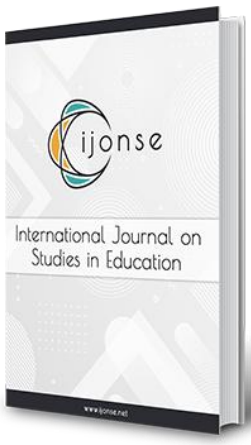

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Navigating Sustainable Educational Practices in Higher Education: A Systematic Literature Review

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Navigating Sustainable Educational Practices in Higher Education: A Systematic Literature Review

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Abstract

When the pandemic hits, the current higher education landscape was shaken and disrupted. The situation was hastily remedied by resorting to emergency remote teaching and both students and instructors were forced to shift into online environment with minimal or lack of preparation. An important question arises from this unprecedented event; can the pre-pandemic framework of higher education be able to sustain challenges for unforeseen future challenges during the era of BANI (Brittle, Anxious, Non-linear, Incomprehensible) like economic downturn, environmental calamities, and political turmoil. To ensure educational practices at higher education remain continuous when disrupted, the teaching and learning landscape at higher education need to be transformed by adapting to sustainable educational practices that can thrive during crises. This study aims to conduct a systematic literature review concerning the ways higher education has adapted and adopted sustainable educational practices in the era of BANI post-pandemic. The review processes included five key methodological steps, namely guided by review guidelines, formulation of research questions, systematic searching strategies based on identification, screening, and eligibility on two established databases like Scopus and Google Scholar, followed by quality appraisal, and data extraction and analysis. Five main themes were revealed based on the thematic analysis: (1) Pedagogical shift to online learning; (2) transformative roles of instructors; (3) digital literacy and digital facilities; (4) social inclusivity and socio-emotional well-being in online community and finally (5) resilience and agility.

Introduction

The unprecedented event of the Covid-19 pandemic has affected the education landscape for higher education institutions. The COVID-19 pandemic has highlighted the necessity for novel and effective approaches to ensure the continuity of education at times of crisis and unpredictability. The university plays a crucial role in sustainable development. However, the COVID-19 pandemic has introduced new challenges that require a re-evaluation of university practices to fulfil this goal. The pandemic has caused a sudden shift from traditional in-class education to online distance education. This has changed the basic operating model of Higher Education (HE) all over the world. Higher education institutions have understood that online teaching necessitates a distinct methodology,

and focus should be shifted to the influence of internet-enabled innovation and its role in distance teaching and learning (Elaref, 2020). The pandemic marks the era of disruption, uncertainties, and complexities alongside acceleration of digital society creation and innovation. The paradigm shift has pushed educators to critically review their teaching pedagogy and application of technology. When the pandemic first hit, as part of the measure to curb the infection, universities were closed, and teaching and learning were hastily migrated online. As a result, in a very short of time, the education landscape is forced to change drastically from face-to-face interaction to sharing content via online medium and "open educational practices" (Burgos, 2020; Huang et al. 2020).

Wu (2020) describes the pandemic as a time that test "organizational agility" as universities hastily brought learning into an "online environment" rather than setting up a holistic online pedagogical approach as a response to the unprecedented pandemic outbreak. Unfortunately, this revealed the unpreparedness of institutions in terms of resources and socially marginalised learners who have limited access to the internet, thus hindering them from participating and engaging in an online environment (Greenhow et al., 2021; Zhong, 2020). This brings the question of whether our higher education is prepared to face the forthcoming digital era of learning (Houlden & Veletsianos, 2020) especially in New Time. Education setting is no longer confined to bricks-and-mortar as it is being shifted to distance delivery. Educational institutions, instructors, course developers, subject matter experts must quickly adapt and cope with the sudden change and disruption caused by the pandemic, thus distance education model/online distance learning/ crises distance education/ emergency remote teaching (Al Lily, 2020; Almarzooq et al., 2020; Che Ahmad Azlan et al., 2020; Hodges et al., 2020; Robinson-Neal, 2021) is the primary temporary remedy to tackle this conflict.

Contextualising BANI Environment in Higher Education

Covid-19 pandemic is not the only factor that could cripple or disrupt an education setting. Other parts of the world which are affected by natural disasters and armed conflict ((Affouneh & Burgos, 2021; Sinclair, 2001; Soriano et al., 2021) could also trigger the education system to be in crisis or emergency mode. The pandemic exemplifies the current age of chaos that disrupts stability and familiarity. Previously, the world was guided by the VUCA (Volatite, Uncertain, Complex, Ambiguous) framework when making decisions within the paradigm of jarring and confusing changes in technology and culture, however, as the world is progressing more chaotic, VUCA framework is perceived to be insufficient, thus BANI (Brittle, Anxious, Non-linear, Incomprehensible) takes place to respond to upheavals that are unforeseen and disorienting (Cascio, 2020). Brittle refers to inefficiency and non-resilient, thus susceptible to failure and destruction. Anxiety is another emerging characteristic of today's world that reflects anguish, stress and fear about uncertainties. Furthermore, non-linearity refers to "lack of causal relationships" and "…inability or difficulty" to grasp the cause and effects relationship that appears to be disconnected. Finally, incomprehensibility refers to rapid pace of change and feeling overwhelmed by abundance of emerging new data, making current knowledge becomes obsolete, and even wrong (Cascio, 2020; Musiol, 2022).

Effectively strategising and overseeing education in times of disaster has posed an immense undertaking that

revealed the vulnerability and brittleness of education systems where each crisis necessitated different approaches and policy interventions, for which education systems were mostly unprepared (Küçükakın et al., 2024). To overcome this challenge, higher education institutions need to execute the process of transition by migrating teaching and learning to online platforms as a crucial step to guarantee a continuity of the educational process to be held in either partial or complete isolation or physical distancing. The pandemic has shown the strength and agility of higher education when facing a health crisis which causes the institutions to be closed. This unprecedented event has forced educators to work hard restoring teaching and learning via technology, innovation and collaboration (Devaney et. al., 2020). Universities need to make quick decisions by reimagining alternative means to deliver seminars and lessons and making on-going improvements to online teaching. Transformative, innovative and creative strategies were carried out with a sense of urgency to ensure continuous learning (Ossiannilsson, 2021). This new era has accelerated even further the need for information and communications technology (ICT) as the main catalyst to deploy virtual class webrooms-based, virtual discussions, and other forms of teacher–student interaction (Bower, 2001; Bojovic, 2021).

Despite the sudden consensus of educational institutions to take learning into online mode, it is not as simple as it may seem. Synchronous or asynchronous online learning across platforms like video conferencing, Zoom, Google meet, and WebEx or e-mail, google form, streaming video content, posting lecture notes and social media platforms are the means to ensure the process of teaching and learning is not disrupted during the pandemic (Simamora, 2020). The COVID-19 crisis has realigned our focus on the importance of digital connectivity in daily life. Good and stable connectivity and possession of smart devices are critical to survive within "forced virtual education" as without these facilities, inequity may easily surge for individuals or communities where connectivity is unstable and poor (Soriano et al., 2021). As many countries underwent lockdown periods, digital infrastructure was critical to mitigate the impact of stay-at-home restrictions. Post-COVID-19, the "new normal" will likely see an acceleration of digital activities across various aspects of daily life. Educational institutions are likely to continue leveraging some level of online education in the future, from sharing pre-recorded lectures, launching homework collaboration platforms, or allowing students to study from home at alternate time. A study by Mauro et al. (2020) found that 64% of the surveyed full-time students said they used online education tools more actively during COVID-19 with 30% of them were first-time users. 70% of the full-time students believe that their dependency and increased usage online education will last post- COVID-19.

