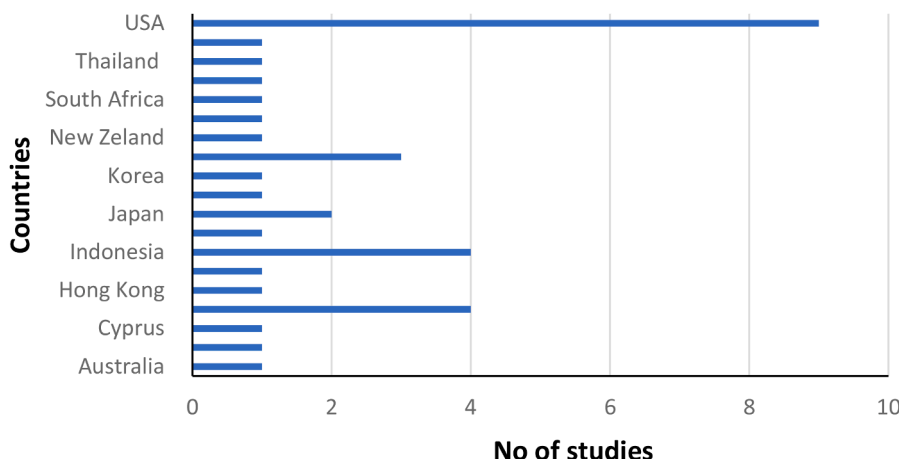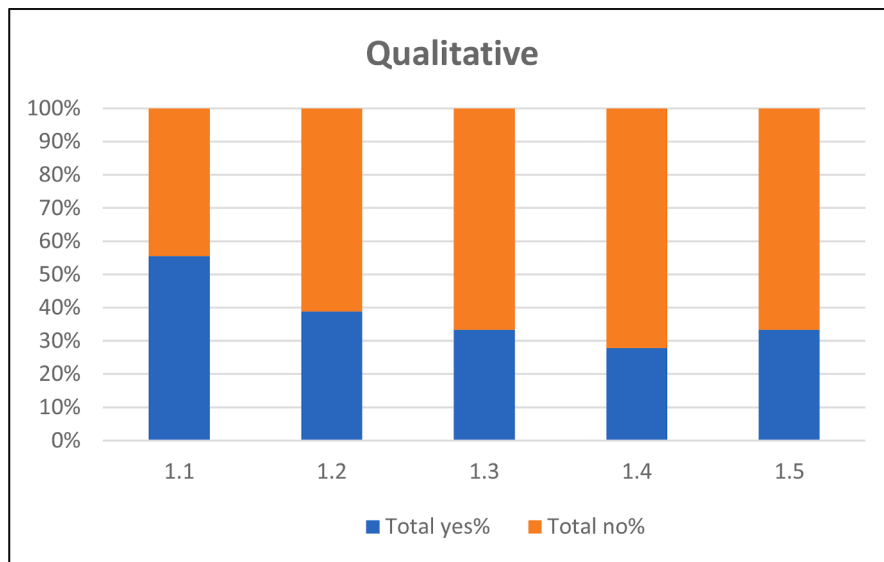*4.6.1.1. Heroic digital leadership.* Collinson, Jones & Grint (2018) and

Fig. 2. Studies by country of data collection.
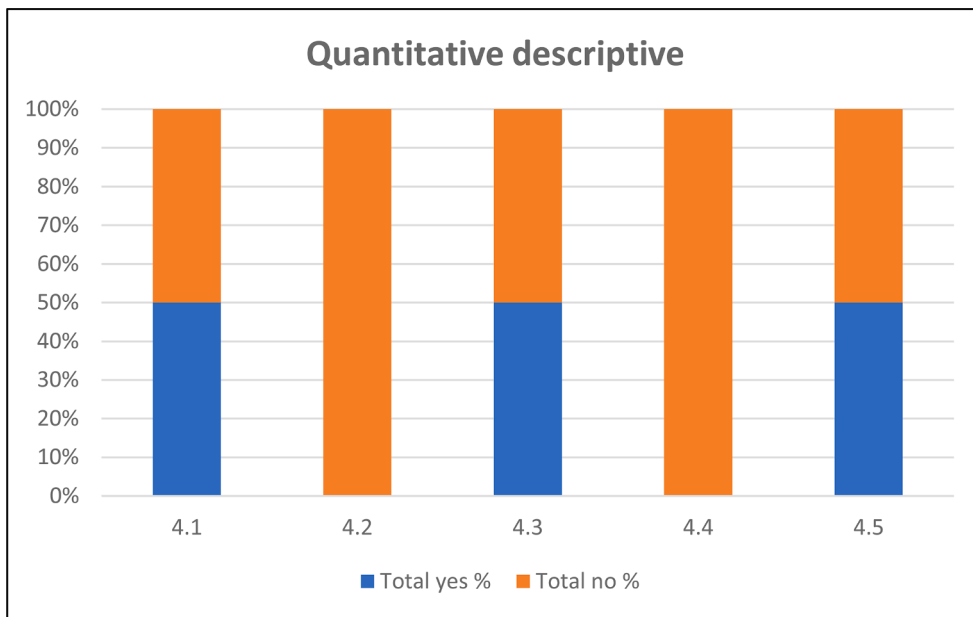
Qualitative: Quality Appraisal Criteria

1.1   Is the qualitative approach appropriate to answer the research question?
1.2   Are the qualitative data collection methods adequate to address the research question?
1.3   Are the findings adequately derived from the data?
1.4   Is the interpretation of results sufficiently substantiated by data?
1.5   Is there coherence between qualitative data sources, collection, analysis and interpretation?
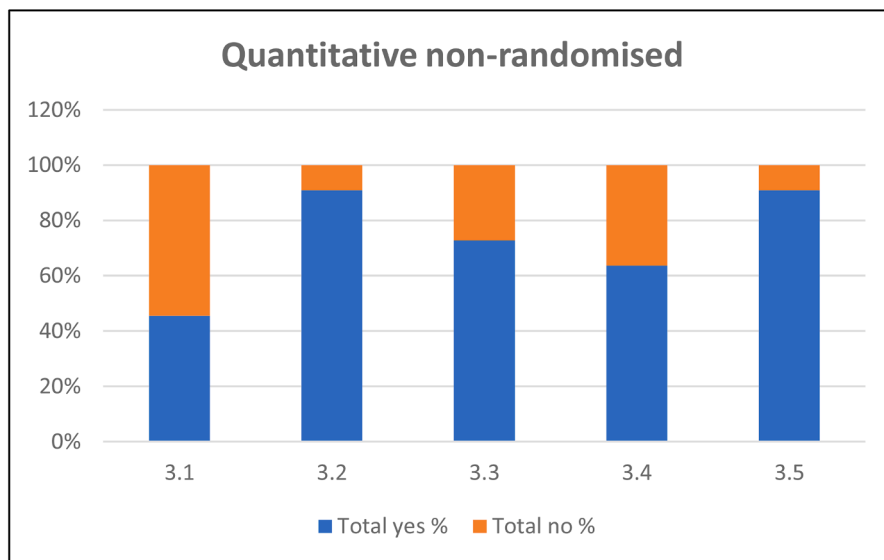
## Quantitative non-randomised: Quality Appraisal Criteria

