

Article

The Organizational Learning Role in Construction Organizations Resilience during the COVID-19 Pandemic

Rufaidah AlMaian ^{1,*}  and Amani Bu Qammaz ²
¹ Industrial and Management Systems Engineering Department, College of Engineering and Petroleum, Kuwait University, AlShadadyia 5969 Safat 13060, Kuwait

² Civil Engineering Department, College of Engineering and Petroleum, Kuwait University, AlShadadyia 5969 Safat 13060, Kuwait

* Correspondence: rufaidah.almaian@ku.edu.kw

Abstract: The speed of the COVID-19 outbreak forced decision-makers to implement emergency plans to mitigate the impact of the pandemic on their business. This research is conducted to study the role of organizational learning (OL) practices in construction organizations' resilience during the COVID-19 pandemic. The strengths, weaknesses, opportunities, and threats (SWOT) analysis was implemented together with the results of semi-structured interviews that were conducted immediately before the pandemic to learn how OL would help construction organizations survive during crises similar to the pandemic and create potential opportunities after the crisis that could contribute to ensure long-term sustainability. The results show that OL practices can assist construction organizations in surviving the threats of the pandemic and creating opportunities. The defined opportunities were distributed on three interrelated dimensions: management awareness, investing in information, communication technology (ICT), and standardized business practices. The results of the SWOT analysis revealed the inevitable need for OL-based business cultures. Therefore, it is essential for construction organizations to focus on implementing OL practices that would best assist them in being robust and resilient during crises and ensure their sustainable status in the long term.

Keywords: organizational learning; SWOT analysis; COVID-19 pandemic; construction industry; resilience; sustainability



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1. Introduction

Construction organizations, in most cases, find themselves forced to invest in building cumulative experiences to increase their opportunities for successful endeavors [1–4]. Most opportunities in the construction industry are subject to the capability of the construction organizations to demonstrate the required level of experience to undertake construction projects; thus, the experience can become a crucial competitive advantage in the construction industry [5]. Moreover, the fact that each construction project is unique, the main product of a construction organization maximizes the need to optimize the learning process within the construction organization to aid in the success of such an industry [6,7]. It is argued that implementing a systematic approach toward organized and standardized business practices would assist in building a learning culture within the organization and capture the organization's experience for improving future performance [3,6,8,9].

On the other hand, [10,11] aimed to empirically validate the positive effect of learning on organizational resilience. The results of their study support the positive effect of organizational learning on resilience. Furthermore, [10] found that organizational learning showed to have a particularly strong positive effect on the adaptive capacity of resilience, compared to organizational resilience overall. They explained that to build a learning capability for organizational resilience, managers should foster an open system culture in their organization that is open to learning and adapting to be able to withstand adversity.

During a crisis similar to the COVID-19 pandemic, managers who adopt an open system culture have the chance to rebuild organizational structures for better information flow, such as implementing formal knowledge management structures [10–17].

The objectives of this research paper are to discuss the role of OL in supporting construction organizations' resilience during a crisis similar to the pandemic. Additionally, to discuss the role of OL in enhancing business practices and creating new opportunities in the post-pandemic era that support sustainable status in the long term.

1.1. Organizational Learning (OL)

The idea of OL as a philosophy was created by [18], implying that OL must be perceived as a series of communications and modifications at the individual level or group/team level and the organizational/institutional level. Since this theoretical overview of OL, many academics have investigated OL. For instance, [19] thought that organizations could learn through people seen as mediators. The individuals' learning activities are then preserved by a system of characteristics called an organizational learning system. According to [19], OL is a process of observing and fixing errors; these mistakes are elements of knowledge. Reference [9] described OL as a process of the organization to sustain and/or improve performance built on its experience. According to [20], OL is a dynamic multilevel process that begins with individual learning, leads to group learning, and then supports organizational learning. Refs. [21,22] concentrated on the knowledge part of OL. Reference [21] described OL as developing knowledge from the organization's employees and then applying that acquired knowledge in important processes, such as decision-making. Reference [22] defined OL as a dynamic process of forming, acquiring, and integrating knowledge to create the resources and skills that promote enhanced organizational performance. Table 1 depicts the evolution of OL definition and the concept area.

Table 1. OL description with its concept area.

OL Description	Concept Area	Authors
The process of observing and fixing errors. Errors are features of knowledge that inhibit learning.	Error correction	[19,23]
The process of the organization to sustain and/or improve performance is built on its experience.	Performance improvement	[9]
The changes in organizational knowledge induced by information processing enable an organization to find new ways of surviving and succeeding in new situations.	Knowledge and information	[8,21]
A dynamic multilevel process that begins with individual learning, leads to group learning, and then leads to organizational learning.	Multi-level learning	[20]
A dynamic process of forming, acquiring, and integrating knowledge to create the resources and skills that promote enhanced organizational performance.	A dynamic process of knowledge	[22]

1.2. Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis

There exist several views regarding the origin of the SWOT analysis. Still, the most cited view is that SWOT was initially introduced by Harvard academics in the 1960s [24] and was promoted in the work of [25], who can be considered an innovator of the concept of the SWOT analysis; the concept has progressed since then. The SWOT analysis is commonly adopted for analyzing internal and external situations, encouraging the development of strategies that can cope with changing environments.

The SWOT analysis is a business strategy tool; it allows an organization to analyze its macro and micro business environments to identify the main issues impacting its business practices [25]. The SWOT analysis also helps the organization assess its strategic capability, which would affect its strategic planning and implementation of the strategy [26,27]. Furthermore, the SWOT analysis allows the organization to understand its capabilities in terms of strengths and weaknesses and how they would enable it to deal with changes in the surrounding environments. Therefore, reliable implementation of SWOT analysis is

anticipated to lead to the optimum market selection decisions and implement adequate competitive strategies [24–27].

As discussed earlier, the SWOT analysis concept was implemented and applied to study the role of OL in the resilience of construction organizations during the COVID-19 pandemic. Additionally, the tool was used to analyze OL practices in the construction industry before the COVID-19 pandemic and how the changes experienced due to the pandemic would create new opportunities for construction organizations with the help of OL practices.

