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Impact of the Corona Virus Disease 2019 and the post-pandemic construction sector (Pakistan)

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Abstract

Purpose: The COVID-19 pandemic has negatively affected project management organizations especially those conducting large construction projects that involve a large number of people, complex supply chains, and due to lack of experience and preliminary arrangements in managing remote work. This study aims to analyse the impact of COVID-19 on the construction sector and how to minimise the effect of pandemic disruptions.

Design/methodology/approach: This study is based on the reviews of relevant reports, articles, and semi-structured interviews of the experts working in the Pakistan construction industry during the current COVID-19 pandemic. The primary data for this study was collected through semi-structured interviews with the construction experts and analysed them using thematic analysis. A total of 15 semi-structured interviews were conducted in this study.

Findings: Through thematic analysis, this study identified approximately 55 initial raw data themes, 15 first-order themes, 11 second-order themes, and 4 general dimensions of the impact of COVID-19 on the construction sector. The study identified working style and behavioural changes, challenges and risks, stakeholders, and new directions for the construction sector in the post-pandemic world as the four main dimensions of the pandemic effect on the construction sector. Further, lack of digitalization, complex cash flow, abundance of labour-intensive methods, diverse stakeholders, and dependencies on foreign expertise, imported material and machineries were identified as the most important reasons for poor resiliency of the construction sector during COVID-19 pandemic in Pakistan.

Originality/value: This study’s major contributions are: a) analysing the impact of COVID-19 on the construction sector in relation to Pakistan b) discussing new directions for the construction sector c) putting in place a set of mitigation measures that will help minimise disruptions in construction related projects to ensure that set objectives are achieved.

Keywords: Project management, pandemic, COVID-19, construction projects, adaptive project management approach

Article classification: Research paper

1 Introduction

Apart from being unique, projects represent new experiences and further address a new problem with new sets of management challenges which vary in nature and sources (Mir & Pinnington, 2014).
Growth and new developments in project management are still prevailing with the aim of managing the respective challenges. Researchers are focusing on a more project-specific framework rather than the classical one-size-fits all approach (Atkinson, 1999; Canonico & Söderlund, 2010; Shenhar, 2001). Dvir, et. al. (2006) maintained that it is crucial for success of each project to identify its type and apply appropriate project management approach. Various studies have suggested guidelines to select the right approach for managing each project differently, distinguishing among their project efforts (Shenhar & Dvir, 2007). All projects differ hence, they should not be managed using similar approaches (Sauser, Reilly, & Shenhar, 2009).

In addition to project specific challenges, external and unforeseen events such as war or pandemics put the projects at more risk. For example, the unprecedented nature of the current COVID-19 pandemic has brought uncertainty and has slowed down the activities in the construction sector (Alsharef, Banerjee, Uddin, Albert, & Jaselskis, 2021; Araya, 2021; ENR, 2020). Therefore, it is crucial to understand the nature of COVID-19 impact on construction sector to take right steps for getting out of it completely or adjust to the new normal.

The COVID-19 pandemic has caused unprecedented healthcare, economic, and social crises to the modern digital world. It has interfered with the routine activities across all sectors and organizations. Each sector and profession including project management in the construction sector, have been clouded by uncertainty. After World War II, COVID-19 is the biggest health, social, and economic crisis. The virus is highly transmissible which covered almost all world in no time caused hundred thousands of causalities (WHO, 2020b). Until 14\textsuperscript{th} of November, 2020, the virus has caused approximately 1,290,653 deaths and infected around 52,487,476 people in 214 countries and territories around the world (WHO, 2020a). It is a new virus, there was no cure or vaccine available to stop its infection in the first year of the pandemic. Therefore, the lockdown was a measure of last resort used to slow down the spread of virus that cannot be controlled through other means. Many parts of the world went through locked downs, which disrupted the global supply chain and led to the shutting down of different industries. This caused unemployment and delay in projects in different regions of the world. The fresh waves of the virus are felt in different countries such as Italy, United States, Spain, Russia, Pakistan etc. This pandemic also has significantly affected Pakistan. Until the 14\textsuperscript{th} of November 2020, the virus has infected approximately 349,992 people and consequently caused 7,055 deaths across Pakistan (WHO, 2020a). The unexpected nature of the pandemic has shaken the stability of each sector particularly construction sector in the country.

