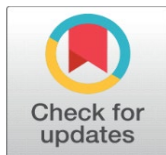


OVERCOMING COVID-19 CHALLENGES IN EMERGING SPACE INDUSTRIES

Ali Al Mahmood ¹  , Amina AlBalooshi ¹  , Amal AlBinali ²  , Rasha Alamad ²  

¹ Satellite Design and Construction, National Space Science Agency, Bahrain

² Strategic Planning and Projects, National Space Science Agency, Bahrain



Received 22 March 2023

Accepted 23 April 2023

Published 08 May 2023

Corresponding Author

Ali Al Mahmood,
almahmood.ali@nssa.gov.bh

DOI

[10.29121/ijetmr.v10.i5.2023.1324](https://doi.org/10.29121/ijetmr.v10.i5.2023.1324)

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Copyright: © 2023 The Author(s). This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

With the license CC-BY, authors retain the copyright, allowing anyone to download, reuse, re-print, modify, distribute, and/or copy their contribution. The work must be properly attributed to its author.



ABSTRACT

The Covid-19 pandemic challenged every business in all sectors around the world, whether it is a private or public, which demanded swift adaptation ensuring the persistence of businesses, industries, or organizations, and maximizing resource utilization. Therefore, different strategies were implemented by different governments and entities to tackle the challenges that accompanied the lockdown situation. This article describes the different tools and processes utilized by the National Space Science Agency (NSSA) of the Kingdom of Bahrain during the pandemic, tackling mainly communication, work culture, and remote project management challenges that severely impacted the nanosatellites development and space applications projects. This article also provides recommendations to have a better workflow to maintain organization sustainability, increase the productivity of the workforce during any pandemic and promote a culture of adaptability in the workplace; while minimizing the risks of the spread of pathogens, thus protecting the business and most importantly employees.

Keywords: NSSA, Bahrain, Covid-19 Challenges, Nanosatellite, Pandemic, Projects, Space, CubeSat

1. INTRODUCTION

The outbreak of Covid-19 pandemic was a major disruption to the activities in most businesses and organizations around the world as countries and governments enforced new rules and regulations to limit the spread of the virus. They had to apply extreme solutions of closing borders, lockdowns, and imposing curfews on citizens to contain and control the pandemic and maintain the country's health care capacity.

In addition, new safety measures were implemented in the working environments: frequent handwashing, wearing masks, physical distancing, working in shifts, avoiding mass gatherings, and limiting face-to-face meetings, supporting

quarantine, robust testing, and contact tracing responses. However, despite the procedures taken by the world, the virus continued to spread, and business had to scale down or implement new procedures to adapt to the new regulations.

In this article, we present the case of the National Space Science Agency, a government entity in the Kingdom of Bahrain, in overcoming the challenges that the Covid-19 pandemic brought to the workplace throughout the two years of the outbreak, touching mainly on the key aspects: Communication, Work Culture, and Remote Project Management. Also, highlighting the key opportunities that those challenges created while giving recommendations to have better workflow to ensure business and organization sustainability and adaptability during such pandemics.

The article is organized as follows: Section II provides the experience and approaches of different organizations and their input regarding remote project management through the pandemic. Section III provides the challenges encountered by NSSA during the Covid-19 pandemic tackling the key aspect of a healthy and an effective workflow: Communication, Work Culture, Project Management. Section IV provides the solutions of NSSA utilized in overcoming those challenges. Section V provides recommendations to maintain a sustainable workflow and more resilient organizations. The last section concludes the research and sums up the solutions and recommendations.

2. RELATED WORK

The Covid-19 outbreak in 2020 drastically changed the way people perform their daily tasks; many switched to partial or complete remote working which was not considered normal to the majority of organizations and businesses. It was also thought of the change as a drawback in the efficiency of operations; however, it can be agreed on that remote working provided an opportunity for organizations to enhance their utilization of online platforms such as Zoom and MS Teams for communication and project management, software such as JIRA and MS Project for easier scheduling, file sharing, communication, and reporting. Also, providing opportunities to create a foundation such that future pandemics would have minimum to zero negative impacts on the operation of organizations, in particular: Communication, Work Culture, and Project Management.

