



Organizational Level Responses to the COVID-19 Outbreak: Challenges, Strategies and Framework for Academic Institutions

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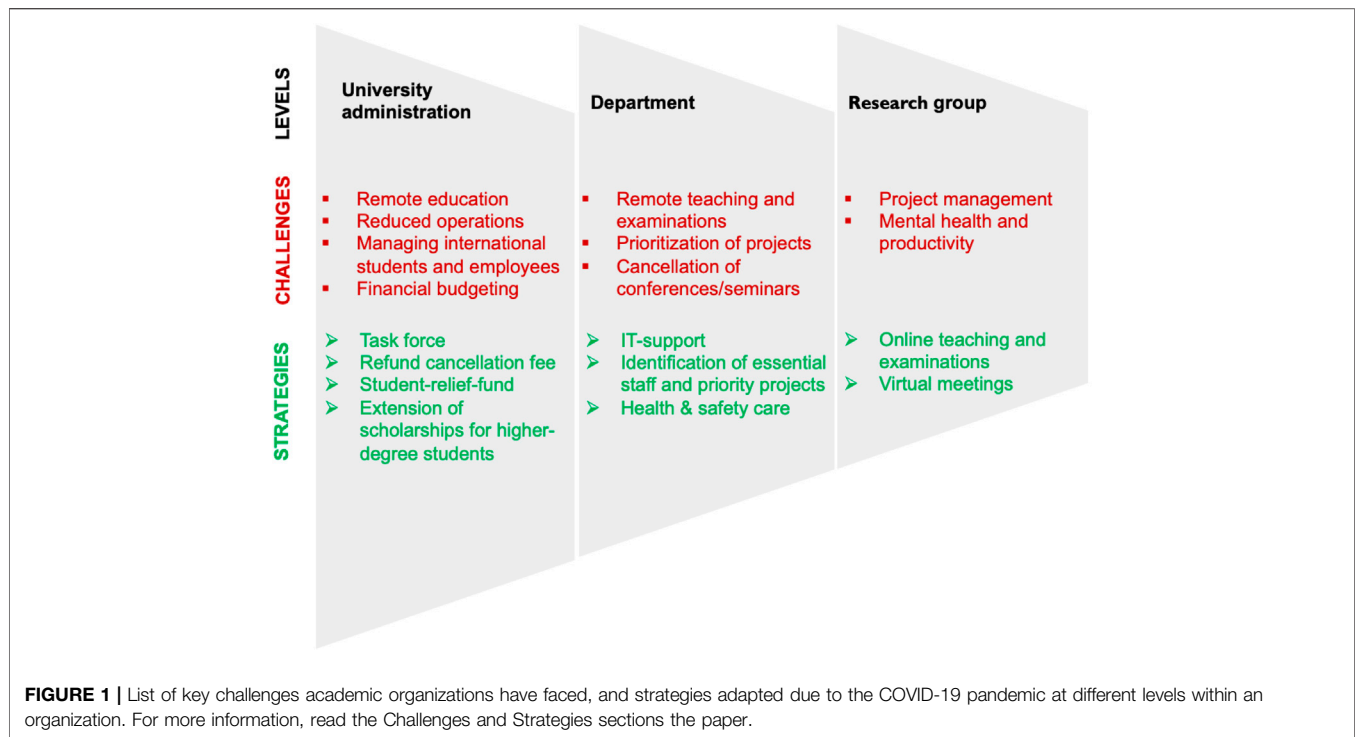
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The outbreak of the novel coronavirus, severe acute respiratory syndrome (SARS)-CoV-2, has gained unprecedented global attention. SARS-CoV-2, which causes the newly described coronavirus disease 2019 (COVID-19), has affected millions of people and led to over 1.9 million deaths worldwide by the beginning of January 2021. Several governments have opted for lockdown as one of the measures to combat the rapidly increasing number of COVID-19 cases. Academic institutions (i.e., universities, colleges, research centers and national laboratories), which are home to thousands of students, researchers, technicians, and administrative staff, have strictly followed government regulations. Due to the lockdown, the majority of academics have been facing various challenges, especially in transitioning from classroom to remote teaching and conducting research activities from a home office. This article from an early-career researchers' perspective addresses the common challenges that academic institutions have encountered and possible strategies they have adopted to mitigate those challenges at the individual organizational level. Furthermore, we propose a framework to facilitate the handling of such crisis in any near future at the organizational level. We hope academics, policymakers and (non) government organizations across the globe will find this perspective a call to better improve the overall infrastructure of academic institutions.

