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Leadership and Lifelong Learning in Higher Education: Leading for Learning in The Industrial Revolution 4.0 Era

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Abstract

Lifelong learning is essential for higher education institutions in the IR 4.0 era. Higher education institutions must shift from their traditional role of imparting specialised knowledge to a flexible system that embeds lifelong learning for its members. Educational leadership is a crucial part of the shift, and the present study explored the role of educational leaders in supporting lifelong learning in higher education. This study employed a qualitative semi-structured interview to collect data and answer the following research questions: 1) What is the meaning of lifelong learning in IR 4.0? 2) What are the roles of educational leaders in supporting lifelong learning in IR 4.0? 3) How do educational leaders support lifelong learning in IR 4.0? The findings of this study showed that educational leaders play the roles of digital leaders, change agents, and communicators. This study found that educational leaders must possess the following core competencies in supporting lifelong learning in IR4.0: 1) inspiring and empowering members to become self-driven and self-organising learners, 2) visionary and value-driven 3) aware of the interconnectedness of behaviours and mindsets, 4) cultivating collective and collaborative learning in the institution. This study's findings suggest that leaders are boundary spanners who break the boundaries between faculties and disciplines in developing a sustainable lifelong learning culture. In addition, higher education institutions should prioritise the digitalisation of workflow in supporting the lifelong learning of its members.

Keywords: Lifelong Learning, Leadership, Digitalisation

Introduction

The Fourth Industrial Revolution (IR 4.0) is characterised by disruptive technologies, autonomous processes, ubiquitous and mobile Internet, artificial and machine learning, and innovative practices (González-Pérez & Ramírez-Montoya, 2022; Lee et al., 2018), which forced educators to rethink and redesign the curricula to match the educational objectives with the "soft and technical competencies" as required by IR 4.0 (González-Pérez, & Ramírez-Montoya, 2022, p. 2). To keep up with the changing pace of IR 4.0, educational institutions should adopt lifelong learning as a strategy (Taşçı & Titrek, 2020) and foster a mindset in the

institutions that both students and faculty "will never be done with their education" (Penprase, 2018, p.224).

Lifelong learning is a personal learning endeavour that arises from personal factors and goals to improve one's knowledge and skills about an individual's personal, social, and related employment (Billet, 2018; Mawas & Muntean, 2018). McKee and Gaugh (2020) believe that lifelong learning should be embedded in students while learning in a formal educational setting and further into their working lives. They see lifelong learning as an antidote to transformational issues in the IR 4.0 era, which requires workers' commitment to learning and reskilling. Mawas and Muntean (2018) asserted that one must develop 21st-century skills to become a lifelong learner, including digital literacy, communication, critical thinking, problem-solving, collaboration, creativity, and imagination. Meanwhile, higher education must find a balance between delivering specialised content and promoting and developing "holistic self-regulating lifelong learners" (Watson, 2022, p.220).

Lifelong learning in IR 4.0 should focus on developing one's ability to learn, unlearn and relearn relevant knowledge and skills essential to addressing real-life problems. Oke and Fernandes (2020) view education in IR 4.0 as "The integration of human and technology intelligent systems that are fusing the physical, digital, and biological worlds with unprecedented consequences across different education disciplines and pose significant challenges on how we learn, teach and work" (Oke & Fernandes, 2020, p.3). In contrast, traditional education institutions feed students with knowledge and skills in large amounts and in advance, which can be obsoleted when they join the workforce after graduation. Instead, students in the IR 4.0 era need to learn something just when needed to solve real-life problems (McKee & Gauch, 2020). Soh and Mohamad (2021) asserted that lifelong learning is the extension of formal education where members of an organisation learn and grow to improve organisational profitability. The idea of lifelong learning is far from new since the Year of Lifelong Learning in 1996, which focuses on individuals' employability throughout their working lives (Billet, 2017). Even the Ministry of Education Malaysia aspires to create a culture of continuous learning among its people (Ministry of Education, 2015)

In the effort to embed lifelong learning in individuals, Taşçı and Titrek (2020) found that the leadership approach significantly impacts lifelong learning. In the IR4.0 era, leaders who are sensitive to others' learning needs, capable of catalysing change by the environmental shirt, promoting skills and development, and adopting and integrating new management trends in facilitating personnel's learning are essential in supporting lifelong learning (Soh & Mohamad, 2021; Taşçı & Titrek, 2020). Leaders are expected to lead changes in the IR 4.0 education landscape by acting swiftly to changes, initiating changes, and being open-minded to new management trends and implementing new technologies. Given this, Soh and Mohamad suggested that quantum leadership is the key to promoting lifelong learning in organisations. In an IR 4.0 institution, where changes are constant, and innovative and adaptive mindsets are expected, Soh and Mohamad believe that quantum leaders can "catalysed change using innovative ideas and visions of future possibilities" (Soh & Mohammad, 2021, p.238) that would bring changes in the institution.