The work presented [Bick et al. \(2020\)](#) evidence of the shift that occurred between working in the office and at home during the pandemic in the United States. The findings of the paper were based on the Real-Time Population Survey (RPS) that included retrospective questions of the start of the pandemic regarding their employment status and commuting behaviors. The RPS was a collaborative project between the Arizona State university, Virginia Commonwealth University, and the Federal Reserve Bank of Dallas; and its main objective was to provide labor market estimates during the pandemic in the United States. It was designed correspondence to the Current Population Survey (CPS) and was conducted on a biweekly bases with respondents between 1000 to 3000 and resulted in a total of 47 thousand respondent during the period of April 2020 to June 2021. The survey was able to produce the estimated rate of employment and unemployment, the labor forced participation and the worked hours per person during the pandemic. It was evident according to the survey that of all the employed individuals during the pandemic, 35.2 percent were working-from-home, while only 8.2 percent of them were doing so prior to the pandemic. Furthermore, of all the employed individuals, 43.7 percent continued commuting to work during the pandemic, whereas 28.6 percent reported working from home at least once a week and 27.7 percent were unemployed. And

that explains the significant decreased in the commuting volume during the pandemic. The study also highlighted that there was high variance between the different socioeconomic groups with regard to switching to telecommuting or becoming inactive; it was noticed that working from home was predominant among highly educated, high income and white employees, and a lot less with employees with relatively low incomes and a high-school diploma. Lastly, a survey based on Dingel and Neiman measure, concluded that the majority of the employed workforce were actually working effectively at home, such that the ratio of the effective to potential home-based workers was 71.7%. The authors stated that the other 28.3% could switch to telecommuting especially to the sectors such as education, information, and finance.

With regard to the first key principle, the workplace communication is defined as the process of developing thoughts, ideas, facts, and opinions in relation to work such as performance, effectiveness, efficiency, and achievements towards specific goals, then communicating, analyzing, and understanding [Markovic and Salamzadeh \(2018\)](#). Effective and efficient communication is important for managers in organizations to fulfil the basic functions of management such as planning, organizing, leading, and controlling. Furthermore, according to PMI's Guide to the Project Management Body of Knowledge, effective communication is the most important activity for the success of any project, where 75-90% of the project manager time is spent on communications [Project Management Institute \(2017\)](#).

Communication in an organization is usually between the following parties: employees, management, shareholders, subsidiaries, suppliers, clients, companies, government agencies, local communities, and stakeholders. Therefore, the absence of effective communication internally is troublesome such that managers would not be able to manage and supervise the employees, and the health of the workforce would crumble alongside the strength of the organization. Externally, receiving feedback of clients towards the product or service is essential for improvement by thoroughly understanding the needs and challenges. As for the stakeholders, it is critical to establish effective communication to ensure clear and comprehensive exchange of information, thus, leading to a successful execution of the project.

In [Travers \(2016\)](#) authors presented the results of a survey conducted on sample of 779 individuals in 2015, classifying the preferred communication method depending on meetings' size, and in general, respondents preferred meetings with small number of attendees. Face-to-face meetings were the preferred method to hold small meetings by 96.6%. On the other hand, communications in medium-large meetings were preferred to be hosted via online tools such as: e-mails, telephone, and communication application. Additionally, the survey summarized 31 advantages to hold face-to-face meetings, which can positively impact individual collaboration, productivity, and connectivity.

Another survey conducted in December 2021 [Project.co \(2022\)](#) collected a sample of 444 respondents to study the impact of the pandemic on communication and individual productivity. The study concluded that the number of individuals working from home increased by 28%, where more than 50% of the workforce shifted to remote working post pandemic. This change pushed employees to change communication medium utilization internally, which increased the popularity of online tools utilization by 17% over others such as: e-mails, telephone, and face-to-face meetings. Additionally, respondents declared that the major difficulties were related to data allocation on both organizational and personal levels. The challenges encountered through the pandemic negatively impacted organizational relations

with customers; 46% of businesses reported the loss of a customer and 35% of businesses lost an employee.

