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Digital transformation in Vietnamese higher education: an epistemic network analysis of policy documents

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Abstract

Purpose – This study aimed to utilize Epistemic Network Analysis (ENA) for a thorough evaluation of policy documents concerning the digital transformation in Vietnam's higher education sector.

Design/methodology/approach – Adopting a quantitative ethnography approach, this research employed ENA to analyse a curated collection of 21 documents that specifically addressed higher education (HE) and digital transformation within Vietnam. The study also incorporated qualitative content analysis, utilizing the constant comparison method as outlined by Onwuegbuzie *et al.* (2009), for data coding. ENA facilitated the examination of connections among various policy aspects.

Findings – The study revealed a consistent overarching theme in Vietnam's digital transformation policies during and post-pandemic, focusing on key areas such as ADMINISTRATION, VISION, QUALITY, and INFRASTRUCTURE. However, a temporal shift in emphasis was observed: during the pandemic, policies were more focused on ADMINISTRATION and INFRASTRUCTURE, while post-pandemic, there was an increased emphasis on COLLAB, VISION, and TEACH_LEARN.

Originality/value – This research represents one of the initial efforts to showcase the utility and significance of ENA in analysing policy documents. It underscores ENA's potential in elucidating the complex interplay of policy elements in the context of digital transformation in higher education, particularly within a developing country setting.

Keywords Epistemic network analysis (ENA), Higher education, Policy analysis, Developing countries, Digital transformation

Paper type Research paper

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1. Introduction

In the contemporary era, the acceleration of technological innovation has catalysed a global shift towards digital transformation, a phenomenon that transcends geographical and economic boundaries. The urgency for digital transformation in education is underscored by the evolving demands of the 21st-century workforce and the societal shift towards knowledge-based economies (Chu, Reynolds, Tavares, Notari, & Lee, 2017). As articulated by the World Economic Forum (2016), the Fourth Industrial Revolution necessitates an educational paradigm that fosters digital literacy and skills essential for navigating the complexities of the modern world. Furthermore, the COVID-19 pandemic, despite its conclusion, has left an indelible mark on the educational landscape, significantly expediting the adoption of digital technologies in teaching and learning processes. This transition is particularly pronounced in the domain of education, where the imperative for digital integration has been universally acknowledged, extending from affluent nations to emerging economies such as Vietnam. In this context, Vietnam's endeavour to integrate digital technologies into its educational system is reflective of a broader global trend aimed at enhancing access, quality, and relevance of education in the digital age (Nguyen, Tran, & Duong, 2023). The role of educational policy in facilitating this digital shift cannot be overstated, necessitating a thorough examination and understanding of policy frameworks to effectively harness the potential of digital education.

However, the transition towards digital education is fraught with challenges, particularly in developing countries where infrastructural deficits and disparities in digital access exacerbate educational inequalities (UNICEF/UNESCO, 2007). The pandemic has amplified these challenges, yet it has also demonstrated the potential of digital technologies to bridge educational gaps and foster inclusive learning environments (Khong *et al.*, 2022; Nguyen *et al.*, 2023). Educational policies play a pivotal role in navigating these challenges and leveraging the opportunities presented by digital education. A comprehensive policy framework that addresses access, equity, quality, and innovation is essential for the sustainable integration of digital technologies in education. Such policies must be informed by empirical evidence and grounded in a nuanced understanding of the socio-economic and cultural contexts of the countries in which they are implemented.

As building upon the foundational understanding of the critical role that educational policy plays in the digital transformation of education, it becomes imperative to employ robust analytical methodologies capable of dissecting the complex interplay between policy initiatives and their practical implications. One such methodology that stands at the forefront of educational research for its ability to illuminate the connections between qualitative data and quantitative analysis is Epistemic Network Analysis (ENA) (Shaffer *et al.*, 2009). ENA offers a novel approach for examining the intricate relationships within policy documents, making it an invaluable tool for researchers and policymakers alike in the quest to understand and enhance digital education frameworks.

Consequently, this study is designed to harness the Epistemic Network Analysis (ENA) methodology for an in-depth examination of policy documents pertinent to the digital transformation within the Vietnamese higher education (HE) sector. This analytical approach is selected for its robust capacity to elucidate the complex interplay of ideas and themes embedded within policy narratives, thereby offering a comprehensive understanding of the policy landscape surrounding digital education in Vietnam. Specifically, our investigation is guided by two principal research questions:

RQ1. What key elements are frequently highlighted in policy documents regarding the digital transformation of HE in Vietnam?

RQ2. What are the policy shifts for digital transformation in Vietnamese HE during and after the pandemic?

Through addressing these research questions, our study seeks to contribute to the body of knowledge on educational policy analysis by offering insights into the strategic directions and interdependencies among policy aspects in the context of digital transformation. The findings are expected to inform policymakers, educators, and stakeholders in the Vietnamese HE sector, facilitating informed decision-making and strategic planning for the continued advancement of digital education.

2. Literature review

2.1 Digital transformation in higher education

The term "digital transformation" refers to a constant process of the integration of such technologies as artificial intelligence (AI), cloud computing and the Internet of Things (IoT) to improve business models, deliver superior consumer experiences and build up an agile culture (Warner & Wäger, 2019). This viewpoint is advocated by the fact that there is a continuous and ever-evolving nature to HE's digital transformation initiatives, with technology adoption being seen as a strategic priority (Fernández, Gómez, Binjaku, & Meçe, 2023). However, many HEIs are in the early stages of digital maturity whereby a small number focus on single digital initiatives with little integration into a collective plan (Fernández *et al.*, 2023).

