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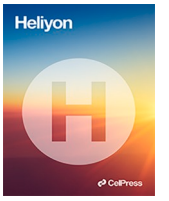

Research article

Knowledge-intensive teamwork development through social media adoption after the COVID-19 pandemic in higher education institutions

Bui Thanh Khoa [a,*], Tran Trong Huynh [b]

[a] Faculty of Commerce and Tourism, Industrial University of Ho Chi Minh City, Ho Chi Minh City, Viet Nam
[b] Mathematics Department, FPT University, Ha Noi, Viet Nam

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ABSTRACT

Although knowledge drives organizational growth, limited teamwork skills have hindered effective knowledge sharing and utilization across departments and individuals in higher education institutions (HEIs). Thus, this paper develops a pertinent knowledge-intensive teamworking model for HEIs. Educational background, leadership, and social media adoption were independent variables, while knowledge acquisition, development, application, revision, and knowledge-intensive teamwork were dependent variables. Using an online questionnaire, a quantitative investigation of 918 people across different HEIs tested hypotheses based on PLS-SEM findings. Results showed that educational background, leadership, and social media adoption are integral enablers in smoothing knowledge management operations, while the synergistic combination of process phases drives teamwork. Consequently, outcomes establish foundations for fostering a continuous learning culture, accountability, and cooperation in HEIs.

1. Introduction

Most management and technology research has focused on the technical efficiency of social media [1]. Information technology revolutionized education over three decades ago, and more recent research has examined various impacts on the workplace, such as training and communication [2,3]. Social media adoption in higher education institutions (HEIs) depends on strategic aims, resources, and cultural factors [4]. Furthermore, the adoption of technology by HEIs is contingent on organizational strategy and differs among HEIs in the same education system [5]. The use of social media in education has drawn interdisciplinary interest [6,7] as HEIs shift communication from one-way to interactive to regularly engage stakeholders [8]. Continual society-wide communication needs frequent updates across media, especially social platforms. Different methods can shape how HEIs utilize social media as key channels, enabling stakeholder conversations. Communication frequently starts on blogging platforms and spreads across media as users access multiple integrated channels, facilitating tailored, multi-way exchanges without time barriers.

The COVID-19 pandemic necessitated remote work and learning, disrupting traditional HEI teamwork models and requiring new virtual collaboration approaches [9]. This research extends knowledge management theory by examining how social media enables leadership, knowledge sharing, and co-development in virtual teams. Specifically, it provides empirical support for the knowledge management cycle model of Kang and Hau [10] by demonstrating how social media can facilitate key stages of knowledge acquisition,

* Corresponding author.
E-mail addresses: buithanhkhoa@iuh.edu.vn (B.T. Khoa), huynhtt4@fe.edu.vn (T.T. Huynh).

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sharing, and revision in virtual settings. The findings reveal how social media-enabled leadership, through modeling knowledge-sharing practices and incentivizing participation, is critical for overcoming motivational barriers to collaborative knowledge activities online [11]. This paper advances the theoretical understanding of the interconnected relationships between social media adoption, leadership influence, and iterative knowledge improvement critical for virtual team effectiveness in higher education institutions. Moreover, a key contribution is providing empirical evidence on the affordances of different social media platforms for enabling specific collaborative activities in virtual HEI teams. The findings provide actionable guidance to HEI leaders on effective social media policies and professional development to optimize virtual teamwork. This research also contributes a new conceptual model of social media-enabled knowledge-intensive teamwork tailored to the HEI context.

The upsurge of technological advancements and global exchanges emerged in the knowledge economy throughout different stages, from manufacturing to services [12]. Thus, labor quality is a paramount consideration before the dynamic landscape of the knowledge economy. The role of knowledge is fringed with human capital and magnified to one of the strategic capabilities for more significant value creation of organizational competitivity [13]. In particular, labor inputs signified a low contribution to GDP growth during the 1990–2011 period with 19.13% [14]—noticing that sustainable economic development characterizes the efficiency of various resources from the natural environment, workforce, and finance to constitute total factor productivity [15]. According to Nguyen [16], the growth rate of capital stock was five times greater than the labor supply during 1990–2019. Therefore, improving the education labor quality, particularly knowledge, is worthwhile through education oriented to sustainable economic growth. There are several negative implications of the Covid-19 pandemic that are now impacting all aspects of society. In addition to the often reported financial and healthcare crises, there is rising attention to the effects of the coronavirus crisis on the human mind. Isolation, loneliness, a delayed return to work or school, and social interaction restrictions all contribute to an increase in new cases of depression, suicidal ideation, self-harm attempts, fears, anxieties, mood disturbances (elevated or irritable mood), academic procrastination, and insomnia [17]. These and other harmful impacts of the present pandemic bring more new patients into the current public health problem and aggravate existing patients' situations [18]. The global education industry's digital revolution verifies the future roadmap to sustainable education management. Many universities must be prepared to embrace the quick changes imposed by the macro environment and include the important trends in their digital transformation plan to acquire a reasonably sustainable position [19]. The digital revolution and transformation, globalization, information interchange, network society, and social media challenge the concept of gaining a competitive edge in higher education [20].

