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Designing the Resilience Pattern of Higher Education Institutions in Response to the Covid-19 Pandemic based on Grounded Theory

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Purpose: The Covid-19 pandemic has presented unprecedented challenges to higher education institutions, necessitating a robust resilience framework to navigate disruptions and ensure continued educational excellence. This study aimed to design a resilience pattern for higher education institutions based on grounded theory, drawing insights from the experiences of stakeholders in Islamic Azad Universities in Tehran, Iran.

Methodology: The present study in terms of purpose was applied and in terms of implementation method was qualitative. The target population was all students, employees, and faculty members of Islamic Azad Universities in Tehran, Iran. The sample size of this study was determined based on the principle of theoretical saturation, resulting in a total of 29 participants who were selected by the purposive and theoretical sampling method and were underwent to a semi-structured interview. Interview validity was established using triangulation, and reliability was assessed using the intercoder agreement coefficient method, yielding a value of 0.72. The data obtained from semi-structured interviews were analyzed using open, axial, and selective coding techniques in ATLAS.ti qualitative software version 9.

Findings: The analysis showed that the resilience pattern of higher education institutions in response to the Covid-19 pandemic had 189 concepts, 39 subcategories and 10 main categories based on the systematic grounded theory. In this pattern, the central phenomenon was the resilient response of higher education institutions to the Covid-19 pandemic. Causal conditions were categorized into three main categories: individual (6 subcategories, 29 concepts), organizational (7 subcategories, 41 concepts), and social (3 subcategories, 11 concepts). Intervening conditions consisted of national factors (4 subcategories, 18 concepts), while context were represented by global factors (4 subcategories, 16 concepts). Strategies included prediction and prevention (3 subcategories, 17 concepts), response and coping (5 subcategories, 24 concepts), and adaptation and compatibility (3 subcategories, 18 concepts). Consequences were classified into short-term (2 subcategories, 8 concepts) and long-term consequences (2 subcategories, 7 concepts). Finally, the resilience pattern of higher education institutions in response to the Covid-19 pandemic based on grounded theory was designed.

Conclusion: The proposed resilience pattern serves as a valuable guide for higher education institutions to proactively address the challenges posed by unforeseen disruptions, fostering adaptability and sustainability in an increasingly volatile world. The framework emphasizes the importance of resilience not only at the organizational level but also among students, staff, and faculty members. By incorporating this pattern into their strategic planning and operational practices, higher education institutions can enhance their capacity to navigate crises such as Covid-19 pandemic and emerge stronger amidst adversity.

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1. Introduction

The COVID-19 pandemic has not only been a global health crisis but also resulted in an educational crisis, with over 1.5 billion learners worldwide affected by school closures and educational institutions shutting down. This has led to major disruptions in educational systems, highlighting their weaknesses and vulnerabilities worldwide. Many government officials, university staff, students, and parents were concerned that transitioning from traditional to online learning would lack the desired functionalities and expected outcomes (Mseleku, 2020). As we have witnessed, disasters and crises can disrupt the teaching and learning process for weeks, months, or even longer. Stopping education and learning, even for a short period, results in financial loss, job losses, harm to university reputation, and curriculum constraints. This highlights the urgent need for resilience and agility in coping with disasters and crises (Dohaney et al., 2020). Resilience has been an essential component of sustainable development discussions for several decades. This structure is known as the ability to stand firm in times of turmoil and as a mode of thinking, is the basis for perception and strategies that make change possible (Folk et al., 2009). The key role of higher education institutions in shaping communities by providing knowledge and perspectives to students for resilient thinking is emphasized, and it is believed that this paves the way for a sustainable community (Escrigas, 2016). Especially today, when education is accepted as an indicator of development, the resilience of educational institutions has become an important issue (Sezen-Gultekin & Argon, 2020). However, improving resilience is not limited to the ability of an organization, but also encompasses students (Bozkurt & Sharma, 2021) and educators (Lagat, 2021) as well as a wide range of other factors (Bozkurt, 2022).

Lessons learned from the Covid-19 pandemic should serve as a guide for future progress in education systems in dealing with other global crises. This pandemic has demonstrated that the future of higher education needs to be reviewed; international and inter-sectoral collaboration, both within different educational sectors and policymakers, associations, and other stakeholders, needs to be strengthened and made more powerful. Conducting various research studies on the resilience of educational organizations in crises such as this pandemic and examining the short-term consequences and effects of COVID-19, which is being carried out by various research, may pave the way for predicting long-term consequences that await us. In order to better predict global challenges and envision a more resilient future, the need for creating and sharing knowledge is felt more than ever in these circumstances. This crisis has also highlighted the importance of innovative and resilient higher education organizations that prepare students for creativity and resilience (Abdullah, Husin, and Haider, 2020).

In Iran, about 15.5 million school students and 3.5 million university students were also affected by the consequences of this pandemic. The pandemic has shown us that one of the vulnerable areas of the country is the education system, which lacks the necessary preparedness to cope with and respond to unpredictable events and sustainability and resilience in unforeseen circumstances. Therefore, with the onset of the COVID-19 crisis, the need for resilience of educational institutions and relevant research in Iran was felt as much as other parts of the world. In other words, higher education institutions were trying to identify a resilience model that would absorb the immediate and sudden shock of the pandemic, prevent the continuation of its adverse effects, then reorganize to continue to empower students, create knowledge, and teach skills. This can increase their capacity to adapt to the threats posed by the pandemic. In addition, the evolving nature of resilience model creates opportunities to interact with individuals, family, and the environment, explains the underlying stressful experiences of students, staff, educators, and other stakeholders in detail, and can help higher education institutions to rebuild the system during the postpandemic recovery period (Nandy et al., 2021).

Resilience is about "Learning how to change in order not to be changed" (Waller et al., 2019). The Oxford Dictionary defines resilience as the ability of individuals or objects to quickly recover from an unpleasant events such as shock, injury, etc., and the ability of a substance to return to its original shape after being bent, stretched, or compressed. In other words, the term resilience refers to sustainable, strong, and stable

adaptation under challenging conditions (Delos Reyes et al., 2022). It also includes an individual's mindset, values, and behaviors that enable the individual to overcome obstacles (Waller et al., 2020).