While there are numerous studies on educational leadership, such as leadership and quality of education (see Prestiadi et al., 2019), sustainable leadership and lifelong learning (see Taşçı & Titrek, 2020), leadership in post-pandemic education (see Buffone, 2021; Harris & Jones, 2020), there are not enough studies on the effect of leadership on supporting lifelong learning, especially in IR 4.0 era. Educational leaders are the key to successful and sustainable

lifelong learning implementation, and thus, there is a need to study leadership in supporting lifelong learning in IR 4.0 higher education. The research objectives for the present study included exploring the meaning of lifelong learning in higher education, investigating the roles of educational leaders in supporting lifelong learning, and identifying the strategies implemented by educational leaders in supporting lifelong learning. The findings of this study can provide insight into leaders' approach to supporting lifelong learning through exploring their perspectives on lifelong learning. In addition, the present study could contribute to the literature on leadership in supporting lifelong learning in higher education. Besides, the present study can provide insight into higher education institutions' planning on leadership training programs and setting strategies to support lifelong learning.

Literature Review

Disruptive technological advancement in IR 4.0 creates uncertainties in the educational landscape, bringing us into a "quantum age" where educational institutions have become a living system filled with human beings who are influenced by "the energy of the leaders" (Soh & Amiruddin, 2020 p. 412).

Theoretical and Conceptual Frameworks

Everyone lives in a quantum environment where changes are constant, and leaders are expected to lead organisations sailing through turbulence. Hanine and Nita (2019) argue that the complexities and uncertainties in today's organisations require a leadership shift in responding to rapid changes. Quantum leadership is a leadership paradigm that applies the principles of quantum physics into leadership practice (Zohar, 2022). Zohar (2022) pointed out the key aspects of quantum leadership, which include 1) the leader's consciousness and self-awareness through self-introspection, 2) the leader's understanding of the interconnectedness and interdependency of elements in the system, 3) the leader's acknowledgement of their impact beyond their current physical presence, 4) the leader's embrace of creativity and innovative thinking in searching for solutions, 5) the leader's emphasis on values like authenticity, integrity, compassion, and a sense of purpose, 6) the leader's ability to communicate a compelling vision that drive the organisation to success, 7) the leader's priority on promoting collaboration in the organisation.

Transformational leadership was introduced by Bass in 1985 (Holst, 2021), who described it as a process where the leader becomes the source of inspiration in boosting followers' confidence and expanding their interests. There are four sub-dimensions in transformational leadership, as shown in Table 1.

Table 1
Four dimensions of transformational leadership through the IR 4.0 concept

Dimensions	***Description***
Idealised influence	Leaders' behaviours that lead to respect and confidence
Inspiration motivation	Leaders' behaviours that are inspiring and motivating
Intellectual stimulation	Leaders who can come up with new ideas and provide possible solutions
Individualised consideration	Leaders who listen attentively to followers

Notes: Adapted from "Role of transformational leadership in education 4.0" by Prestiadi et al., 2020, *Advances in Social Science, Education and Humanities Research, 501*, p.122. Copyright 2020 by the authors.