3.1   Are the participants representative of the target population?
3.2   Are measurements appropriate regarding both the outcome and intervention (or exposure)?
3.3   Are there complete outcome data?
3.4   Are the confounders accounted for in the design and analysis?
3.5   During the study period, is the intervention administered (or exposure occurred) as intended?

Fig. 3. Quality appraisal graphs/tables.

Quantitative descriptive: Quality Appraisal Criteria

4.1   Is the sampling strategy relevant to address the research question?
4.2   Is the sample representative of the target population?
4.3   Are the measurements appropriate?
4.4   Is the risk of nonresponse bias low?
4.5   Is the statistical analysis appropriate to answer the research question?
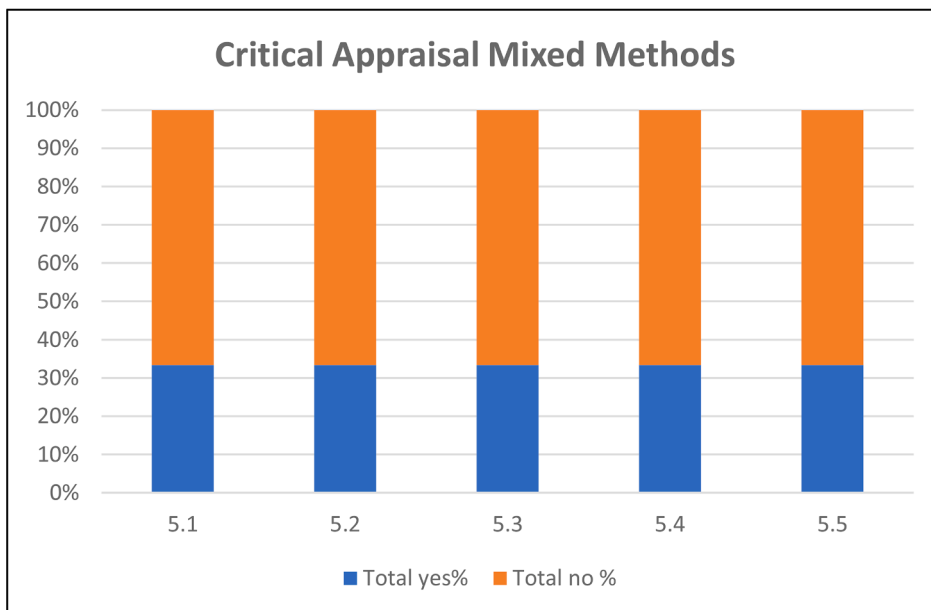
Critical Appraisal Mixed Methods: Quality Appraisal Criteria

5.1   Is there an adequate rationale for using a mixed methods design to address the research question?
5.2   Are the different components of the study effectively integrated to answer the research question?
5.3   Are the outputs of the integration of qualitative & quantitative components adequately interpreted?
5.4   Are divergences & inconsistencies between quantitative & qualitative results adequately addressed?
5.5   Do different components of the study adhere to quality criteria of each tradition & methods involved?

Fig. 3. (*continued*).

Collinson [38] define *heroic leadership studies* as those focusing primarily on leaders' qualities and practices. Such studies tend to be leader-centred, and void of the contextual and relational dynamics that surrounds leaders in real life organizational contexts. Followers in such studies are rarely discussed: their interests are assumed to 'automatically coalesce' with those of leaders ([38], p. 261). Out of 36 studies of digital leadership, a dominant majority of 28 studies assume the notion of heroic leadership without much reflection (Table 2).

However, there are a four studies [36,78,100,112] that lean towards a more critical perspective, making passing observations of greater complexity of leadership processes. The location of leadership in most studies was presented as uncontested, with little reflection on the inter-dependencies between stakeholders, or possible tensions between different organizational levels. The general trend was to focus on top leaders within a particular unit of analysis. For teaching and learning studies, this typically means a teacher in the classroom or learning technology designer operating as if in an organisational vacuum. For example, Ashbaugh [18] placed digital leadership firmly with instructional designers in relation to teaching and students; Ciabocchi et al. [36] and Garrison and Vaughan [53] reflected on the roles of faculty governing bodies and individual academic staff with governing responsibilities [36] as well as senior leaders [53] as strategically influential digital leaders in the design and implementation of online and blended teaching and learning.

For organization-focused leadership studies, digital leadership was aligned to different senior level actors. Tan [112] focused on senior leaders, specifically Vice Chancellors' (VCs) online technology-mediated leadership discourse, performing a digital multimodal discourse approach in a small-scale case study. This study analysed leadership within the online presence (speeches and videos) of senior university leaders at VC level. Antonopoulou [11,12] focused on members of the Academic Senate in higher education, evaluating their leadership styles in the context of digital transformation, while Turner and Burnett [114] located leadership in community college leaders at different levels, including administrators and faculty.

A number of studies positioned leadership in the generic category of 'educational administrators' in the context of online and digital work [64,6]. Akcil et al. [6] offered explicit recognition of senior leaders' responsibility in their research with a group of 153 education managers, advocating growing a generation of digital citizens through 'open leadership' in social networks in higher education contexts. This study explored how individuals in leadership roles related to technology and made connections between their attitudes and broader concepts of digital citizenship, hinting at relational aspects of leadership. Quddus [100] positioned leadership in both the head of the university and academic lecturers, identifying their engagement with different leadership types (digital, servant, and ecological) and subsequently the impact of each type on university performance.