Sahibzada, Jianfeng [21] argued in the higher education context that, while higher education institutions would benefit greatly from knowledge management, they would need to make significant changes in their institutional culture and values; thus, a suitable institutional culture is critical in carrying out knowledge management. Furthermore, in higher education, organizational learning culture has the greatest impact on attaining organizational performance via knowledge management. In addition to knowledge production and distribution capability, teamwork has also been imperative in the contemporary economic climate [22]. Observed from the perspective of human capital, Fajaryati and Akhyar [23] affirmed stronger employability due to high demand from employers in the labor market, whereas Tripathy [24] emphasized the reinforcement of individual skills within a collaborative working regime. Looking at competitive business advantages, Tripathy [24] agreed on an internal win-win strategy via sharing expertise, resolving conflicts among members, and reducing risks of failure compared to individual work to multiply creativity, trust, and connectivity among people in the organization. Dodoo, Surienty [25] studied determinants of effective teamwork and discovered mandatory attitudes such as psychological safety, accountable interdependence, everyday purposes, and mature communications. Tran, Admiraal [25] identified a vast cultural difference in work-related attitudes between Vietnamese employees and Western employees, whereby indicators in the Vietnamese group were lower than the Western group in terms of punctuality in a direct way or with the condition involvement in decision-making, open relationship with employers, accountability, face concern and work-performance orientation versus autocratic orientation. Like contribution to education growth, knowledge capital is also a significant facilitator to fostering team performance and pivotal in university viability. From the macroeconomic perspective, Parcero and Ryan [26] dichotomized three pillars incentivizing knowledge economy: capabilities for organizations to grasp and create knowledge, inputs from educated populations, and facilitation of the Information and Communications Technologies system (ICT), specifically as social media adoption. Since the research above indicates limitations in teamwork in different cultural contexts, it is essential to pinpoint dimensions shaping effective knowledge-intensive teamwork for value maximization at the HEI in developing countries, in the case of Vietnam.

With the considerations mentioned earlier, this research aims to execute and present a comprehensive and cohesive evaluation of the repercussions of adopting social media on the knowledge management process within a higher education institution, examined through the lens of a singular cultural context. This study will specifically explore the interconnectedness among the knowledge management process, social media adoption, educational background, leadership, and knowledge-intensive teamwork in Higher Education Institutions (HEI). The capacity to assimilate and apply knowledge is crucial for transforming knowledge into value, as more than mere exposure to information is needed. Existing evidence underscores that absorptive capacity stands out as the paramount predictor of organizational knowledge flows. Absorptive capacity has become indispensable for understanding variations in corporate learning and information-sharing capabilities. Despite the ongoing discourse surrounding the interpretation of absorptive capacity, experts assert that its organizational antecedents, particularly Human Resource Management (HRM) practices, have yet to receive adequate attention. Nevertheless, the absorptive capability is frequently ascribed to a company's Research and Development (R&D) operations, with other organizational dynamics often overlooked.

This study delves into the intricate interplay between educational background, leadership, social media adoption, the knowledge management process (encompassing acquisition, development, application, and revision), and knowledge-intensive collaboration. In this context, the utilization of social media significantly impacts the internal knowledge management of Higher Education Institutions (HEIs). A nuanced understanding of knowledge-related phenomena necessitates prioritizing individuals. The collective ability of

organizational members to learn, cultivate, and apply knowledge plays a pivotal role in generating and implementing new information within a company. Consequently, absorptive capacity may hinge on factors such as an individual's intelligence quotient, motivation, and habits.

The subsequent sections of this paper are structured as follows: firstly, an exploration of the literature and the development of hypotheses. Subsequently, the research method outlines the techniques employed for literature review, hypothesis formulation, and sampling. The fourth section provides a detailed discussion of the study's findings. Finally, this study conducts a comparative analysis of its results with previous studies and suggests managerial implications to enhance knowledge-intensive teamwork within Higher Education Institutions.

2. Literature review

2.1. Social media adoption in education

In recent years, there has been a growing interest among scholars, politicians, and corporate executives in understanding the impact of social media on organizations [27]. Social media, defined as web-based applications enabling users to generate and share user-generated content [28], encompass diverse platforms such as social networking sites, content communities, blogs, and online forums [29].

The pervasive use of social media for information exchange and communication has led to an increased focus on knowledge-sharing activities. Individuals with subject expertise are brought together through information-sharing endeavors on social media, fostering collaborative learning and knowledge dissemination. Consequently, many educational institutions are progressively leveraging social media to solicit ideas through individual knowledge-sharing activities [30].

Previous research has predominantly examined how workers utilize social media for information exchange in various organizational contexts. Sun, Zhou [31] identified four affordances of social media—meta voicing, triggered attending, network-informed associating, and generative role-taking—that facilitate knowledge sharing in organizations. Motivators such as a desire to assist others, management support, and recognition, as well as obstacles like a lack of trust and time, were highlighted by Majchrzak, Faraj [32] in the context of workers' knowledge sharing on social media. Engineers, for instance, employ social media to exchange expertise and facilitate collaboration during software creation [33], providing valuable insights into employee knowledge sharing in such environments.

It's essential to note that information sharing among university employees differs significantly from consumer knowledge sharing. Academic staff, often originating from the same university, perceive themselves as members of the organization, fostering deep social interactions and trust. This organizational camaraderie enhances information exchange as academic staff are inclined to view themselves as business members with a willingness to assist one another. Conversely, in consumer information sharing on social media, participants are not typically affiliated with the same company and may need more familiarity with one another. Consequently, customers may encounter greater challenges in sharing information than university staff.

2.2. Knowledge management in HEI

The consideration of Knowledge Management (KM) in Higher Education Institutions (HEIs) is on the rise [34]. While the traditional goals of HEIs include knowledge production and transmission, significant changes in the technological landscape [35], social shifts within higher education, and the evolving global marketplace have prompted increasingly entrepreneurial approaches in HEIs. Additionally, HEIs face normative demands for openness, competitiveness, and quality, compelling them to enhance and report on their knowledge-generation processes. Consequently, substantial changes have transpired over the past decades in both external policies and the internal strategies and structures of HEIs.