The history of digital transformation in HE spans a long time, from early technology adoption to the emergence of more complex digital ecosystems. The early use of Learning Management Systems (LMS) as the first type of e-learning environment provided a foundation for the following growth of educational technology (Al-Busaidi, 2013). Parallel to these technical breakthroughs, Massive Open Online Courses (MOOCs) played an increasingly important role in expanding educational access. The incorporation and assessment of MOOCs in HE helped to improve teaching methodologies and increase educational access (Shoukry & Elnainay, 2022). As the digital environment grew, the incorporation of modern digital technologies became critical. Emerging technologies, such as Artificial Intelligence (AI), Virtual Reality (VR), and Augmented Reality (AR), started generating immersive learning experiences (Colreavy-Donelly *et al.*, 2022; Järvelä, Nguyen, & Hadwin, 2023). This current period not only saw major advances in educational technology, but also new issues, such as preserving privacy, narrowing the digital access gap, and eliminating any biases in educational algorithms (Nguyen, Ngo, Hong, Dang, & Nguyen, 2023). In solving these problems, leadership and strategic vision play a major role in underlining the need for a coherent strategy in terms of the complexity of digital education and stakeholder engagement (Laufer *et al.*, 2021).

Digital technologies have recently been integrated across a range of areas in HE institutions. A remarkable change toward blended and online learning environments which are supported by LMS such as Moodle as well as Blackboard (Bond, Marín, Dolch, Bedenlier, & Zawacki-Richter, 2018; Cerezo, Sánchez-Santillán, Paule-Ruiz, & Núñez, 2016). These technologies bring the possibility of more personalised learning and adaptive learning technologies In addition, the development of digital infrastructure, particularly high-speed internet connectivity and cloud computing services (Naved *et al.*, 2022) has been instrumental in the scalability and accessibility of educational resources. Digital technology implementation in HE largely has facilitated administrative activities, such as student services, records maintenance, and governance. For instance, "Verificate" study by Thakare, Phatak, Wadhani, Karotra, and Priya (2024) has shown how blockchain can revolutionise the certificate verification process which makes it more efficient and secure by design. In terms of research and innovation, top leaders of HE in 24 countries have experienced the exponential adoption of digital transformation and identified the potential of digital education for research collaboration (Laufer *et al.*, 2021).

Policies can promote digital innovation through provisions that enable the experimentation and adoption of new technologies; likewise, policies may pose challenges to digital change by imposing traditional norms and rules that restrict the use of new digital corporate forms and systems (Hinings, Gegenhuber, & Greenwood, 2018). National policies are the guiding principle that represents the trend and priorities of institutional approaches in HE's digital transformation (Xiao, 2019). Some countries have developed national digital agendas or strategies that outline goals for digitalization across various sectors, including education. "National Educational Technology Plan" (NETP24) from the US Department of Education offers a comprehensive roadmap to employ technology in education for improved learning. It focuses on inequitable access to connectivity, devices, and digital content, for instance, digital accessibility and digital health, safety, and citizenship skills (U.S. Department of Education, 2024). The UK's approach to digital transformation in HE is multifaceted, in the policy paper "2022–2025 roadmap for digital and data," a foundational framework was created which impacts HE through provision of improved digital infrastructure, data governance, and digital literacy (UK Government Digital Service, 2022). More disruptive and innovative digital goals in the development plans of the future are foreseeable, which suggests that national policies not only direct but also influence the evolution of digital initiatives in colleges and universities (Xiao, 2019).

McCarthy, Maor, McConney, and Cavanaugh (2023) analysed digital transformation frameworks in the educational context and emphasized that digital transformation extends beyond mere technology. Their study identified key components of digital transformation, including leadership, people, experience, and technology. While McCarthy *et al.*'s (2023) integrated framework provides valuable direction for our analysis, our study employs quantitative ethnography (QE) approach with Epistemic Network Analysis (ENA) in a more bottom-up approach. This approach aims to explore policy shifts for digital transformation in Vietnamese higher education as part of a discovery research effort.

2.2 Quantitative ethnography with epistemic network analysis (ENA) in educational research

Quantitative ethnography (QE) represents a methodological innovation in educational research, merging the depth of qualitative insights with the rigour of quantitative analysis. This approach, pioneered by Shaffer (2017), facilitates the exploration of complex cultural patterns within educational settings, allowing researchers to quantify and model the relationships between different elements of learning environments. QE has been increasingly recognized for its ability to bridge the traditional divide between qualitative and quantitative research paradigms, offering a comprehensive framework for analysing educational phenomena.

Shaffer's seminal work, "Quantitative Ethnography," lays the foundation for this methodology, introducing key concepts and tools such as Epistemic Network Analysis (ENA) that enable the visualisation and analysis of connections within qualitative data (Shaffer, 2017). ENA, a core technique of QE, allows for the examination of discourse and interaction patterns, providing insights into the cognitive and social processes underlying learning experiences. This method has been applied in various educational research contexts, from classroom interactions to online learning environments, demonstrating its versatility and depth of analysis.

The application of QE extends beyond traditional educational settings, addressing the challenges of analysing complex data sets in informal learning environments and Massive Open Online Courses (MOOCs). For instance, Wang *et al.* (2023) utilized QE to investigate the development of nursing students' practice readiness using an digital application called

Shadow Health® Digital Clinical Experiences. This illustrates how QE methods can uncover the learning dynamics within digital platforms. Similarly, Siebert-Evenstone *et al.* (2017) applied QE to explore participation patterns in computer-supported collaborative learning (CSCL) environments, highlighting the methodology's capacity to reveal the nuanced ways in which learners engage with online content and with each other.