4.6.1.2. Post-heroic digital leadership perspectives. Post-heroic perspectives in digital leadership research move away from a solely leader-centred emphasis to focus on leadership relationships, systems, and collective dynamics. The role of followers and context is more prominent in these studies. Such studies pay more attention to providing details and acknowledging links between stakeholders. However, these studies, like those in the heroic category, remain silent on issues of asymmetries of power, privilege, and ways of handling these differences. Out of 36 studies only three were in this category [30,52,53]. Whilst considering leadership at a classroom [30] and institutional [53] as well as higher education students esports games level [52] in relation to teaching and programme delivery levels, these researchers acknowledge the wider network of relationships and mutual influences within which leadership of key actors is taking place. Falkenthal and Byrne [52] were reviewed as being at the edge of post-heroic perspectives, moving towards a critical leadership perspective. These researchers offered an interesting

analysis of interconnected leadership relationships amongst higher education students within the context of collegial esports games. The need to trust co-players is embedded into the game design, encouraging power sharing in some cases but not in others, thus forcing the players to evaluate the context and develop optimal leadership strategies. The authors provided thoughtful critical commentary on the complexity of leadership processes, but in some ways did not meet quality criteria or identify wider issues, as previously noted.

Organizational studies acknowledged inter-dependencies to a limited degree, sometimes only implicitly or through the data collection design. Sathithada and Niramitchainont [102], for example, located future e-leadership in diffused and potentially distributed ways in innovative workplace practices, although without explicit recognition of distributed leadership. The authors explored views of administrators, lecturers, staff members, and stakeholders of both Thai public and private higher educational institutions on challenges of e-leadership, using a futures-focused sustainability model for their analysis. There was a degree of recognition of the wider context (governmental policies) and of inter-relationships amongst different stakeholders. There was, however, little explicit discussion of the power relationships between them. Hapha and Somprach [64] investigated the components of creative and digital leadership for innovation potential in leading institutional and national development in Thailand. acknowledging the importance of higher education for students' personal and career development. Identifying multiple components and subcomponents of innovation, digital leadership and creative leadership, the authors claimed to validate their finding that there is a positive relationship between innovation and digital leadership for educational performance development, using content analysis of experts' judgements. Akcil et al. [6] introduced the term 'digital citizenship' in their study involving 153 education managers. The authors found that technology acceptance and self-efficacy in technological leadership positively influences a medium level of digital citizenship in other stakeholders, which in turn, alongside technology acceptance, positively influences 'open leadership.' Akcil et al. [6] articulated why education managers need to develop their digital learning abilities to embrace digital citizenship skills to raise new generations in competent ways, thus making connections to wider context.

4.6.1.3. Critical digital leadership studies. Collinson [38] argues that research should go beyond simply acknowledging or describing different players in the field of leadership. His-critical perspective pays explicit attention to issues of location and the power of actors involved in research, harnessing insights around asymmetries of influences towards generating a more contextual, richer understanding of leadership processes as well as barriers to achieving desired outcomes.

In the 36 reviewed studies, there was a general lack of research utilising critical perspectives in most reviewed articles, with limited discourse on power dynamics and or awareness of the risks of technological determinism. Three notable exceptions to this were provided in studies by Burnette [32], Dimitriadi [45]; and Msila [90]. Burnette [32] employed a critical theory lens with a focus on senior leadership to investigate administrative leaders in higher education. She draws on the knowledge that online educational administrators in higher education have less prestige and power in comparison to other administrative groups of staff and that this power differential influences their capacity to implement technology-mediated learning. Dimitriadi [45] examines how universities could respond to technology-driven change by engaging students further and supporting awareness of digital citizenship through instructional design. Such design is based on principles of partnerships between teachers and students, drawing on students' existing knowledge of various ICTs and focusing on elements of the relationship of students (teacher trainees) in partnership with their lecturers.

Table 2

Central themes and subthemes in the published empirical studies.