In this study, the SWOT analysis tool was used to investigate the role of OL practices in the resilience of construction organizations during the COVID-19 pandemic. The research aims to reveal how OL helped construction organizations to cope with the threats initiated by the pandemic and would create opportunities following the COVID-19 pandemic. First, using the results from semi-structured interviews conducted immediately before the spread of the COVID-19 pandemic, we aimed to understand the strengths and weaknesses of OL practices in construction organizations. Then, we studied the construction industry's status during the COVID-19 pandemic to reveal the significant changes experienced in the construction business environment. Finally, we associated the proper or lack of proper investment of OL to the severity of the impact of the COVID-19 pandemic during and after the pandemic. The study also investigates the potential opportunities following the pandemic.

1.3. The Impact of the COVID-19 Pandemic

COVID-19 is an infectious disease caused by a coronavirus, SARS-CoV-2 (the novel coronavirus). The first cases were reported in late December 2019 in Wuhan, China, and on 31 December 2019, China informed the World Health Organization (WHO) about the outbreak of COVID-19. Due to the outbreak, by the end of January 2020, China imposed a lockdown on Wuhan, the source of the virus; by then, more than 30 cities across 26 countries were impacted. On 11 March 2020, the World Health Organization (WHO) declared COVID-19 a pandemic [28]. Since then, millions of cases have been reported worldwide, and all countries were at risk and needed to prepare for and respond to COVID-19 due to the escalated number of cases.

The COVID-19 pandemic has threatened the public health of the entire world. Moreover, the element of surprise and the novel dynamic nature of the pandemic represented a threat to the world, individual societies, and business practitioners, and consequently forced the governments to impose severe measures to control the spread of the disease.

As was advised by the WHO, one of the best measures to prevent or slow down the transmission of the virus was through promoting social distancing to limit human-to-human transmission. Accordingly, the world was in lockdown for many months. In addition to other measures that were implemented by local governments, such as total or partial curfews, quarantine, distance working/learning, and later when the vaccines were introduced, many governments have linked the vaccine to the individuals' ability to join their workplaces or being able to practice daily activities freely.

1.3.1. The Socioeconomic Impact of the COVID-19 Pandemic

The socioeconomic impact of COVID-19 is the social and economic impact that the pandemic has on individuals and communities [29]. In addition to the tragic consequence of the pandemic and its immediate risk to health and lost lives, the socioeconomic impact of the pandemic is catastrophic [29,30]. The widespread outbreak caused the world to be in lockdown for extended times since early 2020, and to date, the socioeconomic impact of the pandemic is still under research and investigation.

The uncertainty associated with how the pandemic has affected global business stems from being categorized as an unknown–unknown risk. It is a global crisis that no one would have predicted, and the extent of its impact could not be predicted as well since it was not preceded by any similar event at present [29,31].

The unemployment percentages increased dramatically, which required the governments to step in to offer recovery measures; the risk of layoff was valid for most workforces [29,31–34]. The Australian Institute for Health and Welfare (AIHW) found that the unemployed have a higher chance of dying and more illnesses than those of similar age who are employed [35]. Thus, the governments had to provide prompt responses to the escalated unemployment numbers, or they would face social crises in addition to the pandemic [29]. The pandemic and associated measures to mitigate and control the spread of the virus were expected to lead to the segregation of the societies and the people who would not be active members of their families. Therefore, some of the measures implemented at the early stages of the pandemic were offering paid leaves or incentives to the employees in the private sector [34,36]. Nevertheless, the pandemic lasted for an extended period, making the risk of losing jobs very high, particularly the types that require physical availability, and whose scope cannot be achieved from home [29,31–33]. These risks forced business practitioners to develop innovative solutions to overcome the consequences of the pandemic mitigation efforts on their business.

Worldwide implemented mitigation policies focused on the most impacted sectors, including logistics and small–medium businesses. Those policies include giving incentives (e.g., tax or customs) for business owners who keep their employees, supporting banks to reschedule debts, reducing or deferring any potential charges on impacted sectors, and creating funds to support the cash flow of the impacted sectors (e.g., deferring the debts installment for 3 or 6 months for the impacted sectors) [30,36,37]. The governments were advised to be transparent, open, and honest since the market is already severely impacted by uncertainty. Moreover, oil-producing countries were under pressure to resolve the oil conflict; due to decreased demand, oil prices decreased since airports and factories were closed [29,30,36]. The conflict complicated the situation. Most governments implemented measures to reduce unnecessary expenditures and target impacted individuals and sectors (e.g., provide programs to support the unemployed due to layoffs) [29–31]. Investment in the health sector was increased due to governments' efforts to mitigate the pandemic and end the crisis; it was believed that when the disease is seen to be controlled, the markets/economy could be stable [29]. Additionally, most governments worked to support and ensure liquidity in the money market (e.g., reduce interest rates and increase the government bonds budget) [36].

1.3.2. The impact of the COVID-19 Pandemic on the Construction Industry

The construction industry was not exempt from the impact of the pandemic; it was subject to the same consequences discussed under the socioeconomic impact of the pandemic and specific risks associated with the unique nature of the construction projects [38]. However, as can be expected, the impact was not the same and varied due to many factors. In addition, the severity of the impact on individual construction projects would be subject to many factors, including the project stage, location, site inventory, supply chain resilience, the effectiveness of remote/distance working, and the financial capabilities of the construction organizations [38–40].

Figure 1 depicts the sources of the impact of COVID-19 pandemic prevention measures from the global, country-specific, and project-specific levels. The figure reveals the higher-level measures that would have triggered the sources of risk to the projects' performance. As can be seen, the impacted resources were labor, materials, and project finance (i.e., money). On the other hand, health and safety are among the highly impacted issues, and protecting the health and safety of the workers during the pandemic would hinder the progress of construction projects.