Organizational resilience is defined as the ability of an organization to anticipate adverse conditions, emerge from unexpected events, and turn threats into opportunities that lead to organizational change (Duchek, 2014). Resilience is a business model that always connects resources to consequences. In other words, organizational resilience is a measure of an organization's capacity to handle disruptive events and maintain stability and adaptability in the face of sudden undesirable changes or internal and external shocks (Chen et al., 2021). Organizational resilience is divided into three stages. First, the anticipation stage describes the period before a crisis occurs. It often reflects the organization's readiness to accurately observe internal and external organizational events and quickly detect crisis signals. Second, the coping stage reflects the organization's ability to develop a solution/policy to address a particular crisis. Third, the adaptation is the stage following the occurence of a crisis and involves developing new processes/systems/practices to effectively handle the new circumstances (Duchek,2020).

Resilience takes on various meanings according to its social context and disciplinary approach. For example, in psychology, "resilience" refers to people's response to challenging event, while in education, it refers to learners' ability to cope and thrive through adversity, also known as "educational resilience". Digital resilience refers to the technical knowledge and preparedness of learners to adapt to different digital environments and to overcome technological difficulties while pursuing higher education (Eri, Gudimetla, Star et al., 2021). Organizations that provide education describe organizational resilience as the "ability of an organization to survive a crisis and succeed in a world of uncertainty." They also refer to resilience as how well these organizations improve their ability to respond to, and quickly recover from, crisis events such as natural disasters. Such events can disrupt the activities of a scientific organization while implementing technology during crises helps to overcome these obstacles (Ayebi-Arthur, 2017). The important and related research findings to the present study are presented in Table 1.

Table 1. Summary of important relative studies

Row	Authors	Title and Findings
1	Raghunathan, Darshan Singh and Sharma (2022)	The authors identified resilience as a system attribute in their research titled "Study of Resilience in Learning Environments During the COVID-19 Pandemic." They considered the resilience criteria in education in three aspects: individuals, technology, and the environment of the basic processes. The aim of this research was to understand the resilience of educators during the COVID-19 pandemic, especially the continuity of learning and the role of various factors in this continuity. According to them, resilience research and its understanding are as important as the pedagogical and technological aspects in an education system because it is a trait that encompasses individuals, the socio-economic system, and their relationships.
2	Sharma and Yukhymenko-Lescroart (2022)	They conducted a study titled "Life Purpose as a Predictor of Resilience and Persistence in College students During the COVID-19 Pandemic." The purpose of this study was to investigate the extent to which life purpose explains the variance in college students' levels of resilience and persistence amidst COVID-19 pandemic. The practical implications of this study were to support students to actively explore and achieve their life goals since doing so not only strengthens their resilience but also leads to their perseverance and stability.
3	Shaya, Abu Khait, Madani and Khattak (2022)	They developed a theoretical framework for organizational resilience in higher education institutions under the title "Organizational Resilience of Higher Education Institutions: An Empirical Study During the COVID-19 Pandemic." Using a qualitative phenomenological approach, 13 executive managers of universities in the United Arab Emirates were interviewed. The results of the study conceptualized organizational resilience as a three-stage process of prediction, coping, and adaptation (in line with the Duchek's 2020 theoretical model), and added the innovative culture factor to the leading factors of the Duchek's model, including knowledge, available resources, social

		resources, and power relations. In addition, two moderating factors including crisis leadership attributes and employee resilience were identified.
4	Delos Reyes, Blannin, Cohrssen, and Mahat (2022)	In their research titled " Resilience of Higher Education Academics in the Time of 21st Century Pandemics " reviewed how academic resilience in higher education has been addressed in scholarship, with particular attention to the five major pandemics from 2001 to 2020. The review of 14 related articles showed a lack of attention to the resilience of university teaching staff. This research emphasized the need for universities to manage and support the resilience of their staff to overcome adversities and uncertainties.
5	Baumber, Allen, Key, Kligyte, Melvold and Pratt (2021)	They conducted a case study titled "Teaching Resilience: Enabling Factors for Effective Responses to COVID-19" in Sydney, Australia. The research indicated that the information flows, feedbacks, self-organization, leadership, openness, trust, equity, diversity, reserves, social learning, and nestedness were essential for higher levels of the system resilience. This study revealed that resilience frameworks related to university teaching systems require protection and strengthening to enable effective responses to future disruptions.
6	Bento, Bottino, Pereira et al. (2021)	They presented a qualitative study titled "Resilience in Higher Education: A Complex Perspective to Lecturers' Adaptive Processes in Response to the COVID-19 Pandemic." This study indicated that the experiences of instructors regarding adaptive processes went beyond learning new technological tools. Participants' statements indicated differences in behavior, exploration, changes in interactions between instructors and students, and the emergence of an unstable and unexpected environmental context resulting from the pandemic.
7	Eri et al (2021)	They used a mixed-methods approach in their research entitled "Digital Resilience in Higher Education in Response to COVID-19 Pandemic: Student Perceptions from Asia and Australia." The findings emphasized the urgent need for universities to transform in the following areas: redesigning course delivery strategies that suit cohorts with multiple levels of digital competences, digital and emotional intelligence; developing novel professional development programs for staff; designing special workshops for staff; developing supportive structures at the university level for students with the leadership of student ambassadors and recent graduates; revising assessment strategies; and finally engaging academics to be more empathetic, not just for students' professional needs but also for their emotional needs.

Before the outbreak of the COVID-19 pandemic, the scope of resilience articles in higher education was mainly focused on health, business, behavioral sciences, sports sciences, agriculture, and music. With the onset of the COVID-19 crisis, the need for educational resilience and related research has been increasingly felt worldwide. The number of published articles since then has been greater than in previous years; however, the gap in this type of research is still evident. Meanwhile, it should be noted that in the grounded theory, which is the qualitative research method employed in this study, the literature review is not indicative of major concepts or hypothesis generators; rather, the literature review is indicative of the existence of a gap or bias in existing knowledge, and as a result, it provides a rationale for studying and allows the researcher to refer to the background when presenting data to provide external support for the theoretical model (Creswell, 2013). This enhances theoretical sensitivity and improve theory building. Although special attention has been paid to the resilience of educational institutions in the past three years, and a lot of knowledge has been produced in this field, few coherent studies have been conducted on the design of the resilience model of higher educational institutions in the COVID-19 crisis, and if there have been, they have mostly been based on general propositions and conceptual model of organizational resilience. In Iran, as far as it has been searched in internal databases, no model or pattern has been presented in this area and in the context of higher education institutions. Therefore, due to the existing gap, this study examines this issue by examining the lived experience in the context of Islamic Azad Universities in Tehran and presents a conceptual pattern that can be transferred to higher education institutions in other contexts. Furthermore, its findings are useful for educational institutions in creating important knowledge, awareness, and insights for

stakeholders to cope with other various incidents such as COVID-19. To this end, this study attempts to design the resilience pattern of higher education institutions qualitatively and using systematic grounded theory approach in response to the COVID-19 pandemic.