To face future challenges, posed by the environment or health, a total transformation in redesigning and reshaping the education system is urgently needed apart from taking precautionary measures to face future outbreaks or conflicts. Higher education needs to be prepared for a future that is "fundamentally digital with "post normal condition" that may consist of "permanent disruption, ignorance and uncertainty" (Sá et al., 2021, p. 13). The pandemic has transitioned universities to improved digital infrastructure, virtualization, and gamification. Higher education institutions return to 'new normal' that shifts from emergency remote teaching to digital transformation. Digital transformation is not only an innovative solution, but it is a risk mitigation to cushion the impact of future calamity (Devaney et al., 2020). Benito et al. (2021) perceives the future landscape of higher education post – pandemic to shift into hybrid or blended learning to prepare for upcoming crises or disruptions. Living with the pandemic has taught universities, faculty members and students to be more prepared and adept with digital

equipment to continue learning via online or hybrid educational mode.

Education models need to be refashioned and redefined values and norms to enable positive human interaction in current innovation-driven world together with the action plan to equip learners with critical skills to create more inclusive and productive world. Not only learners need to learn the 'hard' skills, such as technology design and data analysis, education institutions also need to foster human-centric skills—cooperation, empathy, social awareness, and global citizenship—that enable children to shape future societies that are inclusive and equitable (Elhussein et al., 2020). Emphasis needs to be placed on learners rather than a new pedagogy or technology with careful consideration on aspects like learning environment, health, satisfaction, and motivation index (Daniel, 2020; Ossiannilsson, 2020).

Post-pandemic requires more dramatic change for higher education institutions, not only to ensure its survival but also its transformation during the era of BANI. Implementation of BANI framework to sustainable educational practices in higher education involves creating teaching and learning environment that is resilient, supportive, flexible, and comprehensible. Higher education institutions need to re-design and re-define their educational landscape by innovating more solid, long-lasting and sustainable remedies considering the current time of uncertainty and its adverse impact on academic life (Sigalés, 2021). Sustainability focuses on longevity and ability to thrive without excessive waste (Mishra & Dholakia, 2023). The integration between the concept of sustainability and education is refashioned as the ability to adapt to new and changing situations (Chen et al., 2023), which fit within the BANI environment. Online pedagogy needs to be expanded and accelerated by putting into force the aspects of technology-based learning that are most effective with strong information technology support, thus bringing higher education into the age of digital revolution that is pertinent for sustainability (Deroncele-Acosta et al., 2023; Santos et al., 2021). This systematic review will explore further on the transformation of higher education landscapes post pandemic and adaptation of innovative initiatives to ensure its continuity and sustainability during the time of uncertainties and vulnerabilities.

Methodology

Systematic Literature Review Guidelines

This review paper is guided by several guidelines as proposed by Shaffril et al. (2021) and Xiao and Watson (2019). Despite the reputation of PRISMA (2020) as the main reference for review protocols, however, the researchers found PRISMA to be a less appropriate choice due to several issues as stated by Haddaway et al. (2018). It is suggested in PRISMA that only a review can be conducted with search results from only one database, which could affect the effectiveness and comprehensiveness of the review. Additionally, PRIMSA is primarily designed to review studies on medicine and health topics which do not fall into the scope of this review. Also, due to the nature of this review, PRISMA (2020) is still found to be unsuitable to be used as a guide for it is biased towards meta-analyses rather than giving focus on qualitative and mixed synthesis methods (Haddaway et al. 2018). According to Xiao and Watson (2019), to prepare a review, a researcher needs to go through three instrumental stages; planning the review, conducting the review and reporting the review. The planning stage involves the researchers to state the purpose of a review by specifying the research questions, followed by a review

protocols. Next, the process of the review involves the researchers to identify and select primary studies and to extract, analyse and synthesise data and finally a report needs to be prepared to present the findings from the review. In addition, the guidance provided by Shaffril et al. (2021) is tailored for reviews by non-health related researchers in which it focusses on seven main aspects of SLR methodology; 1) the development and validation of the review protocol/ publication standard/ reporting standard/guidelines; 2) the formulation of research questions; 3) systematic searching strategies; 4) quality appraisal; (5) data extraction; 6) data synthesis; and 7) data demonstration (p. 1321).

Formulation of the Research Question

This review is navigated by the research question: 1) How do higher education institutions redesign their educational practices making it sustainable and crises-ready? This research question was formulated by utilising information from past research by Crawford, and Cifuentes-Faura (2022), Kang (2021), Ewing (2021), Slaski et al. (2020), Sutton (2020) and Dick (2020). These articles have discussed extensively on how higher education institutions around the globe were chronically and acutely disrupted by the pandemic which forced the institutions to re-design and innovate the landscape of its educational setting which aligns with the requirements of the new normal and appropriate for the current new time. Research questions also operate to guide data analysis through the different processes of thematic analysis (Braun & Clarke, 2022). Moreover, the formulation of the research questions was further guided by Lockwood et al. (2015)'s mnemonic of PICo in which 'P' represents (Population or Problem), 'I' (interest) and 'Co' (Context). Based on this mnemonic, the following aspects are included for this review; higher education institutions (Population), managing disruptions in New Time (Interest) and exploring sustainable educational practices at higher education in New Time (Context).

Systematic Searching Strategies

This review has adopted systematic searching strategies as proposed by Xiao and Watson (2019) and Shaffril et al. (2020). The review began with the process of identifying the relevant literature in the database, followed by a screening process by determining the inclusion and exclusion criteria and finally all the retrieved articles were assessed to ensure its eligibility for the review.

Identification

To identify the relevant articles for the review, keywords like post-pandemic, higher education, Covid-19 and disruptions were used in the search. These keywords were further expanded by using other synonyms for the keywords that were used in past studies. Additional keywords like online learning, e-learning, pandemic were also included. The combinations of these keywords were processed using search functions such as field code functions, phrase searching and Boolean operators in databases: Scopus and Google Scholar (see Table 1).

Scopus is found to be reliable with higher stability database (Wijewickrema, 2024). Also, Scopus is proven to be the better option to perform tasks related within the context and orientation of Arts and Humanities (Pranckutė,

2021). Apart from Scopus, Google Scholar is merited for its comprehensive coverage in which many primary studies can be retrieved by Google Scholar and high number of citations (Martin-Martin et al., 2021; Yassin et al., 2020), thus justifies the choice of these databases as the main sources for this review. Searching techniques like phrase searching, truncation, wildcard and field code function were used to extract the potential articles that may answer the research questions. The selected articles were assessed by reviewers to ensure its relevance to the research questions and to determine its eligibility prior being incorporated into the report of the review. In addition, manual searching using handpicking technique was also used to retrieve the articles. Handpicking technique helps to identify the relevant articles that are non-indexed in the database (Shaffril et al., 2020). The decision to include database search and manual search is parallel with Thomas et al. (2017) who proposed for a combination of manual and database search because databases are not capable to cover a complete set of published research articles, and it also lack the sensitivity to retrieve articles based on the pre-set keywords for the review.