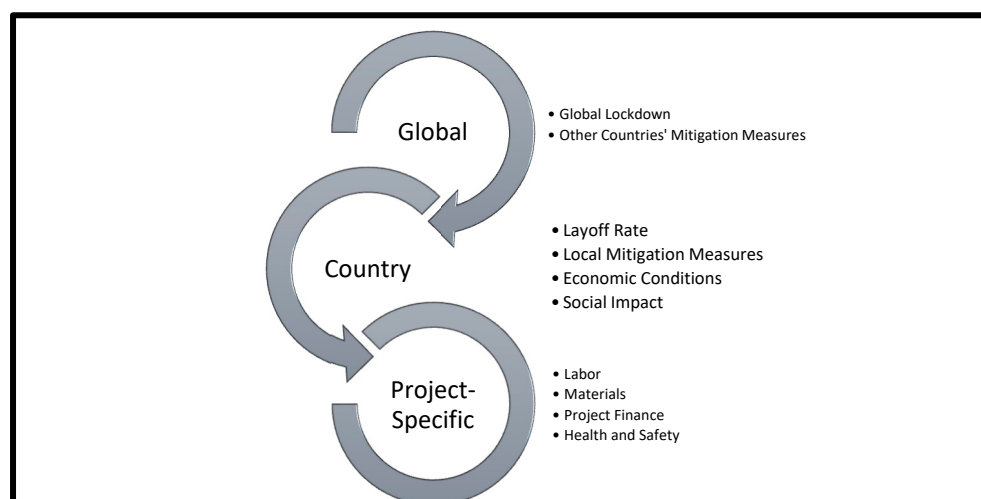


Figure 1. Sources of impact of the COVID-19 pandemic on the construction organizations.

2. Literature Review

The importance to study OL in project-based organizations, such as construction organizations, is evident in the literature because of the challenging nature of construction projects and the complexities to store and share the knowledge and lessons learned from one project to the other [3]. Every organization should learn from their experience and work on enhancing their performance, but the fact is that many organizations are lacking proper systems of learning [3]. In addition, many organizations suffer from a lack of commitment and support from top management which contributes to the unwillingness to share knowledge, and hence they repeat the mistakes in consecutive projects [7,41–43]. Moreover, some governmental organizations lack appropriate communication, coordination, and openness, which may lead to complexities in preserving knowledge [44].

There are barriers to both learning from previous projects and implementing OL practices. As for learning from previous projects, some barriers are a lack of resources and time to review lessons learned [4,7,42], a lack of investment in knowledge-based systems [42,45], and a lack of commitment to knowledge sharing [42,43]. Regarding implementing OL practices, some barriers include unsupportive culture for knowledge sharing [2] and a lack of resources [46]. In addition, there are barriers in government organizations, such as the bureaucratic culture and excessive rigidity [21,47]. Along the same lines, government interventions may affect execution and the learning process [5,48].

The management role is crucial in OL; it is important to build trust and motivation for sharing knowledge. Lack of management support may affect the learning culture in organizations [7,49]. To make OL workable, the management should invest to provide resources and technologies for learning and improvement [49,50]. In general, most project-based organizations are weak in using the accumulated knowledge in strategic decision-making [7]. OL should be promoted to the organizational level in which learning systems, structures, strategies, procedures, and supportive culture are implemented effectively [51].

The knowledge-based system is a strategic asset for organizations [52]. It is also important to develop and continuously improve systematic knowledge sharing, retention of experiences, ease of access to information, and communication [2,53] to ensure long-term effectiveness [54].

The COVID-19 pandemic put businesses through rigorous strategic resilience tests [15]. For the construction business, the COVID-19 pandemic introduced challenges that must be tackled effectively by organizations; it is worth considering the role of OL to support the organizations' resilience during a crisis, such as the pandemic. The pandemic led construction professionals to emphasize practicing new trends to enable construction organizations to survive and emerge stronger after the pandemic. Examples of such trends include increased digitization, investment in technology, investment in improving workforce skills,

and supportive culture to operate in the next normal. References [17,55] conducted a comparative analysis among construction organizations and concluded that it is important to use technology to control and mitigate the effects of the COVID-19 pandemic.

Some studies determined the strategies to control the impact of the pandemic; for example [55] determined the actions for controlling and mitigating the COVID-19 effect, including the use of cloud computing and/or data sharing technologies and databases to enhance the ease of access to information, the implantation and the encouragement for implementing the technology for data management in the short and long term, and the application of efforts to mitigate the fear of using the new technology by providing training, proper communication, and coordination among teams with supportive information when needed.

Connecting the discussion of OL with respect to the COVID-19 pandemic or similar crises, we can think of the mechanisms of how OL evolves with experience to build a solid foundation to tackle any problem or challenge. OL is a continuous learning mechanism that incorporates past experiences, political, and social contexts, and characteristics of new problems in order to find ultimate and effective solutions [13,56,57]. There are important components that either facilitate or inhibit OL, such as the process of creating, retaining, and transferring knowledge [56,58]. Additionally, the organization notes the lessons learned from past failures and mistakes and shares the information to improve their future performance and avoid repeating similar problems [13,56,58]. Hence, organizations can develop and improve in changing and challenging environments by implementing OL [13].

It is believed that building strong OL is one of the critical sustainable strategies to cope with complex and emerging problems [59]. So, the organization will be effective if they have a systematic process to collect, analyze, store, share, and use information with proper communication [46]. However, a lack of this systematic process may inhibit learning and thus may not face the challenges and problems effectively.

3. Materials and Methods

This research extends previous research, [6], undertaken to study OL in the construction industry. A semi-structured interview was designed to investigate the difficulties and barriers of OL in the investigated construction organizations, recognize the implementation efforts for OL with an assessment of the management role, and suggest practices that would improve OL. Based on that research endeavor, this paper used a SWOT analysis as a framework to reveal the role of OL in construction organizations' resilience during the COVID-19 pandemic and the potential opportunities in the construction industry following the COVID-19 pandemic with the help of OL and the fundamental changes in practicing business globally. The data sources used in the research included the semi-structured interview results. There were 15 interviews were representing both public and private sectors. There were reports, policies, local and global regulations, and governmental measures implemented by governments worldwide in response to the COVID-19 pandemic, and the response strategies that business practitioners implemented to mitigate the pandemic impact and overcome the risk of the pandemic. Finally, the available literature concerning the research objectives was also used in the SWOT analysis. Figure 2 shows the data sources that were used in this research.

The interviewed experts were selected based on their experience in the construction industry to ensure that their inputs would be reliable, reflecting OL status in both public and private sectors. Accordingly, the 15 interviewed experts' collective years of experience is 383 years representing different organizations, some of whom have international experience. The average experience is 25 years, where the expert with the least experience has 18 years, and the amplest experience is the expert having 34 years. On the other hand, the visited projects to conduct the interview had diverse profiles, including infrastructure, hospitals, governmental administrative buildings, towers, and residential buildings. Moreover, the

budget of the visited projects ranged from few millions US Dollars to almost one billion US Dollars. Table 2 reveals a summary of the interviewed professionals' information.