2. Methodology

The present study was applicable and qualitative in terms of its research goal and research method, respectively. The target population of this research included all students, employees and faculty members of Islamic Azad Universities in Tehran. The sample size of this study was determined according to theoretical saturation principle, and the participants were selected through purposive and theoretical sampling. The semi-structured interviews were conducted. Given the novelty of resilience in higher education institutions and the lack of a rich background, a systematic grounded theory approach (Strauss and Corbin, 1998; Corbin and Strauss, 2008) was employed, which has the least dependence on literature and research background. Using the grounded theory approach, concepts can be extracted from qualitative data and used meaningfully in the development of grounded theories. In addition, in this study, sampling was conducted first through purposive sampling and then through theoretical sampling until theoretical saturation was reached. When the initial purposive sample was examined for primary coding, the results of that process provided a basis for the next sampling, which is theoretical sampling. There is a brief distinction between purposive and theoretical sampling. Purposive sampling determines the starting point of the grounded theory approach, while theoretical sampling guides where you are going. The purpose of theoretical sampling is to collect data from places, individuals, and events that maximize opportunities for developing concepts in terms of their features and dimensions, discovering changes, and identifying relationships between concepts. To this end, this study benefited from the students, employees, and faculty members of the target population who could help in presenting a richer model of research. The sample of this study underwent semi-structured interviews. Prior to each semi-structured interview, the protocol of that interview was prepared based on the research question and the analysis of previous interviews. Each interview lasted an average of 59 minutes. To start, interviews were conducted with undergraduate students and then with postgraduate students as participants. After saturation of this class and analysis of the obtained data, interviews were conducted with higher-level groups, namely informed individuals such as educational, executive, and financial staff, and then with key informants such as educational and research deputies and IT official. Similarly, after saturation of this class, interviews were conducted with faculty members who also had executive responsibilities and were considered as experts to achieve theoretical saturation. The validity of the interviews was confirmed by the triangulation method, and their reliability was obtained using the intercoder agreement coefficient, yielding a value of 0.72.

To conduct this study, first the theoretical foundations on organizational resilience, organizational resilience in education systems, organizational resilience in crisis, and then during the COVID-19 pandemic were studied, and in the next stage, the initial purposive samples of Islamic Azad Universities in Tehran were identified. Interviews with each of the groups continued until theoretical saturation was reached. The importance and necessity of the research were explained to the participants and ethical considerations were addressed. It should be noted that this study was approved by the Ethics Committee of Islamic Azad University - Central Tehran Branch with code IR.IAU.CTB.REC.1400.055. In addition, during and after the interviews, important issues were noted and memos were written along with recordings. The notes and codings were then verified by 3 experts. At the end of each interview, participants were thanked for their participation in the study.

Data obtained from the semi-structured interviews were analyzed using open, axial, and selective coding methods in ATLAS.ti qualitative software, version 9.

3. Findings

Data analysis was performed on the data from 29 interviewees. The demographic characteristics of the interviewees are presented in Table 2.

Table 2. Subjects' demographic characteristics frequency and percentage

Characteristics	Grouping	Frequency	Percentage
Gender	Female	15	51.72
	Male	14	48.28
Position	Bachelor's student	3	10.34
	Master's student	2	6.90
	PhD student	3	10.34
	Education expert	2	6.90
	Education manager	2	6.90
	Department dean	2	6.90
	Financial Affairs Manager	1	3.45
	Information Technology Officer	1	3.45
	Research deputy	3	10.34
	Dean of the faculty	3	10.34
	Deputy General	3	10.34
	Only lecturer without executive position at the time of interview	4	13.79
Academic rank	Lecturer	4	13.79
	Assistant professor	7	24.14
	Associate professor	3	10.34
	Professor	3	10.34
	No academic rank	12	41.38
Work experience (years)	5-1	4	13.79
	10-6	1	3.45
	15-11	6	20.69
	20-16	3	10.34
	25-21	7	24.14
	30-26	5	17.24
	35-31	3	10.34

As you can see, the number and percentage of demographic characteristics of the interviewees including gender, position, academic rank, and work experience are shown in Table 2. The coding resulting from the interviews with the interviewees is demonstrated in Table 3.

Table 3. Coding obtained from interviews

Grounded theory categories	Main category	Subcategory	Concept
Causal conditions	Individual	Motivation	Strong motivation of academics for continuous learning despite the crisis; the importance of motivation and efforts of students in virtual classes efficiency; creating material and spiritual incentives for employees; positive thinking and strong motivation of faculty members and students for continuous learning and teaching despite the crisis.