Narrative theme	Sub-theme	Number of Studies	Definition of Theme or Scale Item	References
Leadership in Specific Domains of University Work	Digital Leadership in Teaching	20	Studies focusing on classroom teaching and studies focusing on governance and management issues directly linked to academic programme delivery	Ashbaugh [18]; Bogler et al. [30]; Burnette [32]; Ciabocchi et al. [36]; Dimitriadi [45]; Falkenthal (2020); Garrison & Vaughan [53]; Kolb et al. [78]; Slykhuis & Lee [111]; Ann and Aziz [10]; Chang, et al. [35]; Garst et al. [54]; Guthrie, et al. [63]; Hornor [67]; Maruyama and Inoue [85]; Masrur [86]; Mitschke et al. (2022); Mori et al. [89]; Seetal, et al. [103]; Zhu et al. [120]
	Organisational Digital Leadership	16	Studies focusing on organisational leadership of staff, organisational effectiveness, governance issues that are not immediately linked to academic programme delivery or classroom teaching	Akcil et al. [6]; Antonopoulou [11]; Antonopoulou [12]; Hapha and Somprach [64]; Liu et al. [82]; Quddus [100]; Sathithada [102]; Turner and Burnett [114]; Tan, S. [112]; Antonopoulou et al. [[13] and [14]], Ghafur [55]; Gupta et al. [61]; Kotula et al. [79]; Laufer et al. [80]; Msila [90]).
	Digital Leadership in Research	0	Studies focusing on leadership of research centers, research teams and research projects	None
Research Approach to Leadership	Functional heroic leadership	30	Functional heroic leadership studies as those focusing primarily on leaders' qualities and practices. Such studies tend to be leader-centred, and void of the contextual and relational dynamics that surround leaders in real-life organizational contexts. Followers in such studies are rarely discussed: their interests are assumed to 'automatically coalesce' with those of leaders ([38], p. 261). Often the functional definitions of leadership are only implied and not explicitly articulated.	Akcil et al. [6]; Ann & Aziz [10]; Antonopoulou et al. [11]; Antonopoulou et al. [12]; Antonopoulou et al. [13]; Antonopoulou et al. [14]; Ashbaugh [18]; Chang et al. [35]; Ciabocchi et al. [36]*; Garst et al. [54]; Ghafur [55]; Gupta et al. [61]; Guthrie et al. [63]; Hapha & Somprach [64]; Hornor [67]; Kolb et al. [78] *; Kotula et al. [79]; Laufer et al. ([80]); Maruyama & Inoue [85]; Masrur [86]; Mitschke et al. [88]; Mori et al. [89]; Quddus [100]*; Sathithada & Niramitchainont [102]; Seetal et al. [103]; Slykhuis & Lee [111]; Tan et al. [112]*; Turner & Burnett [114]; Zhu et al. [120]; Liu et al. [82]
	Functional post-heroic leaderhip	3	Post-heroic perspectives on leadership research move away from the leader-centred emphasis and focus on relationships and collective dynamics. The role of followers and context is more prominent but these studies, similar to those in the heroic category, remain silent on issues of asymmetry of power and privilege (Collinson, Jones & Grint, 2018; [38]).	Bogler et al. [30]; Falkenthal, & Byrne [52]*; Garrison & Vaughan [53]
	Critical Leadership	3	Critical leadership studies pay explicit attention to issues of power, and privilege, and acknowledge and explicitly recognize asymmetries in the analysis of leadership practice. They see leadership as a complex concept in terms of its location and directions of influence (Collinson, Jones & Grint, 2018; [38]).	Burnette [32]; Dimitriadi [45]; Msila [90]
Research Approach to Technology	Functional Ed Tech Perspective	34	Functional Ed Tech perspectives on design, development and implementation of 'effective' learning technologies may be optimistic re. benefits of 'new' technology adoption for improved learning, teaching, and efficiency from a learning sciences perspective, e.g., using Technology Acceptance Models (TAM) and Theory of Diffusion of Innovations (DIT). Effective functional research may focus beneficially on pedagogic improvements, but in some cases, technodeterministic models drive research. Functional research tends to omit issues of technology beyond instructional design contexts, centring mainly on classroom teaching and learning with technology, learning design, technical and administrative institutional information systems issues rather than macro level organisational functions such as leadership and management.	Akcil et al. [6]; Ann & Aziz [10]; Antonopoulou et al. [11]; Antonopoulou et al. [12]; Antonopoulou et al. [13]; Antonopoulou et al. [14]; Ashbaugh [18]; Burnette [32]; Bogler et al. [30]; Chang et al. [35]; Ciabocchi et al. [36]*; Garrison & Vaughan [53]; Garst et al. [54]; Ghafur [55]; Ghafur [55]; Gupta et al. [61]; Guthrie et al. [63]; Hapha & Somprach [64]; Hornor [67]; Kolb et al. [78]; Kotula et al. [79]; Laufer et al. [80]*; Maruyama & Inoue [85]; Masrur [86]; Mitschke et al. [88]; Mori et al. [89]; Quddus [100]*; Sathithada & Niramitchainont [102]; Seetal et al. [103]; Slykhuis & Lee [111]; Tan et al. [112]*; Turner & Burnett [114]; Zhu et al. [120]; Liu et al. [82]; Falkenthal, & Byrne [52].
	Critical Ed Tech Perspective	3	Critical' educational technology perspectives are more sceptical, challenging, socially aware, and contextually grounded re. the use of technology, focusing on actual use rather than rhetorical idealism about the potentials of new innovations. Critical Ed Tech researchers view technology within wider contexts than just the classroom, including macro issues. Technology is perceived as socially constructed and negotiated; research focuses on objective,	Dimitriadi [45]; Msila [90]

Table 2 (*continued*)

Narrative theme	Sub-theme	Number of Studies	Definition of Theme or Scale Item	References
			realistic and critical accounts of technology use in social contexts underpinning the use of technology in educational settings, as well as issues of democracy and social justice. [105]. Some critical Ed Tech researchers do not address leadership and management, but increasingly this is a subject of interest.	
Digital Leadership Research Maturity Levels				
	Level 1	20	Digital Leadership is only implied; the term is not named but leadership is related to the technological context in a tentative way, there is a clear imbalance in emphasis on leadership vs technology in favour of one or the other and at the expense of exclusion of the opposite.	Ann & Aziz [10]; Ashbaugh [18]; Burnette [32]; Bogler et al. [30]; Garst et al. [54]; Ghafur [55]; Gupta et al. [61]; Guthrie et al. [63]; Hornor [67]; Kotula et al. [79]; Laufer et al.[80]; Maruyama & Inoue [85]; Mitschke et al. [88]; Mori et al. [89]; Sathithada & Niramitchainont [102]; Seetal et al. [103]; Slykhuis & Lee [111]; Tan et al. [112]; Turner & Burnett [114]; Zhu et al. [120]
	Level 2	7	Digital Leadership is used or similar term and there is some acknowledged association of the two streams: leadership and technology which come together prioritising either leadership or technology with some imbalance, no definitions beyond that, sometimes unintegrated presentation of concepts, no discussion of complexities, e. g. risks, power, and trust	Akcil et al. [6]; Antonopoulou et al. [11]; Antonopoulou et al. [12], Ciabocchi et al. [36]; Garrison & Vaughan [53]; Hapha & Somprach [64]; Masrur [86]
	Level 3	3	Digital Leadership is explicitly named and recognizes leadership and technology as two co-existing components, a preference is given to leadership or technology to a smaller degree, dynamic tension between them may be implied but not explicitly discussed, there is no reflection beyond this regarding risks, role of trust, integration or transformational capacity or ethical issues.	Chang et al. [35]; Kolb et al. [78]; Quddus [100]*
	Level 4	4	The two aspects of Digital and Leadership are explicitly brought together with recognition of inherent tension between them to form a more balanced new concept with some preference still evident, some acknowledgement of risks and leaders' role in managing the tension is present, this may manifest as brief references to trust and power dynamics with regards to stakeholders and technology.	Antonopoulou et al. [13]; Antonopoulou et al. [14]; Dimitriadi [45]
	Level 5	2	Digital and Leadership concepts are discussed in a dialectic tension as two sides of the same coin in more balanced way between the two, the ability of digital leadership to transform practices is recognised along with risks of reinforcing pre-existing patterns, issues of trust, power and ethics are touched on as integral aspects of theory and practice	Falkenthal, & Byrne [52]; Liu et al. [82]
	Level 6	1	Digital and Leadership concepts are discussed in a dialectic tension as two sides of the same coin with explicit recognition of equality and mutual influence. Digital leadership is seen as embedded in the strategic organisational development, there is a convincing discussion of issues such as trust, power, integral connection to other aspects of social change and organisational transformation as well as recognition of risk and transformative potential of digital technology and leadership.	Msila [90]

4.6.2. Research approaches to educational technology

4.6.2.1. Functional approaches. Educational technology *functional perspectives* are focused on the design, development, and implementation of effective learning technologies including primarily the use of computers in education. Some Ed Tech studies may be optimistic regarding potential benefits of new technology adoption, preoccupied with improving learning, teaching, and efficiency in innovations with technology from a learning sciences perspective, e.g., using the Technology Acceptance Model (TAM) and its later variants (e.g., Davis, Bogozzi and Warshaw, 1989) and innovation using, e.g., the Theory of Diffusion of Innovations (DIT) (Rogers, 1995). In the case of more optimistic approaches to technology, Laurillard [[81], p. 1] has ironically noted, with regards to the evolution of the field, that 'education is on the brink of being transformed through learning technologies; however, it has been

on that brink for some decades now', critiquing the repeated tendency to focus on over-idealistic potentials rather than the challenges of technology innovations in education.