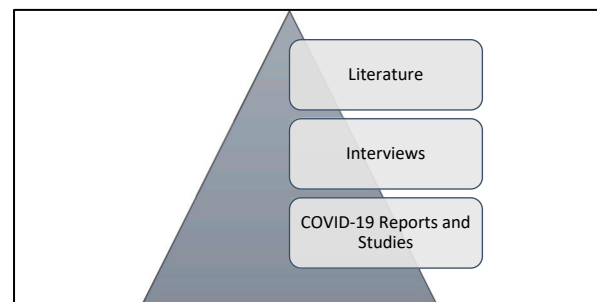


Figure 2. Research data sources.

Table 2. Summary of the interviewed professionals.

Interviewee	Experience (Years)	Project (No.)	Organization Age (Years)
EXPRT1	19	7	75
EXPRT2	29	15	75
EXPRT3	33	13	75
EXPRT4	20	10	75
EXPRT5	20	6	75
EXPRT6	18	7	23
EXPRT7	20	3	85
EXPRT8	25	9	52
EXPRT9	32	20	56
EXPRT10	22	6	25
EXPRT11	34	6	13
EXPRT12	23	20	5
EXPRT13	25	7	52
EXPRT14	32	10	50
EXPRT15	31	10	50

The experts were interviewed at the construction sites and the average interview time was 60 minutes. The methodology to analyze the collected data from the interviews was a qualitative data analysis by following sequential data analysis steps by [60–62] and the constant comparative method (CCM) [61,62]. The first step was developing codes to sort the data by using an open coding technique, as described in [60,62,63]. The second step was identifying patterns, themes, and relationships [60,64] to identify the data patterns. The third step was developing interpretations of findings by building a conceptual framework [65]. The last step was verifying interpretations through member checks, peer review, and triangulation [60,66,67]. More details for the qualitative analysis of the research can be found in [6].

The answers provided by the experts were used to derive inputs to the SWOT analysis of potential construction organizations' strengths, weaknesses, opportunities, and threats. Then, the results were examined against the status of the construction business environment during the COVID-19 pandemic. Thereon, one of the main objectives was to reveal the role of OL in assisting construction organizations to survive the fundamental changes in their business due to the implemented mitigation measures. Thus, the SWOT analysis examines how OL practices would support the construction organizations' resilience during the pandemic and help to cope with the threats induced by the pandemic. Moreover, the analysis discusses how OL can enhance its business practices and create new opportunities in the post-pandemic era. It is anticipated that OL creates advantages for construction organizations in having a sustainable business culture built on business continuity [68]. For example, OL allows reliable storing and sharing of knowledge to improve performance, reduce error, and prevent repeating the same mistakes. Table 3 summarizes the questions

in the interview that were used in OL and SWOT analysis. Following the table, Figure 3 depicts how the SWOT analysis was developed using the interview questions. It is worth mentioning that when the experts were asked to define OL based on their experience, their responses reflected that they were aware of the concept of OL and they perceive OL as a learning process for knowledge creation and sharing, investment in new methods, and the development of human resources, training, and administrative practices.

Table 3. The SWOT aspects derived from the interviews.

Question (Adapted from [6])	Category	Sub-Categories	SWOT Aspects
Why do similar problems persist in all consecutive projects?	1: Problems and learning	Internal reasons (controllable) External reasons (uncontrollable)	Internal reasons: Weaknesses External reasons: Threats
What are the barriers to learning from preceding projects?		Internal barriers (controllable) External barriers (uncontrollable)	Internal barrier: Weaknesses External barrier: Threats
What is the top management's role in preventing recurrent problems?		Supportive and involved Unsupportive and uninvolved	Support practices: Strengths Unsupportive practices: Weaknesses
Have you implemented any practices to support OL?	2: OL awareness and implementation	Yes No	If (Yes): Strength
What are the barriers to implementing the OL in the organization?		Executive support Employee support Time Money Value measurement Knowledge sharing infrastructure	Weaknesses
How can you improve OL in your organization?		Individual practices Team practices Organization practices	Potential Opportunities

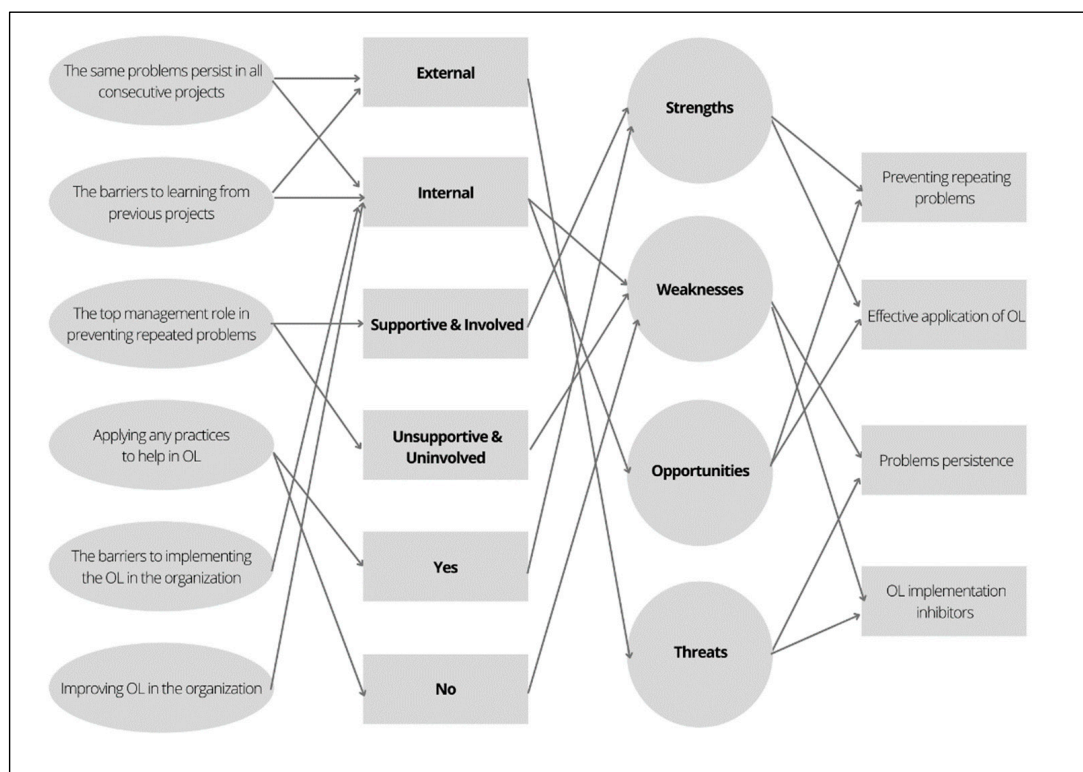


Figure 3. SWOT based on the interview questions.