	Initiative and Creativity	Academics' initiative and creativity; faculty members' initiative and creativity in virtual education; finding creative and alternative solutions in the pandemic era.
	Wisdom and mindfulness	The effect of crystallized intelligence or experience-based intelligence on resilience; continuous updating of personal information and knowledge; self-organization and self-regulation; growth mindset.
	Personal characteristics of academics	The ability to adapt to critical and unexpected conditions; speed of action and power of change and adaptation to different conditions; self-esteem and self-confidence; institutionalization of resilience; responsible and committed personality of academics; self-regulation and self-control.
	Attitude and insight of academics	Attitude towards values; giving meaning and hope to a bright future; faith, beliefs, and religious convictions; beliefs and core values; the effect of worldview on resilience; reliance, recourse, and meditation.
	Depression, stress, and anxiety	Feeling lost and surprised; anxiety about losing loved ones; anxiety about online exams; fear of death; life and work accompanied by fear and anxiety; stress in administrative tasks.
Organizational	Spirit of empathy and cooperation prevailing in higher education institutions	Empathy and collaboration among academics; empathy and compassion of the university with the problems of students; empathy, and listening to the voice of employees by senior managers; feeling valuable and belonging to the university; the role of faculty members and employees in students' resilience; promoting the educational spirit of learning and teaching among academics.
	Training on working with virtual educating systems and platforms	In-service training of employees and faculty members; gradual adaptation of academics to new virtual education systems; technological competence of institutions; the role of the electronic campus of the Islamic Azad University.
	Communication and proper information transfer within the organization	Increasing ways of communication between students and the university; facilitating remote communication with university executives; the role of group managers in communicating with students; interactions between faculty members and students in virtual classes; proper transfer of information to students; proper exchange of information within the organization; effective communication between the queue and the headquarters staff; the role of announcements, circulars, and guidelines.
	Educational management and leadership	Resilient management thinking; university goals and vision; insight, knowledge, and managerial ability; manager's mastery of work and management; managerial wisdom and knowledge; charismatic leadership; timely and appropriate decision making; supportive role of managers; taking advantage of the experiences of experts; future-oriented and transformational management.
	Hardware and software resources and facilities of the organization	Optimal use of available facilities; virtual education conditions, equipment and facilities; university financial support for students; human, financial and material resources; strong internet infrastructure; suitable university hardware and software equipment; strong internet platform; access to university digital resources and libraries.
	Resilient organizational environment	Academics' satisfaction with a safe, healthy, and calm university environment; protective environment for academics; clarification in crisis.

		Organizational support	Physical, mental, and emotional support for students; Psychological and emotional support for academic staff; mental and health counseling for university students.
	Social	Social and economic changes	Economic and livelihood conditions affected by the pandemic; limitation of social interactions; limited family and social communication; restrictions on holding ceremonies and festivals, and even participating in mourning ceremonies for empathy and companionship; quarantines and social restrictions.
		Social support	Use of social networks and virtual communication channels to maintain communication with others; external psychological and health counseling services for academics; public prevention and protection facilities to cope with the pandemic.
		Mass communication media	Using social networks and communication channels to maintain relationships with others; exchanging information through virtual communication channels; obtaining reliable news from informed sources.
Intervening conditions	National factors	Society's resilient culture	Experience from previous crises in the country; individuals' social perception of resilience; social cohesion and solidarity in dealing with problems; virtualization approach in society; teaching resilience as a skill in schools.
		Society's awareness of the pandemic and health protocols	Increasing and improving society's knowledge of the pandemic; changes in customs and traditions based on disease peaks; obtaining the latest information related to the virus and pandemic from reliable domestic and foreign sources; being informed of periodic meetings and decisions of the coronavirus combat headquarters; performing national vaccination; providing access to hygiene items such as masks and alcohol; providing free laboratory tests for academics and other individuals in society; follow health protocols to protect oneself and others.
		Government support	Financial and livelihood support for academics; providing free and high-speed internet; free testing and other medical services for academics.
		National internet infrastructure	Improving the country's internet infrastructure; providing virtual education infrastructure in the country.
Context	Global factors	Continuous and unpredictable global changes	The impact of recurring peaks and various mutations, worldwide; rapid and inevitable global changes; the effects of previous pandemics on the world; international protocols to deal with peaks and mutations; global economic, political, and geographical developments; rapid and inevitable global changes by artificial intelligence tools.
		Global digitalization	Technological advancements and progress; increased cohesion of sciences in this era; virtual communication of universities worldwide using new technologies.
		Preventive measures such as global vaccination	Attention to the latest research by international health organizations related to the virus and pandemic; solidarity in global vaccination implementation; changes in protective and care measures with increased pandemic information.
		Proper global dissemination of pandemic-related information	Awareness of virus mutations; continuous updating of information and findings by international organizations and agencies; daily pandemic statistics in different countries and worldwide; weekly conferences and meetings by the World Health Organization.
Strategies	Prediction and prevention	Acceptance of reality	Understanding the strengths and weaknesses of university; to be knowledgeable about the problems of the university and

		academics; realistic analysis of issues; senior managers' acceptance and understanding of university problems; establishing a crisis headquarters in the university.
	Needs assessment	Attention to the needs of university staff; need assessment along with need creation; recognition of short-term, periodic, and long-term university needs; prioritization of needs.
	Policymaking and strategic planning	Short-term planning with consideration of universal and academic protocols; having alternative plans in case of necessary changes; writing different scenarios based on crisis conditions and planning for each one; intelligent planning and policy-making; flexibility of educational plans; the importance of strategic planning; prioritization of plans; educational policy-making for the coronavirus and post-coronavirus era.
Response and coping with the crisis	Adapting to advanced digital technologies	Using up-to-date digital technologies in education and localization of them; use of user-friendly and smooth systems in universities; equipping educators and students with appropriate hardware and software.
	Improving technological literacy and fluency	Improving digital literacy and fluency; enhancing IT knowledge of academics; simple and effective education of virtual learning systems; teaching academics to work with systems; using videos, slides, and animations in training new systems; sharing learned experiences and knowledge.
	Finding innovative and creative solutions	Establishing brainstorming and consensus meetings in the university; forming a think tank in the university; welcoming the opinions and suggestions of all academics.
	Strengthening intra- and inter-organizational communications	Joint efforts of line and staff managers; take advantage of the opinions of line staff; strengthening horizontal and vertical communications; facilitating communication channels with educators and officials; increasing virtual communication channels; creating new communication channels with students; create interdepartmental coordination.
	Upgrading systems and technical support	Improving security of university systems; using strong and informed technical support team to address system problems; utilizing well known and tested platforms; utilizing strong systems to facilitate student affairs; using user-friendly systems.
Adaptation and compatibility	Adaptation to innovative educational and evaluation methods	Changing educational perspectives and attitude; turning to new educational and learning methods; using up-to-date hardware and software in education and assessment; changing the approach of academic evaluation and assessment and end-of-term evaluations of students.
	Attention to the physical and mental health of academics	Physical, psychological, and emotional support for academics; maintaining the health and safety of academics; applying necessary measures to reduce the stress of academics; calming and inspiring students; continuous monitoring of the implementation of health protocols in the university; the possibility of face-to-face and online psychological counseling for academics, especially students; using posters, infographics, and banners to improve the health knowledge of academics.
	Monitoring and feedback	Periodic evaluation and feedback of performance; monitoring and evaluation of end-of-term exams for students; measures to reduce the possibility of cheating in online exams; changing the approach to end-of-term exams for students; change in how to hold thesis and dissertation defense sessions for students; learning from mistakes and failures; evaluating the effectiveness of virtual education systems.