In the best cases, functional Ed Tech research focuses on sound and beneficial student-centred pedagogic improvements which may be achievable through the skilful, well-designed use of learning technologies. However, in more limited cases, techno-deterministic approaches may drive overly aspirational research innovations, regardless of actual take-up and the real needs of learners. Functional Ed Tech research may sometimes omit to acknowledge more challenging issues of technology innovation that relate to wider issues beyond local instructional design contexts, such as trust, ethics, surveillance, and the potential harms of technology, as well as issues of social context, power structures, privilege, and social justice [104–106,129]. Functional Ed Tech tends to focus on classroom teaching and learning with technology, learning
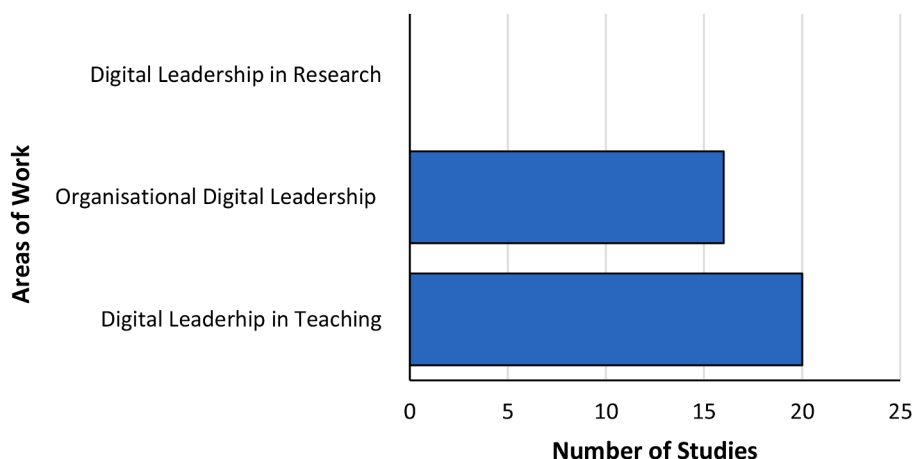
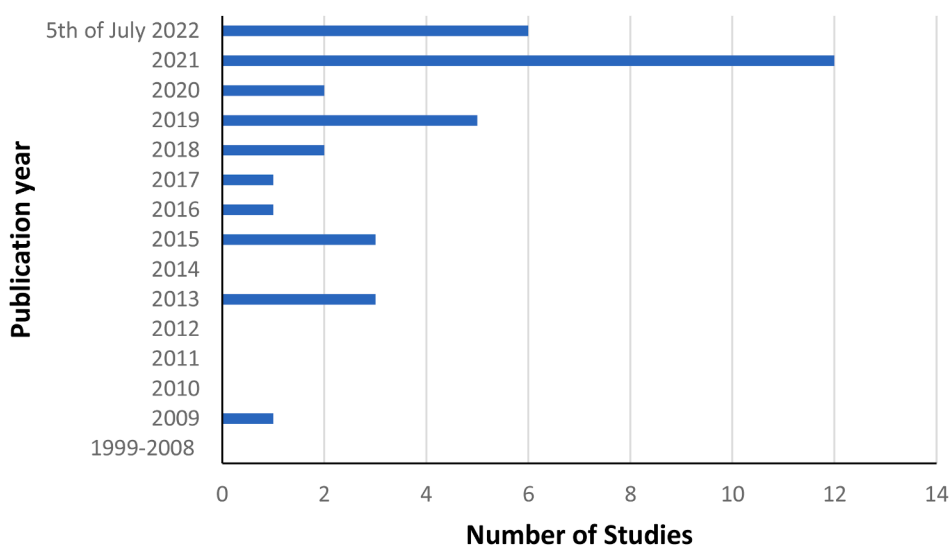**Fig. 4.** Studies by Area of University Work.

Fig. 5. Studies by Year of Publication.

design, and technical and administrative institutional information systems issues rather than macro-level organizational functions such as leadership and management.

In the sample of 36 studies in this review, 33 employed a mainly functional perspective on technology, viewing digital innovation as mostly positive and unproblematic. Although a subset of these studies [36,52,80,100,112] tended towards a more critical view of technology, acknowledging, if only in passing, some ambivalence inherent in technological innovations, these still failed to see the social complexity that may be involved in digitalization. A particularly interesting example is the 34th study, by Falkenthal, & Byrne [52], which seems at the more 'critical' end of functional Ed Tech studies. Although this study considers complex technological features embedded within esport games and their social developmental impact on players, it fails to acknowledge ethical issues of possible addiction of players that may hamper their social lives outside the computer screens.

4.6.2.2. Critical educational technology approaches. Critical perspectives are more sceptical, challenging, socially aware, and contextually grounded about the use of technology, focusing on actual use and challenging issues rather than idealism about innovative potentials of emerging technologies. Critical Ed Tech researchers view technology within a wider context than the classroom, seeing technology as 'socially constructed and negotiated rather than imbued with pre-determined

characteristics', focusing on 'objective and realistic accounts of technology use in situ' [105]. This research aims to develop '... 'context-rich' analyses of the social conflicts and politics that underpin the use of technology in educational settings, as well as issues of democracy and social justice that surround educational technology.' [105]. Out of 36 studies, only two met this criterion: Dimitriadi [45] and Msila [90]. Dimitriadi [45] is one of the few researchers to contribute to collaborative understandings of student digital citizenship and digital leadership development to capitalise on student engagement with technology informally outside the classroom. She provides a challenging discussion on digital citizenship responsibilities regarding the social, ethical, and moral implications of digital technology. Msila [90] is equally challenging regarding the vital role of digitalization in whole organisation change, and the need for institution-wide transformational digital leadership, calling for all Faculty to be critically aware of their responsibilities to build access and success in responding to the needs of the community and country.