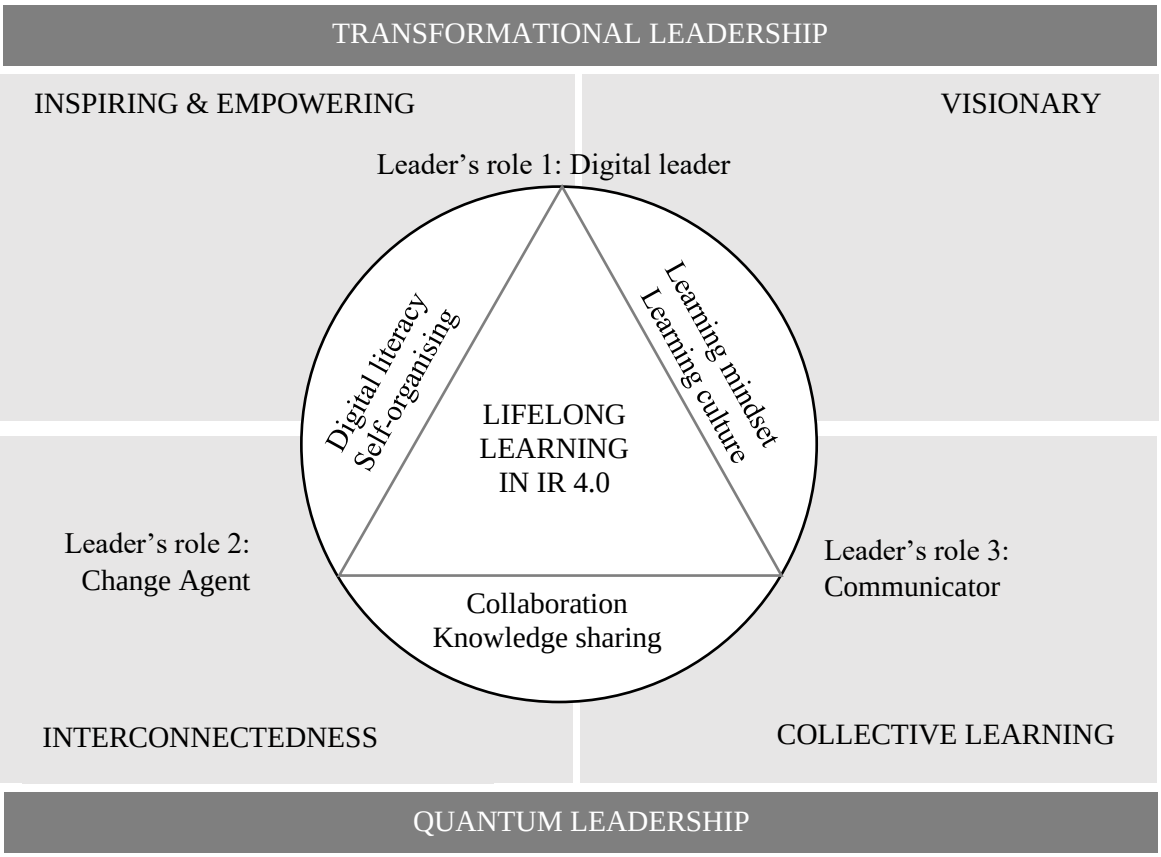

Figure 1: Conceptual Framework

Figure 1 represents the conceptual framework of the present study. The inner triangle represents the core components of lifelong learning in IR 4.0. A lifelong learner in IR 4.0 must possess a learning mindset and immerse himself in the culture of continuous learning. Secondly, he must have adequate technological knowledge or digital literacy to become an effective and self-organising learner in the digital age. Nevertheless, a self-organising lifelong learner must be able to work collaboratively with people and communities at large to leverage knowledge sharing. These three core components will make up a strong foundation for lifelong learning in IR 4.0. However, more is needed to stand alone with the leader's support. Educational leaders in IR4.0 are expected to play three roles in supporting lifelong learning, which include: 1) D*igital Leaders* who possess up-to-date technological and digital pedagogical knowledge, are adaptive, and can envision future technological trends (Ehlers, 2020), so they can provide technical support for lifelong learning; 2) *Change Agent* who manages change to anticipate and induce change in the institutions, encourage and empower others to take on the role of change agent and embrace the ambiguity and uncertainty of changes (Tai & Kareem, 2019; Zohar, 2022). Leaders also act to foster collaborative learning between individuals, institutions, and between institutions with communities. 3) *Communicator* who disseminates the institutional visions and values to all members and

cultivates a learning mindset and a continuous learning culture. Leaders must support, guide, and encourage all institution members to support lifelong learning.

The core competencies of quantum leadership and transformational leadership form the foundation of supporting lifelong learning in IR 4.0. See Table 2 for the leadership competencies for lifelong learning in IR4.0.

Table 2
Core competencies of leadership in supporting lifelong learning in IR 4.0

Leadership approach	Leaders' competencies	Description
Transformational leadership	Inspiring & empowering	Leaders for lifelong learning must inspire and empower followers to become self-organising and self-driven learners.
	Visionary	Leaders for lifelong learning must be visionary. They align institutional goals with stakeholders' values and create plans that could realise those goals.
Quantum leadership	Interconnectedness	Leaders for lifelong learning must understand the interconnectedness of their decisions and actions with various possibilities. They know that their impacts are beyond the institutional boundary towards broader communities.
	Collective learning	Leaders for lifelong learning leverage the power of collective learning and knowledge sharing. They foster collaboration between individuals and departments in knowledge sharing and lifelong learning.

Methodology

Higher education institutions face challenges in digital transformation brought about by the Industrial Revolution. They are forced to act swiftly towards changes to continue providing the quality future workers that the marketplace demands. Besides managing people and resources, leaders have more to commit to ensure the success of the organisations. Thus, this study aims to explore educational leaders' view of lifelong learning in higher education institutions, identify their challenges in "leading for learning", and the strategies they implement to support lifelong learning.

A research plan is created according to Carspecken's approach to critical qualitative research, which emphasises understanding the cultural dynamics, power relations and social structures that shape people's lives by immersing oneself in the social context being examined. Carspecken's five stages of critical qualitative research have guided the research plan, as shown in Table 3.

Table 3
Carspecken's Five Stages of Critical Qualitative Research

Stage	***Description***	***Data Collection***	***Analysis***
1	Building a primary etic record: What is going on?	Fieldwork: nonparticipant observer, monological, unobtrusive, reflection	Cultural reconstruction (etic)
2	Researcher interpretation, etic perspective	Preliminary reconstructive analysis	Cultural reconstruction (etic)
3	Dialogical (emic) data generation, collaborative stage	Fieldwork: participant observer, interactive interviews, reflection	Cultural reconstruction (emic)
4	Describes systems relations to a broader context	Conducting system analysis between locales/sites/cultures (discovery)	System analysis (etic)
5	plains relational systems	Links findings to existing macro-level theories (explanation)	System analysis (etic)

Note: From "Carspecken's five-stage critical qualitative research method: An application to nursing research" by Hardcastle et al., 2006, *Qualitative Health Research, 16*(1), p.153. Copyright 2006 by Sage Publications.

