Framework for IT Project Management During the COVID-19 Pandemic

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Abstract: The COVID-19 pandemic has resulted in many restrictions enforced in our daily lives in an attempt to curb the virus and protect people. However, there are many scenarios in which working from home is not possible. The pandemic has also caused the distribution of misinformation, resulting in behaviours that affect the health and safety of employees. This paper aims to discuss the effect of COVID-19 on Information Technology (IT) Project Management and formulate a framework to assist organisations in effectively handling the management of IT projects during future similar events. Three areas of concern were identified from a literature review: The *management of physical space* to prevent the spread of disease and ensuring that service level agreements with clients contain clauses pertaining to provided services under extreme conditions such as a pandemic. Secondly, the *people management* aspect ensures employees are productive and placed in teams where they are most effective. Finally, the *Agile approach* used as a whole ensures that the organisation is always prepared to deal with change. This paper combines these concepts to provide a framework that tackles the problems that arise in the management of IT projects during COVID-19 and any future similar crises.

1 INTRODUCTION

Recent years have seen the COVID-19 virus have a drastic impact around the world in a variety of different ways. A significant impact on working people has been the restriction of working from home in order to avoid transmission of the disease. Working from home is beneficial when the work-life balance is properly maintained (Chu et al., 2022). However, many jobs do not suit working from home (Lund et al., 2021). The Information Technology (IT) sector within the context of this study refers specifically to those dealing with hardware on-site, such as the maintenance of server rooms and company machines, or having to deal with sensitive data that should not leave company premises and should only be accessed through the local intranet network (Anand, 2021).

It was found that there was insufficient research into methods and guidelines that could guide IT Project Management during a pandemic such as COVID-19, which prompted this study.

The majority of work in IT, such as software development and hardware maintenance, cannot be completed by a singular person and requires teamwork, which means that in the case of COVID and in any future disease outbreaks on such a large scale, there needs to be a reliable framework on how this kind of work can be done in order to be completed effectively and safely for everyone involved.

This framework must involve any processes that the organisation usually undergoes regarding IT and should also include the education and training of employees in combatting misinformation they may be exposed to that could jeopardise the organisation or the individual.

The remaining paper follows with Section 2, a literature review of related works in the field of IT Project Management relating to the current pandemic. Section 3 discusses the method followed to deconstruct this problem by using the associated works found and separating them into areas of concern. Section 4 contains the results found and the

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discussion of the formulated framework. Finally, the paper concludes with Section 5, which outlines the conclusions, limitations, and further research areas.

2 PROBLEM BACKGROUND

The COVID-19 pandemic has resulted in sweeping changes to the world of work in recent years, including in the IT Project Management sector, such as the move from working in an office to working from home and in-person meetings going online (Nguyen-Duc et al., 2022). The pandemic forced organisations to change the way their employees worked, as well as how they communicated with their customers.

Shamin (2022) compiled a report on the various impacts that the pandemic had on project management; it was found that the first notable impact was on communication; organisations had to move to remote work, so communication happened in online meetings rather than in the in-person. These meetings were held in virtual teams, and chats were used for minor issues that did not warrant full meetings. Managers were found to detect problems faster due to this constant communication; however, participation rates in online meetings were low (Hale & Grenny, 2020). The subsequent impact was that project planning was found to take longer due to uncertainties and delays in the initiation phase because stakeholders became unsure of the future. Some projects that required face-to-face interaction were also delayed, and their operations had to be paused due to the restrictions on working on-site. Employees also felt more pressure due to work and home responsibilities overlapping, resulting in increased working hours and isolation. Many project teams had to shift their focus to the essential and critical processes and infrastructures that were required for the business function to continue during the pandemic, sometimes finding innovative ways to accomplish their goals. For example, software such as Google Drive was used to form a centralised data store where all relevant documents could be accessed by all team members anytime, allowing project managers to monitor progress more efficiently (Shamim, 2022).

Having discussed the impacts that COVID had on Project Management (PM) processes, the problematic effects of the pandemic on PM will be addressed in the following section, starting with the impact of misinformation.

2.1 Related Works

2.1.1 Infodemic

The term Infodemic refers to the "information epidemic"; that is, the overload of information being spread during a disease outbreak, with most of it false, misleading, and/or harmful. According to the World Health Organisation (WHO), an infodemic can lead to the public mistrusting their health authorities and governments, as they will regard all information with suspicion, even those coming from trustworthy sources. It undermines the public health response, which can lengthen or intensify an outbreak, as the public could be unsure about the manner in which their health can be protected and the health of those around them (WHO, n.d.). These effects can be felt in the workplace, which must be prevented to ensure the health of employees and customers.