4. Results/discussion

The information collected from the interviews was presented in Table 3 as the SWOT aspects. OL barriers were defined as potential threats or weaknesses of the construction organizations during COVID-19 depending on whether they were external or internal, while OL practices were presented as strengths and openings for potential opportunities. Then, in Figure 3, the outcomes of the SWOT analysis derived from the interviews were grouped into the four SWOT aspects. Under strengths, two outcomes were defined, namely preventing repeating problems and effective application of OL. Furthermore, problem persistence and implementation inhibitors were defined as potential weaknesses. On the other hand, opportunities would stem from the efforts to improve OL in the organization, leading to the prevention of repeated problems and effective OL implantation. Similarly, the defined external sources of problem persistence and OL inhibitors are the potential external threats. The following sections will discuss the four SWOT aspects in detail and their relation to construction organizations' resilience during COVID-19 and the potential for new opportunities following the pandemic.

4.1. Strength Aspects

Two questions from the interview were used to derive the organizations' strength aspects due to implementing OL practices within construction organizations during COVID-19. The first question is "What is the top management's role in preventing recurrent problems?" If the answer to this question indicated that the top management was supportive, then the supportive practices described by the interviewed professional were considered potential strengths to OL supporting organizations' resilience during COVID-19. The second question is "Have you implemented any practices to support OL?" If the answer was yes, then the applications for OL were reflected as strengths as well.

The areas of described strength aspects are related to four management processes: planning, monitoring, reviewing, and communication. Finally, the outcomes of OL practices are preventing a repeating problem, which is associated with supportive practices, and the effective application of OL outcomes is defined from the implemented OL practices. Table 4 lists the organizational practices considered as strength aspects of OL. Examining the supportive or main OL practices reveals that the organizations that have already invested in OL before the COVID-19 pandemic established business cultures that are expected to assist them to cope with COVID-19 threats better than others where knowledge is not shared and individual employees do not communicate effectively with each other or with the management. This is true because the pandemic created unprecedented threats to business and its impact forced construction organizations to implement prompt responses which needed effective communication and collaboration [12,16,55,69,70].

Table 4. Strength aspects.

Supportive OL Practices—Management/Organizational Level. Adapted from [6]	
-	Setting goals aligned with the organization's vision and setting action plans accordingly.
-	Encouraging effective OL culture and teamwork (team spirit and trust).
-	Documenting and recalling the preceding mistakes and preventing similar mistakes from reoccurrence.
-	Monitoring and measuring projects' progress and performance, assessing the results, and altering future OL plans.
-	Reviewing the lessons learned and sharing the information. Regular meetings to discuss and learn, and issuing circulations with the problems and lessons.
-	Having the lessons learned reviewed as one of the project's required deliverables.
-	Issuing manuals and procedures (not for archive but insist on using them)—standardized business procedures.
-	Having a day out during project execution every 6–9 months outside the project location (hotel) to capture lessons for the specified period and to brainstorm learning suggestions and improvements.
-	Promoting ease of communication with top management to express opinions.
-	Accepting valid objections from mid-level managers with a willingness to learn and change.
-	Encouraging and improving open communication to share mistakes and knowledge without fear.
-	Invest in a database for errors and lessons learned.

Table 4. Cont.

OL Practices—Individual and Team Level. Adapted from [6]	
-	Proposing solutions to management to seek their support.
-	Organizing the teamwork among the engineers by assigning the proper responsibilities, as well as encouraging and motivating them.
-	At the beginning of each project, prepare mechanisms and procedures for construction materials and drawings approvals. (Trying to implement these mechanisms as soon as possible.)
-	Transferring knowledge to other team members.
-	Having a systematic approach to learning in every project to avoid repeating mistakes in the next project.
-	Using software to share information and project updates instantaneously.
-	Developing a knowledge-based system to access the required information quickly and easily.
-	Sharing the problems and lessons learned without fear (building trust among the team members).
-	Invest in self and team learning.

4.2. Weakness Aspects

Four questions were used to originate the weakness aspects. The first question was “Why do similar problems persist in all consecutive projects?” since weaknesses are related to the internal issues faced in the construction organizations, the answers sharing the internal causes of repeating the same problems were considered potential threats to the organizations during COVID-19. The second question, “What are the barriers to learning from preceding projects?”, also considered the internal barriers as threats. In the third question, “What is the top management’s role in preventing recurrent problems?”, the management’s unsupportive practices were listed as weaknesses. Finally, the fourth question, “What are the barriers to implementing the OL in the organization?”, was considered the internal barriers under the weaknesses.

The outcomes are grouped under problem persistence and OL implementation inhibitors. Table 5 and Table 6, respectively, reveal the aspects considered potential weaknesses resulting from the lack of OL practices in construction organizations. As described in Table 5, a lack of motivation and willingness to learn [7,41,42], the culture of blaming each other [71,72], and the governmental bureaucracy [21,48] are among the reasons for problem persistence. Additionally, the time limitation and workload [42,73], a lack of guidance [51,74], and other reasons related to barriers, such as a lack of a knowledge-based system, a lack of willingness to share knowledge, and unsupportive management practices, such as corruption, and unqualified decision making [5,42,51,75,76] are problem persistence outcomes that organizations should work their best to eliminate. It is worth mentioning that problem persistence outcomes are depicted in Table 5 under the internal reasons for problem persistent in consecutive projects, the internal barriers to learning from preceding projects, and the unsupportive management practices in preventing repeated problems [42,75]. In contrast, the internal barriers to implementing OL were categorized as implementation inhibitor outcomes; these are listed in Table 6. Construction organizations that have persisting problems are more likely to be vulnerable to the crisis, as having the same problems over and over reflects many weaknesses, such as poor learning [51,75], a lack of experience [74], poor documentation [5], poor communication [44], and a lack of standardized procedures [4,5]. On the other hand, organizations may resist OL practices due to the absence of management support and involvement [75], a lack of ownership [41,72], and a lack of taking responsibility, or it could be due to the culture and its lack of influencing power to share knowledge [7,21]. These aspects would become barriers to proper decision-making during a crisis that needs reliable and quick decisions, such as COVID-19 [13,70].