Keywords: education, electronic learning, research, challenges, developing countries, corona virus, policy



INTRODUCTION

The ongoing COVID-19 pandemic caused by the coronavirus SARS-CoV-2 has been reported to infect more than 90 million people worldwide resulting in over 1.9 million fatalities thus far (as of the beginning of January 2021) (World Health Organisation, 2020; Worldometer, 2020). In addition to its tremendous impact on human lives and healthcare systems, this pandemic has considerably challenged the education and research sectors worldwide. Although some measures on public health management were made available by the WHO following the previous SARS outbreak in 2003, the challenges faced by academics were not addressed (World Health Organisation, 2003). This article summarizes a) the challenges faced by academic organizations and their members (i.e., staff and students) due to COVID-19 and b) the strategies implemented by the organizations to tackle those challenges. Furthermore, this article recommends a framework that helps to tackle these challenges during such global pandemics.

The following sections are based on the perspectives of the authors—ten early career researchers from seven different countries namely Australia, Austria, India, the Netherlands, Norway, Switzerland and the United States. Individual experiences during the crisis are not explicitly cited but we focus instead on the main points that are applicable to most academic institutions around the world. We synthesized publicly available information on universities' webpages (ETH Zurich, 2020; Stanford, 2020; University of Zurich, 2020; University of Vienna, 2020; Utrecht University, 2020; Western Sydney University, 2020; University of Pennsylvania, 2020; University of Oslo, 2020), and survey questionnaires. We are aware that as

the pandemic continues, strategies and frameworks may require continuous monitoring and feasibility checks. Nevertheless, the aim of this perspective article is to highlight the possible ways academic institutions can tackle a global pandemic in order to assist such institutions in handling future crises and to inform policymakers to support the academic and research workforce.

CHALLENGES

Due to the COVID-19 pandemic, academic organizations, including universities, colleges, research centers and national laboratories, have faced a number of challenges, as shown in **Figure 1**. Most academic institutions across the globe have closely followed the government regulations of their respective country, state and territory to maintain the safety and wellbeing of their employees and students. These regulations are formulated based on the recommendations of the WHO (World Health Organization, 2020). As the pivotal goal of academic organizations is to provide education and foster research and development, the current challenges faced by different academic organizations located across the globe might have many similarities and can be categorized as follows:

Providing Education Remotely

In response to COVID-19, most countries imposed mandatory emergency lockdown procedures to control the spread of the virus. With that, academic organizations deemed it necessary for their employees to work from home and that provisions should be made to deliver education remotely. The greatest challenge was to move face-to-face classes, lectures, tutorials and other teaching

and learning activities online in a short duration of time. This imposed a huge workload especially on the information technology (IT) departments of the universities. Technical difficulties such as poor internet connectivity, overloaded university servers and frequent crashing of software, and privacy issues of online apps are just some of the hurdles that universities have faced during the process of providing education remotely.

In addition to delivering live lectures through online services (e.g., using Zoom, Google Classroom and Microsoft Teams), academics have been asked to record their lectures and make them available online for students. Tutorials were also moved online, and teaching assistants (TA) had to quickly learn new software and acquire new IT skills. Many courses, for instance, medicine, physics, chemistry and biology involve one-on-one interactions, group activities and laboratory classes which are highly challenging to conduct on a virtual platform.