Research Design and Ethical Considerations

The present study is a descriptive qualitative study that investigates a topic in-depth and in a flexible manner. This approach is adopted to understand better the perspectives of educational leaders and lecturers on lifelong learning. Informed consent will be secured for every respondent before conducting the interview. The respondents will be assured that their participation is entirely voluntary and that participation can be terminated at any time without any negative consequences. The researcher has informed the respondents that the audio of the interview sessions will be recorded for verbatim transcription.

Population and Sample

Educators from a private university in Perak were selected to participate in the study. Four respondents were chosen from higher educational institutions; two are course coordinators, and the other are lecturers.

Instrumentation

The semi-structured interview for this qualitative study is developed based on the theoretical framework explained in the literature and the present study's research questions. The semi-structured interview questions collected data on 1) leaders' and lecturers' lived experience in lifelong learning in IR4.0, 2) the leaders' role in supporting lifelong learning in IR4.0, and 3) the challenges and strategies to support lifelong learning in IR4.0. Member checking, or participant validation, is applied to explore the credibility and trustworthiness of the data

(Candela, 2019). After the transcription of the semi-structured interview, the transcript was returned to the participants to check for the accuracy of their experience.

Data Collection

Data was collected using semi-structured interviews based on the research questions of the present study. Purposive sampling is applied to select respondents for this study. The respondents were chosen based on their roles in a private university in Perak, Malaysia. Two respondents are course coordinators who act as mid-level leaders, while another two are lecturers with years of experience teaching in higher education. Participants in this study were labelled accordingly: Participant 1 (P1), Participant 2 (P2), Participant 3 (P3) and Participant 4 (P4).

Data Analysis

Data collected through the semi-structured interview is then analysed. Creswell and Guetterman (2019) suggest that data analysis involves first "developing a general sense of the data" and then "coding the description and themes" accordingly (Creswell & Guetterman, 2019, p. 273). Cresswell suggests six steps in the coding process, which include reading the text data thoroughly and then dividing the text into different segments of information where the researcher could label each segment with codes. Then, the researcher could reduce overlapped and repeated codes along the way. The final step involves collapsing codes into themes.

Data Presentation

Part 1: Basic Demographic

Part 1 of the interview required participants to provide information like name, gender, years of experience, Highest education, and position in the institution. Table 4 summarises the demographic information of participants.

Table 4

Summary of participants' demographic information

Participants criteria	**Participant 1 (P1)**	**Participant 2 (P2)**	**Participant 3 (P3)**	**Participant 4 (P4)**
Gender	lale	Female	Female	Male
Years of experience	years	3 years	13 years	9 years
Highest education	Master's degree	Doctorate	Master's degree	Master's degree
Position	Course Coordinator	Course Coordinator	Lecturer	Lecturer

Part 2: Participants' Lived Experience in Lifelong Learning

P1 described lifelong learning as a learning method with one prerequisite that the person has the time to learn. P2 expressed her concern about the younger generation's lack of interest in learning, where she mentioned that she must constantly emphasise the importance of

learning. P2 also believe that lifelong learning should start when one is still a student. When asked how she views lifelong learning in IR 4.0, P3 replied succinctly, "Updating your skill regarding the IR 4.0" because the curriculum she is teaching now aligns towards the development of IR 4.0. P4 believes no one is perfect, and we must continue learning. As such, he asserted that lifelong learning is an ongoing process "until you die".

In IR 4.0, all sectors are facing tremendous and rapid changes. As P1 mentioned, the healthcare industry has developed fast; thus, lifelong learning is essential to keep up with the change. P1 stated that there are online and offline courses for lecturers and staff to update their knowledge. P2 believes that compulsory Continuous Professional Development (CPD) programs relevant to their work are essential and benefit the staff. P3 sees the need to update herself in teaching curriculum related to IR 4.0 because she believes that will help them guide students in their final-year project. P4 stated that he has courses to attend monthly organised by the Learning and Development department in the institution, where they have experienced personnel in charge of CPD programs. The infrastructure the university provides for lifelong learning, according to P4, is a whole department that encompasses experts, tools, and programs dedicated to lifelong learning. P1 and P2 believe that access to online materials is the essential infrastructure that the institution provides to support lifelong learning. P3 stated that technical equipment and labs help support lifelong learning at the university. Table 5 summarises the information pertinent to research question one (RQ1).

Table 5
Summary of information related to RQ1

Research questions and interview questions	Answer from participants
RQ1: Interview question 1: In your view, what does lifelong learning mean in the fourth industrial revolution?	A method of learning (P1) A personal interest in learning (P2) A process of updating skills (P3) An ongoing process (P4)
RQ1: Interview question 2: How significant is lifelong learning in your institution? Please elaborate.	Healthcare is constantly changing, and there is a need for lifelong learning (P1). It is compulsory if continuous professional development is related to work (P2). The syllabus is built based on the requirement of IR 4.0, and lifelong learning is essential (P3). Learning is compulsory in my institution (P4).
RQ1: Interview question 3: Does your institution provide access to lifelong learning opportunities? Please explain.	Compulsory courses (P1, P2, P3, P4) Allocated time for lifelong learning (P2)
RQ1: Interview question 4: Is there any infrastructure in your institution that is prepared to	Internet/online materials (P1, P2) Technical labs/equipment (P3) Experts (P4)

support lifelong learning? Please explain.	