Table 1. Search String used in the Selected Databases

Database	**String**
Scopus	higher AND education AND post AND pandemic AND pedagogy AND disruptions AND online learning AND E-learning Higher education AND sustainability
Google Scholar	Higher education AND post-pandemic OR post-Covid Sustainable education

Screening

Screening process is a process to determine the criteria relevant for this research. In the screening procedure, 862 articles that have been extracted for the study went through the process of inclusion and exclusion which was carried out with the assistance of the databases search criteria and the authors' discretion based on specific criteria (see Table 2).

Table 2. Inclusion and Exclusion Criteria

Criterion	Inclusion	Exclusion
Timeline	2020-2024	2019 and earlier
Document type	Articles (with empirical data)	Review article, book chapter, book, conference proceeding, case study, academic letters
Language	English	Non-English
Subject Area	Social sciences, Higher Education level, online pedagogy, pandemic, post-pandemic, online learning, hybrid learning, sustainability	Non-social sciences School level, conventional pedagogy, does not focus on teaching and learning after pandemic

The search for articles was restricted from 2021-2024. Regardless the short time frame, the number of articles that were extracted from the databases was more than sufficient and rigorous for a review to be conducted. Only articles with empirical data written in English were selected. The articles that were selected for the review should cover elements like higher education, digital pedagogy, online learning, online learning and sustainability. A total of 700 articles were excluded from the review for it did not fulfil the pre-set criterion requirement. A total of 36 articles remained to be evaluated in the upcoming stage.

Eligibility

The process of eligibility is a process to determine the selected are highly relevant to the research question that has been determined. This process was done by the researchers by screening the titles and abstract of the selected documents and if required, the researchers will analyse the content of the articles. A total of 162 articles were read by the authors (by scanning the title, abstract or reading the entire articles) to identify if the articles have fulfilled the established inclusion criteria. 50 articles were excluded due to duplication. A further 76 articles were excluded for not adhering to the inclusive criteria like non-empirical or review articles as well as not focusing on the scope of the review that emphasises on higher education, digital pedagogy, post pandemic, sustainability and online learning. The final number of articles to be reviewed is 36.

Quality Appraisal

These 112 articles went through an appraisal stage by two independent reviewers. The appraisal stage is a crucial stage to ensure the articles are valid and free from any "methodological biases" (Petticrew & Roberts, 2006). The reviewers examined the titles, abstracts and content of the articles to ensure that they have fulfilled the inclusion criteria as well as determining the quality of the study by examining its stages of data collection, data analysis, findings and conclusions (Fink, 2005). For the articles to be accepted in the review, the quality of the articles has to achieve at least a moderate level. To evaluate the articles, the reviewers referred to the Critical Appraisal Skills Programme (CASP) Qualitative Appraisal Tool (Long et.al., 2020). CASP (2020) was chosen as the appraisal tool it consists of series of questions that enabled the reviewers to evaluate the suitability of the methodology and the presentation of the findings (Long et.al., 2020).

The reviewing process was guided by the modified CASP series of six questions as proposed by Long et. al. (2020): 1) Was there a clear statement of the aims of the research? 2) Was the research design appropriate to address the aims of the research? 3) Are the study's theoretical underpinnings clear, consistent, and conceptually coherent? 4) Was the data analysis sufficiently rigorous? 5) Is there a clear statement of findings? 6) How valuable is the research (contribution of the study, identification of new research areas)? Only responses of Yes, No and Can't tell were allowed during the reviewing process (CASP, 2018). If an article fulfilled three to six criteria, it will be included in the review while papers that meet below three criteria were excluded for reasons as the following: (1) Articles did not have empirical data; (2) Articles did not focus on digital pedagogy (3) Some articles did not elaborate on the future of higher education post pandemic. At the end, only 39 articles were accepted to be reviewed for the qualitative synthesis (see Figure 1).

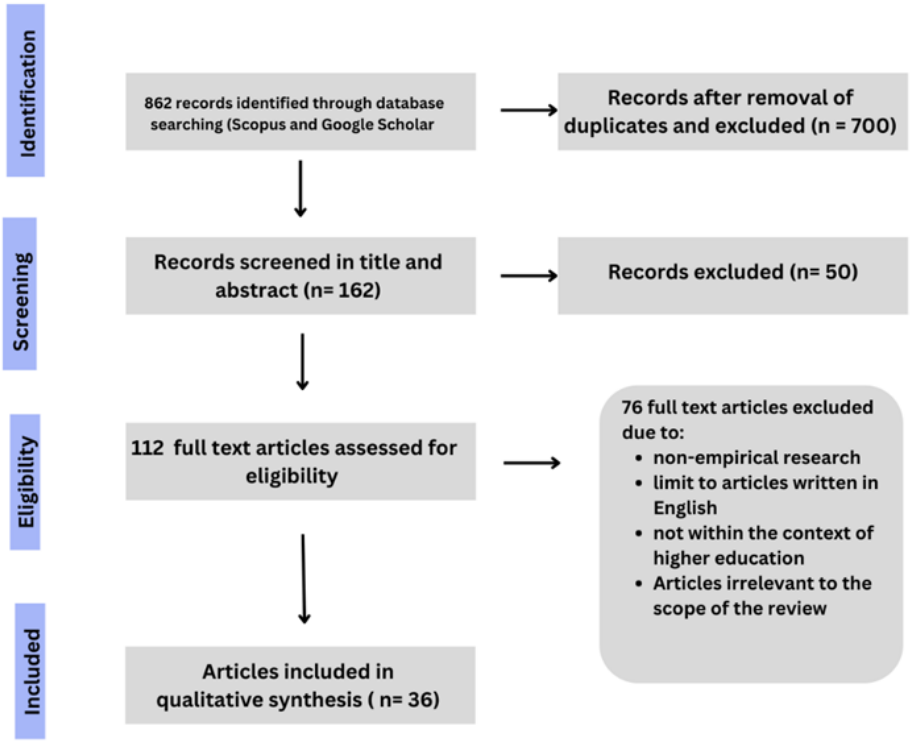

Figure 1. Flow Diagram of the Systematic Review
(adapted from Moher et al., 2009; Shaffril et al., 2021; Page et al.,2021)

Data Extraction and Analyses

The analysis begins with the process of coding prior identification of emerging or recurring themes. Thematic analysis is a robust method in qualitative research that involves the process of identifying, analysing, and interpreting patterns and themes within data (Braun & Clarke, 2006; Braun & Clarke, 2022). This method is particularly useful for exploring and understanding complex social phenomena which offer insights into the study (Braun & Clarke, 2022). In thematic analysis, data is typically analysed using a framework that involves several stages, including familiarisation with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report (Braun & Clarke, 2006; Charmaz, 2014). The code labels generated from the findings involve a constant comparison of data to refine and develop themes that is rich, complex and multifaceted. Themes are developed based on patterns of meaning anchored by a shared idea or central concept (Braun & Clarke, 2022). This fluid process is also known as deductive thematic analysis which is based around the data, the research questions and researchers' knowledge and insights (Braun & Clarke, 2022). The analysis of the emerged themes from the review is to identify prominent themes related to educational practices adopted by HEIs to sustain teaching and learning during disruptive time and the ways higher education is re-designed post pandemic to be crisis-proof and sustainable. Themes are identified, organised and structured based on the qualitative and quantitative evidence. The flexible approach allows easier integration and synthesising of data according to the identified themes (Dixon-Woods et. al., 2005). The developed themes from the findings were further validated by the research team by verifying whether the themes have answered the stipulated research question.