4.6.3. Digital leadership research maturity framework levels
To evaluate the 36 empirical studies with regards to how researchers conceptualised digital leadership and to what degree this was a mature conceptualisation, the review generated a framework for six levels of digital leadership research maturity (see Table 2 and Section 5.5):
Level 1

In level 1 studies, digital leadership is present in the most incipient form, in the form of outlines and ghost-like appearances. These studies grapple with the complexities of leadership in the context of technology without articulating the concept clearly and confidently with identifying terms, components, and tensions. Of 36 studies, 20 fall into this group with an equal split between studies published before (10) and since the start of the pandemic (10).

Level 2

Seven studies at level 2 progress basic and implicit conceptualizations of digital leadership towards a more articulated conception, defining this with greater confidence in the presence of these two streams of activity: *'leadership'* and *'technology'* which need to come together for digital leadership to exist. These studies largely fail to keep the two poles of activity in balance and tend clearly to give priority to either 'leadership' or 'technology.' This may be reflected in the study design, where there is an emphasis on the conceptual framework involved in a discussion of findings. As one aspect ('leadership' or 'technology') outweighs the other, no discussion of complexity is recognised as necessary at this level.

Level 3

Three studies at level 3 shift towards a more explicit recognition of *'leadership'* and *'technology'* as two co-existing components, but there is still some preference given to either 'leadership' or 'technology'. A generous reader may be able to deduce a dynamic tension vaguely implied between 'leadership' and 'technology', but the authors fail confidently to assert this. Thus, once again, there is no recognition of the need to discuss the complexities of 'leadership' with 'technology' regarding risk and its management, as well as such issues as the role of trust, organizational integration, transformational capacity, or ethical issues, in more advanced levels of 'digital leadership' research development.

Level 4

Four studies at level 4 move into a more confident territory. Here the two aspects of *digital* (as an evolution from *'technology'*) and *leadership* are explicitly brought together with recognition of an inherent tension between them to form a more balanced new concept with some preference still evident towards one side or the other. There is some acknowledgement of the risks embedded in such combinations and leaders' role in managing such traction is seen as a part of being the digital leader. This understanding may manifest as brief references to trust and power dynamics with regards to stakeholders and technology.

Level 5

Three papers at level 5 tend to take the recognition of complexity a step further by firming up a dialectic tension between *'digital'* and *'leadership'*. These concepts are viewed more clearly as two sides of the same coin in more balanced and equal way between the two. To be a digital leader, the leader needs to be able to keep both concepts in sight and this ability to balance them effectively can lead to the transformation of leadership practices alongside technological uses. There is also a recognition of the risks of reinforcing pre-existing patterns if the balance is not maintained, allowing techno-driven transformations to reinforce existing organizational inequalities. Complex matters of trust, power and ethics are touched upon as integral aspects of the theory and practice of *digital leadership*. At level 5 the above features are present in sometimes inconsistent manner and are occasionally patchy.

Level 6

At level 6 in the present sample this review identified only one paper by Msila [90]. This paper is carefully crafted in a manner that captures the complexity of *digital leadership* as a concept with two separate tool kits brought together with the power to qualitatively change how institutional challenges are addressed and transformed. Positioned within the agenda of decolonisation in a South African higher education

context, this study illustrates how digital leadership can be embedded in strategic organisational development with considerations of complex relationships between power, trust, and technological skill levels amongst different stakeholders. Such papers have the potential to shift understanding of digital leadership into a qualitative new level whilst embedding it in a clear socio-cultural context and within the real-life struggles of transformational change.

Nevertheless, there is a need to align levels of digital leadership maturity in conceptual, theoretical and research designs alongside rigour in terms of MMAT and other international research quality assessment, and it should be noted that no studies from these 36 empirical examples have yet achieved both.

5. Concluding discussion

5.1. Research evidence of digital leadership maturity

The role of digital leaders in growing mature digital capabilities in organizations or cultivating digital citizenship amongst communities was only recognised by a minority of reviewed empirical papers. These included Akcil et al.'s [6] research integrating social network technologies into managerial processes and Hapha et al.'s research [64] on digital leadership and creativity. Overall, reviewed studies demonstrated a relatively rudimentary understanding of digital leadership transformation potentials. Most of the reviewed research focused on a limited understanding of the location of digital leadership, notably regarding the extent to which relational interconnections were recognised rather than isolated leaders. Overall, research studies did not identify the risk of technological determinism (see Section 2.3 above). A general lack of research investigation into and discussion of theoretical perspectives on digital leadership in higher education tended to omit references to prior research studies into wider aspects of higher education leadership, management, and governance.

5.2. Predominant focus on functional perspectives: lack of criticality

Findings from the review indicated that the digital leadership empirical literature reviewed overall tended to focus on functional and instrumental aspects of digital leadership and ICT innovations. A lack of criticality or critical research perspectives meant that difficult themes seemed to be pushed out of awareness, leading possibly to selective moral disengagement [24], although research funds or other limitations may also be a factor. There was also limited discourse on power dynamics and awareness of the potential for technological determinism [76,95], with the notable exceptions of Burnette [32] and Dimitriadi [45].

This paper identifies reservations about an excessive focus on functional perspectives that is tending to occur in this field, for example in managing initiatives such as the 'learning analytics' some enthusiasts may extol. While learning analytics may be helpful, checks on student participation may also raise ambivalence about how useful digital 'attendance' is, for example, in online meetings. Research on 'low-visibility' students has demonstrated that apparently disengaged students may sometimes achieve better results than others in their cohort, possibly because they spend more time learning in quiet reflection [26]. Respect for rights and privacies is fundamental to acceptance of digitalization. Political monitoring/surveillance can be enabled if IT and data audit systems are intrusive [43,72]. Openness and transparency may also affect governance, as informal conversations may not possible within some online meetings systems, with a risk that decision-making becomes opaque. Although some educational technology theorists have addressed such critical perspectives in relation to learning

technologies [76,95,104,105], they have tended to omit or ignore digital leadership research. The fact that such research is interdisciplinary means that the research communities involved in the disciplines of administration, leadership and management do not tend to engage directly with educational technology or higher education research concerns, and vice-versa [20].