In knowledge management studies, two predominant approaches are commonly employed: the process and practice approaches. The process method centers on techniques for codifying and storing information in database systems, often implemented within the organization through codified rules, procedures, and technology. This method, derived from direct experience and action, is well-suited for managing explicit knowledge within an organization [36]. However, it needs to capture or collect the tacit information individuals hold in their thoughts. On the other hand, the practice approach focuses on managing implicit information, which can only be transmitted through highly engaging dialogue, narrative, and shared experience. Information technology tools are not employed to collect information but rather as a means of communication to foster a social climate within the organization that encourages the exchange of tacit knowledge. Achieving this may require substantial investment in staff.

Researchers have identified various phases in the knowledge management process, including knowledge creation, acquisition, storage, exchange, sharing, and application [37,38]. Several studies have explored the connections between these diverse processes and identified a positive influence across the board [21,39]. According to Pellegrini et al. (2020), knowledge management procedures encompass knowledge acquisition, creation, sharing (transfer), storage, and application, with potential modifications based on specific circumstances.

Knowledge acquisition, as outlined in the knowledge management literature, is the initial step in the knowledge processing cycle [40]. It involves obtaining new knowledge and expanding existing knowledge when further information emerges [41]. Another facet of knowledge acquisition is the capacity to use technology. A fundamental challenge in this complicated knowledge environment is that information must be organized and acquired via constant reflection to become comprehensive. In truth, the development of information feeds innovation and vice versa. Most information that includes errors, namely misunderstandings, leads pupils to new and

deeper understandings. Quarchioni, Paternostro [42] define an application as the ability to apply previously learned knowledge in novel and unique conditions or to demonstrate the right application of a concept or idea in a distinct setting. For instance, entrepreneurship represents knowledge application for business students, contributing to the enhancement of human capital and entrepreneurial activity [43]. Applied to prior knowledge, information revision results in fresh innovation in an individual's knowledge management. This process may occur during reading and updating thinking [44]. Lecturers, for example, continually acquire new ideas and methods, not just through information acquisition but also by questioning previous knowledge to shift the conceptual viewpoint to accommodate new knowledge.

2.3. Knowledge-intensive teamwork

Knowledge-intensive teamwork (KIT) represents a collaborative process wherein individuals leverage their unique and shared knowledge to achieve a common goal. This collaborative approach is evident in typical work teams engaged in activities within communities of practice, task forces, consortia, joint ventures, and similar contexts. Organizations that derive market value from information often exhibit KIT in their operations [45]. Establishing systems and procedures to manage knowledge-based resources effectively is crucial for attaining a sustainable competitive advantage, constituting one of several strategic competencies a corporation can leverage to execute its competitive strategy successfully. Some researchers assert that adeptly managing knowledge-based resources, encompassing skills, talents, expertise, and learning capacity, surpasses the choice of a firm's competitive strategy [46,47].

In the realm of KIT, individuals collaborate on tasks involving information-centric activities, including obtaining, sharing, combining, developing, applying, and modifying knowledge. Brainstorming procedures exemplify the types of interactions that define KIT. Research by Mazorodze and Buckley [45] in a product development firm's brainstorming activities revealed that addressing complex issues involved including multiple individuals in the process. The solutions generated were the outcome of collaborative efforts rather than the thoughts of a single person. Instances showcasing the value of KIT are evident across a diverse spectrum of organizations pursuing various objectives.

2.4. Research theoretical model

Former researchers have provided fundamental definitions of knowledge-intensive teamwork. According to Bolisani [48], knowledge encompasses individual cognition, practical understanding, and experience related to an issue and its corresponding solutions. This definition emphasizes insightful comprehension of a unique, interesting area aligned with decision-making and problem-solving abilities. Beyond individual intellectual capital, it extends knowledge as the most valuable organizational asset capable of attaining strategic business objectives. Simultaneously, as described by Fapohunda [49], the team concept is a designated unit of interdependent people in the organization with prescribed roles committing to shared outcomes, tasks, and challenges.

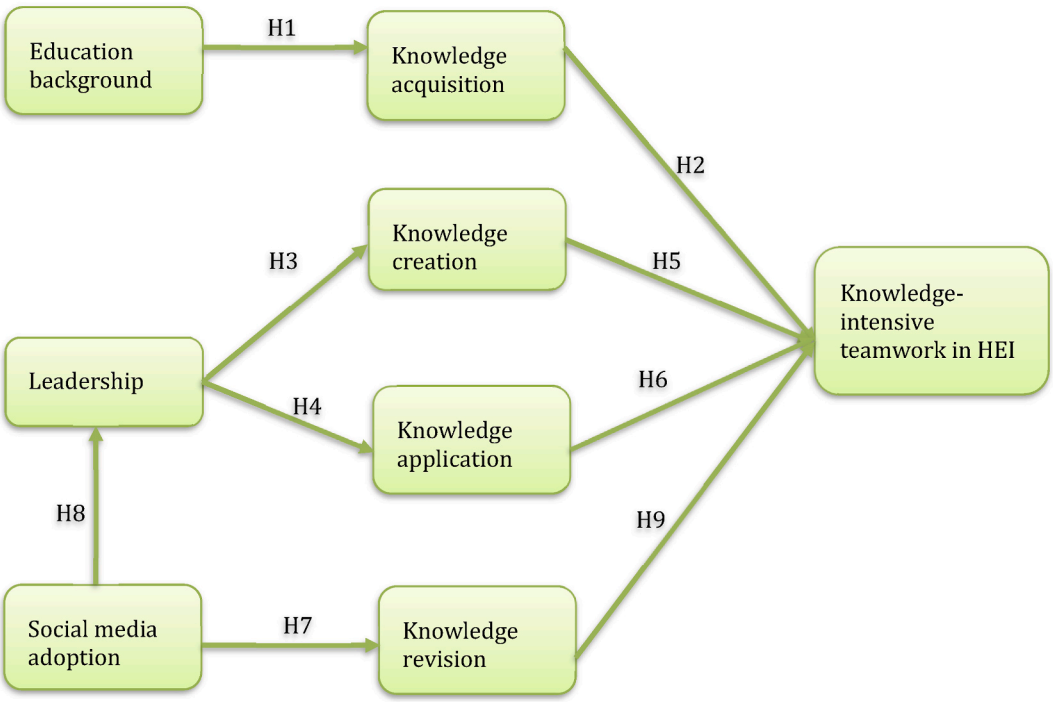

Fig. 1. Theoretical model.