Consequences	Short-term consequences	Turning threats into opportunities	Using the benefits of virtual education for continued education; achieving educational equity; opportunities for reflection and self-awareness in this era; overcoming challenges to foster innovations.
		Organizational flexibility and agility	Reducing unnecessary rules and regulations; facilitating student affairs; reducing unnecessary physical movements and time-consuming trips to the university; focusing on hybrid and flexible educational systems in the post-coronavirus era.
	Long-term consequences	Growth, progress, and digital transformation	Harnessing the benefits of hybrid education for post-COVID times; gradual improvement of virtual education systems; embrassing innovative educational technologies; converging sciences during and after the pandemic.
		Greater empowerment and resiliency in the face of future crises	Empowering students in the face of future crises; academic empowerment; effective management and appropriate educational structures for sustainable development.

Table 3 shows that the pattern of resilience of higher education institutions in response to the COVID-19 pandemic had 189 concepts, 39 subcategories, and 10 main categories based on the grounded theory. In this pattern, the resilient response of higher education institutions to the COVID-19 pandemic was identified as the central phenomenon; causal conditions had 3 main categories called individual (with 6 subcategories and 29 concepts), organizational (with 7 subcategories and 41 concepts), and social (with 3 subcategories and 11 concepts). The intervening conditions had one main category called national factors (with 4 subcategories and 18 concepts), and the context had one main category called global factors (with 4 subcategories and 16 concepts). The strategies had 3 main categories including prediction and prevention (with 3 subcategories and 17 concepts), response and coping (with 5 subcategories and 24 concepts), and adaptation and compatibility (with 3 subcategories and 18 concepts), and the consequences had 2 main categories including short-term (with 2 subcategories and 8 concepts) and long-term consequences (with 2 subcategories and 7 concepts). The resilience pattern of higher education institutions in response to the COVID-19 pandemic based on the grounded theory is shown in Figure 1.

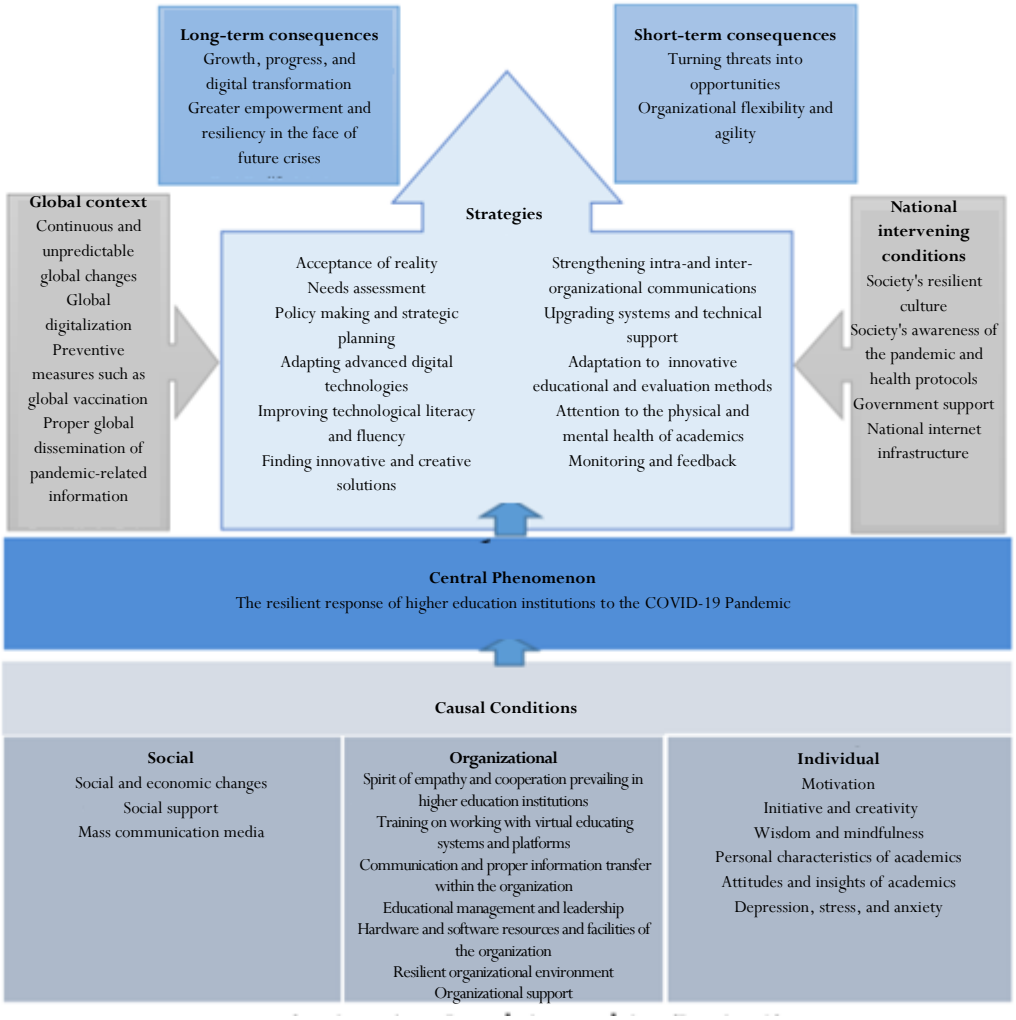

Figure 1. The resilience pattern of higher education institutions in response to the COVID-19 pandemic based on the grounded theory

As it can be seen, the pattern of resilience of higher education institutions in response to the COVID-19 pandemic based on the grounded theory is shown in Figure 1.