Quantitative ethnography's contribution to educational research is also evident in its approach to data analysis. By integrating qualitative data coding with quantitative network analysis, QE provides a robust framework for identifying and understanding the structures of interaction and knowledge construction. This dual focus on content and connection offers a more holistic view of educational processes, moving beyond surface-level descriptions to uncover the underlying mechanisms of learning (Shaffer, 2017).

Moreover, QE challenges and expands the methodological toolkit available to educational researchers, advocating for a more integrative approach to data analysis. This is particularly relevant in the context of learning analytics and educational data mining, where QE can offer deeper insights into the qualitative aspects of learning data, enriching the predominantly quantitative analyses in these fields (Bowman *et al.*, 2021; Shaffer, 2017).

The rationale for employing QE, and specifically ENA, in the analysis of policy documents emerges from the recognition of the inherently networked nature of HE. This sector is characterized by complex interactions among various actors, including technologies, educators, students, and other stakeholders. Policies designed to guide and shape the future of HE must, therefore, account for these multifaceted interactions, acknowledging the agency of both human and technological actors within the policy implementation process. The dynamic and interconnected environment of HE necessitates analytical approaches that can capture and make sense of these complexities.

QE, with its foundation in understanding and quantifying the relationships within qualitative data, offers a promising avenue for exploring the networked characteristics of educational policies. ENA, as a tool within QE, enables researchers to visualize and analyse the connections between concepts within policy documents, providing insights into how different elements of the policy landscape are interrelated. This methodological approach is particularly suited to examining the structure of policy documents, revealing the underlying patterns of emphasis, priority, and linkage that may not be immediately apparent through traditional qualitative analyses.

Despite the potential of QE and ENA for policy analysis, there is a noted gap in the empirical application of these methods within this domain. While previous studies have proposed the idea of using QE, and ENA in particular, for analysing policy documents (Galey-Horn, Reckhow, Ferrare, & Jasny, 2020; Shaffer, 2017), empirical evidence of such applications remains scarce. This scarcity underscores a significant opportunity for research innovation and contributes to the novelty of the current study. By applying ENA to policy document analysis, this research not only ventures into relatively uncharted territory but also sets a precedent for future investigations into the complex networks of policy discourse in education.

This study, therefore, stands as one of the early attempts to demonstrate the applicability and value of ENA in the context of policy document analysis. Through this approach, the research aims to uncover the intricate web of connections that define the policy landscape of digital transformation in HE. By doing so, it contributes to a deeper understanding of how policies are structured to address the multifaceted challenges and opportunities within the digital education ecosystem. The findings of this study are anticipated to offer valuable insights for policymakers, educators, and researchers alike, highlighting the potential of QE and ENA as powerful tools for navigating the complexities of educational policy analysis.

3. Methods

3.1 Data sources and selection criteria

A search for relevant documents was conducted on the official Ministry of Education and Training and Government of Vietnam website. A targeted search approach was applied, including Vietnamese-specific language keywords. Since multiple keywords cannot be entered into the search task bar as the default of the website, the term "Giao duc dai hoc" (HE) was used separately to gather documents on HE policies, and "Cong nghe thong tin" (information technology) was used to search for policies on the use and integration of technology in education. The review timeline was set for 2023 and progressed backwards until all relevant materials had been identified.

The selection process consisted of two phases, the first was to check the relevance of the documents, and the second was to check the quality of the documents for the research objectives following the inclusion criteria (Table 1). In the beginning, the first researcher did a general skimming of the search result titles with 83 documents that are concerning HE, and 66 documents that are related to information technology, followed by the steps of skimming, scanning, and selecting documents that directly mentioned the national decisions and principles for digital transformation in HE in Vietnam. Later, the second researcher took on the critical role of re-examining all the documents, with the aim of confirming their relevance and quality. The documents were identified, and the process of the whole review was performed through discussion. Finally, we agreed upon a set of 21 documents (as listed in Appendix) that specifically covered both HE and digital transformation, in which the set of data was specific and relevant for analysis.

3.2 Qualitative content analysis

To investigate the key aspects emphasised in policy documents for digital transformation in Vietnamese HE, this study employed qualitative content analysis, specifically utilizing the constant comparison method as delineated by Onwuegbuzie, Dickinson, Leech, and Zoran (2009). Initially, following the aforementioned collection of relevant policy documents, each document underwent a thorough examination to fully understand its content and context, noting initial observations. This detailed examination led to a systematic coding process, where data points relevant to our research questions were marked with specific codes.

The initial phase of the systematic coding process involved an open coding process. During this stage, each text segment of every policy document was carefully analysed to identify and assign a descriptor that accurately encapsulates a specific aspect of digital transformation as it pertains to higher education. The constant comparison method, as applied in this study, involves an iterative process of comparing each new piece of data (in this case, descriptors from policy documents, i.e. each paragraph in the documents) with

Table 1. Inclusion and exclusion criteria for the policy documents selection

Criteria	Inclusion criteria	Exclusion criteria
Topic	Documents that specifically include digital transformation in HE	Documents focusing on K-12 education or areas outside of HE and digital transformation
Relevance	Documents that implement rules, principles, or guidelines for integrating digital technologies in HE settings	Documents without clear implementation guidelines about the integration of technologies in HE
Availability	Documents that are publicly available on the official government website	Documents that are inaccessible, classified, or require special authorization for access

Source(s): Table by authors

previously analysed data. This comparison aims to identify patterns, themes, and variations within the data set, thereby facilitating a comprehensive synthesis of the key aspects of digital transformation emphasized in the policy documents. The iterative process of comparing each descriptor from policy documents and establishing themes reflects the nature of the Quantitative Ethnography (QE) approach. This approach characterizes the elements of digital transformation policies and interprets the discourse (i.e., policy documents) to derive both codes (with a small "c") and Codes (with a big "C").