Defining regulations and policies to conduct online assessments and examinations effectively is another predicament during this crisis as many universities are in a nascent stage in handling online tools to conduct examinations remotely.

Reduced University Operations

In addition to transitioning to online teaching and learning systems, universities had to decide which essential administrative departments (human resources and finance) and academic services (e.g., libraries, sports centers, career and student services, and cafeterias) would continue to operate, and, subsequently, to implement measures to disinfect these facilities regularly.

Temporary Suspension of Research Activities

As the pandemic progressed, academic organizations had to temporarily suspend most of their clinical trials as well as laboratory and field-based research activities. They also had to prioritize which research projects (including higher research degree projects, grant projects with fixed deadlines and commercial projects with industry) should be considered essential and could be conducted with minimal staff and resources. As periodic maintenance is crucial for various laboratory equipment, suspending laboratory operations can have detrimental effects on the resources and research outputs of academic institutions over time.

Managing International Students and Employees

Increasing border restrictions and decreasing travel options meant that many international students and employees faced the difficult decision of returning to their home countries. With no certainty as to how the pandemic would unfold, many academic organizations were challenged with the question of how these abrupt changes would impact international students with respect to their studies. International students mostly rely on

either scholarships or jobs that provide them with wages to survive. During this pandemic, many international students lost their jobs and endure difficulties.

Cancellation of Seminars, Workshops and Conferences

Many seminars, career fairs, graduation ceremonies, workshops and conferences involving a large number of participants organized by the universities or societies have either been canceled or transitioned to an online platform. Such measures restrict academics from the well-valued networking opportunities and limit the number of one-to-one interactions they can have with peers.

Financial Challenges

Several universities worldwide are experiencing significant financial strains due to the COVID-19 pandemic (ETH Zurich, 2020; University of Zurich, 2020; University of Vienna, 2020; Utrecht University, 2020; Western Sydney University, 2020; Stanford, 2020; University of Pennsylvania, 2020; University of Oslo, 2020). These financial shortfalls are due to the shrinking world economy and the fact that the universities had to cancel and/or defer many courses and redirect funds to other areas of operations, for example, IT infrastructure (to enhance bandwidth for online teaching and learning) and supporting staff (to minimize job losses) and students (to provide financial help). In addition, many universities may have also lost potential international students due to the COVID-19 pandemic and associated travel and border restrictions. It is highly uncertain how this health and economic crisis will influence governmental, industrial and philanthropic funding that are crucial for the growth of universities, in the near future (Díez Gutiérrez and Gajardo, 2020; Ding and Kalashnyk, 2020).

Mental Health and Productivity

Sudden shifts in the culture and environment for work and teaching and the loss of structure and social contact have perplexed many staff and students in finding a balance between productivity and family responsibilities. Employees with young children requiring care and homeschooling face additional challenges and time-restrictions. Both the lockdown and the uncertainty surrounding the end of this pandemic have affected the productivity and mental health of many early career researchers (who are often on fixed-term contracts) working on time-bound projects and grant deadlines (Bostan et al., 2020; Marcio and Carneiro, 2020). Social isolation is also expected to impact mental health significantly (Cornwell and Waite, 2009) particularly of students (both domestic and international) and staff living alone away from family and friends.

STRATEGIES

We acknowledge that it is difficult to prepare strategies or policies in a rapidly changing and uncertain scenario. Since this global pandemic is new to our times and little is known about the virus,

most academic organizations devised their strategies (examples shown in **Figure 1**) in accordance with governmental guidance. Taskforces were formed quickly at the university and department level to monitor the progression of the pandemic, address the immediate consequences and maintain essential operations safely. While several approaches have been used worldwide, we have identified the following as important strategies that have been, and can be, implemented by academic organizations to manage the COVID-19 crisis (ETH Zurich, 2020; Stanford, 2020; University of Zurich, 2020; University of Vienna, 2020; Utrecht University, 2020; Western Sydney University, 2020; University of Pennsylvania, 2020; University of Oslo, 2020; Wigginton et al., 2020).