Results

The review resulted in three main themes: transformative digitalisation and sustainability at higher education, social inclusion and socio-emotional well-being in the online community and formation of resilience and agility. The first theme is further divided into three sub-themes: pedagogical shift to online learning, transformative roles of instructors and digital literacy and digital facilities (Table 1). The results provided a comprehensive analysis on sustainable educational practices at higher education that are believed to be able to withstand the challenges and trials of BANI era. A total of five articles focuses on transformative digitalisation and sustainability at higher education (Chen et al., 2023; Alenezi & Akour, 2023; Gorina et al., 2023; Leal Filho et al., 2023; Li et al., 2020). 19 studies focus on social inclusion and socio-emotional well-being in the online community (Greenhow et al., 2021; Fisher et al., 2021; Aristeidou, & Cross, 2021; Islam et al., 2021; Devlin and Samarawickrema, 2022; Banihashem et al., 2023; Alam et al., 2023; Mahfoodh & Al Atawi, 2021; Sa et al., 2021; Sliwa et al., 2021; Markauskaite et al., 2023; Küçükakın et al., 2024; Arnold et al., 2021; Munir, 2022; Adi Badiozaman et al., 2024; Eri et al., 2021; Ivanec, 2022; Alon et al., 2023) and five studies focus on the formation of resilience and agility (Devlin & Samarawickrema, 2022; Weidlich & Kalz, 2021; Al- Sholi et al., 2021; Adi Badiozaman et al., 2024; Eri et al., 2021). 27 studies focus on the sub-themes on pedagogical shift to online or blended or hybrid learning, 11 studies focus on transformative roles of instructors and seven studies focus on improvement of digital literacy and digital facilities. Furthermore, 16 studies applied a qualitative approach while another three studies employed a mixed methods (qualitative + quantitative) approach. The remaining studies (17) used quantitative analytic methods and one study utlised Fuzzy Delphi method. Regarding year of publication, one article was published in 2020, 16 articles were published in 2021, five studies were published in 2022, nine studies were published in 2023, and five studies were published in 2024.

The Developed Themes

Table 2 Presents the Topics Discussed in Each of the 36 Articles

Authors and year	**Pedagogical shift from traditional learning to sustainable online/blended/hybrid learning**	**Transformative roles of instructors post normal**	**Digital literacy and digital facilities**	**Social Inclusion and socio-emotional well-being**	**Resilience and Agility**
Greenhow et al (2021)	√			√	
Erlam et al. (2021)	√	√	√		
Phillips (2021)		√			
Fisher et al. (2021)				√	
Aristeidou, & Cross (2021)				√	

Authors and year	Pedagogical shift from traditional learning to sustainable online/blended/hybrid learning	Transformative roles of instructors post normal	Digital literacy and digital facilities	Social Inclusion and socio-emotional well-being	Resilience and Agility
Islam et al. (2021)	√	√		√	
Devlin & Samarawickrema (2022)				√	√
Chen et al. (2023)	√	√			
Banihashem et al. (2023)		√		√	
Alam et al. (2023)	√			√	
Li & Wang (2024)					
Huang et al. (2021)	√				
Mahfoodh & Al Atawi (2021)	√			√	
Sa et al. (2021)	√			√	
Sliwa et al. (2021)	√			√	
Looi et al. (2022)	√			√	
Kohnke & Moorhouse (2021)	√	√			
Weidlich & Kalz (2021)					√
Gorina et al. (2023)	√				
Leal Filho et al. (2024)	√				
Markauskaite et al. (2023)		√	√	√	
Küçükakın et al. (2024)	√			√	
Hamasha et al. (2024)	√	√			
Alamri (2023)	√	√			
Aljanazrah et al.	√		√		

Authors and year	Pedagogical shift from traditional learning to sustainable online/blended/hybrid learning	Transformative roles of instructors post normal	Digital literacy and digital facilities	Social Inclusion and socio-emotional well-being	Resilience and Agility
(2022)					
Arnold et al. (2021)	√	√	√	√	
Alenezi & Akour (2023)	√		√		
Munir (2022)	√		√	√	
Liu et al. (2020)	√	√			
Al- Sholi et al. (2021)					√
Ashour et al. (2021)	√				
Adi Badiozaman et al. (2024)	√			√	√
Eri et al. (2021)	√		√	√	√
Ivanec (2022)	√	√		√	
Alon et al. (2023)	√	√	√	√	
Nechita et al. (2023)	√				√

Pedagogical Shift from Traditional Learning to Sustainable Online/Blended/Hybrid Learning

Erlam et al. (2021) discussed the challenges of emergency remote teaching in university during the pandemic. They argued that the crisis, regardless of its challenges, has been an invaluable learning experience for university as there is an emerging need to embrace sustainability as a strategy to manage future disruptions. Using technology to replace or integrate face-to-face learning with online learning has become essential for fostering and sustaining learning processes. Furthermore, integrating technology is a target of the SDG4 in making teaching and learning more inventive and advanced. To achieve this, digitalising higher education is a necessary step to ensure sustainable access to education during crises. Findings by Erlam et al. (2021) are echoed by Sliwa et al. (2021) who asserted that online learning would continue to accelerate as technology is integrated into learning and communication is sustained through establishment of online community.

Greenhow et al. (2021) in their study argued that the adoption of digital pedagogy brought varied responses from its end users, but it is an effective solution to mitigate future crises. Alam et al. (2023) asserted that digitalising education is an essential and timely step, however, students have mixed reactions on the move. In the study, students who have access to digital tools perceived the move positively while on contrary, student with limited or

no access to digital tools hold negative attitudes towards the move. Critical thinking/ analytical skills were found to be the most essential attribute within a university graduate and highly sought by industry professionals, therefore it is important for universities to design curriculum that can instil these skills among graduates (Miani et. al., 2021). Chen et al. (2023) examines how digital technology influences the relationship between TESOL (Teaching English to Speakers of Other Languages) and sustained learning outcomes in higher education. This specific emphasis provides fresh perspectives on the possible advantages of integrating digital technology into TESOL programs for sustainable educational outcomes. Moreover, employing a socio-cultural theoretical framework provides a unique viewpoint on the function of TESOL in facilitating attitudinal transformation and lifelong learning. In their case study, Alenezi and Akour (2023) emphasised on the urgent need for higher education to undergo digital transformation not only as a strategy to survive in the fiercely competitive education industry but also to enhance students' educational achievements by leveraging technology. This view is further elaborated by Gorina et al. (2023) in her study that explore on the evolution of sustainable education through the adoption of digitalisation and novel technologies by higher education institutions during pandemic found that digitalisation and sustainable educational practices lead to positive outcomes for both students and instructors. Learning becomes more interactive and flexible using various digital learning tools. Looi et al. (2022) argued that the pandemic has forced HEIs to revisit the significance of e-learning "through a fresh lens" (p. 11) in which HEIs may need to push forward digitally enhanced learning through technology like virtual reality (VR) and augmented reality (AR).