Construction projects have a very poor reputation for coping with the adverse effects of change, with many projects failing to meet deadlines, cost and quality targets (Smith, Merna, & Jobling, 2014). The unprecedented lockdown and supply restrictions during the COVID-19 pandemic have significantly affected the supply of construction materials (Jallow, Renukappa, & Suresh, 2020). The pandemic has a multi-faceted impact on the projects and has simultaneously brought changes to the schedules, budgets,
scope, and even project goals. It has also significantly changed the medium of communications as well as
the working styles to work from home and following certain protocols of confinement and physical
distancing in case of the need to be present at project sites. This poses as a serious challenge for
organizations to perform projects in the presence of prevailing fear and uncertainties in the markets.
Organizations face several issues while dealing with projects during a pandemic, including the management
of virtual teams, weak monitoring and reporting systems, poor data management, issues in stakeholder
relationships, shortage of required materials, financial issues, lack of public transport and restriction of
traveling, lack of medical facilities, abundance of fake information and rumours about the pandemic, and
consistent agony of workers at the project sites. Managing the delivery of projects during a pandemic has a
number of challenges that are difficult to address within the scope of the traditional project management
role. Addressing these challenges leads to economic consequences for the construction industry, which is
considered as an important pillar and organizational backbone of the economy (Khan, 2008; Weber, Staub-
Bisang, & Alfen, 2016). The construction industry contributes to the basic objectives of development
including income generation and employment creation (Ofori, 2012). In Pakistan, the construction sector
absorbs around 7% of the country’s total labour force, additional to its support for 42 allied industries
(PACRA, 2021). According to Pakistan economic survey 2019-2020, the construction sector at average has
contributed between 2.3% and 2.85% (around PKR 316 billion) in the last five fiscal years to Pakistan’s
GDP. These findings suggest that the survival of the construction industry is critical for avoiding the
expected financial crises in the aftermath of the current pandemic. As the industry will simultaneously help
to bring back society on track. Therefore, it is crucial to look for innovative methods for managing
construction projects in crises and opportunities provided by the current pandemic.

The COVID-19 outbreak brought unprecedented crises to the world caused human losses, financial
damages, disrupted social lives etc. Its social, financial, and most importantly psychological impact will be
felt for rest of our lives. However, an outbreak and crises can bring opportunities worth pursuing and
exploiting (Simard & Laberge, 2018) and lessons to learn from it (Hällgren & Wilson, 2011). For instance,
the current pandemic magnified the inefficiencies and weaknesses of the construction sector. This may help
the sector to grow faster and be more productive, and resilient against future crises. Therefore, studies are
required in different parts of the world to understand specific challenges to construction sector, explored
the opportunities, and look for proper mitigation measures. In this study, we have explained the impact of
COVID-19 on construction projects and presented a set of recommendations in the context of Pakistan that
can help manage projects during pandemics while considering the prevailing challenges to the projects.
This study will help to better understand the impact of COVID-19, the construction sector in the post-
pandemic world, reduce the disruptions to the essential projects and ensure that the intended objectives are
achieved. The study does not suggest the elimination of the traditional approach. Rather, the adaptive approach builds on it.

The rest of this paper proceeds as follows. Section 2 discusses previous literature that presents the theoretical background of the proposed framework for managing projects during pandemics. Sections 3 and 4 explain the research methodology and the results and discussion respectively. Section 5 discusses the results, contribution and limitations of the study, and future research directions. The section 5 also presents a set of recommendations that can help organization and project managers reduce the effects of disruptions caused by the current pandemic. Section 6 precisely concludes the study.

2 Literature review

Projects have unique objectives that are not routine operations and are at more risk and uncertain as compared with routine operations. Projects should be well planned and well prepared for beforehand. There are still a number of unanticipated events that disrupt project planning, causing overruns or failure of the projects. In some cases, the disruptions are tolerated when their effects are nominal. In other cases, the effects are significant hence the project cannot be ignored. This can rise to the level of crisis that affects everyone associated with projects and organizations in crisis. Reid (2000) states that no human or organization is completely immune to crises. The crises affect all organizations regardless of their sizes, as they are diverse in nature and come from a variety of sources. The most critical and difficult to manage crises were caused by natural disasters (Eid & El-Adaway, 2017). Crises cause inflation and shortage of material, equipment, and workforce, which lead to cost overruns, time overruns, and failure of projects (Pamidimukkala, Kermanshachi, & Karthick, 2020). They also cause acute psychological trauma to the individuals and societies (Kermanshachi, Bergstrand, & Rouhanizadeh, 2019). The current COVID-19 pandemic which has brought unprecedented crises to the modern world led to several new measures regarding social distancing, self-isolation, and travel restrictions. Following these measures, workforce across all economic sectors were reduced (Nicola et al., 2020). The United Nation report on trade and development also indicated that COVID-19 crisis may push 32 million people to extreme poverty (UNCTAD, 2020). Studies also highlighted the fear of increased domestic violence which includes physical, emotional, and sexual violence (Nicola et al., 2020). Researchers have analysed the impacts of COVID-19 on different sectors from various aspects. For example, Fernandes (2020) analysed the economic shock posed by COVID-19 to countries including the USA, China, Japan, Greece, France Germany, the United Kingdom, Canada, Greece, Brazil, Italy, Portugal, and Spain. The author found that for the countries analysed in the study, an average economic impact of -3.5% is expected. Helm (2020) also pointed out that the COVID-19 pandemic has severely disrupted economic activities worldwide. Ivanov (2020) studied the effect of the outbreak on the supply chain and found that the sector has been negatively affected and may
take longer to recover. Nicola et al. (2020) discussed the resiliency of primary sectors (firms involving extraction of raw material), secondary sectors (production firms), and tertiary sectors (service sector) in response to the COVID-19 crisis. They also showed that every sector has been affected by the pandemic (Nicola et al., 2020).