Online Classes

The rapid transition from the classroom to online teaching was implemented using various web applications such as Zoom, Microsoft Teams (within Office 365 licensing), Google Classroom and Skype. With a multitude of online formats, academics have become creative in their educational output, from creating podcasts to making videos. One method accessible to most people is to provide students with lecture materials to read ahead of class (not necessarily a new concept). This facilitates active virtual interactions and engagement of students during the lecture.

IT infrastructure and services are identified as a key resource within a university, which require adequate funding and a skilled workforce (Favale et al., 2020). The services provided by the IT department are crucial for the smooth functioning of working from home. Universities are required to increase their network server capacity so that more software can be downloaded off-campus. Electronic or online library (e-library), where access to journals, books or any other information can be obtained using the internet, is an easy way to provide learning materials to students; the demand for e-libraries was magnified during this crisis especially in countries that rely on physical library facilities. Some academic publishers have relaxed the paywall or provided alternative ways to remotely access institutional subscriptions (Springer Nature, 2020). The COVID-19 pandemic underlines the importance of increased access to scientific findings quickly and freely either through pre-prints or open-access publishers. Transformative journal frameworks such as Plan S launched in 2018 by cOAlition S (an international consortium of research funding and performing organizations) is a great example of open access publishing initiative (Plan S, 2020; Rabesandratana, 2019; Noorden, 2020). Under this initiative, from 2021, research funded by public or private funding bodies, must be published in 1) open access journals, or 2) on open access platforms, or 3) made immediately available through open access repositories without embargo (Plan S, 2020).

Many parts of the world lack stable internet connections, which cause significant challenges to classes (and research) conducted online. In cases where access to e-libraries is difficult, physical copies of books, journals, study materials and assignments might be sent, *if possible*, at a nominal cost to students. Alternatively, the learning materials can be downloaded in flash drives and sent to the students via postal/

courier services. To further minimise the cost of posting the learning materials to students, academic institutions can collaborate with postal and/or courier services. Approaches such as centralised locations with drive-in and walk-up access, providing students with low-cost loan computers/tablets with learning materials already downloaded on them and pop-up libraries (also known as street libraries) to engage with students and other active readers (with appropriate physical-distancing measures) could also be considered. Contact-less pick-up of learning materials should be implemented in the case of physical libraries. Alternatively, academic institutions can partner with satellite internet providers, *where available*, to provide students especially from rural areas where conventional internet facilities are not available with low-cost satellite internet plans to access e-libraries.

Online Examinations

Examinations (written and oral) have been conducted online, where possible. Through regular online meetings, teaching assistants for the courses and the relevant faculty members discuss the course content and exercises. Online examinations might be conducted with different sets of questions given out in different groups within the same class. Doctoral examinations have been conducted remotely in many universities. It is essential to conduct such examinations in the presence of an IT specialist to address urgent IT/network related issues. Professors and the chair of a PhD defense must monitor the attendees to avoid unwanted guests/hackers. Extra cautions such as stronger firewall and password-protected apps and virtual meetings have been used to prevent hackers. Many universities have started to offer cybersecurity courses online to their staff and students to raise awareness of possible cyber-attacks and their prevention (Naidoo, 2020). In addition, universities have been exploring the possibility of using monitoring software such as Proctorio and ProctorU to prevent cheating in examinations, however, concerns have been raised regarding the privacy issues related to these apps (The Guardian Australia, 2020).

Overall, online classes, seminars, conferences, and meetings are appreciated worldwide (Liguori and Winkler, 2020; Dhawan, 2020; Gamage et al., 2020; Murphy, 2020; Di Pietro et al., 2020; Mishra et al., 2020; Gonzalez et al., 2020), as these solutions decrease the planning and execution of travels and accommodation, thus saving time and carbon footprints of individuals. Online solutions have also stimulated entrepreneurial activities in the education sector, leading to the development of user-friendly web applications (Liguori and Winkler, 2020).