Part 3: Leadership in Supporting Lifelong Learning

P1 and P2 are course coordinators responsible for coordinating the development, preparation, delivery, and assessment of the pedagogical design, planning, and practice. P1 stated that he encourages his colleagues and students to commit to lifelong learning as he believes it helps them in the clinical setting. P2 emphasised the leader's role in conducting training needs analysis before organising any training session as she argued that it wasted her time if she did not need the skill in work. P3 and P4 are lecturers, and they view the leader as the administrator of lifelong learning, the individual who works on planning, organising, conducting, and evaluating the lifelong learning of the members. P3 asserted that leaders must allocate time besides work for lifelong learning, while P4 has faith in his Learning and Development department to arrange suitable courses for him.

P1 believed he was a visionary leader who prioritised his patients' rights. He sets goals to improve his practices and contribute to the lifelong learning of his colleagues and students. P1 is a reflective practitioner who actively reflects upon his practice and further develops and enhances healthcare practices. On the contrary, P2 viewed that a leader who supports lifelong learning must be a selfless, good listener who must listen attentively to others' needs. P2 believes that a leader must be open-minded when dealing with others' suggestions, and maintaining professionalism instead of taking a personal approach to work is essential in supporting lifelong learning. Both P1 and P3 believe that collaboration and knowledge-sharing are critical for supporting lifelong learning in the institution. P3 stated that a leader should empower others through empathy and foster collaboration. P4 emphasises the need to keep updated with the latest technological developments as the core characteristic of a leader in supporting lifelong learning. Table 6 summarises the information pertinent to research question two (RQ2).

Table 6

Summary of information related to RQ2

Research questions and interview questions	Answer from participants
RQ2: Interview question 5: In your opinion, what roles does an educational leader play in supporting lifelong learning?	Encouragement (P1) Training needs analysis (P2) Administrator (P1, P2, P3, P4)
RQ2: Interview question 6: What are the characteristics of effective leaders in supporting lifelong learning in higher education? Please elaborate.	Visionary (P1) Reflective (P1) Selfless (P2) Good listener (P2) Open-minded (P2) Professionalism (P2) Collaboration (P3) Empathy (P3) Empowerment (P3) Keep updated (P4)

Part 4: Strategies to Support Lifelong Learning

P1 viewed poor motivation as one of the main challenges in fostering a culture of lifelong learning in his institution. He believes that as a leader, he should provide suitable learning platforms and allocate learning time for members in the institution so that they could learn despite having busy work schedules, which "allow them to be more focused and apply the new knowledge to the patient". Like P1, P3 expects leaders to provide various platforms aligned with the institutional goals. P1 and P3 believe the institution's top management should allocate sufficient funds to support lifelong learning. P2, on the other hand, emphasised the on-time feedback supporting lifelong learning. She suggests keeping the lecturer's anonymity in the feedback system so they could provide genuine data on the effectiveness of the lifelong learning program; as she puts it, "Trust is because of the confidentiality". P4 stated that leaders could provide flexible learning modes, such as digital learning if one could not attend face-to-face learning sessions.

To deal with the disruptive changes brought by digital transformation necessitated by IR 4.0, respondent believes that it is necessary to manage and lead digital transformation as digitalisation of workflow changed the structure of work (P1 & P3), increased usage of Artificial Intelligence (AI) in the teaching practices (P2), and use of educational technology in teaching (P4). P1 believes that by applying the knowledge or skills learned at work, leaders could lead and manage digital transformation. P3 has a similar point of view to P1, where she believes applying the learned skills to workflow is essential. She also mentioned that leaders should avoid creating duplicated work that increases the lecturer's workload. P2 states that, as a leader, she must keep herself updated with the latest developments of AI in teaching so that the students and lecturers can leverage the power of AI in teaching and learning. Similarly, P4 mentioned that leaders should be adaptable to the constantly changing technology development to enable them to manage changes when new technology is implemented in the institution.

The challenges in supporting lifelong learning include time constraints (P1 & P3), poor motivation (P1 & P2), fear of the unknown (P1, P4), and lack of collaboration between members (P2). P1 strongly believes that time is essential in learning as he defined lifelong learning as a learning method for everyone with the prerequisite that "they have time". At the same time, P1 see himself as an educational leader supporting lifelong learning and encouraging and motivating others to engage in lifelong learning. P2 believes collaboration within the institution could create a sustainable lifelong learning system that benefits all stakeholders. Meanwhile, she emphasised the importance of lessening workload in supporting lifelong learning as she mentioned lifelong learning depends on "whether we have the time or not." P3 hopes that her institution offers different learning platforms, including learning opportunities from external training providers in supporting her lifelong learning endeavour. P4 believes that accessibility to reliable learning resources is vital in supporting lifelong learning because a reliable and sustainable knowledge management system is essential in supporting lifelong learning. Table 7 summarises the information pertinent to research question three (RQ3).