Through this rigorous analytical procedure, the study aims to uncover the underlying priorities, strategies, and expectations delineated in the policy framework guiding the digital transformation of higher education in Vietnam. These codes were then grouped into potential themes, with each theme representing a significant pattern or aspect of the data related to the digital transformation in education (Table 2).

To ensure the analysis's rigour, the study employed a dual-coder approach, with two researchers independently coding the same portion of data (20%) to inform the reliability of the coding scheme. Discrepancies in coding were resolved through discussion until agreement was reached. The reliability of this agreed-upon coding was then measured using Cohen's kappa coefficient, providing a statistical measure of inter-rater agreement (Dang, Nguyen, & Järvelä, 2024). Overall, Cohen's kappa indicates a good agreement between the independent coders, with a value of 0.77. This structured approach enables a detailed exploration of the policy documents, offering an overview of the digital transformation efforts within Vietnamese HE.

3.3 Epistemic network analysis (ENA)

Epistemic Network Analysis (ENA) is a technique for modelling the structure of connections in data. ENA assumes: (1) that it is possible to systematically identify a set of meaningful features in the data (Codes); (2) that the data has local structure (conversations); and (3) that an important feature of the data is the way that Codes are connected to one another within conversations (Bowman *et al.*, 2021; Shaffer, 2017). While ENA was originally designed to address challenges in learning (Shaffer *et al.*, 2009), the method is not limited to analyses of learning data. For example, ENA has been used to analyse (a) task performance (D'Angelo, Ruis, Collier, Shaffer, & Pugh, 2020); (b) gaze pattern (Brückner, Schneider, Zlatkin-Troitschanskaia, & Drachsler, 2020); (c) team communication (Sullivan *et al.*, 2018); (d) social media (Dubovi & Tabak, 2019); and even (e) governmental communication and policy (Schnaider *et al.*, 2021).

ENA excels in modelling the connections among Codes across documents or sections, quantifying their co-occurrences to create a weighted network. This network facilitates a comparative analysis, both visually and statistically, of how thematic elements interlink within and across documents, offering deep insights into the data's structure. The key assumption of the method is that the structure of connections in the data is meaningful. ENA is thus a useful technique for modelling the change (similarities and differences) of Vietnam governmental initiatives regarding digital transformation before and after the corona crisis. It can model the relationships among main themes of strategy as they occur within the policy documents.

In this study, we applied epistemic network analysis to our data using the ENA Web Tool (Marquart, Hinojosa, Swiecki, Eagan, & Shaffer, 2018). We defined the units of analysis as all lines of data associated with a single value of Year subsetted by DocumentID and Paragraph. For example, one unit consisted of all the lines associated with DocumentID 'Hướng dẫn nhiệm vụ đối với GDĐH 23-24 - 22092023' and Paragraph II.7.a. The ENA algorithm uses a moving window to construct a network model for each line in the data, showing how codes in the current line are connected to codes that occur previously, defined as 3 lines (each line plus

No	Themes	Code	Description	Examples
1	Infrastructure	INFRASTRUCTURE	Policies related to the development of digital infrastructure within HE institutions Measures taken to ensure accessibility and inclusivity in the adoption of digital technologies	*Tăng cường các điều kiện đảm bảo về hạ tầng kỹ thuật và năng lực ứng dụng công nghệ thông tin trong dạy - học trực tuyến và trong công tác kiểm tra, đánh giá chất lượng giáo dục. (Strengthen conditions to ensure technical infrastructure and capacity to apply information technology in online teaching and learning and in testing and evaluating educational quality.)*
2	Equity and inclusion policy & procedure	EQUITY	Inclusive practices, and equitable opportunities for all members of the university community	*Cung cấp truy cập Internet miễn phí cho sinh viên và giảng viên. (Provides free Internet access for students and lecturers.)*
3	Faculty development and training	TRAINING	Policies addressing the training and development of faculty members to effectively integrate digital tools into teaching, assessment, and admin tasks The support systems in place to facilitate faculty adaptation to digital pedagogies	*Có kế hoạch và thường xuyên tổ chức tổ chức tập huấn, bồi dưỡng nâng cao nhận thức về an toàn thông tin và kỹ năng ứng dụng CNTT cho giảng viên (Plan and regularly organise training and fostering to raise awareness of information security and IT application skills for lecturers)*
4	Technology quality assurance and assessment	QUALITY	Quality assurance for the technologies, including information safety	*Các cơ quan, đơn vị chủ trì quản lý hệ thống thông tin và CSDL giáo dục lưu ý việc tăng cường rà soát và hoàn thiện quy chế quản lý, vận hành và khai thác sử dụng các hệ thống CNTT. (Agencies and units overseeing educational databases must prioritise enhancing regulations for managing and utilising IT systems.)*
5	Digital application in teaching and learning	TEACH_LEARN	Application of digital technologies in the activities of teaching & learning	*Tăng cường kỹ năng ứng dụng công nghệ thông tin trong dạy và học, kiểm tra, đánh giá chất lượng giáo dục. (Strengthen skills in applying information technology in teaching and learning, testing and evaluating educational quality.)*

Table 2.
Coding scheme for document analysis in digital transformation within Vietnamese HE

(*continued*)