This technology-enhanced learning contributes to sustainability in higher education, simultaneously equipping students with crucial 21st century digital skills. Regardless technology plays significant roles in education, it should not be used to replace the current human-based education system with a computerised teaching model without due consideration. However, it is necessary for instructors to refine their pedagogical approaches by complementing face-to-face teaching with innovative technology-based teaching tools. In the study by Leal Filho et al. (2023), they determined that the success of paced digital transformations needs to be supported by specific skills and competences of academic and administrative staff members. Most respondents seem to develop digital skills and increase their regular involvement with e-learning and distance-learning platform, tasks and applications. In addition, digital transformation is argued to be able to boost sustainable development through institutional strategies to promoting digitisation in higher education institutions. Li et al. (2020), asserted several critical areas that need to be reformed to sustain the future of higher education, namely in the areas of the status of blended learning, student support, adaptation of curriculum for online delivery, professional development for instructors to prepare them for online education and implementation of educational technology to assess students' learning. Their research demonstrates that sustainability in education can be achieved using technology. The formation of blended education communities has the potential to ensure learning sustainability, broaden global partnerships, and make significant contributions to life-long learning.

When the pandemic hit, higher education institutions mitigated the crises by optimising the use of E-learning to ensure the continuity of teaching and learning (Phillips, 2021). Literature related to post-pandemic education proposes blended learning as the one of the best approaches to be applied during crises. The shift from conventional face-to-face learning to online learning, even though challenging during the start of pandemic,

however, it has been proven to be the preferred mode of learning by students for it satisfies the current generation of students who are constant users of the Internet (Nicheta et al., 2023). Munir (2022) argued that higher education needs to consider the right balance between on-campus and digital education, thus blended learning is argued as the preferred strategy to sustain learning during crises. Blended learning afforded both instructors and students with flexibility and motivation as well as minimising teachers' load. Banihashem et al. (2023) found that blended learning imposed higher workload for both instructors and students, particularly blended learning induced more stress on instructors for it requires them to design their courses in blended format which many instructors lack with the knowledge. Aspects of online learning need to be aligned with pedagogy, andragogy, and heutagogy.

In a sustainable online learning model, learners are expected to be more involved with their learning process by employing deep learning, problem solving and critical thinking skills. In addition, due to abundance of knowledge in the web and search engines, learners are no longer confined to remember knowledge, instead they need to be able to process and assemble knowledge and align it to personalised learning needs (Mahfoodh & Atawi, 2021). Adi Badiozaman et al. (2023) argues that the barriers and benefits of hybrid pedagogy correlates with students' satisfaction, self-efficacy, and engagement. Students reported the blend between face-to-face and online education in hybrid learning afforded them with the opportunity to socialise in class, simultaneously encourages self-regulated and flexible learning online (Nechita et al., 2023). Blended learning supports interactivity and collaboration in digital learning, in which students need to feel connected either with their peers or instructors, while maintaining the human factor through face-to-face pedagogy (Phillips, 2021). Aljanazrah et al. (2023) discovered that faculty members and students showed positive attitudes towards online learning accessibility of online educational resources. Students have shown appreciation towards initiatives shown by several faculty members who not only utilised pre-existing internet resources, but also developed and shared their own resources online for everyone to access. This verifies that the accessibility and establishment of open online educational resources can have a beneficial impact on the acceptance of online/blended university learning and teaching. In a quantitative study by Arnold et al. (2021), the findings indicate that the transferring of teaching and learning mode into digital platforms during pandemic was appreciated and appealing, despite its excessive demand, for its flexibility. Instructors can mitigate the ambivalence of online learning by developing sustainable forms of blended learning, crafting visual digital presentations, and integrating self-assessments into digital learning. Ashour et al. (2021) and Erlam et al., (2021), asserted on the lessons learned from the pandemic which further highlighted the need for higher education to improve and broaden the availability of online learning resources as a preparedness step for future crises. The study also emphasised the implementation of blended learning, with better integration of advanced educational technologies, to facilitate effective interaction and student engagement. This approach can provide an optimal balance between online and face-to-face learning modalities. Ula and Pereles (2022) in their study proposed hybrid teaching as another sustainable pedagogical approach. However, before it can be executed, there are several considerations that need to be taken account. First, continuous professional development or training needs to be given to instructors to prepare them to shift their teaching into hybrid mode. The training received not only equipping instructors with the knowledge in designing their lessons suitable for hybrid mode, also, instructors need to be able to engage and derive active participation from the students during hybrid lessons. The need for instructors' training is echoed by Eri et al. (2021) who proposed for higher education organise innovative professional development initiatives to cultivate essential digital skills, enabling them to

proficiently utilise digital gear and software for online or blended learning.

Transformative Roles of Instructors

Devlin and Samarawickrema (2022) asserted for higher education educators to re-think their pedagogical approaches and to embrace the likeliness of future disruption. Instructors need to re-assess their teaching approaches by considering a pedagogical move that not only can support digital learning but also an empathic one which helps to cultivate students' resilience in managing distress, uncertainty and anxiety during crises. Ivanec (2022) asserted in her study that the quality of online education can be improved through engaging teaching and in-tuned with students learning needs. Markauskaite et al. (2023) in their study argued that the roles of instructors after the pandemic require the convergence between 'natural,' 'human' and 'digital'. Teaching necessitates a proficiency in embracing a shared understanding of how digital technology is intertwined with human activities at all levels of the educational system. To achieve this, it is necessary to go beyond theories that focus solely on individuals' digital competencies as teachers, instead adopt a more comprehensive and interconnected understanding. Teachers' digital capabilities are related to teachers' individual knowledge, abilities, and attitudes as well the ability to adapt and to form interconnectedness and relationships with collective knowledge practices to traverse and co-create 'post digital learning ecologies'. The pandemic has transformed and reconceptualised the roles of instructors in terms of course delivery in which learning is mostly done asynchronously. Synchronous sessions should focus on enhancing the work that students have completed before the live session through flipped classroom approach (Erlam et al., 2021; Kohnke & Moorhouse, 2021). Instructors or educators need to be prepared, ready and motivated to conduct online learning. They also need to be able to align between learners with online environments and communication. Erlam et al., (2021) and Alon et al. (2023) argued the organisation of higher education need to provide support for instructors and empower them with the knowledge and skills to teach within online and remote settings. Kohnke and Moorhouse (2021) similarly urged the necessity of equipping instructors at higher education institutions with technological support, facilities and professional training. Mahfoodh and Atawi (2021) asserted that in an ecosystem of sustainable remote education (SRE), instructors need to embrace transformative roles from knowledge providers to facilitators, guides, and experts. Instructors need to be resilient and flexible when faced with disruptions. They need to re-invent themselves to be "global citizens" who are able to interconnect and be adaptable to teach personalised and tailored curricular to suit with different learning needs of learners (Devlin & Samarawickrema, 2022). Alamri (2022) found that quality of online learning correlates with instructors' teaching performance and their self-efficacy to carry out online teaching. To further improve the value of online learning, infrastructure and online learning policies need to be improved to support instructors to provide high quality online teaching. Moreover, it is also imperative to provide instructors with continuous professional development training which will equip them with the necessary skills and competency to design, develop, and teach online courses. Banihashem et al. (2023) and Chu et al. (2021) in their respective studies focused on the roles of instructors in designing the landscape of online learning which can support students' various attitudes, learning styles and perceptions towards blended learning. Instructors need to be competent in keeping students motivated during blended learning for it directly impacts on their overall academic performance. Furthermore, it is crucial for teachers to select suitable online resources or tools for blended learning and facilitate the use of these online tools by students to enhance their learning outcomes. Chu

et al. (2021) also argued that course design and student interactions are the primary factors that influence the perceived learning outcome. To enhance students' attitudes toward online learning, online interactions between students need to be facilitated, which would promote peer learning.