Table 7
Summary of information related to RQ3

Research questions and interview questions	Answer from participants
RQ3: Interview question 7: How should educational leaders support lifelong learning in your institution? What are the strategies leaders could implement in supporting lifelong learning?	Importance of leader's support in lifelong learning Increase staff's commitment to lifelong learning (P1) Increase program effectiveness through program assessment (P2) Align learning contents with institutional goals (P3) Play the administrative role in managing learning (P4) Strategies to support lifelong learning Provide suitable learning platform (P1, P3) Allocate time for learning (P1) Provide the budget needed (P1, P3) On-time feedback (P2) Provide flexible learning mode (P4)
RQ3: Interview question 8: In your opinion, how should an educational leader lead and manage the digital transformation brought by IR 4.0 in supporting lifelong learning in the institution?	The necessary for digital transformation in education Digitalisation of workflow (P1, P3) Use of AI in teaching (P2) Teaching with technology (P4) How should leaders lead and manage digital transformation? Ensure application at work (P1) Keep themselves updated with the latest technology (P2) Ensure the integration of technology in workflow does not create duplicated work (P3) Improve adaptability towards technology changes (P4)
RQ3: Interview question 9: What are the challenges in supporting lifelong learning in our institution? Please elaborate. **RQ3:** Interview question 10: What are the supports required to ensure successful lifelong learning in your institution? Please explain.	Challenges: Limited time (P1, P3) Poor motivation (P1, P2) Fear of unknown (P1, P4) Lack of collaboration between members(P2) Supports of lifelong learning: Allocate time besides work(P1) Provide encouragement and motivation (P1) Collaboration between team members (P2) Less workload (P2) Variety of learning platforms (P3) External and internal learning opportunities (P3) Accessibility to learning resources (P4)

Data Analysis

Lifelong Learning in Malaysia Higher Education

Ever since the Year of Lifelong Learning in 1996, discussion on lifelong learning has been closely related to an individual's employability (Billett, 2018). The Malaysia Education Blueprint (Higher Education) stated the aspiration of transforming into a nation of lifelong learners where "lifelong learning will become a way of life for all Malaysians" (Ministry of Education, 2013, p. 22). Learning is no longer a specific age-related activity. Instead, it is now a continuous process in a constantly changing world.

According to the findings of this study, educators are aware of the importance of lifelong learning programs in higher education institutions because they are attached to the pedagogical practices in the IR 4.0 era. Higher education in the IR4.0 is "an obscure, rationalistic and energising open door" (Shahroom & Hussin, 2018, p. 316), essential in inducing changes that bring improvement. Given this, educational leaders play a significant role in administrating and supporting the lifelong learning initiative in an educational institution. The Malaysia Education Blueprint (Higher Education) has outlined the strategies

for lifelong learning, which include 1) developing a framework to recognise an individual's prior learning that will facilitate one's re-entry into the education system; 2) launching programs that engage various stakeholders; 3) provide financial support for learners (Ministry of Education Malaysia, 2013).

In the era of IR 4.0, changes are continuous, and to ensure learning effectiveness, technology integration is inevitable. The present study showed that lifelong learning and technology are interconnected and have a reciprocal relationship – continuous learning of the latest technology to use the technology in enhancing learning, which contributed to the ease of keeping up with the latest technological development, as shown in Figure 2.

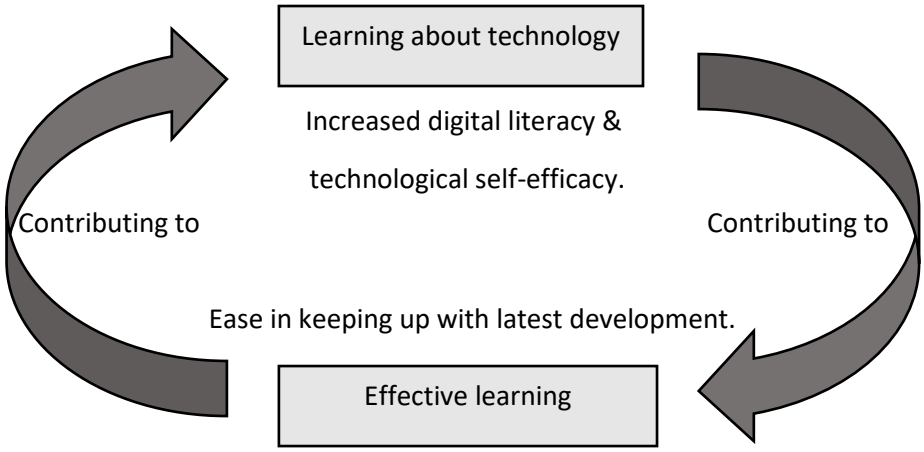

Figure 2 *Reciprocal relationship between lifelong learning and technology*

An educational institution must ensure the sustainability of lifelong learning initiatives by providing flexible learning platforms, equipment or tools that facilitate learning, and learning experts that offer quality learning programs. Nevertheless, educational leaders are boundary spanners who break through the boundaries between faculties and conduct "a large orchestra made up of individually talented musicians" in the institution (Ramaley, 2014, p. 16).