4. Conclusion

The reality is that in most c, higher education institutions cannot prevent disasters and crises from happening, but they can reduce the vulnerability of their institutions and stakeholders in face of these disruptions. Therefore, the aim of this study was to develop the resilience pattern for higher education institutions in response to the COVID-19 pandemic. The study highlighted the resilient response of these institutions as the central phenomenon, and identified 3 main categories including, individual (with 6 subcategories and 29 concepts), organizational (with 7 subcategories and 41 concepts), and social (with 3 subcategories and 11 concepts). Additionally, the study examined the actions and interactions taken by this institutions in response to the crisis that consisted of prediction and prevention (with 3 subcategories and 17 concepts), response and coping (with 5 subcategories and 24 concepts), and adaptation and compatibility (with 3 subcategories and 18 concepts). There was national intervening factors (with 4 subcategories and 18 concepts) and global contextual factors (with 4 subcategories and 16 concepts) that influenced these actions and interactions. Finally the study explored the short- term (with 2 subcategories and 8 concepts) and long-term consequences (with 2 subcategories and 7 concepts) of a resilient response by higher education institutions.

Motivation, initiative and creativity, wisdom and mindfulness, personal characteristics of academics, attitudes and insights of academics, and depression, stress and anxiety have been identified as individual category of causal conditions. A decrease in motivation, which most of the interviewees referred to, had a negative impact on educational institutions' resilience. Ang, Shorey, Lopez, Chew, and Lau (2022) also identified problem-solving skills, emotions and motivation as individual factors that contribute to the ability to cope with challenges and hardships based on resilience theory. Eri et al (2021) argued that the lack of social interactions puts students in a dark place and distances them from where they feel motivated. On the other hand, rapid adaptation to online learning environment requires the exploration of innovative learning sciences and the introduction of various technological innovations to facilitate effective online learning and the initiative and creativity of academics in utilizing these technologies as quickly as possible for the development of learners' skills, as mentioned in Bhagat and Kim's (2020) study. Wisdom and mindfulness have also emerged as one of the individual factors from interviews. Vidal-Melia, Estrada, Monferrer, and Rodriguez-Sanchez (2022) found that mindfulness has a positive relationship with resilience, which leads to better academic performance. Additionally, the personal characteristics of academics have been identified as individual causal factors in higher education institutions' resilience. Oshio, Taku, Hirano, and Saeed (2018) studied the resilience attribute by identifying personality traits and abilities that are particular to those who can cope with severe stress to achieve successful outcomes. Dohaney et al (2020) also found that New Zealand students perceive resilience as combination of characteristics, abilities, and knowledge. Resilient students, according to their respondents, are "flexible, adaptable, emotionally resilient, participatory, empathetic, and open-minded." The ability to reorganize and adapt driven from the personal characteristics of academics can help make an organization resilient. The concept of the attitudes of university students within the framework of integrated digital teaching and learning developed by Sailer, Schultz-Pernice, and Fischer (2021) indicates that students' learning activities involving digital technology have reciprocal relationships with students' knowledge, skills, and attitudes; student-arranged learning opportunities involving digital technology, and higher education teachers' digital technology use. The latter is influenced by higher education teachers' knowledge, skills, and attitudes; and higher education teachers' qualification regarding teaching and learning with digital technologies. It appears that the attitudes that higher education teacher and students have towards digital technology have a significant impact on teaching and learning; and the perception of sustainability and resilience among university teacher and students has a significant impact on the continuity and quality of education during crises. The mental health issues related to COVID-19 and the sudden shift from face-to-face to online learning, including stress, anxiety, and depression, due to a sudden changes in personal, educational, and occupational lifestyles and future uncertainty, especially among undergraduate and newly enrolled students, have been addressed in many studies, such as Mseleku (2020), Xiong, Lipsitz, Nasri, Lui, Gill, Phan, and et al (2020), Rajkumar (2020), and Tandon (2020).

The organizational category of causal conditions were classified into subcategories of spirit of empathy and cooperation prevailing in higher education institutions, training on working with virtual educating systems and platforms, communication and proper information transfer within the organization, educational management and leadership, hardware and software resources and facilities of the organization, and the organization's resilient environment and support. One of the important subcategories emerged from the current research interviews related to the spirit of empathy and cooperation prevailing in higher education institutions, particularly emphasized by educational and executive employees. The study by Shaya et al (2022) also emphasized the role of employees' cooperation and collaboration in the resilience of educational organizations. Furthermore, students complained about the changes in educational systems and platforms. administrative and academic staff also considered the constant changes in systems and their complexity as obstacles to resilience during a crisis, causing dissatisfaction among them and students. Alexander, Ashford-Rowe, Barajas-Murphy, Dobbin, Knott, McCormack, et al (2019) considered effective adaptation to online teaching methods dependent on access to regularly updated technology tools and services on laptops, mobile phones, and other devices. Reese (2018) believes that leadership requires the ability to predict and anticipate

the future, maintain flexibility, think strategically, and initiate changes that create a competitive advantage for the future. Waller et al (2020) implied that the lessons of leadership in a crisis apply to leadership generally wich includes good governance, personal integrity, capacity development, staff equipment, effective mobilization, good communication and responsiveness to needs, are essential application of leadership. The findings of Latif Sellami, Sawalhi, Henry Romanowski, and Amatullah (2019) also showed that a better understanding of educational leadership occurs when it is not limited to the educational environment but is present "everywhere" and "all the time". Yokus (2022) also regarded effective leadership during the COVID-19 crisis necessary to implement effective policies in line with the university's mission and vision, provide professional development, and train learners in new virtual learning methods. Shaya et al (2022) also listed leadership features during a crisis as a strengthening or weakening factor of educational organizations resilience. The data obtained from interviews indicated the importance of the organization's hardware and software resources and facilities in resilience. Dohaney et al (2020) believed that resources and support are the backbone of professional academic development. Staff and learners should be digitally competent, and infrastructure (virtual and physical) is necessary to support flexible learning. Abdullah et al (2020) also argued that in this unprecedented situation, access to resources such as quality information technology infrastructure and fast internet connectivity, apart from computer facilities such as laptops and personal computers, is essential. However, alongside all of these factors, the resilient environment of the organization, often derived from the organization's culture, goals, vision, and policies, was identified as an important factor affecting organizational resilience according to employees and faculty members.