Second, and as defined by [Limeade Institute. \(2020\)](#). “Organizational culture is defined as a set of shared underlying assumptions an organization regarding what is valued, how people should behave, and beliefs about what is “normal” within the organization.” Organizational culture is critical in providing the best experience for employees hence consequently impacting their work and productivity.

Covid-19 had a significant impact on the work culture in terms of the working environment and the tools utilized; through introducing new safety measures to contain the spreading of the virus. Employees were working from home, in office or closed workplaces and practiced social distancing; in addition to utilizing face masks, face shields and gloves. However, due to the resulted discomfort, organizations accelerated the migration to digital tools and virtual working environments.

[Brown et al. \(2021\)](#) stated that organizational cultural beliefs’ have changed since the Covid-19 pandemic. Some traditional cultural factors became of less priority, such as: customer orientation, individualism, detail orientation, results orientation, and collaboration, in contrary to some cultural factors, such as: flexibility, transparency, supportiveness, decisiveness, and confronting conflict. To summarize, the mindset of performance-oriented organizations has been shifted to a more understanding culture which empathize and provide mutual support to employees; thus, allowing co-located teams feel connected.

Third, project management is the key to execute and achieve the strategic goals of any organization or business, and it describes procedures and methods to implement the business strategy based on PMI standard five main process groups: initiating, planning, executing, controlling, and closing [Project Management Institute \(2017\)](#). Applying the knowledge, skills, tools, and techniques to the process groups, allows project team to meet the project requirements. Due to the importance of a successful project management, it has always been an intriguing topic for researchers to propose and enhance techniques to manage different projects. Additionally, sharing the experience of implementing and using different tools and methods on the overall project success.

In [Barbosa and Azevedo \(2012\)](#) authors presented a prototype of a project management platform to manage space projects by following the European Cooperation for Space Standardization standards. The work presented a list of the key requirements to manage space projects: meetings, schedule, financial, project phasing, risk management, documents, users, and project managers. Based on the requirements, a system architecture was proposed to construct a software prototype which allows users to effectively manage their tasks and activities.

The work presented by [Ng et al. \(2020\)](#) highlighted the importance of reviewing some planning and operations issues for information technology (IT) management when implementing work from home (WFH) policy. One of the main concerns that were mentioned was the division of employees into groups (“Team A” vs “Team B” shift system), hence, creating rotational duties to maintain the smoothness of operations while mitigating the absence of all due to quarantine. This new arrangement, especially the one depending on the on-site data centers to be effective, has impacted the operation cycle, client, and service level agreement (SLAs); which required data and systems to be up-to-date and protected against any failure. In addition, it influenced the communication between managers and project teams and communication within teams.

[Chernogorova et al. \(2021\)](#) conducted a comparative analysis to compare the planned and implemented activities running scientific projects during the Covid-19 pandemic. The research analyzed activities based on five main groups: management, scientific, educational, dissemination, and production. Authors conducted an assessment considering three main constrains to the project: time, budget, and scope. The assessment was based on a survey which found that the pandemic impacted the ability to conduct scientific experiments by 80%, and 57% respondents faced difficulties with sharing their research findings. The results of the survey came matching to a different research which stated that the time required for scientific experiments was highly impacted during Covid-19 pandemic. Additionally, authors found that the pandemic impacted the mobility, willingness, and ability of scientists to research or study abroad by 85%. Furthermore, the research included risk assessment response and activity plan based on the projects priorities to overcome difficulties encountered due to the pandemic. The research highlighted the importance of funding organizations being flexible in operation costs and transferring fundings from one activity/category to another, which will aid project teams to avoid hurdles by conducting alternative activities.

Lastly, another study [Honore-Livermore and Birkeland \(2021\)](#) described the impact of the lockdown and dependency on digital tools considering project management approaches based on a case study of a CubeSat project in Norway. Managing the team remotely required enhancing the digital tools and infrastructure, managing the different situation and incidents, and managing schedule impacts on the project success, which required extra efforts by project managers to ensure the continuity and success of the project. Authors highlighted the main “soft issues”: trust, relationship building, frequency of communication, and social ties, which project managers must pay additional attention to especially in unusual situations such as the Covid-19 pandemic. The study concluded that flexibility is the key factor for projects to succeed through any unexpected situation, in addition to being adaptive and reinforce new culture and norms when needed. Besides that, project managers are mandated to put more efforts following up with the distributed team.