The construction industry does not readily embrace digitalisation (Davies, 2018). The industry is equally slow in embracing technological innovation despite poor productivity and low financial returns in the construction sector (Agarwal, Chandrasekaran, & Sridhar, 2016; Group, 2010). Researchers have compared the evolutionary paths of different sectors toward digitalisation. In their studies, Gasparini and Tornarolli (2015) found that in the United States of America, the construction sector is the least digitalised while the financial industry and business services are the most digitalised. The McKinsey Global Institute industry digitalisation index also shows that the construction sector is the least digitalised, followed by the agricultural sector. Similarly, Eurostat data show that the construction sector has adopted the lowest level of technology, which is just above the hotels and restaurants sector (Friedrich, Le Merle, Grone, & Koster, 2011). The construction industry seems to be undergoing the slow digitization process and poor research and development activities worldwide. The R&D spending of the construction sector is less than 1%, which is significantly lower than other sectors such as the automobile sector invest 3.5% and aerospace sector 4.5% on their R&D activities (Agarwal et al., 2016). Studies also show a high potential of approximately 47-45% for automation technology in the construction sector, which is the highest after that of manufacturing, trade, and agriculture (McKinsey Global Institute, 2019).

Apart from being complex, construction projects involve various types processes (Yang, Shen, & Ho, 2009) and stakeholders of different professional and cultural backgrounds (Mok, Shen, & Yang, 2015). Stakeholder management is more challenging following the temporary nature of construction projects (Yang et al., 2009) and the associated uncertainties (DE MEYER, Loch, & Pich, 2002). Stakeholders required close collaboration for instant responses to uncertain events (Read, Madani, Mokhtari, & Hanks, 2017; Yang, Shen, Drew, & Ho, 2010). Social distancing strategies during the COVID-19 pandemic have led to virtual interaction among stakeholders. This is however, a poor way of communication and simultaneously makes it difficult for stakeholders to build strong relationships (Wong & Burton, 2000).

Construction projects are well known for their ambiguity and complexities in forecasting cash flow (Zayed & Liu, 2014). The payment mechanism in construction projects is lengthy and complex (PWC, 2019), which is prone to the risk of price escalation and liquidity issues. The disruption caused by COVID-19 further increased the risk of insolvencies in the sector due to delay in payments from the sponsors and unexpected rise in expenses because of certain new safety measures and price rises (Alsharef et al., 2021). Furthermore, the complexity of construction projects and the use of labour-intensive methods make the construction sector more vulnerable to the COVID-19 pandemic (Araya, 2021). Various types of workforce,
such as labour, foreman, technical staff, and supervisors, need to work closely within a limited space of construction sites. Therefore, the sector was more prone to the COVID-19 pandemic and struggled in addressing the challenges of the current pandemic. This study discusses the impact of the current pandemic on the Pakistan construction sector in detail, the post-pandemic construction sector, and the measures required to minimise the disruption in construction projects in case of future crises.

3 Research Methodology

The unprecedented nature of the coronavirus outbreaks has brought severe public health crises and consequently disrupted social and economic activities in an unparalleled proportion in modern history. The problems facing the project management society in managing projects during the COVID-19 pandemic are unexplored and unprecedented in the modern digital world. Therefore, we used a qualitative research method, which is considered suitable for investigating new fields of study or theorising prominent issues (Corbin & Strauss, 2014; Creswell & Poth, 2016) in this study. There are many qualitative methods that are developed to provide an in-depth and extensive understanding of the respective issues. The most common types are interviewing and observation (Creswell & Poth, 2016). In this study, we used semi-structured interviews method for collecting data. The following subsection discusses the procedure and contents of interviews, participants, and methods of analysis in detail.