Therefore, teamwork represents coordination and interaction among team members involving common interests [13]. Due to interdependence and individual differences, Roczniewska, Richter [50] underscore harmony in integrating team resources and incremental improvements for individuals toward effective teamwork. Intensiveness implies a magnitude of interaction within the team. Therefore, knowledge-intensive teamwork postulates immense communication and collaboration to harmonize team members' intellectual resources, directing the optimally effective achievement of common goals [13].

The study of Petrov, Ćelić [51] reveals two views of knowledge-intensive teamwork: organizational culture and managerial practices. The corporate culture perspective emphasizes voluntariness, accountability, and empowerment, fostering a collaborative learning ethos in the organizational setting. However, obstacles in the knowledge management process, such as inept planning, direction, and appraisal, can hinder the pursuit of learning and sharing culture in organizations [52,51]. The knowledge management process involves accumulating, utilizing, and transferring tacit knowledge (know-how) and explicit knowledge (codified database). It is crucial to scrutinize standardized stages in the knowledge management process: knowledge acquisition, creation, application, and revision.

The effective integration of knowledge capital in teamwork depends on three facets: people, processes, and technologies, constituting the tripartite nature of knowledge management [52]. People represent human resources and their ability and need to search, amass, and experience knowledge. Educational background fosters labor productivity, satisfaction, and learning motivation [53]. Processes articulate the ability to accomplish team results efficiently and effectively using knowledge, emphasizing the role of leadership in encouraging a learning spirit within the team. Facilitating ICT is an essential initiative, enlarging the scope and speed of information exchanges. Therefore, the tripartite nature of knowledge management aligns with three elements extrapolated from three contributors to the knowledge economy [26] in terms of educational background, leadership, and social media adoption.

Based on these secondary findings, the study constructs a research model to examine relationships between the four dimensions of knowledge management's tripartite nature, different stages of the knowledge management process, and antecedents of knowledge-intensive teamwork. The theoretical model is proposed in Fig. 1.

2.5. Research hypotheses

In conjunction with the dimensions illustrated in the research model, this study seeks their definitions and relationships found in the previous studies to make research hypotheses.

Knowledge acquisition comprises a sequence of intellectual growth via eliciting, gathering, clarifying, modeling understanding of new findings, and confirming the knowledge [54]. Knowledge acquisition responds to environmental incentives from behavioral perspectives, while behavioral change is visible and measurable. Therefore, it understands knowledge acquisition as grasping something new through experiences and experiments [40]. Meanwhile, according to Khalid, Ali [55], educational background refers to the qualifications that learners obtain from their academia or institution, which vary by levels or specializations and shape individual competencies. The findings of Keumala, Samad [53] indicated positive influences of educational background on learning motivation, and systematic strategy and positive motivation during the learning process uphold knowledge acquisition. Hence, the relationship between education and knowledge acquisition is proposed by the following hypothesis:

H1. Educational background positively impacts knowledge acquisition in higher education institutions.

Besides, the more collaborative teamwork is used to acquire knowledge, the more excellently engaged team members [13] foster knowledge-intensive teamwork activities. Team creativity was positively associated with external information acquisition and internal knowledge integration, which comprise team integrative competence. Internal knowledge integration may mitigate the direct influence of external information acquisition on team creativity [56]. Given the intrinsic connection between external and internal team activities, there are further correlations between external information acquisition, internal knowledge integration, and team creativity [57]. According to Gold, Malhotra, and Segars (2015), access to new information enhanced the extent of knowledge that could be merged and contemporary techniques for integrating existing team knowledge, improving the scope and flexibility of knowledge integration. Thus, the relationship between knowledge acquisition and knowledge-intensive teamwork is made by the following hypothesis:

H2. Knowledge acquisition positively impacts knowledge-intensive teamwork in higher education institutions.

In addition, the transference of knowledge leads to knowledge creation within the team. Nevertheless, Fabrizi, Guarini [58] emphasized individual creative and absorptive capability in creating knowledge. It, therefore, refers to exploring and transferring new ideas or findings within the team instead of peculiar past experiences. Another significant component in the knowledge management process is knowledge application, defined as the exploitation and usability of knowledge gained into practices. Meanwhile, Sohmen [59] defined leadership as the interpersonal skill sets of the team leader to influence and empower other members toward desired goals. The research results by Micic [60] interview methods showed remarkable impacts of roles and competencies of leaders, especially charisma, transformational leadership, team leader roles, and networking skills, on leveraging knowledge creation and application within learning organizational culture. Therefore, the relationship of leadership in these three phases of the knowledge management process is given by the following hypotheses:

H3. Leadership positively impacts knowledge creation in higher education institutions.

H4. Leadership positively impacts knowledge application in higher education institutions.

Knowledge generation and learning are at the heart of long-term competitive advantage in chaotic and dynamic corporate contexts. In knowledge-based education, knowledge has been considered the most significant resource. HEI can tap into information in a range

of geographic, sociocultural, and institutional settings, which, if properly shared across borders, may supply them with the knowledge their rivals do not have. Simultaneously, the rarity and uniqueness of new ideas contributed to competitive advantages and exceeded the team's growth if they were only widely available through knowledge creation. Knowledge creation is highly appreciated to enable the team to strive for continual standardization and improvements with little refinement over time. These findings reveal the following hypothesis:

H5. Knowledge creation positively impacts knowledge-intensive teamwork in higher education institutions.