Table 5. Weakness aspects—problem persistence outcomes.

Internal reasons for problem persistence in consecutive projects. Adapted from [6]	
-	Lack of motivation and willingness to learn
-	Lack of managerial experience, in some cases
-	The culture of blaming each other but not learning from each other
-	The government sector bureaucracy and lengthy process for routine work and taking approvals
-	Problems related to design review and updates
-	Problems related to the decision-making process
-	Problems related to the lowest-bid contract
-	Lack of standardization of the required standards and regulations by the government
-	Lack of implementation of solutions and lessons learned
-	Continuous change in the management (political reasons)
Internal barriers to learning from preceding projects. Adapted from [6]	
-	Lack of motivation and willingness to learn (resistance to change and learning)
-	Lack of relationships among the employees
-	No guidance from top management
-	Lack of managerial experience in some cases
-	Time limitation and excessive workload
-	Regular changes in government rules and regulations affect the learning process
-	No mechanism to implement the procedures
-	Lack of strategic management
-	Lack of documenting the experience
-	Lack of ownership and taking responsibility in the government (everyone blames the other instead of learning from the mistakes)
-	The mentality of some of the employees for not sharing the information with others (knowledge is power)
-	The high turnover rate for the team members throughout the projects
-	Difficulty accessing the needed information quickly
-	Lack of a knowledge-based system or a systematic mechanism to share the knowledge and lessons learned
Unsupportive top management practices in preventing repeated problems. Adapted from [6]	
-	Problems are reported locally between middle management levels, not higher management levels
-	Refusal to implement OL because of lack of knowledge of top management
-	Lack of investment in youth (poor HR training)
-	Corruption
-	Lack of experience
-	Lack of qualified decision-makers

Table 6. Weakness aspects—OL implementation inhibitor outcomes.

Internal barriers to implementing OL. Adapted from [6]	
-	Lack of motivation and willingness to learn
-	Resistance to record lessons learned by some employees, as they may be held responsible for their mistakes or violations
-	Lack of upper management support and involvement
-	Corruption
-	Lack of ownership and taking responsibility
-	Time limitation and excessive workload
-	No incentives are given for sharing knowledge
-	Lack of understanding and appreciation for the importance of OL
-	Lack of a knowledge-based system (no commitment to use it)
-	Lack of coordination among the government ministries and authorities (every sector works independently)
-	Refusing to implement improvements and solutions because of limited authority given to change, and political reasons
-	The company culture and its lack of influencing power to share knowledge.
-	Lack of responsibility from the top management to promote the culture of knowledge sharing
-	Lack of mentoring for new employees to learn
-	Resistance to change
-	The mentality of not sharing knowledge
-	The difference in perspectives among the managers
-	Budget
-	Lack of investment in a knowledge-based system

4.3. Opportunity Aspects

It is argued that the fundamental changes in the business environments, including the construction industry, have created the potential for a better understanding of the inevitable necessity of implementing systematic OL practices. Due to the speed of the COVID-19 outbreak, there was a need for prompt response strategies to mitigate the consequences of the COVID-19 pandemic. OL-based organizations were more likely to cope with the threats imposed by the mitigation measures of the pandemic [10,14]. Therefore, construction organizations become more aware that OL practices can make them more resilient to survive crises similar to the COVID-19 pandemic [14,16]. The research aims to reveal how the changes in the external and internal environments of the construction organizations due to the COVID-19 pandemic have created potential opportunities for better practices and potential competitiveness for OL-based organizations.

Since early 2020, construction professionals have been trying to monitor the pandemic's impact on the construction industry, including the stakeholders, organizations, and projects. Soon after the outbreak, it was clear that the construction industry, like all other businesses, started to suffer the economic impact of the pandemic and the extreme measures implemented by the governments to prevent or at least control the spread of the coronavirus. Measures including lockdowns, social distancing, closed borders and airports, and suspension of imports from severely infected countries have directly and indirectly impacted the construction industry [17,55,69]. On the other hand, the extended feeling of insecurity about the fluctuation of the prevention measures due to the repeated COVID-19 waves and virus variants impacted the industry's decision-making process. As a result, the concept of essential construction was introduced to define the essential construction projects that activities must be supported to be continuous, and all others were at risk of suspending their progress.

In the early stages of the outspread in the US, the state of New York narrowed the description of essential construction, closing projects in the state and ensuing employees' safety, as the number of cases and deaths increased [77]. For example, all non-essential construction had to shut down except emergency construction [77]. Since then, the measures have fluctuated between total curfew, partial curfew, or opening the construction sites with reduced staffing to protect the health of the workers. Additionally, many owners had to cancel projects because of social distancing, and the financial situation does not allow them to proceed [78].

Similarly, most governments have decided to shut down unessential projects, where the definition of essential may vary, but the number of projects under shutdown is very high globally. The essential construction definition was broader in Kuwait and included public projects, particularly transportation projects. However, it is worth mentioning that even when the projects were allowed to continue their activities, the curfew and global lockdown impacted the progress on construction sites. However, the shutdown's impact is expected to be less for skilled trades, such as electricians, plumbers, and construction firms, and professionals for essential infrastructure or emergency and safety repairs [77]. These services are essential and must not stop.

It was believed that the pandemic would stay much longer than expected initially. Thus, business practitioners had to be innovative to overcome or mitigate the consequences of the prevention measures. Construction organizations started COVID-19 emergency protocols, including developing crisis/emergency teams to implement crisis plans, together with safety awareness training [38,78]. Worker numbers were limited on hoists, start times were staggered, workers' temperatures before entering sites were taken, and other measures were employed [38,55,77]. These measures caused daily progress to decline, and cost versus value analysis was needed to determine the feasibility of continuing or shutting down the construction sites [17,38]. On the other hand, layoffs or paid leaves were common decisions made in most organizations; working from home was also considered a viable option if physical availability was not required [55,69].