3.1 Semi-structured interviews

Semi-structured interviews are commonly used to collect data in social sciences (Bradford & Cullen, 2013), following their comprehensiveness to allow researchers to view and experience (Flick, 2018). They consist both closed-end and open-end questions accompanied by follow-up why or how questions so as to understand the various aspects of the problem at hand (Newcomer, Hatry, & Wholey, 2015). Semi-structured interviews provide flexibility and freedom to obtain a more realistic picture of the participants’ views (Gruber, Szmigin, Reppel, & Voss, 2008). In this study, data were collected through semi-structured interviews from the construction experts. A total of 15 construction experts carrying out projects in the current pandemic were interviewed. They were sent a brief outline of the purpose of the study and assurance of the confidentiality of their identities. The interviews were conducted individually through zoom video conferencing, which lasted from 30 to 40 minutes. The challenges and changes that occurred in the construction sector, long-term and short-term impacts of COVID-19 on the construction sector, reasons for poor performance of the construction sector, and mitigation strategies to reduce the disruptions in the construction sector during the pandemic were discussed in the interviews.
3.2 Participants

We used a purposive sampling technique which involves drawing samples that are both easily accessible and willing to participate (Tashakkori & Teddlie, 2010). The purposive sampling approach was used to select the construction experts that are willing to participate their experiences and opinions about the impact of COVID-19 on construction projects in articulate and expressive manners. The attributes of construction experts followed in this study are similar to those defined by Fei and Khan (2015) in their study. According to their definition, a construction expert is a person that is older than 30 years and has been working as a manager in a particular industry for at least ten years. Other researchers have also adopted the same definition of construction experts in their studies (Gamil & Alhagar, 2020; Gamil, Rahman, Nagapan, & Alemad, 2017). The participants of this study have at average 17-years working experience ranging from 12-23 years and have worked as managers for at least 10 years in a single Pakistani construction organization. They were fully aware of the issues of the construction sector in the country. Therefore, their feedback is critical in understanding the challenges facing the construction sector in the current pandemic.

3.3 Thematic analysis

Thematic analysis is a qualitative research method that is independent of any particular theoretical approach (Braun & Clarke, 2006). It is used to identify, analyse, and interpret patterns within qualitative data for providing an in-depth understanding of the respective issues. Theoretical freedom provides more flexibility to thematic analysis that can be modified for diverse studies (Braun & Clarke, 2006; Cassell & Symon, 2004). It is best suited for situations in which researchers are interested in examining how people make meaning out of their experiences (Evans & Lewis, 2018). Therefore, we opted for thematic analysis in this study for investigating various aspects of the impact of COVID-19 on construction projects. We applied the procedure of thematic analysis suggested by Braun and Clarke (2006) as shown in Table 1. The applied procedure offers a clear and usable approach for doing thematic analysis (Maguire & Delahunt, 2017).

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Familiarizing with the data</td>
<td>Transcribe and read the data</td>
</tr>
<tr>
<td>2</td>
<td>Generating initial codes</td>
<td>Coding the points of interest and organized the themes</td>
</tr>
<tr>
<td>3</td>
<td>Searching for the themes</td>
<td>Gather the relevant codes to identify potential themes of higher order</td>
</tr>
<tr>
<td>4</td>
<td>Involved reviewing the themes</td>
<td>Review the potential themes and generate a thematic map</td>
</tr>
<tr>
<td>5</td>
<td>Defining and naming themes</td>
<td>Refining the themes and naming them clearly</td>
</tr>
<tr>
<td>6</td>
<td>Producing the report</td>
<td>Analyzing the themes and produce the report</td>
</tr>
</tbody>
</table>
3.4 Trustworthiness and validation of the results

Researchers have used many techniques to improve the trustworthiness of qualitative data. The transcribed interviews were evaluated by different coders so as to confirm that the analysis in this study represents the participants’ descriptions. First, the interviews were transcribed and coded by the authors as per the procedure of the thematic analysis. They thereafter asked another experienced qualitative researcher who was unfamiliar with the content but was familiar with the theoretical background, to read the transcripts and code it as an independent coder. The coding of the independent coder was compared with the researcher’s coding to see if there was any discrepancy. This method increases the conformability of the research by reducing the biases and subjectivities of the researcher (Brewer & Sparkes, 2011). Third, the themes were cross-checked by all the authors in a group discussion. Fourth, the transcript and researcher’s interpretations were sent to the participants to reflect their opinions on the interpretations. The participants confirmed these interpretations. Further, no themes were amended or adjusted.

4 Results

The data collected in this study through semi-structured interviews are intended to analyse the impact of the current pandemic on the construction sector using thematic analysis. Using the procedure of thematic analysis, we identified 55 raw data themes, 15 first-order themes, 11 second-order themes, and 4 general dimensions from the interviews of construction experts. Raw data themes are the basic themes, which have been connected through first and second order themes with the highest categories known as general dimensions using data structured frameworks [see Figure 1 and Figure 2] in line with Corley & Gioia, (2004) and Gioia, Corley, & Hamilton, (2013) in their respective studies. The frameworks used in this study provide graphical representation of how we progressed from 55 raw data themes toward four major dimensions. It helps us to think theoretically about the data, which is a key component of demonstrating rigor in qualitative research (Tracy, 2010). The following subsections discuss each general dimension in detail.