3. CHALLENGES

The challenges arising in the workplace due to the Covid-19 Pandemic affected all sectors in many ways, but this paper focuses on the space sector and in three primary areas: Communication, Work Culture and Project Management.

3.1. COMMUNICATION

In terms of communication, the major challenge was the lack of face-to-face activities such as face-to-face meetings and informal discussions. This impaired the flow of updates within the teams, threatening the key principles (loyalty and trust) that NSSA emphasized on to ensure a strong relationship between coworkers. In addition, employees found themselves disconnected and discouraged occasionally due to unbalance of workload. Externally, the lack of face-to-face meetings with suppliers, customers, and stakeholders created difficulties in conveying the challenges and defining the needs which hindered the potential of establishing new businesses with potential clients and stakeholders. Additionally, switching to remote platforms impacted NSSA’s strategic goal in spreading space science and technology awareness by reducing community engagement.

Furthermore, knowledge gain within among the employees was impacted, as participants in events and conferences had limited interaction and engagement with

direct dialogue or discussions with the presenters and audience; because of the transition of the seminars and conferences to using online platforms and pre-recorded presentations. Another aspect is the reduction of on-job shadowing and in-house trainings of employees due to minimizing contact as a result of splitting teams, affecting their career development and team building.

3.2. WORK CULTURE

Aside from the communication, the work culture within NSSA was impacted heavily due to the sudden and unexpected transfer to remote working. It led to efficiency degradation of employees mainly because of not having the necessary digital skills and infrastructure, distracting environment while working from home, and difficulties sharing digital resources and network access. However, despite those challenges, the employees had to maintain the same level of productivity, which therefore led to employees working, responding to emails, and being occupied outside their working hours. The unbalanced work overload and pressure to achieve in a timely manner reflected heavily on the employees' wellbeing as a result of stress related issues and prolonged exhaustion.

On the other hand, managers were challenged by how to measure employees' productivity and to deliver balanced task distribution. The unusual circumstances enforced NSSA's technology migration to online platforms (i.e., communication tools, collaboration tools and project management tools), which mandated modifying existing infrastructure and enhancing network security. The new organizational infrastructure had to cope with the increased online traffic and enable remote access to on-premises servers and files from foreign networks, which increased the organizational vulnerabilities to security breaches and imposed risk on the confidentiality. The online attacks coming from malicious emails, non-compliant employee behavior, and software vulnerabilities, mandated the need to review and upgrade organizational security.

3.3. PROJECT MANAGEMENT

Projectized organizations were hit severely due to the obstacles created by the pandemic, whether its governmental restrictions, border closures, or transaction delays due to partial closure of banks. And to NSSA, the following resulted in constant delays in receiving purchased items (e.g., satellite components) and project teams' inability to travel to different project sites due to the travel restrictions and government-imposed regulations (e.g., Bahrain Space Team constant traveling to/from Bahrain/UAE). Additionally, projects required additional reviews, frequent risk analysis, iterative planning, rescheduling of activities, scope modifications, and budget reallocation (e.g., to overcome reduced budgets, or to acquire new/additional items/activities as a result of new circumstances) to ensure successful results.

The unusual circumstances required more time and effort from project managers to manage vendors remotely and manage co-located teams. The unusual work shifts, and limited contact reflected on the work performance and knowledge transfer. Additionally, in response to organizational adaptation towards data management frameworks and online tools, project managers were required to develop new skills in managing tasks and teams remotely, as well as adapting to new process and protocols.