In higher education institutions, knowledge application can positively impact knowledge-intensive teamwork by providing team members with the tools and strategies to share and effectively utilize knowledge within the team. Knowledge application can positively impact knowledge-intensive teamwork by promoting the sharing of expertise and experiences among team members. When team members share their knowledge and skills, they can learn from one another and build on each other's strengths. This can lead to more effective and efficient teamwork, as team members can apply their knowledge and skills to different aspects of the project [52,61]. In addition, Ode and Ayavoo [37] found that knowledge application can positively impact knowledge-intensive teamwork by promoting knowledge management systems and strategies. These systems and methods can be used to organize and store information, making it more accessible and useable for team members. This can help team members stay updated on the latest information and research in their field and easily access and apply knowledge to their work. Based on this evidence, the relationships between these two variables are as follows:

H6. Knowledge application positively impacts knowledge-intensive teamwork in higher education institutions.

Since internal and external business environments constantly change, the knowledge must be revised in liaison with those adjustments to avoid obsolescence [62]. Meanwhile, Sefollahi [63] stated that ICT facilities encompass various digital apparatuses enabling access to information such as the Internet, communications media, or wireless networks, which diversified the learning environment for e-learning (web-based platforms) and blended learning (a combination of web-based and face-to-face platforms) [64]. Former researchers agreed that ICT played a significant role in knowledge management, significantly accelerating, storing, and disseminating a massive flow of information [63]. Hence, this study proposed the hypothesis H7:

H7. Social media adoption positively impacts knowledge revision in higher education institutions.

Organizational use of social media (e.g., Facebook, WhatsApp, Twitter, etc.) improves information accessibility [65]. Regarding managing employee concerns and creating internal connections, social media tremendously impacts enterprises in the digital era. As a result, Borah, Iqbal [66] proposed that organizations use social media as an interconnected collection of strategic resources to create leadership for managers. Social media adoption can positively impact leadership in higher education institutions in several ways. First, social media can facilitate communication and collaboration among leaders and other stakeholders within the institution, allowing them to share information, resources, and best practices. This can lead to more effective and efficient decision-making and foster community among leaders, which can benefit the institution's overall leadership. Second, social media can provide leaders a platform for sharing their vision, mission, and goals and engaging with students, staff, and other stakeholders. This can help leaders build trust and support from these groups and increase their visibility and reputation within the institution and the broader higher education community. Third, social media can be used to develop leadership skills and provide leadership training and professional development opportunities. Social media can facilitate access to information, resources, and knowledge on leadership and allow leaders to connect with other professionals in their field [67]. The instrumental value of social media usage is closely related to the two sub-dimensions of the self-dynamic leadership behavioral dimension, self-insight and shared vision [68]. Overall, social media adoption can positively impact leadership in higher education institutions by promoting effective communication, collaboration, and professional development among leaders. Thus, these studies underpin the following hypothesis:

H8. Social media adoption positively impacts leadership in higher education institutions.

Knowledge revision and other processes of knowledge utilization inside the company may be leveraged to build a competitive advantage [69]. Consistent application of knowledge transformation strategies develops new organizational knowledge since knowledge revision develops and integrates further information into current knowledge. As a result, it can benefit the firm [44]. However, like with other processes of knowledge utilization within the organization, excessive investment in rewriting knowledge may be counterproductive since it can divert stretched resources away from other important areas, particularly in complicated or volatile competitive contexts [70]. To be successful, the company must balance knowledge revision with different types of knowledge acquisition. Moreover, Muhisn, Almansouri [71] confirmed the importance of using a knowledge system. Without discarding obsolete knowledge to gather new updates, the team will lack responsiveness to the changing environmental conditions. As a result, the following hypothesis is proposed:

H9. Knowledge revision positively impacts knowledge-intensive teamwork in higher education institutions.

3. Methodology

This study utilizes a quantitative methodology with a cross-sectional survey design. Quantitative methods allow for standardized data collection from a large sample, enabling the generalization of findings to the broader population of higher education institutions [72]. The cross-sectional survey design collects participant data simultaneously, providing an economical approach to examine relationships between key variables in this study (social media adoption, leadership, education background, knowledge management process, and knowledge-intensive teamwork) [73]. The quantitative research method is undertaken through an online survey to testify

to predetermined hypotheses by exposing statistical relationships that generalize the population's behavior [74]. An online questionnaire was distributed to 1000 virtual team members and leaders across a representative sample of 50 higher education institutions in Vietnam. The survey included validated measures of the key constructs adapted from prior studies, assessed using 5-point Likert scale questions. Quantitative data provides standardized numerical data on the relationships between these variables. This method enables more objective analysis using statistical techniques such as correlation, regression, and structural equation modeling [75].

An alternative qualitative approach through interviews or focus groups could provide richer, contextual data on a smaller sample. However, quantitative methods were preferred due to the ability to generate generalizable insights and test a theoretical model on a large scale. The benefits of the quantitative approach include more efficient data collection, increased objectivity, and sophisticated statistical analysis of relationships between variables [76]. This method lends greater credibility and rigor regarding the generalizability and significance of findings on social media's role in virtual teamwork in higher education. This study pertains to academic staff in Vietnam who are currently involved in teamwork and are characterized by gender, age, field, and education level. There are 918 participants in the survey, whose characteristics are illustrated in Table 1.