Based on the discussed risks resulting from the pandemic and the implemented responses, OL-based organization opportunities, and competitive advantage became evident in three interrelated dimensions: management awareness, investing in information and communication technology (ICT), and standardized business practices. Figure 4 depicts these dimensions together with proposed potential OL-based opportunities under each dimension. It is worth mentioning that these dimensions are not independent of each other; for example, when the management in an organization is aware of the importance of OL to their business it would be more involved and supportive of the efforts for regulated and systematic OL practices. On the other hand, investing in ICT and providing cloud systems and information and data management tools, and other ICT-related investments, helped the organizations to mitigate the lockdown and social distancing imposed because of the pandemic. Organizations that have the infrastructure for working from distance could ensure business continuity when physical availability is not a must for its employees (remote work) [16,17]. Moreover, ICT is an essential asset for standardized practices, such as business manuals and standardized procedures. Thus, it can be argued that these opportunities are related to both the internal and external environments of the construction organizations and thus, if seized, it would as well eliminate several OL threats and weaknesses and would improve the business practices and create better opportunities, and open new markets [12].

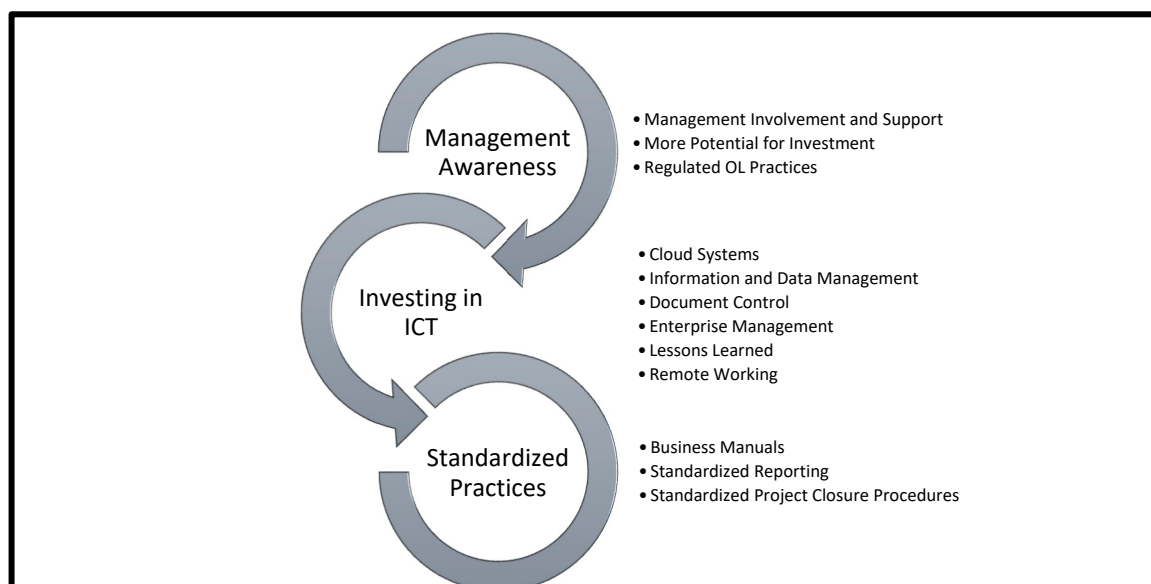


Figure 4. Potential opportunities for OL-based organizations during the COVID-19 pandemic.

4.4. Threat Aspects

Threat aspects examine the external environment of the construction organizations. Three questions were used to derive the threats. These questions are “Why do similar problems persist in all consecutive projects?”, where the provided external reasons for repeating the same problems were considered as potential threats during the pandemic, “What are the barriers to learning from preceding projects?”, and the external barriers were listed under the threat aspects, and “What are the barriers to implementing the OL in the organization?”, and again the external barriers are defined as potential threats to OL. Like the other aspects, the management areas are planning, monitoring, reviewing, and communication. Additionally, most of the outcomes may be considered under either problem persistence or OL implementation inhibitors. Table 7 includes the potential threats derived from the provided responses, such as the government bureaucracy [21], problems of the lowest bid and poor design [47,79], and lack of coordination [44]. The results show that regular changes in government rules and regulations affect the learning process [5,47] and may create barriers to learning from previous projects and barriers to implementing

OL within the organization. During the COVID-19 pandemic and due to the dynamic nature of the outbreak and the waves of the virus variants, governments were forced to have fluctuated regulations to control the spread of the virus. OL-based organizations were more likely to survive during this era because they are more flexible and do not face most of the defined OL implementation barriers which are expected to retard the organizations during the continuous changes of regulations [13,15,17].

Table 7. Threat aspects.

External reasons causing problems to persist in all consecutive projects. Adapted from [6]	
-	The government sector bureaucracy and lengthy process for routine work and taking approvals
-	Lack of planning, coordination, and communication among the government ministries and authorities
-	Problems related to poor design
-	Lack of motivation and willingness to learn
-	Problems related to the lowest-bid contract
-	Problems related to the decision-making process
External barriers to learning from previous projects. Adapted from [6]	
-	Regular changes in government rules and regulations affect the learning process
External barriers to implementing OL. Adapted from [6]	
-	The government sector bureaucracy and lengthy process for routine work and taking approvals
-	Regular changes in government rules and regulations affect the learning process
-	Lack of coordination among the government ministries and authorities (every sector works independently)
-	Lack of ownership and taking responsibility in the government (everyone blames the other instead of learning from the mistakes)

The next section discusses OL opportunity dimensions juxtaposing threats and weaknesses expected to be eliminated if the opportunities were seized effectively.

4.5. Opportunity Dimensions Juxtapose Threats and Weaknesses to Be Eliminated

The three proposed opportunity dimensions are coupled with the previously defined internal weaknesses and external threats for OL in the construction industry. The consequences of the pandemic, particularly in losing experienced employees and lost knowledge, made the management more aware of the need to capture the organizational experience in a more sustainable and resilient learning system instead of their employees, who may leave the organization taking all their experience with them. Standardized business practices would protect the organization from losing its experience. Thus, the management post-pandemic is expected to be more supportive and involved in OL practices than in the era before the pandemic [59]. Accordingly, better investment in OL may be expected. This would help overcome the barrier of the lack of motivation and willingness to learn in the organization. Moreover, the ICT and BIM (building information modeling) implementation were boosted rapidly due to the pandemic prevention measures implemented globally and locally [16,17,80]; it is argued that the increase's pace helped eliminate years of delays in the ICT investment. As a result, the government sector bureaucracy and lengthy processes for routine work and approvals can be improved. On the other hand, ICT and BIM tools are essential for OL practices, but OL cannot be effective without standardized business practices and standardized business culture. The pandemic has revealed that intuitive business practices may jeopardize the organization, as it hinders decision-making in critical situations due to the lack of proper information and data essential for educated and reliable decisions [70].