5.3. Trust in digital leadership

Findings suggest that values, linked to trust and ethics, which incorporate broader, cultural issues relating to moral engagement, are relatively lacking in the empirical digital leadership research literature assessed. This review identifies this as an important area for future higher education research. Recognising the importance of trust in digital leadership is part of a wider conception of organizational transformation that cross-disciplinary researchers are recognising is required to achieve digital maturity [3,19,31,91,116,122]. Abbu et al. [[3]: 29] observe that, 'In the digital landscape, leadership must change from an emphasis on competency to a focus on trust.' The reason for this is that high trust organisations encourage voluntary participation in institutional change, which is essential if digital transformation is to be achieved across the whole organization effectively [91,122]. This is linked to the character and competence of institutional leadership and organizational achievement of digital maturity. As Abbu et al. [2] observe from the empirical evidence gathered in their *Patterns of Digitization* survey, informed by insights from 559 middle and senior management business decision makers across five continents:

> '.... character and competency motivate digital leaders to build trust and credibility; to take differentiated actions that set apart digitally mature organizations from digitally developing organizations.' ([2]:1)

Leadership engagement in establishing trustworthiness and integrity influences perceptions relating to individuals. Views may differ if individuals are not there in person, face to face. Evidence of this is emerging in the context of education post-COVID relating to accessibility and transparency in the use of data in institutions [43], emphasising the key role of trust within the fostering of successful digitalization.

5.4. Proposed digital leadership research maturity framework

The challenges and deficiencies in this field as outlined above give rise the need to develop more robust theoretical, conceptual, empirical, and professional understanding of digital leadership and its operation in higher education. Research which recognises recent developments on digital maturity in managing digital transformation [57,58,74,98,107] highlights the importance of large-scale organisational change to achieve the agility and flexibility required to remain competitive for swift take-up of digital opportunities [84]. In response to the above identified deficits in the literature, this review therefore proposes the following initial outline of a Digital Leadership Research Maturity Framework. The framework builds on prior exploratory work on the development and assessment of digital maturity in higher education at a generalised level, rather than focused on digital leadership research [46,47,84,109]. These are useful background frameworks for the detailed conceptualisation of digital maturity in higher education, but regrettably do not focus much, if at all, on digital leadership or research into this. For example, Durek et al. [124] do include 'Leadership, Planning and Management' in their research paper on assessing the level of digital maturity in a framework for HEIs across seven areas of operation encompassing 43 elements. However, these elements focus in a limited way on financial, functional, and strategic aspects of ICT integration and resourcing, which are no doubt important but do not recognise or encompass other critically important leadership perspectives and duties.

5.5. Digital leadership research maturity framework

The *Digital Leadership Research Maturity Framework* develops the analysis carried out above in Section 4.6.3 in the analysis of empirical studies. In answer to research question 4, the framework proposed addresses the gaps identified in the field, distinguishing between levels 1–6 in the growth of digital leadership maturity understanding, capabilities, and practice in developing awareness of and methods for research into advanced levels of digital transformation throughout higher education institutions. The framework recognises digital leadership research development from novice to expert levels.

Levels of Digital Leadership Research Maturity.

Level	
Level 1	Digital Leadership is only implied; the term is not named but leadership is related to the technological context in a tentative way,. There is a clear imbalance in emphasis on leadership vs. technology in favour of one or the other and at the expense of the exclusion of the opposite.
Level 2	Digital Leadership is used or similar term and there is some acknowledged association of the two streams: leadership and technology which come together, prioritising either leadership or technology with some imbalance. There are no definitions beyond that, sometimes with an unintegrated presentation of concepts, and no discussion of complexities, e.g., risks, power, and trust
Level 3	Digital Leadership is explicitly named and recognizes leadership and technology as two co-existing components, a preference is given to leadership or technology to a smaller degree. Dynamic tension between them may be implied but not explicitly discussed.There is no reflection beyond this regarding risks, the role of trust, integration or transformational capacity or ethical issues.
Level 4	The two aspects of Digital and Leadership are explicitly brought together with recognition of inherent tension between them to form a more balanced new concept with some preference still evident. Some acknowledgement of risks and the leaders' role in managing the tension is present; this may manifest as brief references to trust and power dynamics with regards to stakeholders and technology.
Level 5	Digital and Leadership concepts are discussed in a dialectic tension as two sides of the same coin in a more balanced way between the two,.The ability of digital leadership to transform practices is recognised along with risks of reinforcing pre-existing patterns.Issues of trust, power and ethics are touched on as integral aspects of theory and practice
Level 6	Mature digital leadership of technology is integrated throughout the research. Digital and Leadership concepts are discussed in a dialectic tension as two sides of the same coin with explicit recognition of equality and mutual influence. Digital leadership is seen as embedded in strategic organisational development, and there is a convincing discussion of issues such as trust, power, with an integral connection to other aspects of social change and organisational transformation as well as recognition of the risks and transformative potentials of digital technology and leadership.