No	Themes	Code	Description	Examples
6	Digital application in administration service	ADMIN	Application of digital technologies in the activities of management, and other administrative tasks	*Xây dựng cơ sở dữ liệu quốc gia về giáo dục đại học phục vụ công tác báo cáo, thống kê, dự báo và các hoạt động quản lý giáo dục đại học. (Build a national database on HE to serve reporting, statistics, forecasting and HE management activities.)*
7	Strategic vision planning and evaluation	VISION	Setting objectives and evaluating the outcomes of technology implementation	*Tổ chức kiểm tra, đánh giá, tổng kết triển khai nhiệm vụ ứng dụng công nghệ thông tin, chuyển đổi số và thống kê giáo dục. (Organise inspection, evaluation, and summary of implementation of information technology application tasks, digital transformation and educational statistics.)*
8	Stakeholder engagement and collaboration	COLLAB	The involvement of various stakeholders, including government agencies, university leaders, teachers and students Mechanisms for fostering collaboration and partnerships to enhance the digital transformation process	*Sở GDĐT phân công lãnh đạo đơn vị/cơ quan phụ trách, lãnh đạo cụ phòng/tổ và chuyên viên làm đầu mối theo dõi triển khai nhiệm vụ CNTT và công tác thống kê giáo dục. (The Department of Education and Training assigns unit/agency leaders in charge, department/team level leaders and experts to act as focal points to monitor the implementation of IT tasks and educational statistics work.)*
9	Investment	INVEST	How financial resources are allocated to support digital transformation initiatives in HE	*Các cơ sở giáo dục đại học căn cứ vào nhiệm vụ được giao tại Kế hoạch này, tự cân đối nguồn ngân sách được cấp và của đơn vị để triển khai nhiệm vụ. (HE institutions, based on the assigned tasks in this Plan, balance their allocated and unit budgets to implement their tasks.)*
10	Resource allocation	RESOURCE	How HEIs allocate their own financial resources to facilitate digital transformation	*Kinh phí quản lý, vận hành, bảo trì, mở rộng và nâng cấp Hệ thống CSDL giáo dục và đào tạo được bảo đảm từ nguồn kinh phí chi sự nghiệp. (Funding for management, operation, maintenance, expansion and upgrading of the education and training database system is guaranteed from non-business funding sources.)*

Source(s): Table by authors

Table 2.

the 2 previous lines) within a given conversation. The resulting networks are aggregated for all lines for each unit of analysis in the model. In this model, we aggregated networks using a binary summation in which the networks for a given line reflect the presence or absence of the co-occurrence of each pair of codes.

Our ENA model included the following codes: ADMIN, COLLAB, EQUITY, INFRASTRUCTURE, INVEST, QUALITY, RESOURCE, TEACH_LEARN, TRAINING and VISION. We defined conversations as all lines of data associated with a single value of Year subsetted by DocumentID. For example, one conversation consisted of all the lines associated with Year After 2021 and DocumentID Hướng dẫn nhiệm vụ đối với GDĐH 23-24 - 22092023.

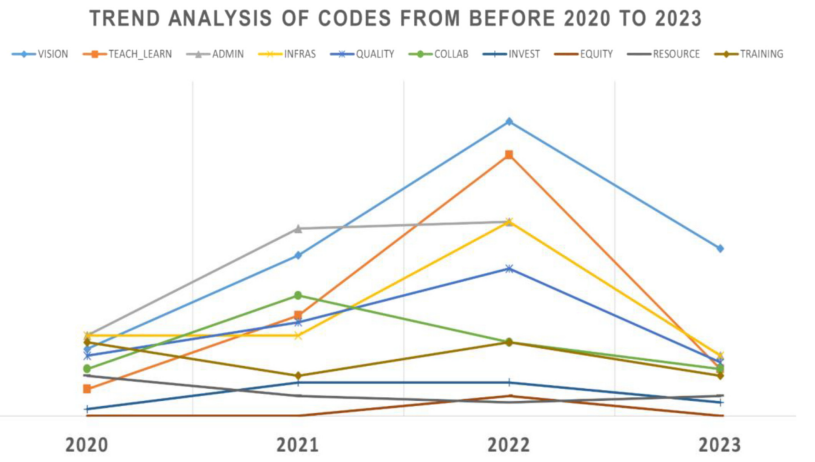
4. Results and findings

RQ1. What are the main aspects highlighted in policy documents for digital transformation in Vietnamese HE?

The systematic review of policy documents pertaining to Vietnam's HE digital transformation yielded a total of 378 coded instances from the years 2020 to 2023. Figure 1 provides a graphical representation of the trends, highlighting the evolving focus of policy over this period whilst the frequency and percentage distribution of these codes are detailed in Table 3.

The results reveal a strategic emphasis on VISION, accounting for 13.89% (f = 10) in 2020, rising to 22.56% in 2022, and constituting 32.89% (f = 25) in 2023. This reflects an increasing prioritisation of long-term planning, goals and objectives in response to the evolving educational landscape.