The previous studies are instrumental for the formation of research questionnaires for three independent variables, namely educational background (EDU), leadership (LDS), and social media adoption (SMA), and five dependent variables, namely knowledge acquisition (KAQ), knowledge creation (KCR), knowledge application (KAP), knowledge revision (KRV), and knowledge-intensive teamwork (KIT). The total number of items for all variables is 31, with precisely four items in the EDU variable [77], three things in the LDS variable [78,79], three items measured SMA [80], five items in the KAQ variable, four items in KAP variable, and three items in KRV [81], six items in KCR variable [82], and three items in a KIT variable [13]. In addition, the 5-point Likert scale, with descending values from totally agree to disagree, is a measurement for each item. The data from the online survey are infiltrated and analyzed by IBM SPSS Statistics and Smart-PLS software.

The protocol number is 154/2022, approved by the university's ethics committee at the Industrial University of Ho Chi Minh City. All research participants provided their informed permission. Respondents might stop participating at any moment without penalty. As an ethical researcher, the researchers value protecting the anonymity of subjects. Therefore, the presented statistics do not permit people to be identified by their responses. No personal information was collected from poll takers, completely concealing their identities.

4. Result

All structures' outer loading (OL) values were between 0.701 and 0.902, which is considered significant. The composite reliability (CR) and Cronbach's alpha values (CA) for all constructs were also evaluated, and both were more than the 0.70 threshold. The average variance extracted (AVE) value was more than the threshold value of 0.50. All constructs in Table 2 have perfect convergent validity and reliability results. The discriminant validity was also assessed using the Heterotrait-Monotrait Ratio of Correlations (HTMT), as shown in Table 3, which must be less than 0.85 [83,84]. Hence, all measurement scales became reliable and valid.

All relationships between the constructs in the research model were positive and significant. Education background positively impacts knowledge acquisition (Beta = 0.656, t-value = 18.771); hence, hypothesis H1 was supported. Besides, leadership positively affects knowledge creation (Beta = 0.636, t-value = 20.901) and knowledge application (Beta = 0.676, t-value = 22.727); therefore, hypotheses H3 and H4 are accepted in 99% of the confidence level. Social media adoption positively impacts knowledge revision (Beta = 0.445, t-value = 12.794) and leadership (Beta = 0.257, t-value = 6.682), which states that hypotheses H7 and H8 are supported. Finally, Knowledge-intensive teamwork is the consequence of knowledge management in HEI as it was positively impacted by knowledge acquisition (Beta = 0.216, t-value = 5.521); knowledge creation (Beta = 0.244, t-value = 6.053); knowledge application (Beta = 0.253, t-value = 7.976); and knowledge revision (Beta = 0.209, t-value = 5.715). The result supported four hypotheses: H2, H5, H6, and H9. Table 4 provides a summary of these results.

In Table 5, four dimensions of knowledge management explain 57.7% of the Knowledge-intensive teamwork's change (R^2 = 0.577); education background contributed to 43.1% of the shift in knowledge acquisition; leadership made 40.5% of the difference in knowledge creation and 45.7% of the difference in the knowledge application. Furthermore, social media adoption explains 29.8% of the shift in knowledge revision and 21.6% of the leadership change.

The predictive value of a structural model was evaluated. Generally, if Q^2 is more significant than zero, the structural model's latent

Table 1
Participant description.

		Frequency	Percentage
Gender	Male	513	55.9
	Female	405	44.1
Age	25 - 30	198	21.6
	31 - 40	348	37.9
	41 - 50	228	24.8
	>50	144	15.7
Field	Management Science	516	56.2
	Technical science	402	43.8
Education level	Master	537	58.5
	Doctor	381	41.5

Table 2
The reliability and convergent validity.

Construct	CA	CR	AVE	OL
EDU	0.805	0.873	0.631	[0.763 - 0.816]
SMA	0.799	0.881	0.713	[0.830 - 0.870]
KAP	0.850	0.899	0.689	[0.822 - 0.840]
KAQ	0.913	0.935	0.743	[0.848 - 0.887]
KCR	0.925	0.942	0.732	[0.701 - 0.902]
KIT	0.850	0.909	0.770	[0.787 - 0.920]
KRV	0.849	0.908	0.768	[0.860 - 0.902]
LDS	0.812	0.889	0.728	[0.807 - 0.883]

Table 3
The discriminant validity.

Construct	EDU	KAP	KAQ	KCR	KIT	KRV	LDS	SMA
EDU								
KAP	0.401							
KAQ	0.761	0.574						
KCR	0.491	0.620	0.655					
KIT	0.461	0.698	0.693	0.726				
KRV	0.527	0.553	0.731	0.749	0.727			
LDS	0.589	0.817	0.519	0.723	0.689	0.590		
SMA	0.101	0.321	0.249	0.411	0.389	0.539	0.317	

Table 4
The PLS-SEM result.

Relationship	Beta	Standard Deviation	t-value	Hypothesis	Conclusion
EDU - > KAQ	0.656	0.035	18.771***	H1	Accepted
KAQ - > KIT	0.216	0.039	5.521***	H2	Accepted
LDS - > KCR	0.636	0.030	20.901***	H3	Accepted
LDS - > KAP	0.676	0.030	22.727***	H4	Accepted
KCR - > KIT	0.244	0.040	6.053***	H5	Accepted
KAP - > KIT	0.253	0.032	7.976***	H6	Accepted
SMA - > KRV	0.445	0.035	12.794***	H7	Accepted
SMA - > LDS	0.257	0.038	6.682***	H8	Accepted
KRV - > KIT	0.209	0.037	5.715***	H9	Accepted

Note: ***: $p < 0.001$.

Table 5
f^2, VIF, R^2, $Q.^2$.