Digital Literacy and Digital Facilities

HyFlex learning is essential to support social distancing and learners' diverse need like being separated geographically to which teachers conduct lessons with students who are present physically and synchronously online through video conferencing. Despite communication challenges and IT infrastructure, students prefer this learning mode due to its flexibility (Kohnke & Moorhouse, 2021). Hamasha et al. (2024) conducted a study on the use of e-learning during the pandemic in higher education institutions, highlighting that the effective use of e-learning platforms depends on their system, information, and service quality. This necessitates making significant investments in enhancing these attributes, such as enhancing the user interface, system reliability, and support services. According to the the study, user satisfaction is also essential for the adoption and success of E-learning. Universities and E-learning providers should incorporate regular feedback mechanisms to adapt and enhance their systems according to user requirements. This research also facilitates the initiatives to adopt E-learning as a sustainable component of education, rather than as a supporting learning tool in times of crisis. Ula and Pereles (2022) emphasising on the implementation of hybrid teaching as a mitigation strategy for future crises. However, it is imperative for higher education institutions to be prepared with the necessary technological tools like the internet, a web camera, a microphone, and online platforms like Zoom or Microsoft Teams. Investment of time, effort and resources is imperative not only to prepare higher education institutions for future crises, but also to create a more inclusive and equitable learning environment that is sensitive to the needs of both students and instructors (Alon et al., 2023).

Social Inclusion and Well-Being in the Online Community

The pandemic has caused many challenges for learners at higher education when learning was shifted to online learning from physical classrooms. One of the primary challenges of online learning is its impact on mental health and overall well-being. Learning from computer screens is a challenging experience for learners and instructors felt isolated and detached from the outside world and this triggered anxiety, depression and stress (Ferrer et al., 2020; Debose et al., 2020; Munir, 2022; Unger et al., 2020). Ivanec (2022) found that the lack of academic context interaction and academic social isolation during online learning has become one of the stressors for students. In the time of digital teaching, management of mental health and well-being is a priority for both students and instructors (Deroncele-Acosta et al., 2023). Learners need to feel engage and included during online learning while instructors need a safe space for them to validate and express their stress and negative emotions for having the need to be constantly alert and upbeat in front of their screens (Deroncele-Acosta et al., 2023). Given the obstacles and uncertainties that virtual classrooms entail, it is critical, to acknowledge and address vulnerability and imperfection of both learners and instructors, thus help to improve sustainable pedagogical practices appropriate for online learning. Li and Wang (2024) asserted that the ease of use, accessibility and flexibility of e-learning tools and resources foster motivation, engagement and positive emotions among students that have

been linked to improved academic success. Moreover, e-learning resources enable students to have a sense of control in determining the direction of their education which has become a crucial factor to improve psychological well-being. To combat academic isolation induced by crises, Eri et al. (2021) emphasised on the need for instructors to participate in tailored seminars that assist them in recognising the significance to be emotionally engaging with their students, who may be experiencing academic and social isolation. It is also important for instructors to acknowledge their emotional needs while cultivating empathy for their students' emotional and mental needs.

Resilience and Agility

Weidlich and Kalz (2021) investigated on the instructional resilience of university instructors during emergency remote teaching. To further improve this sense of resiliency, HE institutions need to improve the facilities needed for online learning, professional training and conducive and durable work environments. Al-Sholi et al. (2021), proposed Agile Educational framework to prepare higher education for future crisis. The framework includes student and faculty needs and support, IT support, course design, and assessment methods for the three instruction delivery modes (online, hybrid, and face-to-face). The suggested framework will allow higher education institutions to adopt a holistic approach in considering the most significant aspects that impact the successful delivery of high-quality education, regardless of the instructional delivery modality. The framework categorises student and instructor attributes that are best suitable for each specific learning setting, whether it be online, hybrid, or face-to-face. Due to the organic nature of the framework, it needs to be further reviewed and adapted by higher education when faced with unprecedented situations or crises in the future. Küçükakın et al. (2024) stated that it is critical for institutions not to overlook the importance of face-to-face interactions between staff and students in the aftermath of natural disasters. Feeling connected to a broader community can be critical is one of the coping mechanisms to deal with emotional distress and to be able to continue learning during disaster. Furthermore, higher education institutions can maintain their resilience by utilising online learning and prepare their instructors with instructional knowledge and pedagogical approaches in times of crisis. Eri et al. (2021) in their study on investigating the perceptions of students at higher education on emerging new digital learning norm triggered by the pandemic argued that to ensure resilience and readiness of higher education in facing future crises, they need to undergo transformations concerning course delivery that is able to suit students' digital competences as well as digital and emotional intelligence.

Discussion

The pandemic became the catalyst in accelerating digital transformation at HEIs. During that time of uncertainty, technology was initially perceived to stay afloat due to its flexibility to be conjugated with learning management and student learning platforms to support learning (Trevisan et al., 2024). As the world moving into the BANI era, digital technology is no longer just a tool but a culture that promotes "a digital mindset, digital literacy and competencies" (Antonopoulou et al., 2023, p. 9). Moreover, the adoption of digital transformation is the key to salvage higher education in conflicted or war-torn areas by providing a more inclusive, equitable and resilient educational environment for the future through active collaboration and partnership with global organisations who

have experiences and resources in digital education and post-conflict reconstruction (Habib, 2023). Technology-assisted learning and technology-based pedagogy is argued to be crucial for sustainable development (Alotaibi, 2022). Higher education plays a crucial role in promoting sustainability, and now more than ever, it must find ways to adapt to challenging times. By weaving resilience and innovation into teaching and research, universities can better handle the unpredictable and complex world. After the pandemic, HEIs around the globe are becoming more aware on the need to make learning sustainable and crisis-proof. Sustainability relates closely to longevity which contributes to the betterment of "environment...social and economic environments" (Mishra & Dholakia, 2023, p. 61). The fundamental concept of sustainability education gives focus on transformative learning that fosters changes in attitudes, behaviours, and society (Rasli et al., 2022).

From the review, it is evident that digitalisation is a prominent strategy which was initially taken to mitigate disruption caused by the global pandemic. This strategy is proven to be effective and improves the efficacy of learning at HEIs. Digitalised education not only arguably may speed up learning and teaching, also it marks the move of HEIs towards sustainable practices that promotes learning (Nanjundaswamy et al., 2021). E-learning, hybrid learning, online learning and blended learning are argued to be imperative in facilitating and making education accessible as well as inclusive for all during time of disruption (Munir, 2022; Sobaih et al., 2021). The integration of technology as exemplified in blended learning enables the provision of equal access, quality education and prepares new generation of learners with enhanced 21st century skills and improved motivation (Mohd Fadzil & Mohamad Nor, 2019). It also supports human needs of human connection and belonging which could not be provided by "robots and neural learning". Despite some challenges to blended learning like feeling of stress during synchronous lesson, Radovan and Radovan (2024) found that it is pedagogically successful in increasing engagement and fostering positive educational behaviour through the integration of technology into lessons.