The TEACH_LEARN category experienced a surge (20.11%, f = 39) in 2022, the accelerated adoption of digital practices in response to the pandemic. The ADMIN and INFRASTRUCTURE themes, which underpinned the operational and logistical dimensions of digital transformation, maintained a steady stable and evolving significance, respectively. While ADMIN maintained a consistent importance with 14.87% (f = 29) in 2020, INFRASTRUCTURE saw a notable increase from 9.60% (f = 12) in 2021 to 14.87%



Source(s): Figure by authors

Figure 1.
Trend analysis of Vietnam's digital transformation policies during and after the pandemic

Codes	2020		2021		2022		2023	
	f	%	f	%	f	%	f	%
Total	72		125		195		76	
VISION	10	13.89	24	19.2	44	22.56	25	32.89
TEACH_LEARN	4	5.56	15	12.0	39	20.00	7	9.21
ADMIN	12	16.67	28	22.40	29	14.87	9	11.84
INFRASTRUCTURE	12	12.50	12	9.60	29	14.87	9	11.84
QUALITY	9	9.72	14	11.20	22	11.28	8	10.53
COLLAB	7	1.39	18	14.40	11	5.64	7	9.21
INVEST	1	2.86	5	4.00	5	2.56	2	2.63
EQUITY	0	0.00	0	0.0	3	1.54	0	0.00
RESOURCE	6	8.33	3	2.40	2	1.03	3	3.95
TRAINING	11	15.28	6	4.80	11	5.64	6	7.89

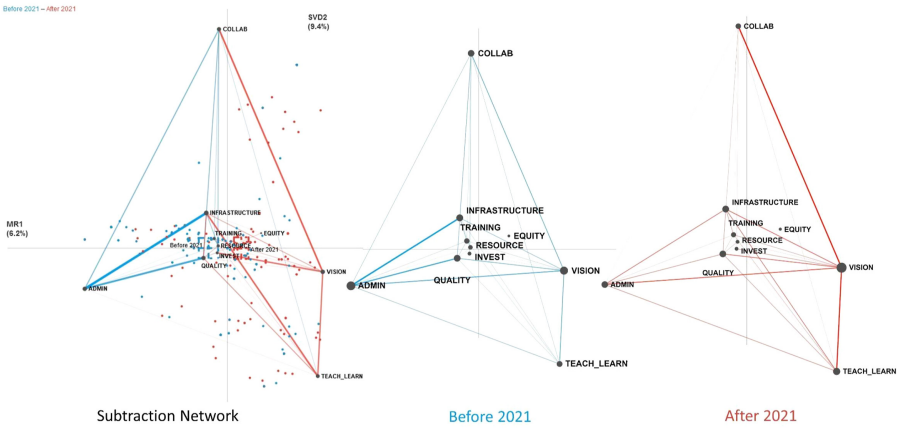
Source(s): Table by authors

Table 3. The frequencies of each code across the years 2020–2023

(f = 29) in 2022. This uptick reflects the escalating demand for robust digital education infrastructure to meet the requirements spurred by the pandemic. The QUALITY dimension exhibited stability throughout the period, contributing approximately 10% each year. Fluctuations in focus on areas such as COLAB, INVEST, RESOURCE, and TRAINING, depict a dynamic and adaptive policy landscape in response to the evolving digital transformation in education.

RQ2. What are the connections between policy aspects for digital transformation in Vietnam during and after the pandemic?

To answer our research question of whether we can identify differences in the Vietnamese governmental policies for digital transformation during and after the pandemic period, we started our analysing by looking at Figure 2 which showed the main subtraction networks created via ENA on the basis of our coded data. The subtraction networks show each period in the form of a square with dotted boxes, which indicate their confidence intervals (CI) in both dimensions of the projection space. The centroids of these periods are positioned apart, yet they exhibit some overlap in their CIs. This spatial distribution and overlap suggest the



Source(s): Figure by authors

Figure 2. Epistemic network analysis graph of policy documents before and after 2021

presence of both differences and similarities in the framing of digital transformation policies across the two periods.

Along the X axis (MR1), a Mann-Whitney test showed that Before 2021 (Mdn = −0.03, N = 129) was statistically significantly different at the alpha = 0.05 level from After (2021) (Mdn = 0.08, N = 176 U = 7227.50, $p < 0.01$, $r = 0.36$). Overall, this indicates that during and after the pandemic, the overarching theme in Vietnam's digital transformation policies remained constant throughout and beyond the pandemic, emphasising critical domains like ADMINISTRATION, VISION, QUALITY, and INFRASTRUCTURE. This emphasis is reflected in the relatively high co-occurrences among these nodes. Yet, the emphasis shifted over time: policies during the pandemic were more oriented towards ADMINISTRATION, and INFRASTRUCTURE, whereas after the pandemic, there was a heightened focus on COLLAB, VISION, and TEACH_LEARN. This observation is supported by the subtraction network diagram indicating that the co-occurrence between ADMIN and INFRASTRUCTURE was very strong during the pandemic, while the co-occurrences among COLLAB, VISION, and TEACH_LEARN became prominent after the pandemic.

5. Discussion

The aim of this study was set to conduct a comprehensive assessment of policy documents related to the digital transformation in Vietnam's higher education sector. By utilizing the Epistemic Network Analysis (ENA) method (Shaffer, 2017), which integrates both qualitative and quantitative approaches, this research not only facilitates a detailed examination of the complex interrelationships and knowledge structures embedded within these documents but also contributes to the methodological literature by demonstrating the applicability of ENA in the analysis of policy documents. This innovative application of ENA allows for the identification of dominant themes, patterns, and deficiencies in the policy landscape, providing insights into the strategic orientations and priorities of Vietnam's digital transformation initiatives in higher education. Through showcasing the utility of ENA in this context, the study enhances our understanding of how policy frameworks support or impede the integration of digital technologies in educational environments. Consequently, this research informs future policy development and implementation strategies, aiming to advance technological integration in higher education, while also enriching the methodological toolkit available for policy analysis in the field of educational technology and learning sciences. More specifically, post-pandemic collaboration for effective digital transformation is emphasised, which draws attention to the need for holistic policies in the future that not only target quality, innovation, but also cooperation in digital education for policymakers.