4. SOLUTIONS

Despite all the hurdles encountered during the pandemic, NSSA maintained workplace sustainability. Swift adaptation was the key to minimize the impact of the pandemic on the three major areas, allowing NSSA to continue with the ongoing projects without interruptions. Those include successful development and launch the first Bahraini – Emirati CubeSat, assigning the appointed technical team to contribute to the development of DhabiSat CubeSat, offering remote sensing services to private and public entities, and publishing tens of scientific research papers in various space disciplines in collaboration with local and regional universities and research centers. Additionally, NSSA begun the establishment of the space data analysis center to respond to national requirements of space information and earth observation data. And pursued capacity building through various events, workshops, specialized trainings, and post graduate studies in the UK and UAE.

4.1. COMMUNICATION

Traditionally, most organizations employ a waterfall type communication model such that it flows in a one-way direction from the executive management to employees throughout the hierarchy. Post pandemic, many organizations including NSSA shifted to a more interactive flow in communication between the hierarchy levels allowing faster problem solving and easier remote working between the workforces. However, if executed with the wrong terms, can cause chaotic communication between departments and teams, harming the relationship and workflow of the organization. Therefore it was at utmost importance for the management within NSSA to ensure that all communication was done in an organized manner.

Also, the communication policies and plan set by NSSA had to be clear, concise, and easily applied by the workforce. The communication processes, types and expectations were compiled in a document organized to act as a guideline for existent and future employees. The plan formally defines the type of information, the time to deliver the information, the channel used to deliver the information, and the authorized personnel to receive the information internally and externally.

On the first hand, internal communication procedures and work instructions were changed in a way to create new norms in the workplace. Which were achieved as follows:

- Reserve to online team building and engagement activities (e.g., remote teatime, remote celebrations, morning team check-ins).
- Schedule regular e-meetings within teams with mutual interest.
- Introduce automation in processes of updating procedures, reporting challenges, identifying risks, balancing workload, and generating and circulating achievement reports.
- Embed remote job shadowing and knowledge sharing between team members by utilizing methods of collaborations and informal meetings.
- Attendees of virtual conferences submit and present a summary, recommended further actions with participants, and suggest further networking opportunities for potential collaboration.

On the other hand, external communication significantly influences the place of the organization within the local and international market. Therefore, as a solution and to avoid difficulties during future crises, it was mandatory to establish strong communication with external entities which were achieved through the following:

- Enhance customer and stakeholder engagement through online tools.
- Increase customer satisfaction (e.g., automated surveys for stakeholders and customers).
- Promote networking and collaboration with stakeholders, suppliers, customers, and potential sponsors using different remote techniques.
- Provide relevant information and automated forms for the public to reach specified teams through the organization website.
- Settle for an agreement with stakeholders to lower the frequency of meetings and change from face-to-face to online meetings utilizing online platforms such as MS Teams or Zoom.

Lastly, the organizational infrastructure was modified to be capable of handling the growing demand in the use of different communication and collaborative tools. And to facilitate seamless online access, the network speed and bandwidth were increased, as well as providing secure and reliable access to online documents, shared cloud storage, video chat applications, and instant messaging applications. Additionally, NSSA emphasized upon knowledge transfer among employees to enhance the soft and technical skills which would help the workforce to adapt to the new online communication and collaboration tools.

4.2. WORK CULTURE

The work culture within an organization is a result of the internal policies, strategies, and employees' mindset. The internal policies, procedures, and guidelines of any organization shall allow adaptation to unpredictable circumstances, NSSA's policies were altered to ensure seamless workflow. The first step was embedding working from home policies based on a priority system, prioritizing employees that have difficulties working from home to work from office, while others work from home. The main reason for the given priority system is to avoid interruptions due distractions, connectivity issues or lack of resources while at home (e.g., specific software or unavailability of machines with high specifications for satellite imagery analysis). And with employees working remotely, the focus was to achieve goals by constantly measuring progress and having strict deadlines.

The second step adopted by NSSA was creating a cloud centralized database for each department/team, which allowed collaboration among employees that were working remotely and employees in the office. It also allowed easier accessibility and dissemination of information among the same group members. This approach required an upgrade to the existing IT infrastructure by improving the connectivity, security, and storage.

Finally, introduction of the new technologies, collaboration tools and online platforms were given through several training programs to ensure adaptation of employees to the sudden change in the work culture. Thus, it was easier to accept the idea of remote working and having virtual conferences beside the usual face-to-face meetings and conferences.