4.1 Working and Behavioural changes

All the construction experts that participated in this study noted that the current pandemic brought changes to the behaviour of stakeholders and their working styles. In their interviews, the construction experts discussed 7 raw themes as shown in Figure 1. The raw themes include social distancing, hygiene and safety protocols, frequent usage of technology for communication, modification of working hours, remote project management, travelling limitations, and wearing standard working attires while working on
the construction sites. The Pakistan government re-opened the construction sector and the associated industries amid the outbreak. Consequently, they issued strict guidelines for the health and safety of building and construction workers so as to reduce the risk of epidemics following internationally recognized precautions for the respective sector (Ministry of National Health Service, 2020). Adhering to the COVID-19 protocols brought tremendous changes to the behaviour and working styles of the management and operational staff at construction sites. As one expert noted, *face-to-face meetings were replaced by zoom meetings, staff were encouraged to work from home as much as possible, work was carried out in different shifts instead of a single shift, travelling restrictions were implemented, and personal and workplace hygiene and safety were made mandatory.* This pandemic will eventually pass. However, the changes it brought to the working styles and behaviour of the stakeholders will persist for years and years to come.

### 4.2 Challenges in Risks

The experts in this study discussed multiple challenges facing the construction sector during the COVID-19 pandemic, such as financial issues, uncertainties in achieving goals and objectives, risk and risk response, etc. Through the thematic analysis of their interviews, 13 raw data themes, 4 first-order themes, 2 second-order themes were identified under the challenges and risks general as stated in Figure 1.

Organizations faced liquidity issues (reduction of cash), delays due to lockdown, shortage of material, slowdown of activities, high market uncertainty etc. To address these challenges, they adopted a reactive approach by laying off and dismissing employees, deducting salaries, closing supportive departments, unpaid vacations, etc. As one expert pointed out, ‘*organizations are suffering following delays in the completion of projects and the reception of funds from the partners, which has led to liquidity crisis. Therefore, organizations have cut on their expenses mainly by deducting the salaries and wages of their employees*’. The pandemic makes it possible to identify, evaluate, and address the challenges to the construction sector and its weak areas.
Raw Data

<table>
<thead>
<tr>
<th>1st Order Themes</th>
<th>2nd Order Themes</th>
<th>General Dimensions</th>
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<tbody>
<tr>
<td>Working style and behavioural</td>
<td>Working style and behavioural</td>
<td>Working style and behavioural</td>
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<tr>
<td>Financial issues changes</td>
<td>Financial issues and Interruptions</td>
<td>Challenges and risks</td>
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<tr>
<td>Interruptions</td>
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<tr>
<td>Uncertainty</td>
<td>Risk</td>
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<tr>
<td>Reactive approach</td>
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<td>Management</td>
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<td>Project team</td>
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<td>Operational team</td>
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<td>Workers</td>
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<tr>
<td>Recruitment and training</td>
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<tr>
<td>Stakeholders</td>
<td></td>
<td></td>
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<tr>
<td>Stakeholders’ interactions</td>
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</tbody>
</table>

- Social distancing (restriction of large gathering)
- Hygiene and safety protocols such as hand sanitizers, wearing mask, avoiding physical contacts, regular temperature checks, and using hygienic food and facilities.
- Using technology such as zoom, skype etc., for virtual meetings
- Modification in working hours (employee roster)
- Remote project management
- Travelling limitations of site team and banning entry of outsiders to the construction sites
- Compulsory wearing standard working attire

- Liquidity crisis
- Fund transferring issues amongst partners

- Suspension of all construction activities during lockdown from march 24 till 14 April 2020 (lockdown continue till May 09, 2020)
- Frequent interruption of planning and scheduling
- Delays in project related legal issues
- Disruption of imported construction material supply

- High uncertainty and difficulties in project estimation
- Uncertainty in Quality of local materials
- Uncertainty of receiving fund and materials

- Layoff and unpaid vacations
- Deduction in salaries
- Closing supporting departments and dismissal of the concerned employees

- Assurance of health and safety of site team
- Frequent and multi-channel communication approach
- Updating relevant authorities about implementation status of government working protocols
- Communicating and assisting operational team in implementing project plan (without face-to-face meeting)
- Trust building within team in absence of senior management on construction site
- Continuous motivation to project team (pandemic caused mental stress to each person)
- Understanding of the situation of the team member on construction site and resolving their issues from home
- Medical arrangement in case of Corona infection on construction site

- Difficulty in overseeing the activities on construction site all the time
- Continuous concern of virus contagious to operational team
- Shortage of protective gears at construction site
- Challenge of site hygiene and decontamination
- Reducing the availability of the support staff

- Continuous concern of virus contagious on construction site
- Travelling limitations and meeting with family members
- Declining worker’s productivity during pandemics because of continuous mental stress