Educational Leaders' Roles and the Effectiveness of Lifelong Learning Initiative

Lifelong learning in IR 4.0 has a few core components, including individual attributions such as digital literacy and self-organising ability, organisational culture in fostering a learning mindset and learning culture, and promoting collaboration and knowledge sharing within the institution to facilitate learning. In leading and managing lifelong learning in IR 4.0, educational leaders are expected to play the role of digital leader, communicate the core ideas of lifelong learning within the institution and manage change along the way.

The findings of this study show that digital transformation is imperative in today's lifelong learning. The digitalisation of workflow is inevitable, especially in education. Korhonen et al. (2021) argued that digitalisation in the educational context is imperative for 21st-century pedagogical practice to deal with rapid changes in teaching and learning practice. Besides, this study showed that AI-driven and technology-based teaching and learning applications also contribute to the need for digitalisation. To play the role of digital leader in the institution, educational leaders must stay current with the latest technological developments. However, leaders' attitudes toward using digital technology in pedagogical practices are crucial in developing digital skills (Korhonen et al., 2021). Consistent with this view, this study

found that leaders' attitudes towards learning the latest technology affect the lifelong learning practice in the institution.

The strategies to support lifelong learning, according to this study, include providing a variety of learning platforms that offer flexibility in learning, allocation of time for learning, provision of sufficient funds, and collection of on-time feedback to ensure program effectiveness. Thus, educational leaders must communicate effectively on lifelong learning issues in the institution. This is consistent with Mawas and Muntean's (2018) claim that communication, collaboration, and problem-solving are essential for lifelong learning. Educational leaders must communicate the learning objectives, expected outcomes, and institutional goals and obtain feedback from learners to ensure successful learning.

The finding of this study suggested that educational leaders in IR 4.0 support lifelong learning through managing change. Managing change is one's ability to catalyse change, involve others in change, and sustain and anticipate constant change (Tai & Kareem, 2019). Consistent with the findings of Prestiadi et al (2020), educational leaders in IR 4.0 must be idealised influencers (behaviours that lead to respect and confidence), inspirational motivators (behaviours that are inspiring and motivating), intellectual stimulators (be innovative and provide creative solutions), and provider of individualised considerations (good listeners).

According to the findings of this study, to support lifelong learning effectively, educational leaders must be: 1) inspiring and empowering to encourage followers to become self-organising and self-driven learners; 2) visionary where they could align institutional goals with followers' values; 3) understood how their decisions bring impact to the individuals across the institution; 4) understood the power of collective learning and knowledge sharing.

Critical Factors for Supporting and Sustaining Lifelong Learning Initiative

According to the present study, the challenges in supporting lifelong learning in the educational institution include personal factors such as poor motivation and heavy workload and institutional factors such as low budget for learning, limited learning platforms that offer flexible learning, and lack of immediate feedback in ensuring program effectiveness. Given this, educational leaders must play more roles apart of their administrative roles in supporting and sustaining lifelong learning in the institution, which include 1) communicating the compelling and clear vision for lifelong learning initiatives to inspire and motivate members; 2) obtaining support from top management and across the institution through engaging all stakeholders in the lifelong learning initiative; 3) integrate technology in digitalisation of workflow and lifelong learning which enable institution in leveraging knowledge-sharing and collaboration; 4) provide immediate feedback and conduct a continuous assessment which provide information to the effectiveness of the learning; 5) adopt learner-centred approach that emphasis on the leaners' needs in learning; 6) develop a sustainable financial support for lifelong learning that ensure provision of learning platforms, integration of latest technology, and various tools to enhance learning.

Watson (2022) asserted that lifelong learning is the foundation for leadership development, which enables leaders to adapt to a changing environment, embrace new perspectives, and constantly update their leadership skills. Consistent with Watson's argument, the present study found that educational leaders are expected to stay flexible, listen attentively to members' feedback, and constantly update their skills to support lifelong learning in the institution. Educational leaders must adapt to the changing environment and update their technological skills. Soh and Mohammad (2021) claimed that leaders should induce change in

the institution by being adaptive and innovative to stimulate followers' intellectual curiosity, support them as they recognise the environmental challenges in lifelong learning, guide them through adapting to difficulties, and foster behavioural learning by promoting a positive learning climate in the organisation.

The digitalisation in workflow is another pressing issue educational leaders must address for lifelong learning sustainability. In this study, educators expressed the need for digitalisation of workflow to lessen their workload, which is crucial for supporting lifelong learning. This finding is consistent with the argument of Kohenan et al. (2021) that the digitalisation of workflow is essential for educational institutions to evolve into a complex adaptive system that thrives in a disruptive and rapidly changing environment. Educators from the present study view collaboration between individuals and knowledge-sharing as strategies to support lifelong learning in the institution. Similarly, Zohar (2022) pointed out that leaders in the disruptive quantum era prioritised collaboration and co-creation, which promotes a culture of lifelong learning and knowledge exploration.

An educational leader is essential in supporting and sustaining lifelong learning in an institution. Educators from the present study asserted that a successful leader in supporting lifelong learning must be visionary, reflective, selfless, a good listener, open-minded, collaborative, empathetic, and empowering. Figure 3 shows the core competencies of educational leaders in supporting lifelong learning in the IR 4.0 era.