Subcategories of social and economic changes, social support, and mass media communication were identified as social conditions affecting the resilience of higher education institutions. The results of the interviews showed that social and economic changes had significant and deep impacts on academics, and consequently, on educational institutions. Changes in academics' lifestyles also created different and sometimes conflicting conditions with the traditional learning and teaching conditions of educational institutions, leading to role conflicts within the home environment. Raghunathan et al (2022) also identified resilience research and understanding is as important as the pedagogical and technological aspects in an educational system as it is a trait that encompasses the people, the socio-economic system and their relastionships. The findings of the interviews indicated that especially students emphasized the importance of social support, both from family and friends and from other social institutions, in reducing anxiety and depression and increasing resilience. Eri et al (2021) also illustrated the deep anxiety of students during home quarantine, physical isolation, lack of communication with peers, changes in the usual lifestyle, and differences in social interactions and communication methods with educators and friends. Along with these issues, IT official and employees highlighted the role of internal messengers in maintaining communication with students and other academics and students with each other. Students and faculty members also referred to the role of mass media and social communication channels. Chan, Nickson, Rudolph, Lee, and Joynt (2020) also believed that well-designed free open access educational materials, along with traditional communication methods, could collect and disseminate key information in a clear and executable format through social media and social networks.

Subcategories of society's resilient culture, society's awareness of the pandemic and health protocols, government support and national internet infrastructure were identified as national intervening factors that contribute to the resilience of higher education institutions. Faculty members in interviews emphasized the role of society's resilient culture and the need to educate and strengthen it; as well as cultural development of resilience from schools, in the form of life skills training or hidden curriculum. In this regard, Ostadtaghizadeh, Ardalan, Paton, Khankeh, and Jabbari (2016) considered community resilience against disasters as "the ability of a community to coexist, cope with, and manage disasters through an integrated, comprehensive, participatory, and positive approach" and defined it for practical purposes as "the level of risks that a community can absorb without damage, the level of primary functions that remain active, and the period a community needs to return to normal conditions." In Iran, it takes shape as a comprehensive approach that makes disaster management effective and efficient in social, managerial, economic, cultural,

physical, and environmental areas. Participants in the research also found it necessary to raise society's awareness of the pandemic and to adhere to health protocols set by the government, health organizations, and national health agencies to reduce fear and anxiety and prepare the public for crisis response. Challenges related to internet connectivity were prominent as the main factor in weakening e-learning during pandemic as stated in many studies (Bao, 2020; Dawadi, Giri, and Simkhada, 2020; Mseleku, 2020). Also, in the study of online learning barriers, Baticulon et al. (2021) found that fast and reliable internet access and connectivity were a more important concern than device ownership or technical skills. Similarly, Chang & Fang (2020) stated that weaknesses in internet speed and stability led to many challenges for most educators in accessing online teaching tools. Also, evidence from study of (Mseleku, 2020) indicated that reliable network infrastructure, access to internet data, and digital learning devices such as smartphones, tablets, and laptops were essential for students to ensure online learning and education.

Continuous and unpredictable global changes, global digitalization, preventive measures such as global vaccination and proper global dissemination of pandemic-related information were identified as global contextual factors. Concepts derived from the interviews indicated that constant unpredictable global changes must be accepted, and the necessary readiness for these increasing changes must be achieved to increase individual, organizational, national, and global resilience to cope with them. Waller et al (2019) also considered awareness and understanding of these changes and preparing thoughtful, adaptive, and agile responses as the key to successful change management during the COVID-19 era. The academics participating in the study agreed that is necessary to keep pace with the phenomenon of global digitalization and fill the gap between our country and digitally advanced countries as quickly and efficiently as possible in order to be able to withstand crises such as this pandemic and be more resilient. Appolloni, Colasanti, Fantauzzi, Fiorani, and Frondizi (2021) also argued that in a knowledge-based society especially for higher education, globalization and expanding the internet and other technology devices have encouraged the need for new learning formats and the diffusion of digitalization. Findings showed that many academics considered global vaccination and, consequently, national vaccination as the most crucial step in increasing hope and resilience in response to this unpredictable virus.

Resilience strategies were categorized into main categories of prediction and prevention, response and coping, and adaptation and compatibility. Acceptance of reality, needs assessment, strategic planning and policymaking were identified as prediction and prevention strategies. Most academics agreed that the first step in resilience strategy in this crisis is acknowledging and accepting the facts and realities. This is an alarm that crises and natural disasters should be predicted in educational institutions before they occur. Based on studies (Bartuseviciene, Pazaver and Kitada, 2021; Duchek, 2020; Shaya et al, 2022), the prediction stage consists of two main capabilities - observation and identification and preparation. Kantur & ISeri-Say (2012) also cited a positive understanding of experience as a principle of organizational resilience that emphasizes a constructive tendency to problem-solving rather than avoidance or complaining. According to Coutu (2002), resilience is a reflection and a way of facing the world and understanding it, which is deeply ingrained in an individual's mind and soul. Resilient individuals and companies, instead of screaming in despair and frustration, face reality with seriousness, make meaning of hardships, and create improvised solutions. Some faculty members participating in interviews, emphasized the needs assessment and needs creation in crises.

The factors of adapting to advanced digital technologies, improving technological literacy and fluency, finding innovative and creative solutions, strengthening intra- and inter-organizational communications, and upgrading systems and technical support are response and coping strategies. Academics agreed adapting to advanced digital technologies in current circumstances and in transitioning from the COVID-19 pandemic to post-pandemic era is inevitable and undeniable. This requires improving technological literacy and fluency among academics, individually and organizationally, with the support of educational institutions. Bento et al (2021) emphasized that teaching has its particularity, involving a variety of tasks, requiring professional skills and personal abilities. In this regard, effective change processes are essential, considering the new social and knowledge-related requirements that are innovating continuously. According to Alexander et al (2019), the