Identification of Essential Employees

Essential staff have been defined for minimal yet smooth operations of the institutions and laboratories. At some institutions, prior authorization from the institution director or university vice-chancellor is mandatory for employees who are required to be physically present on the campus for research or maintenance. Security, finance, IT, human resources, building management and library are some departments that may require the physical presence of essential employees. A list of essential

employees should be submitted to the security staff of the building/institute. Online calendars should be set up for employees to pre-book their schedule in the laboratory/institute. These calendars should be accessible by all staff and students and only allow a certain number of people in each laboratory/institute in order to maintain a safe physical distance at all times. Additional personal protective equipment such as face masks/face shields, gloves and lab coats and rigorous hygiene practices must be implemented during these operations.

Prioritization of Research

The lockdown measures forced universities to identify their priority research projects, which can be conducted under the state of emergency with minimal staff and limited resources. Universities needed to come up with some assessment criteria before identifying the “priority” projects. Research related to the pandemic is commonly considered a high priority (Layne et al., 2020). Other research projects, which are related to government and industrial grants with strict deadlines as well as student research projects were prioritized based on urgency and nature of the research. Extensions of research and employment contracts, higher degree research student candidature and scholarships have been evaluated by universities on a case-by-case basis.

Managing the Wellbeing of Students and Employees

International students residing in hostels and shared accommodations are one of the most vulnerable groups in this crisis. Sudden lockdown and reduced operations of universities have led to confusion, anxiety and stress among students. Many research groups have increased the frequency of group meetings, coffee breaks and lunches through online apps. Faculty mentorship is a possible initiative whereby a professor/group leader/teacher is assigned a group of students to monitor the progress of each student. The students would be responsible for reporting any problems they have to their mentor during the crisis and online discussions could be held to resolve these issues. Many universities have created support registers where their employees can register their interest in providing support such as short-term accommodation, mentoring, guest lecturing and marking to students in need.

Employees with children/aged relatives/caring responsibilities at home also require support from universities and departments to maintain a work-life balance. Implementing flexible working hours will be of enormous help to employees with children. Providing online psychological counseling by mental health professionals is another important aspect that academic organisations can consider for their employees. Many academic organisations have started providing online fitness, yoga and meditation sessions free of cost which are beneficial to the physical and mental health of their employees.

Relief Funds

Student hardship funds for both domestic and international students were established in some universities to provide students with grocery vouchers, loan laptops and limited

financial support (Western Sydney University, 2020). These funds usually support full-, and part-time graduate and professional students who have incurred unexpected expenses directly related to the pandemic. This includes disruption of their semester for which tuition fees are paid, moving expenses, travel, insurance, covering multiple rents and urgent requirements. Conference/seminar registration fees, travel and accommodation costs are also reimbursed in some cases.