- Difficulties in recruitment process
- Difficulties of on-site training of new and existing staffs
- Difficulties in communication to the new staff member without getting chance to have face-to-face meeting

- Communication of clients with contractors, designers, and suppliers via digital tools without visiting sites
- Suspension of engagement with community
- Strong liaison among main stakeholders (Clients, contractor, and consultants)
- Government intervention (grant, monetary relief, relaxation in taxes)

Figure 1: Impact of COVID-19 on construction sector
4.3 Stakeholders

Multiple stakeholders such as senior managements, operation teams, sponsors, consultants, government authorities, community members, and users are involved in construction projects. Evidently, the role of stakeholders and their interactions changed drastically following the COVID-19 pandemic. As shown in Figure 1 that in interviews with construction experts, approximately 24 raw data themes, 5 first-order themes, 3 second-order themes were identified under the stakeholder dimension using thematic analysis. The analysis shows that it was crucial for the management to ensure the implementation of health and safety protocols, the need to motivate and recharge staff, and have frequent virtual communication so as to get regular updates. The pandemic also affected site monitoring, engagements with team and community members, recruitment processes, mobility, and the interactions of stakeholders. Further, it caused an increase in the contractors’ expenses and shortage of funds from the sponsors. In view of the economic consequences of COVID-19, the Pakistan government released a relief package for the construction sector (RSM, 2020). The COVID-19 brought multi-faceted challenges to the construction sector and to the stakeholders regardless of their level of involvement in the projects. One of the experts stated that the current pandemic affected all the stakeholders in the construction sector, including the government, users, sponsors, consultants, project management, and operational teams.

4.4 New directions

Amid a calamity, someone rightly said that ‘this storm will pass, but the choices we make now could change our lives for years to come’. The effect of current pandemics will also be felt in decades to come. Experts in this study also noted that COVID-19 has long-term impacts on the construction sector. Figure 2 shows that from the interviews, 11 raw data themes, five first-order themes, and five second-order themes were concluded under the general dimension of the new direction of the construction sector. An experts noted in the interview that this pandemic can be appeared as a blessing in disguise for the construction sector. The pandemic showed new directions to the sector, which are need to be followed. This may help the sector to grow more rapidly and independently. For instance, focusing on localisation will make the sector improve local supply chains and reduce dependencies on foreign material, machinery, and expertise. This will help to develop local expertise, associated manufacturing industries, and the quality of local material. Further, the construction sector is considered one of the least digitalised sectors. It is slower in accepting new technology as compared to other sectors. The sector felt the need of digitalization during the pandemic more than ever following social distancing protocols, and mobility restrictions. The pandemic may help in changing the mind-set to invest more in technology to bring the construction sector as par other sectors. Moreover, developing centralised data management systems for easy access to information and encouraging off-site construction to reduce delays are other aspects that have received attention during the
current pandemic. In post-pandemic situations, stakeholders will also take into account the various clauses of contracts, such as those of force majeure, price modification, extension of work delivery time, health insurance, and safety protocols. One of the experts noted that the post-pandemic construction sector will be more localised, highly digitalised, and more resilient to external changes. In the light of above discussion, we can conclude that the post-pandemic construction sector can be more developed and stable as compared to current construction sector.

5 Discussion

The current COVID-19 pandemic is a reality check on the performance of the construction sector. It has magnified the weak areas and inefficiencies of the sector, which have always been ignored. The following subsection discusses the reasons for the poor resiliency of the sector in responding to the COVID-19 pandemic.

5.1 Discussion of the results
The study aims to identify the impact of COVID-19 on the construction sector and how to minimise the effect of pandemic disruptions. In this study, working styles and behavioural changes, challenges and risks, stakeholders, and new direction were identified as the four main dimensions of the pandemic effect on the construction sector. During the current pandemic, the construction sector was affected in multiple dimensions. The pandemic highlighted the concepts of virtual teams and remote project management. Most face-to-face meetings were replaced by Zoom or Skype meetings. Health and safety protocols were strictly implemented in construction sites in order to control the disease. The sector faced issues such as supply chain disruption, delay in funding, delay in legal issues, increase in additional expenses (frequent jobsite sanitization, increase in material prices, lack of public transport, etc.), insolvencies of contractors, and the absence of foreign expertise. Consequently, a number of projects got suspended, temporarily stopped, or slowed down. Generally, in the current pandemic construction sector came up as one of the poor resilient sectors to the COVID-19 pandemic. The poor resiliency of the sector in developing countries can be due to multiple reasons such as least digitalised sector, cash flow complexities, labour-intensive methods, diverse stakeholders, and dependencies on foreign expertise, imported material and machineries. It is important to mention it here that the reasons for poor resiliency of the construction sector may be different for different countries. We are exploring the reasons in context of Pakistan from the participants’ interviews.