challenge for many universities and higher education institutions is to provide their academic staff and students with the necessary guidance to upgrade their digital literacy skills. However, only facilitating basic digital literacy among students and teachers to address complex needs in a digital society is insufficient. Findings from interviews showed that individual innovative and creative solutions, particularly from educators and education and research deputies, were successful in promoting better teaching methods, especially at the beginning of the crisis. More research is required to investigate such solutions' direct relationship with the acceptance and role satisfaction of faculty members. Bryson and Andres (2020) assert that universities must develop innovative solutions for providing high quality education. The new challenges related to online teaching and learning should foster creative thinking and innovative solutions in this regard. Strengthening intra- and inter-organizational communications to get easy access to department managers and directors, executive deputies, and faculty members was a significant factor in promoting learning and as a result, resilience of students. In this period, the role of university guidelines, regulations, and circulars was evident. Dohaney et al (2020) identified effective communication channels and cohesive communication strategies at all levels of the institutions, as the two main characteristics of resilient institutions in the face of disruption in learning and teaching programs. Educational system changes and their technical support were also a significant concern for academics. It seemed that these changes and lack of strong support, affected the process of teaching-learning and subsequently, institutional resilience at the beginning of the crisis. However, by adopting strategies to upgrade systems, utilizing user-friendly systems along with creating educational content on how to use them and benefiting from informed technical support, students' concerns diminished.

In this research, main categories of adaptation and compatibility strategies were identified by subcatogories of adaptation to innovative educational and evaluation methods, attention to the physical and mental health of academics, and monitoring and feedback. At the beginning of the crisis, students and faculty members had deep concerns about adapting and adjusting to new educational and evaluation methods that could properly measure students' knowledge, skills, and performance. Gradually, more effective strategies were adopted after one or two terms from the start of the crisis. Bozkurt (2022) also concluded in his study that the survival of higher education depends on the resilience, adaptability, and sustainability skills of higher education institutions. Eri et al (2021) also stated that students, employees, and other facilitators had to spend more time online and off-site, forcing all to constantly adjust and adapt themselves to changing teaching and learning pedagogy. Wadi, Nordin, Roslan, Tan and Yusoff (2020) also demonstrated that although digital tools can enhance educational values and online learning is an important part of university education, it should be noted that an absolute move toward online education is not the best long-term plan and has a complementary role. Eringfeld (2020) also believed that universities will need to expand their blended approach to education after COVID-19. Additionally, interviews revealed that attention to physical and mental health of academics was an important point that policymakers and strategic planners should consider it. Academics mainly, demanded physical, mental, and emotional support, maintaining their health and safety in dealing with COVID-19, constant monitoring of the implemention of protocols in universities, and the possibility of in person and online counseling, especially for students. Given that Iranian and global higher education institutions were not prepared to deal with this unknown crisis at the outset, most strategies and solutions were based on trial and error without prior planning; such as conducting online final exams and evaluations, which had shortcomings that required constant monitoring, feedbacks and gradual modification of the strategies after receiving feedback. Baumber et al (2021) in their research, also emphasized the importance of information flows, feedbacks, self-organization, leadership, openness, trust, equity, diversity, reserves, social learning and nestedness in the resilience of higher education systems.

The consequences of resilience have been divided into two main categories of short-term and long-term consequences. Subcategories of turning threats into opportunities and organizational flexibility and agility were mentioned as short-term consequences of resilience. Concepts derived from interviews with Master's and PhD students revealed that they considered this crisis as an opportunity to optimally use virtual workshops and classes inside and outside the country. Faculty members also listed the opportunities that, if virtual

education technology systems were properly utilized and infrastructures were provided, could effectively reduce costs and wasted time in traffic in major cities. It could also create equal educational opportunities for remote students. In addition, it was an opportunity for more flexible curriculum and the use of a wider time spectrum, such as early morning or late afternoon hours for some working students who were unable to attend classes physically. Moreover, reducing redundant rules and regulations provided an opportunity for organizational agility. The spread of COVID-19 provided opportunities for new research in new areas, more use of digital data collection methods, and wider virtual dissemination of research results that researchers and academics faced with new experiences in the digital world, which were essential for their capacity development. Peimani and Kamalipour (2021) also noted that for optimistic academics, mandatory transition in the light of the coronavirus crisis could inform different forms of change that were long overdue. The role of information technology in creating agility was demonstrated, and it was emphasized that "achieving a desirable faculty members" is a factor that encourages agility (Delos Reyes et al, 2022).

Factors of growth, progress, and digital transformation and greater empowerment and resiliency in the face of future crises were raised as long-term consequences of higher education institutions' resilience. According to some faculty members who also had executive responsibilities, this crisis was a test to measure the resilience and stability of universities so that they could evaluate themselves and be able to reach developments that could have taken several years under normal conditions. As a critical experience, by learning from mistakes, they become more capable and resilient in dealing with future crises. Of course, this is achieved when they have learned the necessary lessons from this crisis and have become "wise" through this crisis; flourishing results from a cognitive shift in response to challenges. The study of Baumber et al. (2021) also showed that the resilient system characteristics require protection and strengthening to enable effective responses to future disruptions. Dohaney et al (2020), in line with this study, concluded that a greater understanding the role of resilience in higher education and the challenges faced by academics to perform their academic duties more resilient, facilitates ongoing resilience rather than responses to singular events.

The important limitations of this study include the restriction of the research population to students, employees, and faculty members of Islamic Azad University branches in Tehran, and the limited research background on the resilience of higher education institutions. Therefore, conducting further research on the resilience of higher education institutions in response to the COVID-19 pandemic, and conducting research on different types of higher education institutions such as public, private, and distance education is recommended. It is also suggested that the resilience model of higher education institutions should be designed separately based on interviews with graduate students, employees, and faculty members, and their results should be compared. Based on the findings of this study, experts and planners of higher education institutions can benefit from the designed resilience model in responding to the COVID-19 pandemic and effectively cope with it. Therefore, the preparedness of higher education institutions to respond to the COVID-19 pandemic requires the enhancement of resilience, which is not limited to the organization and its employees, but also relates to students and other factors arising from this research.

Ethical Considerations

This study was approved by the Ethics Committee of Islamic Azad University - Central Tehran Branch with the code IR.IAU.CTB.REC.1400.055.

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Authors' Contributions

The student was responsible for collecting data, conducting interviews with students, employees, and faculty members, and analyzing the data. The faculty members were responsible for supervising the data analysis and drafting, uploading, and revising the article.

Conflict of Interest

There was no conflict of interest in this study.

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