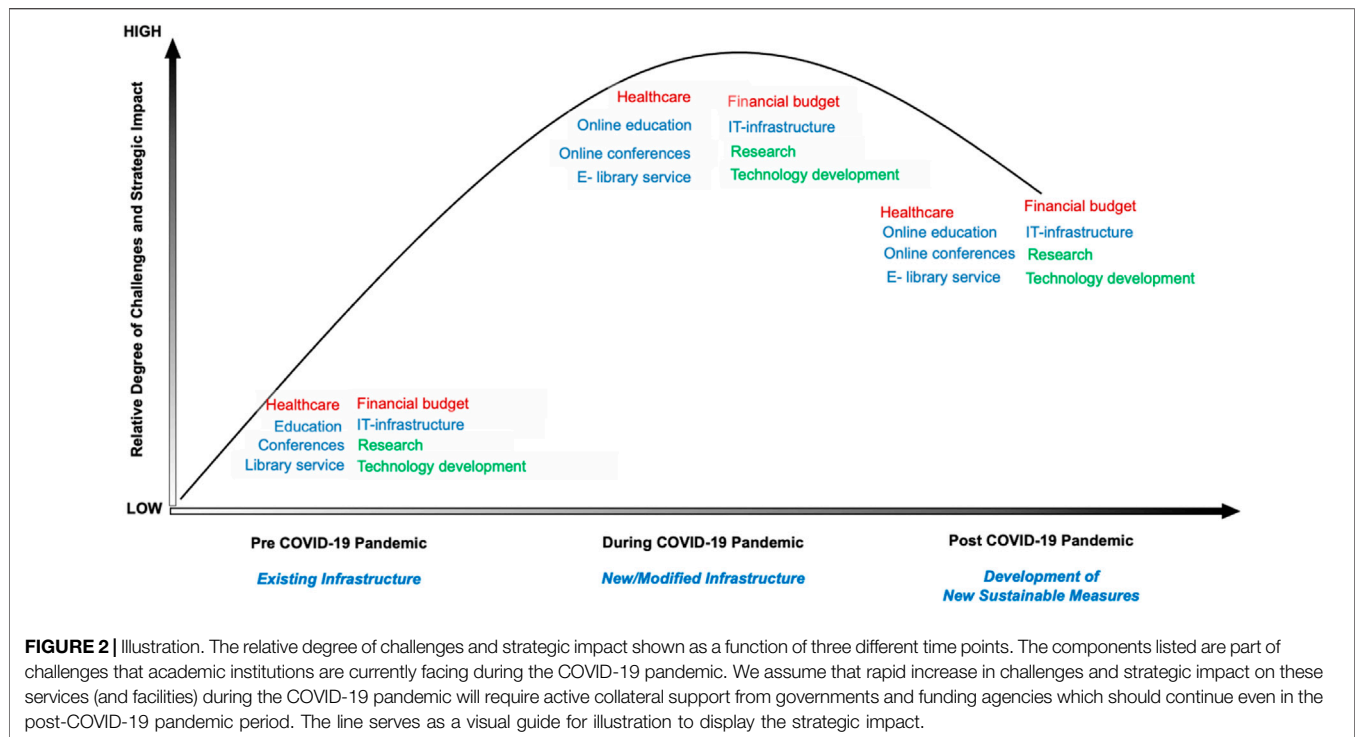
Many universities have made several changes such as freezing new recruitment, using savings across all strategic initiative projects, workload adjustment for academic and professional staff, reducing leave balances, fractional appointments, voluntary retirement program, deferring of the estate and capital works programs to bear the financial downfall and accommodate the relief funds. In addition, senior staff from some universities donated up to 20% of their salaries to the student relief funds (Western Sydney University, 2020). This indicates that the universities and departments should start creating separate emergency funds especially toward future potential outbreaks like COVID-19. Governments and funding bodies should work together with universities and academic institutions on how to create crisis management funds.

FRAMEWORK

The challenges faced by academic organizations that host thousands of students and employees and strategies adapted to overcome those challenges during the pandemic are still uncharted territory for most organizations. We recognize that under given circumstances, many new sustainable measures have to be implemented and the academic sector can change considerably in the post-COVID-19 times compared to the pre-COVID-19 pandemic. As the degree of challenges and the strategic impact can vary across academic organizations (Figure 2), there is a need to have a common framework that academic institutions can trigger in times of global crisis. Below, we provide some key points for strategies that can help academic institutions to mitigate the effects of a global crisis.

University Level

1. Securing the universities financially so that students and employees are not affected due to pandemic and related crisis.
2. Setting up a task force to determine the feasibility of working normally while maintaining social distancing in the future without going into complete lockdown.
3. A pandemic management committee can be established involving healthcare professionals, scientific researchers, academics and policymakers to formulate guidelines and evidence-based preventative measures in line with their respective government during a pandemic phase.
4. The universities can design custom courses on dealing with future outbreaks and suggest standard protocols based on scientific evidence. These can be made accessible to the public free of cost.
5. Provide better funding opportunities for research on designing vaccines for viruses [as several previous outbreaks were caused



by viruses (World Health Organization (2021)), epidemiology and other potentially infectious diseases. In general, academic institutions should work together with federal governments to allocate more funds to health and medical research from the total yearly health expenditure.