To close with, whether it is related to OL planning, monitoring, reviewing, or communication process, the defined opportunities for OL-based organizations if captured and properly invested would provide the optimum business environment that would eliminate most of the business risks related to poor OL practices, such as the ones clustered under the reasons for the same problems that persist in all consecutive projects or internal barriers for

learning from previous projects. In addition to creating supportive top management practices that help in preventing repeated problems and eliminating the internal OL barriers, the opportunities for OL-based organizations can help create more competitive advantage. Finally, the opportunities that stem from the changes that impacted the external business environment are expected to eliminate the external barriers to implementing OL.

5. Findings

As described in the previous section, the outcomes of the SWOT analysis derived from the interviews were grouped into the four SWOT aspects, with their relation to construction organizations' resilience during COVID-19 and the potential for new opportunities post the pandemic.

For OL-based organizations, under the strength aspects, two outcomes were defined, namely preventing repeating problems and effective application of OL. Additionally, opportunities would stem from improving OL in the organization leading to the prevention of repeated problems and effective OL implantation. For the strength aspects, we found that the supportive management team or individual OL practices disclose that the organizations that have already invested in OL before the COVID-19 pandemic built robust business cultures that are likely to assist them to cope with COVID-19 threats better than others with lack of knowledge sharing and communication. This is true because the pandemic created challenging threats and emerging problems to business and its impact forced construction organizations to implement prompt responses which needed effective communication and collaboration, and investment in knowledge-based systems and technologies that enable the organizations to pursue its work. For the opportunity aspects, OL-based organizations were more likely to cope with the mitigation measures of the pandemic while being resilient to survive crises similar to the COVID-19 pandemic. The research highlighted how the changes in the external and internal environments of the construction organizations due to the COVID-19 pandemic have formed opportunities for improved practices and potential competitiveness for OL-based organizations.

For organizations lacking effective OL practices, under the weakness and threat aspects, two outcomes were grouped under problem persistence and OL implementation inhibitors. For weakness aspects, construction organizations that have persisting problems are more likely to be weak to the emerging problems associated with crisis, as having the same problems over and over concludes many internal weaknesses in the learning system of the organization because of issues such as poor learning and communication, a lack of experience, poor documentation of lessons learned, a lack of knowledge-based systems and use of proper technologies for accessing the information when needed, and a lack of standardized procedures. The research found that inhibitors for OL implementation are the absence of management support and involvement, a lack of ownership, and taking responsibility, or they could be due to the culture and its lack of influencing power to share the knowledge. These aspects would become barriers to proper and agile decision-making during a crisis such as COVID-19. For the threat aspects, during the COVID-19 pandemic and due to the dynamic nature of the outbreak, governments were forced to have fluctuated regulations and mitigation measures to control the spread of the virus. Organizations lacking effective OL practices were not prepared to face the challenging external environment due to the COVID-19 pandemic. On the other hand, OL-based organizations were more likely to survive during this period because they are more flexible and their OL status can face the threats of the external environment that can be considered as OL implementation barriers which are expected to retard the organizations during the continuous changes of regulations and working conditions.

6. Conclusions

This research is a development of a previous study that aimed at assessing OL in the construction industry. The research aim is to discuss the role of OL in supporting construction organizations' resilience during a crisis similar to the pandemic. Additionally,

to discuss the role of OL in enhancing business practices and creating new opportunities in the post-pandemic era that support sustainable status in the long term. The SWOT analysis was implemented together with the results of semi-structured interviews that were conducted immediately prior to the COVID-19 pandemic to discuss how OL would help construction organizations survive during crises such as the pandemic and create potential opportunities following the crisis that could contribute to ensuring long-term sustainability. The research found that OL-based organizations that have already invested in OL before the COVID-19 pandemic built robust business cultures that would assist them to cope with crisis and threats, such as COVID-19. Organizations lacking effective OL practices, due to the fact that they have persistent problems, could contribute to their inability and weakness to cope with emerging problems and challenges in the external environment similar to as COVID-19. The study findings can be useful for construction practitioners and scholars interested in assessing the organizations' readiness for emerging problems and crises, such as the COVID-19 pandemic.

In this research, the results obtained from semi-structured interviews concerning OL implementation status in the construction industry were used as an eye-opener for construction organizations to realize the role of OL practices in construction organizations' resilience and the potential opportunities for OL-based organizations during the COVID-19 pandemic. The pandemic's impact on the construction industry was examined and it was found that the mitigation measures to respond to the pandemic created the need for prompt decision-making and innovative solutions to minimize the consequences on the industry. Construction organizations must make the best of the lesson learned from the catastrophic consequences and the fundamental changes that occurred in the global business, mainly in the ICT field. It can be argued that ICT is an essential pillar in OL-based organizations, and the changes in the use of ICT due to the pandemic prevention measures are dramatic. Online conferences or meetings, home working, and cloud investments are all potential opportunities for effective OL practices.

To close with, it can be concluded that construction organizations need to create an OL business culture and implement OL practices within their organizational structure to ensure their resilience by coping with any challenge that they may face and creating potential improvement opportunities that contribute to its sustainability in the long term.

The study did not examine the extent of the impact of the COVID-19 pandemic on OL practices, and the extent of the usage of OL opportunities by construction practitioners; this is considered a limitation. The work of this research did not evaluate OL practices under the strength aspects against specific actual organization performance during the pandemic. Additionally, the research used data from interviewing experts prior to the pandemic, and it cannot exploit the experience accumulated by the experts during the crisis period. In future work, it is important to investigate the extent of the impact of the business changes due to the pandemic on OL practices and to what extent the construction industry practitioners made the best of OL opportunities created out of the pandemic. Additionally, suggested future work can include investigating the effectiveness of OL practices by surveying a wide range of construction organizations to recommend strategies that could help in the development of effective response plans for a crisis.

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