Historically, the construction sector resisted the adoption of new technology and remained one of the least digitalised sectors. The current pandemic brought about issues such as social distancing protocols, travelling limitations, difficulties in onsite monitoring, and limitations of face-to-face meetings, which are difficult to overcome without the aid of technology. Technology such as the Internet of Things (IoT) can improve operational efficiency, safety of construction sites, and connectivity among stakeholders while strictly following social distancing protocols. The fact that the construction sector is the least digitalised can be one possible reason for its poor resiliency in responding to the current pandemic. This pandemic has highlighted the need to accelerate the digital transformation of the construction sector.

Managing cash flow is difficult in all sectors. However, it is the worst in the construction sector. According to PricewaterhouseCoopers International Limited, the average payment takes around 83 days, which is the longest among all industries (PWC, 2019). The rise of COVID-19 increased the risk of insolvencies in construction sectors following the interruption of project funding and increasing expenses. Contractors are experiencing high expenses for certain reasons such as frequent sanitizing of offices and construction sites, disruption of the supply chain, higher prices of material, and reduced labour productivity because of continued mental stresses, working in multiple shifts, etc. The utilisation of multiple shifts in the construction sector often leads to additional costs and causes low productivity of nightshift workers following the disruption of circadian rhythm and social lives of workers, health disorders, and high accident rates (Hanna, Chang, Sullivan, & Lackney, 2008). Moreover, the government curtailed the anticipated
progress fund to public sector projects as they announced the country’s largest ever cash program to provide relief to vulnerable segments of the society during the current pandemic. Other clients also slowdown, delay, or made partial payments to the contractors following the uncertainty in the market. Contractors went out of business because they run out of money rather than work. The unbalanced cash flows cause insolvencies in the industry, which significantly affects contractors.

Construction projects are generally unique in nature based on their fragmentation, processes, and interaction with numerous parties (Bourne, 2005). In today’s globalized market, construction projects involve large project teams and stakeholders with diverse occupational and professional backgrounds, different levels, and types of interests in the project (Mok et al., 2015). The involvement of diverse stakeholders and the lengthy process of design and execution of construction projects constitutes a complex system of collaboration, negotiation, and interrelationships among stakeholders (Winch, 2010). These have made project communication more complicated. The current pandemic has risen social distancing protocols and put restrictions on face-to-face communication between the project teams and other stakeholders. Despite the advent of improved communication and information technologies, face-to-face communication remains the most effective and preferable means of communication (Flache, 2004; Kock, 2004). The lack of face-to-face communication, diversity of stakeholders, and their vast geographical spread can be other possible reasons for the poor resiliency of the construction sector to the current pandemic.

The construction sector’s projects demand large quantities of physical construction activities such as earth excavation and filling, plinth beam, wall construction, tiles laying, fixing frames, etc. It is primarily dependent on labour-intensive methods due to the low adoptability of technology. Construction sites are usually crowded with labourers, foremen, operators, supervisors, and other types of workers (Mohammadfam, SOLTANZADEH, Moghimbeigi, & Akbarzadeh, 2014), who are at risk of getting infected. Therefore, health and safety protocols during the pandemic have significantly disrupted the construction activities. Further, the Pakistan’s construction sector’s dependency on foreign funding, expertise, and imported construction material and machinery can be another reason for the poor resiliency of the sector to the current pandemic.

The challenges that construction sector faces during COVID-19 pandemic are difficult however manageable. A collaborative effort is needed from all parties to keep the projects continues at normal pace during the pandemic while giving special considerations to the safety of contractors and other stakeholders. The following subsection discusses a specific set of recommendations to address the challenges of COVID-19 to the construction sector in the context of Pakistan.

5.2 Recommendations
The experts in this study suggested various recommendations for the construction sector to be more resilient to future crises, such as the COVID-19 pandemic. They talked about urgent need for investment in IT, human development, technology, and digitalization, and increasing role of building-information modeling (BIM) team. One of the experts mentioned that *government should support and facilitate the construction sector to implement innovative digital technologies*. Another expert added that *all the stakeholders must come together to stipulate a roadmap for radical digitalization of the sector to reduce major human involvement in construction activities*. Experts also discussed the importance of strengthening local organizations and import substitution to reduce dependencies on foreign organizations, experts, and machineries etc. On the basis of our detailed discussion and the expert’s feedback, we suggest the following set of recommendations in this study.