Blended learning exemplifies a form of flexible education that offers students the opportunity to gain extra learning hours, leading to improved self-confidence and enhanced academic achievements. Students are afforded with the flexibility of being in campus to interact with their peers and instructors and the balance between on-campus and digital education is said to deliver the best outcomes (Munir, 2022). Furthermore, students will get greater autonomy in cultivating their creative thinking and innovative talents during their educational journey (Munir, 2022; Rasli et al., 2022). Hybrid learning is the way forward direction that blends "teaching, learning, mentoring" with technological and digital tools (Munir, 2022, p.9). Hybrid learning which is based on the principle of flexible education that appeals to both younger generation who prefer to study online and elder group of students who have indicated their preference for face-to-face learning requires HEIs to be prepared in the aspects of pedagogy, technology and curriculum development. More research and training need to be provided to instructors to better prepare them to effectively teach and manage learning in hybrid setting. Technological and digital facilities need to be upgraded such as providing more smart classrooms, while the curriculum need to be designed with flexibility that can accommodate students' various learning needs. HEIs need to consistently invest in "future vision", resources and training to ensure superior quality educational provisions for all students (Jamil & Morley, 2022, p. 812). Despite the sudden transition from conventional learning to online learning, most HEIs are equipped with technology readiness through existing facilities and readily available online platforms, ergo the

shift to remote learning was executed smoothly. The pandemic has highlighted the critical importance of "digital agility" in higher education institutions, showcasing it as a key strength for recovery and sustainability during academic disruptions. (Zhaohui, 2020). It is important to note that online learning does not mean replicating conventional teaching into a digital format. The technology imbued in online learning is a supporting tool for the essence of online learning: pedagogy and learning design (Ferrel et al., 2018). Online learning is perceived to be the golden opportunity for HEIs to be innovative, flexible and adaptable (Tzavara, 2021).

Social presence and relationship building are instrumental in technological approaches to managing learning during crises. Academic innovations should be based on students' needs led by empathy and flexibility, while using any new digital innovative tools. Communication between teachers and students is vital in education. In online classes, features like chat functions enable real-time interaction and the presentation of teaching materials through the university's web system. These tools allow numerous questions to be addressed in a single lesson, enhancing both the quality of the lectures and the learning experience. Essentially, it reaffirms that lectures are a collaborative effort between instructors and students, which ultimately improves the overall quality of the lectures (Katsu, 2021). Online learning is not confined to delivering lectures digitally or compiling lists of online resources for students to access, but it is a medium to foster a sense of community with shared learning goals (Tzavara, 2021). Separated in virtual space, it is imperative for learners to be approached emphatically. The approach places personal relationships and social-emotional dimensions at the centre of remote learning in which relationships are formed through meaningful interactions and establishment of trust (Ossiannilson, 2022). Learning activities like E-tivities promote collaboration, engagement, and autonomy in language learning by activating learners to collaborate and engage in independent learning as well as help students perceive the teacher's presence and facilitate online socialisation (Ju-Zaveroni & Lee, 2023).

Apart from providing support for learners and caring for their well-being in post pandemic learning environments, Warrier et al. (2021) asserted the significance of equipping students of HEIs with emotional intelligence competencies like self-awareness, self-control, and adaptability to counter their fear of uncertainty of future challenges and disruptions. Additionally, the adoption of blended learning at HEIs benefits students' wellness for students are afforded with the flexibility of learning online and being on campus. Spaces at higher education can serve as one of the supporting systems for students and platform for students to maintain human connection through collaborative activities that promotes student-centric learning, and this is perceived to be one of the initiatives to promote resilience and sustainability (Alammari, 2024; Mishra et al., 2024).

To achieve the efficacy of online learning, instructors are one of the key players. During the pandemic crisis, they had to quickly adapt to transitioning their teaching to online platforms, hence their technological skills and expertise grew rapidly. Xiao et al. (2024) in their study highlighted the hardships endured by instructors during the pandemic that revealed "deficits" at higher education which calls the emergent need for HEIs to enhance instructors' competence to teach using digital platforms and to validate their "invisible, yet meaningful labor" (p. 18). Instructors need the required digital skills and competency to realign their pedagogical approaches into online setting making learning more meaningful and attuned to students' needs (Fakir Mohammad et al., 2024). Jamil and Morley (2022) argued that instructors are the key players to initiate innovation in their teaching by infusing

relevant digital tools in their pedagogical approaches. The skills to utilise digital tools for online learning is part of resilient pedagogy as discussed by Clum et al. (2022) in which the pedagogy prepares instructors with crisis readiness skill and best online learning practices. The pandemic punctuated the need for instructors to be resilient through reconfiguration and adaptation of digital skills (Walletzký et al., 2023). The experience of teaching during crisis has revitalised instructors' pedagogy which has improved their motivation, commitment and effectiveness (Fakir Mohammad et al., 2024). As the world transitions into the BANI era, teachers' primary role of transmitting information shifts into "navigators of learning journey" (Purcell & Lumbreras, 2021). This shift has been driven by technology, as information is now readily accessible through technological means. To increase students' engagement and to create social presence, instructors are to be given academic freedom in organising interactive learning activities such as small-group seminars, tutorials, problem-based learning, open dialogue and case studies analysis (Dwivedi et al., 2024) using support of digital platforms that require learners to interact, contribute, reconfigure and share information and resources (Nanjundaswamy et al., 2021). Thus, it is imperative for HEIs to provide training programs that empower instructors to be adept in managing a technology-mediated learning environment, which affords them to immerse themselves in new educational experiences, prompting them to rethink and reassess their pedagogical practices and ways to support and interact with their students (Fakir Mohammad et al., 2024; Munir, 2022; Tzavara, 2021). Furthermore, to ensure sustainability in learning, instructors need to empower themselves to view online learning from a broader lens, participate in professional development training to equip them with sustainable pedagogy approaches and learning about best practices of sustainable online learning. Also, through training, instructors amplify their skills by integrating contemporary teaching approaches that utilise their students' digital literacy, thus meeting expectations and demands in higher education post-pandemic (Fakir Mohammad et al., 2024; Ju-Zaveroni & Lee, 2023).

The Covid-19 epidemic has demonstrated that technology and digital competencies are crucial for uninterrupted process of teaching and learning. Therefore, it is essential for curricula content at HEIs to place a strong emphasis on acquiring comprehensive digital literacy skills and technologies. Previously, it is established that blended learning and online learning are sustainable pedagogical approaches and for these approaches to be successful three key components must be attained: the effectiveness of instructors, appropriate technology, and actively engaged students. Instructors need to possess a profound understanding of content and have expertise and digital competency in utilising digital learning platforms and tools as well as the ability to modify and adjust their teaching methodologies to accommodate the educational requirements of students who are learning remotely (Caeiro-Rodríguez, 2022). The current generation of students are technologically inclined as they define themselves as digitally-literate, thus, their level of digital literacy can be further enhanced by engaging and stimulating them through integration of digital tools and technological-driven learning approaches (Inan Karagul et al., 2021). Digital literacy of students can be enhanced through creation of a variety of online texts and provision of space to interact and collaborate with other people by means of various digital technologies (Ju-Zaveroni & Lee, 2023). In addition, the digital literacy infrastructure at HEIs must be robust that it is capable to withstand future crises (Udeogalanya, 2022). Implementing a comprehensive approach to address digital literacy and investing in continuous effort to improve digital facilities will enable higher education institutions to create a more inclusive and equitable learning environment for all students.