4.3. PROJECT MANAMAGEMENT

Through the pandemic, NSSA implemented an adaptable, resilient, and agile project management plan to ensure the success of the ongoing projects. By adopting flexible policies and practices that alter the scope, budget, and schedule of projects depending on the availability of resources and the pandemics situation. Furthermore, interactive tasks and dynamic risk management was another

approach employed which reduced the risk impact and increased the knowledge gain; and in the case of CubeSat projects, the team had to conduct several mission reviews internally and externally. However, unexpected changes brought up new activities and requirements which required budget transfer, such as the need to get new hardware like purchasing laptops for employees to allow working from home rather than desktops, or new software and/or licenses like file sharing tools, communications tools, and project management tools.

The utilization of technology helped project managers manage employees, stakeholders, and resources efficiently. The online project management tools had the capabilities to plan, manage and provide a summary report of the projects which enhanced the collaboration and communication between the teams. As the team needed to have the ability to construct and elaborate the project collectively, NSSA created a centralized online project database with remote access. Finally, the soft skills of project managers were enhanced to include not only leadership, but also the ability to empathize and connect team members remotely, enhance motivation, and avoid miscommunications that might delay crucial project milestones.

5. RECOMMENDATION

The approaches followed by NSSA through the pandemic proved to be successful to handle unexpected circumstances, yet continuous improvement of the approaches is required to ensure sustaining adaptability in the workplace. Also, the approaches would create new accredited standards and policies with regards to the key aspects mentioned in this study: communication, work culture and project management to be adopted in emerging and existing work environments.

In terms of communication, a recommendation of changing the meeting protocols by focusing on effective communication between teams and departments: keep meetings short and conversations brief, always consider teams' achievement and obstacles, hold separate meetings for independent projects or different departments, keep frequency of meetings to a minimal but recurrent. Besides, it is important to believe in "Whole-body decision" which allows individuals to listen to their emotional and instinctual feelings to have a clear communication between other employees and making decisions.

Adapting to change is the key to survive future pandemics, therefore it is vital to promote the cultural change within the organization through passing enthusiasm and flexibility to the workforce. However, change doesn't mean deviating from the core values of the organization, such that each change should be assessed thoroughly prior to implementation. A recommendation of changing the focus metric to productivity rather than working hours, which can be accomplished by adopting a process to evaluate a measurable quantity of employees' performance (e.g., KPI) while having lenient time and attendance procedures. This cultural change will not only shift the workplace to be more environmentally friendly but also encourages remote working and creates a digitally centralized data center for the organization. And to resolve a concern of unstable internet connections or disruptions, salary compensation to provide decent internet service could be provided to employees.

Furthermore, to have successful project management, organizations are required to provide online tools with the capabilities to support project managers in managing resources, employees, and schedule, through all project phases: planning, managing, monitoring, and reporting. Additionally, setting project KPIs is important to measure and track project progress and resources. KPIs help as well in

data visualization and sharing within teams and with sponsors and stakeholder. Also, organizations must consider setting a “Change Management Plan” to manage changes through crises or pandemics by following the below key steps:

- 1) Assess and evaluate the unusual circumstances and how they would impact the work within the organization.
- 2) Survey the input of all employees to find the key aspects to be considered in the “Change Management Plan”.
- 3) Arrange awareness meetings to communicate the initial plan and get employees’ feedback.
- 4) Compile the “Change Management Plan” by defining the procedures, tools, and resources required to achieve it.
- 5) Implement the plan and promote the culture of adaption and adoption within the organization.
- 6) Embrace and monitor the “Change Management Plan” by the executive management, where necessary enforce the plan.
- 7) Seek enhancement of the “Change Management Plan” through continuous monitoring and evaluation.