In the evolving landscape of Vietnam's HE sector, the strategic integration of digital technologies has been paramount, reflecting a significant shift in policy and practice aligned with the nation's broader digital transformation agenda (Thi, Tran, La, Doan, & Vu, 2022). Initially, the focus was squarely on laying a robust digital infrastructure (INFRASTRUCTURE), a foundational step deemed essential for widespread technology adoption in educational contexts. This initial phase was marked by a strong emphasis on ensuring equitable access, underscoring the critical importance of inclusivity in the technological overhaul of educational systems. The analysis of policy documents prior to 2021 reveals a clear prioritization of measures aimed at fostering equity, highlighting the recognition of infrastructure not merely as a technical requirement but as a pivotal element in ensuring equitable educational opportunities.

Progressing from the foundational emphasis on infrastructure, the discourse within the sector evolved to articulate a more nuanced vision (VISION) for technology integration in education to nurture talent to enhance the country's progress and meet the demands of

Vietnam's social and economic developments (Hoang, Tran, & Pham, 2018). This vision encompassed setting precise objectives and evaluating the efficacy of technology implementation, ensuring that such initiatives are aligned with Vietnam's overarching digital transformation policies. The administrative (ADMIN) application of digital technologies soon followed, with a significant focus on leveraging these technologies to enhance management and administrative efficiencies within the educational sector. This included, notably, the development of a national database for educational reporting, forecasting, and statistics, marking a significant step towards digitalized educational governance.

The onset of the COVID-19 pandemic accelerated this digital shift (Ishida, Shrestha, Thapa, & Subba, 2023; Tran & Do, 2022), highlighting the urgency of addressing the digital divide as students faced unprecedented challenges in accessing education remotely. Policies rapidly adapted, prioritizing infrastructure (INFRASTRUCTURE) development to mitigate disruptions and enhance connectivity and device accessibility for students. Concurrently, administrative (ADMIN) strategies were refined to better capture and address educational challenges, demonstrating a responsive and dynamic policy environment.

As reported by Oxford Insights, Vietnam's ascent in the global rankings for AI readiness from 76th in 2020 to 39th in 2023 exemplifies the tangible outcomes of these strategic efforts (VNA, 2024). This improvement reflects the successful implementation of digital infrastructure and underscores the shift towards a comprehensive vision (VISION) for digital transformation in education. This vision increasingly emphasizes the integration of digital technologies into pedagogical practices, highlighting the imperative to effectively equip educators with the necessary digital skills (TEACH_LEARN). It also advocates for a re-evaluation of teaching and assessment methodologies to enhance educational delivery. Furthermore, the emphasis on collaboration (COLLAB) highlights the recognition of digital transformation as a multifaceted endeavour requiring the engagement of a broad spectrum of stakeholders (Tran & Do, 2022), including government agencies, educational institutions, teachers, and students, to ensure inclusivity and equity.

As Vietnam's HE sector intensifies its digital transformation efforts, it is anticipated that the ensuing discourse and policy development will increasingly incorporate key themes highlighted in recent analyses. Foremost among these will be a focus on more professional development (TRAINING) to ensure that educators are continuously updated on the latest technological advancements (Tran & Do, 2022). This priority is expected to be paralleled by measures aimed at the fair distribution of technological resources (RESOURCES), addressing the potential exacerbation of digital divides (EQUITY). Nevertheless, with strong government support (ITA, 2024) HE institutions would see more funding for tech investment (INVEST) from the government to allow institutions to better address learners' equity and enable them to experiment and implement emerging technologies to better prepare learners for the digital future.

Such measures are crucial for fostering an inclusive strategy that effectively serves the varied needs of key stakeholders across the educational spectrum. Furthermore, the introduction of emerging technologies necessitates a heightened focus on the security of learner data (Tuong, Tran, & Nguyen, 2023), prompting a more rigorous discourse on quality assurance and information security (QUALITY). This holistic approach to digital transformation, prioritizing both enhancement of educational methodologies and safeguarding against inequity and security risks, is poised to become a central pillar of Vietnam's educational policy agenda, ensuring that technological integration advances in a manner that is equitable, secure, and aligned with national educational objectives.

From a policy analysis perspective, this study enhances the theoretical understanding of digital transformation in the context of Vietnam, a developing country. The need for digital transformation in higher education has become increasingly important due to the

acceleration caused by the pandemic (Khong *et al.*, 2022; Nguyen *et al.*, 2023) and the rapid advancement of technology, particularly generative Artificial Intelligence (AI) (Gašević, Siemens, & Sadiq, 2023; Kishore, Hong, Nguyen, & Qutab, 2023; Nguyen, Hong, Dang, & Huang, 2024). This focus highlights the importance of understanding policies related to digital transformation in developing countries like Vietnam. Such countries often face challenges within their educational systems, especially in terms of digitalization. Therefore, by exploring the policy environment, this research sheds light on the specific obstacles and opportunities that developing countries encounter as they strive to integrate digital technologies into their educational systems. This contributes valuable perspectives to the strategic planning and implementation of digital transformation efforts in these settings.

6. Conclusion and implications

This study employed ENA to discover the implicit elements of policy documents concerning technology transformation in tertiary level education in Vietnam. The results revealed a relatively small but important shift in strategic orientation in the digital education arena during and after COVID-19. It shows a clear transition from administrative and infrastructure centricity to a more comprehensive approach where visionary and innovative pedagogy became the central foci. The paper also shows the gradual reshaping of such attempts in a conformable manner with regards to the wide range of educational spaces and social contexts.