These levels are illustrated as a matrix framework in Fig. 6, alongside a suggested categorisation into functional heroic, post-heroic and critical digital leadership approaches discussed in 5 above, with reference to Collinson [38]. At more advanced levels, research awareness of critical approaches to whole-institution integrated digital leadership approaches become possible. This is achieved alongside the perception that all staff are included in sharing, discussing, reflecting, and improving sustainable innovative digital leadership practices to transform the whole organization. A mature level of research understanding of digital leadership increasingly reconciles inherent tensions, potentially including collaborative engagement, socio-cultural development, democratic participation in digital leadership and growing digital citizenship. In a systematic review of this length, it is not possible to investigate or develop this proposed research maturity framework more fully. However, the recommendation of reviewers is that further research and professional development for impact on policy and practice from research into the above digital leadership maturity levels is carried out.
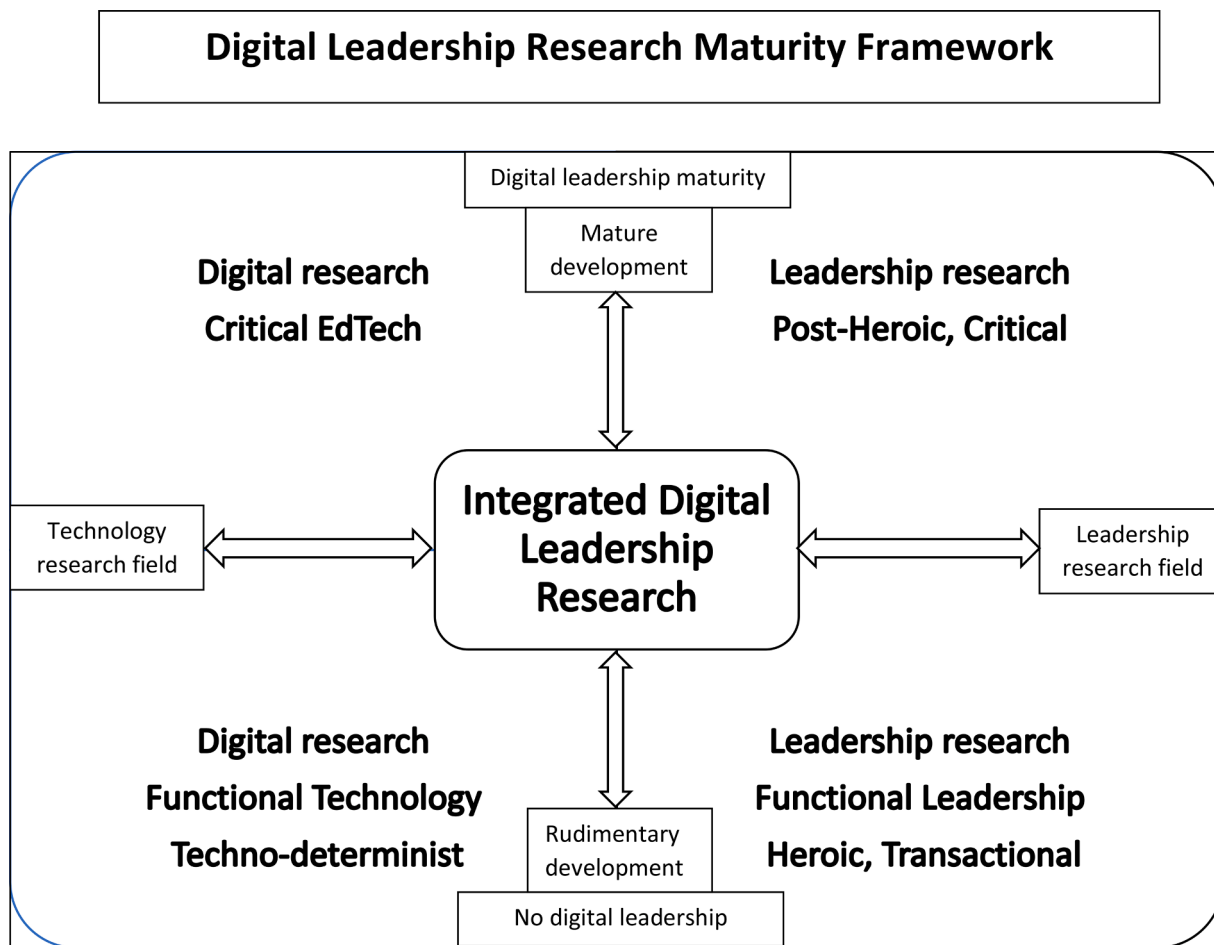
Fig. 6. Digital Leadership Research Maturity Framework.

6. Conclusion

Digital leadership is essential for effective functioning of higher education. However, limited, sometimes contradictory, and ambiguous knowledge from different fields of research exists on how digital leadership is conceptualised and operates, particularly at an institution-wide level. Following a wide-ranging consideration of the background literature in this field, this systematic review aimed to address this limitation in the literature, analysing empirical studies on digital leadership in higher education between 1999 and 2022, their value, focus and the research methods involved. The review combined descriptive synthesis and textual narrative synthesis, applying a data-based convergent synthesis design. From 251 records, 36 studies remained following application of exclusion criteria.

The research questions examined: 1) the nature and extent of prior empirical research investigating the concept and operation of digital leadership in higher education institutions, 2) the methodologies involved in this empirical research, and outcomes examined, 3) to what extent such research met the established quality thresholds of the Mixed Methods Appraisal Tool (MMAT), the benefits and shortcomings of this literature, and 4) summative results of the overall narrative themes and recommendations for a digital leadership capabilities maturity framework to inform research and policy emerging from these studies on digital leadership in higher education.

Overall, functional rather than critical digital leadership perspectives predominated. The quality of most research was low, lacking rigour in research questions and methods, which rendered findings inconclusive, although we analysed research both through the rigour of the MMAT quality standards and in the summative results of a thematic

analysis of digital leadership research maturity. The review recognised the need to align levels of digital leadership research maturity in conceptual, theoretical and research designs alongside rigour as assessed by the MMAT or other international research quality standards of assessment. It should be noted that no studies from these 36 empirical examples achieved advanced levels in both forms of analysis. The review therefore recommends a *Digital Leadership Research Maturity Framework* for higher education and further research on theoretical definitions and digitalization in robust studies to address gaps in the literature identified in the review.

Despite this, the geographical coverage of the reviewed research mirrors the global proliferation of digital technologies and the various ways in which these are employed by current digital leaders. In spite of many gaps and opportunities for improvement in conceptual and research design domains, the widely based interest of researchers in this topic can be taken as evidence that the international research community is seeking a better understanding of digital leadership practice and wider, better coverage of digital leadership research, to support and inspire digital leadership practices in higher education globally.

However, a notable feature of the collected review papers is that of 36 papers, there are 32 different first authors. Only Antonopoulou has published four papers as a lead author, [11–14] focusing specifically on digital leadership in HE. All other authors have written either solo papers or have led a team of researchers only once with this particular focus. It is of value to observe this when considering the maturity of research in the field. There is a need to acknowledge the complexity and difficulty of researching digital leadership in higher education, given the tensions and disconnections between the different fields and understandings involved [17,20,121]. Whilst the absence of authors with a

number of publications in the field is understandable for recent publications (2020–2022), readers may wonder why researchers of earlier publications did not return to the subject. Encouraging authors to persist with research investigating this complex, 'fuzzily' defined [48] difficult topic is one sustainable avenue for promoting field maturity. It is our hope that this review will assist both established and new authors to proceed with greater clarity and confidence to embrace research designs and questions that correspond to the growing importance of global digital leadership in higher education.

This review recommends that future research would benefit from more critical perspectives, and further development of digital leadership research maturity for digital transformation at whole organisation levels in higher education. This could include larger scale global and multinational quantitative studies, in-depth qualitative and diverse mixed methods research investigations of digital leadership across multiple HEIs and countries. Higher education digital leadership research would also benefit from theoretical models investigating a continuum of distributed digital leadership amongst staff both at general institution-wide level and for other more specialist roles in HE. This could include new digital leadership research relating to academic research and teaching, AI, MIS, neuroscience, newer research tools, organizational climate, technological, psychological, bioethical, and environmental aspects of digital leadership and how these can be researched and theorised.

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