Finally, it is also recommended for organization to make telecommuting the predominant work arrangement, as the benefits immensely outweigh the negative aspects. Multiple studies showed that it not only increases the productivity of the workforce but also increase the satisfaction levels of the employees and making them less likely to leave. In a given case study [Bloom \(2014\)](#), some employees were switched to remote working and it was noticed that those have completed 13.5% more calls than the staff in office. This increased productivity results in an extra workday per week; besides, it was estimated that for each employee remotely working, the company saved \$1900 in only 9 months. Though, implementing telecommuting is not as simple as employees can be slacking due to low morale, especially with jobs that require team collaborations and discussion. Therefore, the recommendation is to have 2 to 3 days of work-from-home for such jobs as it can be highly beneficial for the well-beings of the employees, lowers the likelihood of exhaustion, and enables the attraction of highly skilled individuals in need of flexibility in their jobs.

6. CONCLUSIONS AND RECOMMENDATIONS

Two years through the Covid-19 pandemic, several industries have collapsed, new game changers emerged to the market, and organizations needed to adapt. Based on several studies, working remotely was found to be successful by employers since employees’ desire flexible working arrangements and employers benefit financially. Thus, many organizations and companies adopted shifting the majority of their employees to working from home permanently, this change is here to stay and for a very long time, demanding new technologies, protocols, and procedure to work optimally.

NSSA being the Kingdom of Bahrain’s space science entity, had a team of engineers, in which most were fresh graduates with different backgrounds to work on the first Bahraini satellite which was developed in the UAE. The circumstances of this unique project created another level of difficulty being in another country in addition to the new work, culture, and procedures to the team. In addition, the team and management had little to no experience with regards to the satellite projects,

satellite remote sensing, and space image analysis therefore adding complexity in the planning and execution.

During the pandemic, NSSA encountered several challenges tackling three main areas: communication, work culture, and project management. The absence of face-to-face meetings was the key challenge to the current communication plan, which was the reason behind deriving other difficulties. Switching to virtual and remote communication platforms required modernizing the communication plan from a waterfall approach to a more collaborative communication with employees, management, and stakeholders. The unusual conditions required immediate adaptation to accepting virtual platforms and modifying the current work culture in terms of security and seamless networking, by modifying the current infrastructure and implementing new policies. Being a project-oriented organization, the role of project managers required additional effort of being fixable, agile, and resilient. The successful story of NSSA through the pandemic reflects the adaptation and determination of the workforce, as the lessons learned will be the key to future accomplishments and successes.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

REFERENCES

- Barbosa, D., & Azevedo, A. (2012). A Platform Specification of a Space Project Management Handbook, *Procedia Technology*, 5, 589–598. <https://doi.org/10.1016/j.protcy.2012.09.065>
- Bick, A., Blandin, A., & Mertens, K. (2020). Work From Home after the COVID-19 Outbreak, *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3786142>
- Bloom, N. (2014). To Raise Productivity, Let More Employes Work From Home, *Harvard Business Review*.
- Brown, N. C., Harrington, Y., Vicinanza, H., Chatman, P., Goldberg, J. A., & Srivastava, S. (2021). How Have Organizational Cultures Shifted During the COVID-19 Pandemic, *California Management Review*.
- Chernogorova, Y., Bliznakov, Z., & Bliznakova, K. (2021). Management Challenges in Implementing Scientific Projects During COVID-19 Pandemic, *Polish Journal of Management Studies*, 23(1), 136–150. <https://doi.org/10.17512/pjms.2021.23.1.09>
- Honore-Livermore, E., & Birkeland, R. (2021). Managing Product Development and Integration of a University Cubesat In A Locked Down World. <https://doi.org/10.1109/AERO50100.2021.9438490>
- Ng, J. J., Navaretnam, S., & Lee Qiong Wei, J. (2020). Considerations for IT Management in a COVID-19 World, *IEEE Engineering Management Review*, 48(3), 16–18. <https://doi.org/10.1109/EMR.2020.3014777>
- Limeade Institute. (2020). Organizational Culture [Research paper].
- Markovic, M., & Salamzadeh, A. (2018). The Importance of Communication in Business. *Management 7th International Scientific Conference on Employment*.

[Project Management Institute. \(2017\). A Guide to the Project Management Body of Knowledge.](#)

[Project.co \(2022\). Project.co. Business Communication Report.](#)

[Travers, C. \(2016\). Does the Future Have Room For Face-To-Face Communication.](#)