- For students based in remote areas with limited or no internet connectivity, the universities can look into establishing a robust learning framework based on correspondence delivering the required course material via physical mail or pop-up/drive-in/walk-up libraries or satellite internet services.

Department Level

- Provide better training to non-technical staff on how to operate online tools in order to facilitate work from home.
- Monitoring how transitioning to online teaching affects overall teaching quality and provide strategies to improve virtual teaching and learning experience.
- While online teaching works, online exams are problematic as it is difficult to ensure that the students are not cheating with the current setup. Develop strategies to build trust and examination-monitoring software that does not violate privacy. In addition, open-book examinations can be considered in course that need to evaluate the critical thinking and problem-solving abilities of the students.
- Where home office is imposed, employees on fixed-term contracts, PhD students, early career researchers and tenure track academics should be given priority to return to the workplace.
- Plan/establish networks that support the mental health and emotional needs of employees and students. It is common in

academia that researchers are at institutes in foreign countries away from their home. Allowing academics to work from their home country could be an option.

Research Group Level

- Ensure that members of the group do not experience social isolation by organizing regular online group meetings and one-to-one check-ins with supervisors.
- Support each other through kindness and empathy. Establish an online format/tool for social interactions between groups.
- Design courses in such a way that they can be efficiently delivered even when physical teaching is not feasible. Use of high-quality multimedia (e.g., animation, video and audio) can be quite helpful in delivering online courses effectively.
- Flexible work environment
 - Providing laptops/tablets instead of desktops
 - Removing the strict rule of working in the office
 - Adaptation of time-shift work environment
- Offline services to online services
 - More use of e-signature
 - Decreasing paperwork (online application/submission/approval)
 - Virtual meetings for regular updates

A significant amount of teaching, learning and research-related work can be done remotely especially in developed countries due to the strong internet connectivity and availability of several online apps and platforms (König et al., 2020; Favale et al., 2020; Noorden, 2020; Murphy, 2020). This opens up several exciting avenues for people with disabilities who

can work from home. Continuing use of online meetings could have a large impact on the mobility of researchers (less travel to meetings and conferences) and would grant more flexibility to scientists who can and want to work remotely.

It is fundamental that universities regularly update and maintain their IT infrastructure for hassle-free operations of online services. This also emphasizes the urgency to improve network connectivity in remote places where there are no internet services. Governments and international agencies should prioritize building infrastructures to support online teaching and learning operations, facilitate research and technology development and improved healthcare systems to better prepare the world for the current and any future global pandemics.

SUMMARY

The COVID-19 crisis has shaken every industry and organization worldwide, including the education and research sector. This article highlights the common challenges that universities face and the strategies that have been implemented. It also proposes a framework to facilitate better handling of such a crisis in the future at the academic organizational level. The measures we suggested here are based on our own experiences during the initial hit of COVID19. As the crisis is very dynamic and ongoing, we are aware that strategies will need to be adapted over time and systematic research is required to further investigate the feasibility of these measures and frameworks. Nevertheless, the

proposed strategies will enable academic institutions, especially in developing and underdeveloped countries, to build a fast system, which would potentially support the operation and maintenance of the institutions during the current and a future emergency. Suggestions provided through the framework can potentially facilitate engagements and collaborations of institutions with governments, funding bodies and other organizations associated with education and research sector. We hope that the outcome and the proposed framework of this study will be beneficial to academic institutions, without compromising their time and resources during an emergency such as the COVID-19 pandemic.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

JB conceptualized, visualized, wrote the original draft, created the figures and finalized the manuscript for publication. DR, GiS, SD, SA, MA and AP wrote and edited the manuscript. GaS and KK wrote and edited the manuscript and contributed to the figures. DB visualized, wrote the original draft, contributed to the figures and finalized the manuscript for publication.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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