- Despite the advent of smart manufacturing technology and robots, the construction sector depends mainly on labour-intensive methods. Construction sites are crowded with various types of workers who face difficulties in following health and safety protocols implemented during the current pandemic. A comprehensive research must be carried out at government level to provide proper guidelines and a roadmap for implementation of digital technologies in the construction industry. The use of digital technologies will alleviate social distancing complications among human beings.
- The construction sector generally tends to resist the digital transformation that other industries have adopted in recent years, such as block chain technology. Block chain technology can potentially address various problems in construction sectors. It will enable instant data sharing with project parties, reduce payment delays by applying block chain-supported smart contracts, robust monitoring, self-regulation, delivering trusted database, etc.
- Further, radio-frequency identification (RFID) sensor technologies can enhance traceability and transparency in the supply chain
- To minimise the movement and interaction of the workforce at construction sites, the work setup for off-site construction (prefabrication) needs to be strengthened. Prefabrication will help the project team to avoid project delays and reduce the risk of exposing the workforce to infection.
- Face-to-face meeting and communication is the preferred mode of interaction for its naturalness in medium and its synchronous manner which employs facial expression and body language. During the current pandemic, virtual communication is the main mode of communication. It is likely to increase the probability of misinterpretation and ambiguity of messages. The following points need to be considered for effective virtual communication and team management, throughout the project:
  - Frequent communication among stakeholders is important where the situation is volatile and rapidly changing
Regular and timely reports and feedbacks are critical to the effectiveness of the virtual team.

- Data centralisation to provide easy access to the concerned stakeholders.
- Lateral communication which reduces the hierarchical structure of the team, clear role and task, and assertive attitude of the leaders are important in virtual team management.
- Adaptive and change management skills of the project manager.

- Import substitution should be encouraged throughout developing countries so as to reduce the dependencies on foreign experts, construction material, and machinery. Therefore, governments should help to both financially and technically strengthen local companies so as to effectively compete with international project companies.

- In addition to the above set of recommendations, collaboration is the key to addressing the current challenges of market volatility and supply chain disruptions.

5.3 Contributions of the study

The following are this study’s multi-faceted contributions:

- This study’s primary contribution is analysing the impact of the COVID-19 pandemic on the construction sector.
- This study also discusses the reasons behind the poor resiliency of the construction sector in response to the current pandemic.
- The study further discusses new directions for the construction sector in post-pandemic situations.
- The study also presents a detailed set of recommendations that will help the construction sector to perform better and be more resilient to crises.
- The study’s findings will assist stakeholders, particularly contractors, to design more effective approaches so as to manage the virtual team efficiently.

5.4 Limitations of the study

Despite the novel insights provided by this study, it has some limitations.

- We selected senior construction experts for the study, with an average of 17-years working experience ranging from 12 to 23 years. Their opinions are important to understanding the current challenges facing the construction sector. However, their opinions may be influenced by their personal experiences and organisational structure.

- The findings of this study are based on 15 semi-structured interviews, which are considered sufficient for conducting the thematic analysis. However, it may not be fully representative of the country’s construction sector.
This study’s findings are limited to the Pakistan construction sector only; as such, the level of generalisability outside this context may be very limited. However, we think that the obtained results are useful to similar developing countries.

5.5 Future research directions

- The study recommends the digitalisation of the construction sector. In future, researchers may explore different aspects of digitalisation, such as its social, economic, and health and safety aspects in construction sector.

- The study discusses the impact of COVID-19 on the construction sector and highlights the important reasons for its poor resiliency. Other researchers can discuss the reasons behind the construction sector’s poor resiliency to crisis in more detail and quantify them based on their importance.

- This findings of the study are based on a set of interviews from a single country. In future, other researchers should carry out more comprehensive studies that cover more organisations in various countries and include different perspectives to understanding the impact of COVID-19 on the construction sector in more detail.

6 Conclusion

COVID-19 is the biggest health, social, and economic emergency the world has faced since the Second World War. It has caused approximately 1,290,653 deaths and infected approximately 52,487,476 people across the world (figures as of 14th of November, 2020). This study provides more detailed insight in the understanding of the level of the impact of COVID-19, the challenges and risks to the sector, and the changes the construction sector has gone through during the pandemic. The study discusses new directions for the construction sector as highlighted by the COVID-19 pandemic. The study also emphasizes the importance of localisation, adoption of new technology, effective virtual communications, and remote project management for the future growth of the construction sector. The study further discusses the reasons behind the construction sector’s poor resiliency to the pandemic. The main reasons behind the sector’s poor performance are low digitalisation, imported material and machineries, labour-intensive methods and lack of experience in virtual team management, complex cash flows, diverse stakeholders, and dependencies on foreign expertise. The study has also put a comprehensive set of recommendations, including adoptability of technology, encouraging offsite construction, data centralisation, frequent and valuable communication and feedback, and import substitutions. Although this study has valuable contributions, it also has some limitations, such as dependence on interview-based data collection methods in which the risk of subjectivity
is relatively higher. Second, the data were collected from experts working in the Pakistan construction sector. The findings may not be fully explained in the context of developed countries. In future studies, researchers can use more quantitative methods and relatively higher sample sizes to investigate the impact of COVID-19 in different countries.

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