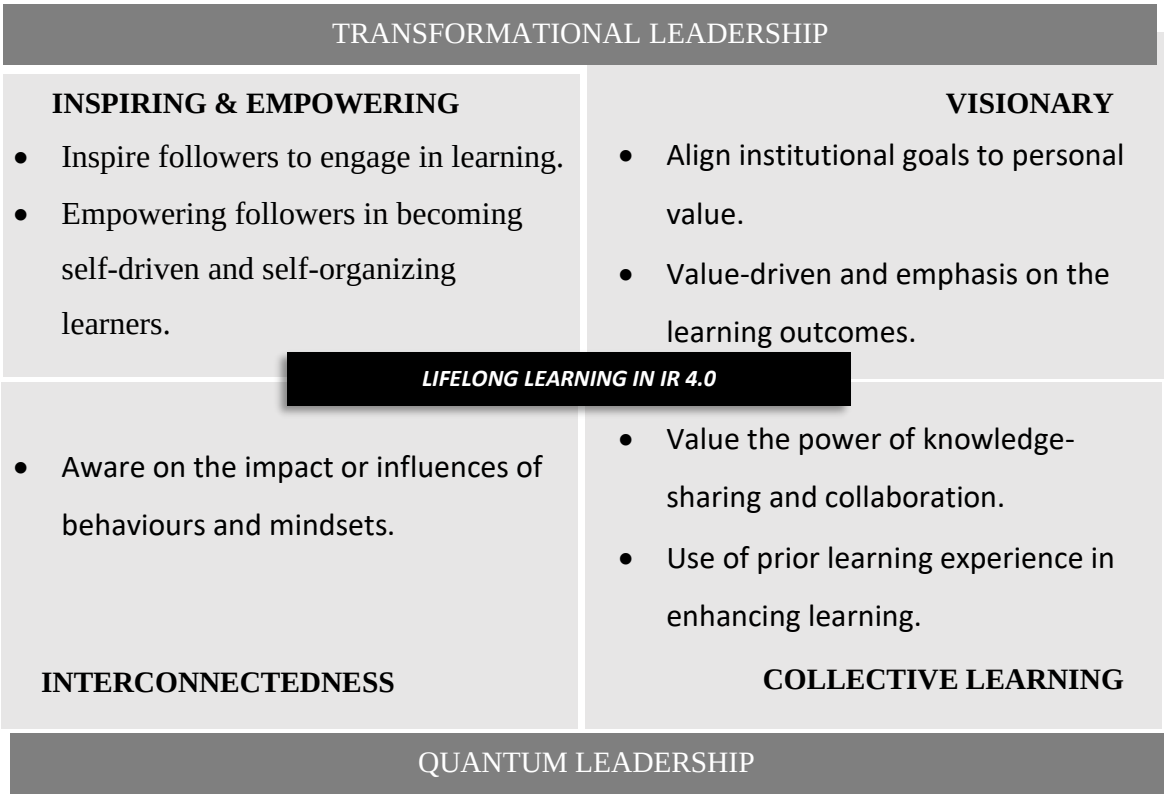

Figure 3: *Core competencies of leaders in supporting lifelong learning in IR 4.0*

Conclusion

IR 4.0 has changed the educational landscape through digitalisation and the use of AI in teaching practices. Educators are expected to stay flexible and adaptable to rapid changes to ensure the effectiveness of their pedagogical practices. The participants of this study are

relentlessly committed to lifelong learning as they also viewed lifelong learning as necessary to teach effectively in IR 4.0. However, there are challenges in fostering a culture of lifelong learning in the institution due to poor motivation, lack of time, limited financial support and lack of collaboration between individuals. To overcome these challenges, educational leaders should be digital leaders, agents who manage change, and communicators.

To play these three roles effectively in supporting lifelong learning, educational leaders must: 1) inspire followers to learn and empower them to become self-organising learners; 2) create a compelling vision which aligns institutional goals with lifelong learning; 3) be aware of the impact of one's behaviour and mindset in a complex organisation; 4) foster a culture of lifelong learning within the institution. The present study's findings showed that educational leaders are boundary spanners who break the boundaries between faculties and disciplines in developing a sustainable lifelong learning culture in the institutions. In addition, the findings showed that leaders' mindsets and attitudes towards technology would determine how other members act towards digital learning. The findings also suggest that the digitalisation of workflow is imperative and should be given priority as it will lessen the lecturers' workload and provide them with the necessary time for learning. Besides that, digitalisation in the institution also facilitates the development of a sustainable knowledge management system that members can easily access without the barriers of time and space. Lifelong learning in IR 4.0 is imperative for educators to stay ahead of rapid changes. Educational leaders must prioritise "leading for learning" by developing a sustainable framework for lifelong learning that could overcome challenges, as discussed in the present study. Lifelong learning should, indeed, "become a way of life", as the Malaysia Education Blueprint suggested (Ministry of Education Malaysia, 2013), if we want to achieve our aspirations of becoming a high-income nation through a knowledge economy.

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