We acknowledge, nevertheless, that policy documents may not accurately represent the most recent developments in practice yet. The adoption of new technology and methods in practice usually lags behind the creation of policies. The inability of educational institutions to adjust to new advancements and the shifting demands of digital learning may result from this delay. In order to solve this issue, we recommend that further research be done to look at strategies to reduce this lag time. Future studies might investigate ways to design more adaptable policy development platforms. Investigating improved stakeholder engagement is an additional crucial subject. A broad range of stakeholders, including legislators, educators, students, and technology experts, should be included in the policy-making process to ensure that the final result more closely represents current conditions and patterns (Beerkens & Udam, 2017).

The research has several implications that can help national policymakers, educators, and other relevant education stakeholders inside and outside Vietnam. It draws attention to the need for holistic policies that not only target quality, innovation, but also cooperation in digital education for policymakers. Policies should be developed to meet existing needs as well as future concerns. Educators are unlocked in how to function together, envision a future for learning and instructional design concept, which suggests that the curriculum can be improved and novel approaches to instruction can be developed in light of the digital medium to enrich the learning outcomes. This involves replacing traditional competencies with digital competencies in curricula, adopting innovative teaching techniques, and designing environmentally friendly learning spaces adjusted to the complexity of modern reality. Stakeholders, including educational institutions, technology businesses, and community organisations, are expected to take an active role in the advancement of digital education. Collaborative interactions are critical to the development of solid digital infrastructures, the production of high-quality and dependable learning resources, and the provision of equal possibilities for digital learning. The potential to expand policy analyses using ENA opens up an abundance of possibilities for further research. By applying ENA, researchers may ascertain and visualize the degree to which different policy components are aligned or misaligned, which can be essential for guaranteeing that policies are effectively addressing their intended goals (Elmoazen, Saqr, Tedre, & Hirsto, 2022). The tracking of changes in

educational policy over time can be made easier with the use of ENA in longitudinal research. This approach is quite beneficial for evaluating the scalability and sustainability of digital transformation programs (Brohinsky, Marquart, Wang, Ruis, & Shaffer, 2021).

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Appendix

No	Document types	Main objectives	Year	Reference number
1	Official dispatch	The implementation of information technology application tasks for universities and colleges	Pre-2020	4966/BGDĐT -CNTT
2	Decision	Approving the plan to apply information technology, develop digital government and ensure network information security for the period 2021–2025 of the Ministry of Education and Training	Pre-2020	4919/QD-BGDĐT
3	Decision	The establishment of a digital transformation steering committee within MOET	2021	4977/QD-BGDĐT
4	Decision	The approval of the survey plan "Assessing the quality of online training being implemented at higher education institutions during the COVID-19 pandemic period"	2021	937/QĐ-BGDĐT
5	Decision	Plan for implementation of decision No. 69/QD-ttg dated January 15, 2019 of the Prime Minister Approval of "project to improve the quality of higher education in the period of 2019–2025 during the period of 2021–2025"	2021	2622/QĐ-BGDĐT
6	Official dispatch	Instructions for implementing internal inspection and examination tasks for the 2021–2022 school year for higher education institutions	2021	4555/BGDĐT-TTr
7	Strategic plan	Organizing research and compilation of online training programs and materials for key managers of higher education institutions on university administration knowledge	2021	478/KH-BGDĐT
8	Official dispatch	The application of information technology in implementing educational quality accreditation	2021	5778/BGDĐT-QLCL
9	Decision	The issuance of Implementation Plan: Project "Building a learning society for the period 2021–2030"	2021	2646/QĐ-BGDĐT
10	Decision	The promulgation of regulations on management, operation, exploitation and use Education and training database system at the Ministry of Education and Training	2022	4279/QĐ-BGDĐT
11	Decision	The issuance of the Plan to enhance the application of information technology and digital transformation in education and training for the period 2022–2025 of the Ministry of Education and Training	2022	1282/QĐ-BGDĐT
12	Decision	The promulgation of a set of indicators and criteria for evaluating the digital transformation of higher education institutions	2022	4740/QĐ-BGDĐT
13	Decision	The promulgation of the Plan to implement the Strategy for Vietnamese Youth Development in the Education Sector for the period 2021–2030	2022	619/QĐ-BGDĐT
14	Official dispatch	Instructions for implementing the year's tasks 2022–2023 academic year for higher education	2022	4735/BGDĐT-GDĐH
15	Strategic plan	Compiling online training programs and materials for lecturers at higher education institutions on training program development	2022	387/KH-BGDĐT
16	Directive	Regarding key tasks for academic year 2022–2023	2022	1112/CT-BGDDT
17	Official dispatch	Regarding instructions on implementing tasks for the 2023–2024 academic year for higher education and pedagogical colleges	2023	5155/BGDĐT-GDĐH

Table A1.

(*continued*)

No	Document types	Main objectives	Year	Reference number
18	Official dispatch	Regarding surveying the current status of activities of research groups in higher education institutions and implementing policies and laws on training and scientific research development in the priority industry 4.0 field	2023	2254/BGDĐT-KHCNMT
19	Official dispatch	Regarding the implementation of university admission work; College admission in Early Childhood Education in 2023	2023	3996/BGDĐT-GDĐH
20	Directive	The promulgation of the plan, key tasks and solutions for the 2023–2024 academic year of the Education sector	2023	2457/QĐ-BGDĐT
21	Directive	Promulgating an action plan to implement national cyber safety and security, proactively responding to challenges from cyberspace until 2025, with a vision to 2030	2023	4241/QĐ-BGDĐT

Source(s): Table by authors

Table A1.

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