Construct	f^2						R^2	Q^2
	KAP	*KAQ*	*KCR*	*KIT*	*KRV*	LDS		
EDU		0.756						
SMA					0.247	0.071		
KAP				0.097			0.457	0.312
KAQ				0.055			0.431	0.316
KCR				0.065			0.405	0.292
KIT							0.577	0.437
KRV				0.048			0.298	0.151
LDS	0.842		0.680				0.216	0.148

exogenous components have predictive value for the structural model's latent endogenous details. This study comprised knowledge-intensive teamwork, knowledge acquisition, knowledge creation, knowledge application, knowledge revision, and leadership, and the Q^2 values are 0.437, 0.316, 0.292, 0.312, 0.151, and 0.148, respectively, validating the fundamental premise of solid predictive relevance. There is a small impact of KAP, KAQ, KR, and KRV on KIT ($f^2_{KAP- > KIT} = 0.097$, $f^2_{KAQ- > KIT} = 0.055$, $f^2_{KCR- > KIT} = 0.065$, $f^2_{KRV- > KIT} = 0.048$) as well as the small effect of SMA on LDS ($f^2_{SMA- > LDS} = 0.075$), a medium impact of SMA on KRV ($f^2_{SMA- > KRV} = 0.247$), and LDS has the strong effect on KAP and KCR, as well as EDU strongly affect on KAQ ($f^2_{LDS- > KAP} = 0.842$, $f^2_{LDS- > KCR} = 0.680$, $f^2_{EDU- > KAQ} = 0.756$). For each structure, possible collinearity difficulties were also assessed. Collinearity was not a concern in this study, according to the data in Table 6, since all VIF values were less than 3.

5. Discussion

Accepting all proposed hypotheses in the research outcomes highlighted important considerations for enabling effective knowledge-intensive teamwork in Vietnamese enterprises.

Firstly, access to independent learning opportunities that cultivate a self-directed learning spirit allows the translation of theoretical knowledge from the educational environment into practical competencies applied in professional contexts. However, existing dysfunctions in education systems, such as an overemphasis on conceptual knowledge, incentive misalignments, and academic integrity issues, have hindered workforce quality and teamwork skill development [85]. Knowledge application can positively impact knowledge-intensive teamwork by promoting a culture of continuous learning and development. Team members encouraged to learn and apply new knowledge and skills are more likely to be engaged and motivated in their work, leading to higher levels of teamwork and productivity. Secondly, the contribution of leadership to knowledge-intensive teamwork aligns with previous studies [49,86]. Ineffective leadership issues such as lack of executive support, insufficient motivation and rewards, change resistance, poor communication, and inadequate training represent major barriers to knowledge flow [86]. As a result, leadership approaches play a decisive role in enabling innovation throughout the knowledge process; adhocracy cultures evidenced a positive association, while hierarchical ones exhibited a negative association [87]. Thirdly, social media systems can maximize knowledge acquisition opportunities and minimize shortcomings. Beyond endorsing structural conditions, social media adoption allows an infusion of team members' educational backgrounds, comprising both hard and soft skills. At the same time, leadership provides individual skill-building and aligns with organizational needs.

Concurrently, knowledge management can positively impact knowledge-intensive teamwork in higher education by providing frameworks and practices to manage internal knowledge effectively. Knowledge management facilitates the sharing and exchange of information among members. KM systems and strategies store, access, and share information, best practices, and insights, enabling more efficient coordination as members can easily access relevant knowledge to complete tasks. This particularly impacts knowledge acquisition and application [86,88]. Additionally, new and revised internal and external knowledge benefits change management by diversifying and transferring flows. Hence, knowledge management also promotes a culture of continuous learning, creating opportunities to learn skills, share expertise, and enhance collective intelligence via idea exchange [89]. Knowledge management positively impacts teamwork by enabling knowledge sharing, fostering an environment for mutual development, and instituting accountability.

The results showed that social media adoption in higher education institutions positively impacts leadership and knowledge revision. As Vilceanu, FitzGerald [6] discovered, social media allows leaders to stay current, including following experts for the latest information, participating in discussions, and visiting informed on developments. Second, leaders can share knowledge and establish reputations by publishing articles and content and engaging in discussions - positioning themselves as experts [90]. Additionally, according to Nisar, Prabhakar [91], networking with other leaders, joining communities, and participating in events facilitate mutual learning and beneficial connections. Moreover, social media allows leaders to receive feedback and engage with students, staff, and stakeholders, benefiting the revision process by enabling better audience alignment to adjust approaches accordingly. Social media adoption positively impacts leadership and revision by allowing leaders to stay informed, share expertise, connect, and engage with their audience.

As a result, the study evidenced that teams leveraging background, leadership support, social media affordances, and robust knowledge management processes exhibited effective knowledge-intensive collaboration [92]. However, while developmental, cultural, and technological conditions provide advantages, the transformational process is situated within the four-phase knowledge management system rather than initiatives that enhance discrete elements separately. This clarifies that skill-building, leadership, and technology adoption do not directly relate to collaboration. Rather, they enable activities within the team's knowledge workflow - acquisition, development, application, and revision - which shape outcomes.

6. Conclusion

The COVID-19 pandemic has significantly impacted higher education institutions, catalyzing a shift towards remote and online learning. In this context, social media has become an integral platform enabling knowledge-intensive teamwork, allowing seamless communication and collaboration regardless of location. Specifically, social media can promote the development of such teams in several key ways. Online discussions and forums can be leveraged to share information and resources, discuss ideas, brainstorm solutions, and provide feedback among team members. Video conferencing tools facilitate virtual meetings and presentations, helping

Table 6
VIF value.

	KAP	KAQ	KCR	KIT	KRV	LDS
EDU		1.000				
SMA					1.000	1.000
KAP				1.556		
KAQ				1.991		
KCR				2.162		
KIT						
KRV				2.138		
LDS	1.000		1.000			

members stay connected and engaged. Additionally, knowledge management systems allow the centralized sharing and accessing of documents while tracking progress - optimizing coordination. Consequently, social media facilitates effective knowledge-intensive teamwork in higher education after COVID-19 by providing ubiquitous channels for cooperation.