In another aspect, the global pandemic has provided numerous possibilities to actively implement changes that promote diversity and facilitate inclusivity, hence improving the overall quality of the education industry, simultaneously enhance the long-term resilience of the institution. Digital transformation underwent by HEIs during the pandemic is part of sustainable strategies and culture that can prepare HEIs for future collaboration to face unpredictable challenges like climate change or energy crisis (Trevison et al., 2024). To be ready for the challenges of the current competitive and unpredictable environment, many research have shown that sustainability, digitalisation, resilience, and agility are the key concepts that need to be embraced by HEIs as they transition to remote learning, digital transformation and digital collaboration post pandemic (Miceli et al., 2021; Mishra et al., 2024; Perdana & Mui, 2023; Qureshi et al., 2024). Resilience is defined as the ability to successfully adapt to challenges and to survive a crisis while maintaining the ability to thrive during disrupted time (Ossiannilson, 2022). When the pandemic struck, HEIs had shown their resilience and agility in managing the unprecedented disruptions in a dynamic and adaptive manner through digital transformation and adoption of digital pedagogy. Gull et al. (2023) asserted that HEIs can maintain its robustness during uncertain time by adopting adaptive culture outlook and digital transformation. Moreover, resilience is achieved when HEIs are able to proactively take actions to prepare for uncertain situations, prioritise problem-solving, and possess the ability to redesign alternative strategies to innovatively formulate sustainable educational practices (Mukyala & Namono, 2023). Apart from resilience, agility is another essential trait when integrating technology into learning and mobilising digital resources (Perdana & Mui, 2023). Similar view is expressed by Gull et al. (2023) and Alammari (2024) who argued that the move of digital transformation contributes to HEIs organisational resilience and sustainability to withstand, grow, and thrive during uncertain and challenging circumstances. To emulate resilience, key principles like diversification, flexibility, innovation, sense of community and well-being are to be given primary focus. These principles are adapted in the model of resilient pedagogy: planning for extensibility, planning for flexibility and planning for redundancy in which learners can learn in variety of environments and scenarios (Ossiannilson, 2022). Post-Covid 19 educational landscape further reinforces the emerging changes and evolution at higher education that demands HEIs to be adaptive and re-construct learning environments into innovative campuses that are learner-focused with immersive experiences and afford opportunities to form synergistic relationship and collaborations (Deshmukh, 2021).

Conclusion and Future Studies

The pandemic hits during the era of VUCA (Volatile, Uncertain, Complex and Ambiguous) which requires higher education to prepare and arm its students and stakeholders the skills and competencies necessary for post-pandemic success. However, after the pandemic, VUCA world may not be relevant to address the current unpredictable environment (Baskoro et al., 2024). VUCA is to be replaced with BANI framework which helps HEIs to recognise constraints, disruptions, uncertainties and complexities of the future educational landscapeIn a BANI world, without sufficient preparedness, HEIs are vulnerable to system or regulations failure.

As technology becomes rapidly advanced, everyone has access to unlimited resources and information which can lead to anxiety due to information overload. One of the means to sustain learning during times of disruption is to be flexible, thus education need to be viewed from a non-linear perspective and finally, HEIs need to be prepared

to face a world that could be disrupted by another pandemic or world conflict that could be incomprehensible at first to be dealt with. The complexities of the BANI world are envisioned by Bayne and Ross (2024) in their study by speculating the possible future conflicts faced by higher education due to climate disaster, rapid advancement of artificial intelligence, radical political turmoil and unregulated human enhancement. They argued that through speculation and imagining 'the worst possible future' lead to hope and counter actions to secure the future of education. In addition, Kok (2019) asserted the complexities of the BANI world can be counter-measured by resilience and agility, compassion, adaptability and collaboration. The pandemic has shown the resilience of higher education in mitigating the crisis. However, to stay relevant and sustainable, universities should not be defined by their ability to adapt, instead they should be actively anticipating future disruptions and be active players in re-defining and shaping a sustainable future.

The utilisation of digital technologies will continue to play a crucial role in achieving the objective of providing widespread access to knowledge, ergo digital transformation has become a critical aspect of higher education institutions in the post-pandemic era. Higher education institutions have adopted digital tools and technologies to enhance teaching, learning, and research processes that foster student engagement and improved academic achievement in online setting. With the adoption of online learning platforms, educational content has become more accessible, and students can now access course materials from anywhere in the world. In addition, digital transformation not only has made learning to be more accessible and equitable, also it has enabled institutions to adopt new pedagogical approaches that foster active student participation and engagement. As a result, digital transformation has become an essential component of modern education, and it will continue to shape the future of higher education institutions. To ensure the long-term viability of digital education, higher education institutions must establish programmes aimed at fostering the development of digital capabilities among both learners and, particularly, instructors. In addition, it is imperative for them to allocate resources towards the development of pedagogical frameworks for digital education and to make modification and adjustment on their curricula to address emerging social and scientific concerns. HEIs need to prepare themselves for future breed of students who are very adept in using technology to access information and able to regulate their own learning. Universities need to be more adaptive and attentive to students needs that demand flexibility. Universities will soon be unable to sustain their rigid curricula as technology and artificial intelligence continue to be significantly uprising, which enabled educational products to be offered on a larger and more sustainable scale.

Parallel with the growth of digital transformation, the landscape of higher education is further transformed as the age of generative artificial intelligence arrives. The incorporation of generative AI models into the process of learning is asserted to enhance resilience and agility which accentuates society's adeptness to flourish during crises. The use of generative AI like ChatGPT 4.0 at higher education fosters sustainable educational practices by promoting problem-based learning, resource efficiency, inclusivity, research and development, and professional development. These elements contribute to a robust and adaptable educational ecosystem capable of withstanding and thriving amidst various challenges. The use of AI-driven solutions not only helps to mediate immediate difficulties, but also offers lasting strategies for long-term sustainable development and enhanced quality of life, highlighting the critical part that AI plays in promoting and reinforcing organisational resilience of higher education.

Post-pandemic further highlighted the rise of humanising education. Social inclusivity and emotional well-being need to be secured and scaffolded while learning. Students need to be kept engaged with learning by sustaining their interest through activities that are cognitively and socially engaging which leads to positive learning behaviour and outcomes. HEIs need to prepare and armed both instructors and students with emotional resilience and provide the necessary support to enhance their psychological well-being, self-efficacy and grit to thrive in any challenging circumstances during BANI time.

This review has shown the emerging need for HEIs to embrace the goals of sustainability in their educational practices as a preparedness plan for future crisis as well as paving the pathway for future studies. HEIs need to play the role as agents of change who are capable to implement action-oriented strategies to innovate and transform the education landscape that supports sustainability practices. Digital transformation and revitalised roles of instructors that places importance on maintaining inclusivity and well-being are the primary approaches to face disrupted time. As the current HEIs are continuously improving their educational practices in the BANI era, this review has also punctuated the need for further research to identify the long-term impact of digital technologies on teaching and learning activities and carbon footprint and to explore the impact of smart technologies in promoting the culture of on-campus sustainability and finally, more studies are needed to examine the resilience and agility of HEIs by placing HEIs in imaginative and speculative disruptions and anticipates the best responses to mitigate the crises. This study is limited in a sense that only two databases were utilised for the review: Scopus and Google Scholar. Future studies should utilise other distinguished scientific database like Web of Science to provide additional or alternative perspectives on this study and to help generalise the results.

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