In conclusion, high-performing knowledge-based teams in higher education are predicated on an innovation-centric framework requiring integrated organizational and procedural alignment. Positive relationships among knowledge skill-building, leadership support, and cultural enablement underscore the need to embed holistically developmental, technological, and structural conditions that foster learning and innovative capacity at individual and team levels. Internally, sustained idea flows via cooperation enable continuous adaptation and improvement as contexts shift.

Knowledge production and learning are integral for long-term competitive advantage amidst chaos. Knowledge is the most valuable resource in the knowledge economy, with higher education institutions able to tap localized insights across borders, sharing unique socially and culturally situated information globally to access new perspectives and advance learning. Nevertheless, raw information alone cannot confer an advantage without effective flows and absorption. Absorptive capacity, the ability to comprehend and successfully apply knowledge, is the critical predictor of learning and knowledge sharing. This capability arises from human cognition, motivation, and behaviors versus purely procedural R&D activities - founded on people versus process. Thus, individuals must be empowered and prioritized to unlock team knowledge potential. An organization's capacity for insight generation and innovation fundamentally stems from the collective absorptive abilities of its members to acquire, generate, and purposefully leverage new information.

6.1. Theoretical implications

This research makes several noteworthy theoretical contributions that advance the understanding of knowledge-intensive teamwork, leadership, and social media adoption in virtual higher education contexts.

First, the study demonstrates supportive leadership's integral role in enabling effective knowledge processes in distributed teams. The findings provide empirical evidence that team leaders who model transparent knowledge sharing, actively recognize contributions, and prioritize inclusive decision-making can overcome barriers to virtual collaboration. This aligns with and builds on leadership theory by underscoring how participatory, engaging leadership drives successful knowledge creation and application in technology-mediated settings. Additionally, the research elucidates how leadership influences knowledge processes. Constructive feedback emerged as an important behavior that stimulated critical reflection and iterative knowledge building. By encouraging continuous refinement, leaders can promote innovation. Furthermore, empowering leadership that champions autonomous idea generation enhanced knowledge co-creation. This expands understanding of specific leader behaviors shaping collaborative knowledge dynamics.

Second, the research evidences the integral function of social media adoption in facilitating leadership approaches and knowledge processes fundamental for virtual team effectiveness. Visibility, editability, persistence, and other platform affordances allowed leaders to model transparency, provide customized feedback, and create team knowledge repositories - enabling them to stimulate critical knowledge flows despite spatial distance. Moreover, different tools offered distinct advantages – microblogging increased access to external knowledge, while cloud-based social document sharing enabled centralized knowledge capture. This highlights the utility of a repertoire of social technologies to support iterative knowledge improvement across distributed contexts.

Third, this study positions effective knowledge-intensive teamwork as the product of recurring knowledge cycles driven by leadership and technology adoption. The conceptual model elucidates the integral processes through which leadership and social media use translate to collective outcomes. This points to the need to advance perspectives, positioning knowledge as the central binding element in virtual teams.

6.2. Practical implications

This research offers practical insights for university leaders managing virtual teams. First, findings suggest team leaders should receive targeted training on open, engaging practices for remote groups. Building skills in transparent knowledge sharing, constructive feedback, and participative decision-making is critical, and institutions should invest in developing these facilitative leadership capabilities as virtual work expands.

Additionally, guidance is provided on specific social media policies and training initiatives that can optimize knowledge flows and coordination. Microblogging tools facilitate visibility, while cloud document storage can centralize knowledge. Understanding platform advantages allows strategic combinations based on team needs. Further, ensuring proper member onboarding and support in utilizing these tools is essential for adoption. Developing systems to match platforms to tasks, provide IT assistance, and continuously upskill members will accelerate technology-enabled collaboration. The research also indicates potential benefits from knowledge management systems integrating social media to capture, store, and reuse team knowledge. Exploring such innovations represents a fruitful area. Guidance on balancing transparency and privacy in virtual knowledge sharing will help members. Similarly, clear protocols for providing online feedback can facilitate relationships and avoid conflicts, alongside adopting supportive technologies.

Additionally, the study provides a strategic roadmap for institutions navigating the virtualization of teamwork and knowledge exchange. The conceptual model outlines key technological, leadership, cultural, and process factors for managing this transition. Proactively developing these interconnected elements will position organizations for effectiveness as distributed work increases.

6.3. Limitations and further research

This study has some limitations that provide avenues for further research. First, while the findings showed educational background impacts knowledge processes, individual skill gaps among team members were not analyzed. Examining how disparities in abilities like digital literacy and social media fluency affect collaborative knowledge work could further inform this area.

Second, the focus was identifying key components of effective virtual teamwork models in higher education. However, deployment effectiveness and organizational outcomes were not measured. Further studies should relate the proposed knowledge-intensive teamwork model to tangible institutional benefits. Quantitatively assessing financials, retention, commitment, and other metrics could provide more insight into the organizational value of social media-enabled knowledge management approaches.

Third, the survey design allowed economic data collection, but tracking teams longitudinally could better capture the dynamic nature of virtual collaboration and knowledge flows. How social media-enabled leadership, knowledge routines, and relationships evolve across a project timeline may enrich theoretical and practical understanding in this domain.

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Data is available on request due to restrictions, e.g., privacy or ethics.

CRediT authorship contribution statement

Bui Thanh Khoa: Writing – review & editing, Writing – original draft, Validation, Methodology, Conceptualization. **Tran Trong Huynh:** Visualization, Software, Formal analysis, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e26210.

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