The growing use of social media and the internet during the world's digitisation has resulted in the rapid spread of information, and due to the freedom of social media sites, the vast majority of this information is not fact-checked or reliable. (Basol et al., 2021) states that this amplifies harmful messages, which are specifically aimed at catching the attention of a large number of people through the use of alarmist language and outrageous claims.

The misinformation being spread covers a wide range of topics, some of which are extremely dangerous and can cause hospitalisation or even death. There are also many conspiracy theories surrounding the entire outbreak, such as the origin of the epidemic being a deliberate biological terror attack, a mistaken leak from a lab that was covered up, the consumption of a bat in a restaurant, etc. Theories that governments are causing coverups to hide facts have caused people to think that authorities cannot be trusted. This misinformation has been shown to travel further and faster through social media than legitimate, accurate information. Due to the sheer amount of misinformation and repeated exposure, people are more likely to believe in this false information. The misinformation poses a problem in that any policies put forth in an organisation can come to nothing if those who are meant to abide by such policies to protect their own health and that of their colleagues instead believe the misinformation. Thus, organisations must do their utmost to ensure that misinformation is kept at a minimum from the very beginning.

The WHO lists the following four methods that are mainly used to fight an Infodemic and show the community that their concerns are heard and that all

reasonable possible measures are being taken to combat such a disease outbreak (WHO, n.d.): the first method is that of listening to the concerns of the community and their questions. Secondly, organisations should promote awareness and understanding of health risks and expert health advice. Thirdly organisations must build resilience to misinformation. Finally, engaging with and empowering communities to take positive action ensures that employees can focus on their work because they are being kept up to date with reliable information instead of jeopardising their colleagues' health and the progress being made on the project they are working on.

2.1.2 Agile Transformation

Bushuyev, Bushuiev & Bushuieva (2020) explored the phenomenon of the COVID-19 Infodemic and proposed that an Agile Transformation be used in managing projects and programs to deal with misinformation. It was found that the first key principle to consider in this topic is that of ignoring resistance to change, which refers to the fact that the majority of people are resistant to change and cling to the old (Bushuyev et al., 2020); ignoring this fact can result in failure. Secondly, the lack of change being comfortable refers to the fact that when lack of change is the status quo, it becomes a challenge to deal with because remaining the same is easy and known territory. In contrast, change is unfamiliar and can give rise to fears. For example, if rewards have always been given to individuals, how does one come to work in a team? How does one learn to self-organise if they have always been under strict subordination? This means that change is a long, arduous process and must be implemented carefully, leading to the next point, which is teamwork.

There are three common mistakes when creating a team for agile projects. Firstly, selecting team members based on psychological compatibility. A common goal and teamwork should be used instead to unite the team. Secondly, reforming existing teams for potential psychological compatibility destroys the team's foundations; creating a new team in a new environment is more effective. Finally, underestimating the value of diversity as people with dissimilar personalities and backgrounds are more effective because they bring in more differing background experiences and enhance relationships (Bushuyev et al., 2020).

It is also important to note that while a team must be cohesive in order to work effectively and efficiently, a balance must be kept as the impact of having a team that is too cohesive can have disadvantages in decision-making. When team members think alike, a small number of options are considered in group decisions, and initial goals are not further reviewed or contested. To avoid changing the course of action, newly discovered risks are not considered, and decisions that have already been rejected are not re-examined when new information is found. Furthermore, no external experts can bring their knowledge and experience. The group might also prioritise information supporting their original decisions and ignore those conflicting with it. Finally, the group does not consider the effects of bureaucracy and their organisation on their decisions as they are too used to working within the group.

Figure 1 (Bushuyev et al., 2020) illustrates the life cycle of a project manager presented as a Kuber-Ross curve for personal changes. It demonstrates that the beginning stages of a change are met with resistance and a drop in performance due to shock, denial, frustration, and depression, which affect both the project management team and beyond. This is followed by experimentation, decision and integration as the change is slowly accepted and implemented (Bushuyev et al., 2020). By using agile methodologies, one can become more accustomed to this lifecycle and react to changes faster, resulting in less time being spent languishing in phases 1 and 2. Rather, the more productive phase 3 will be predominant.

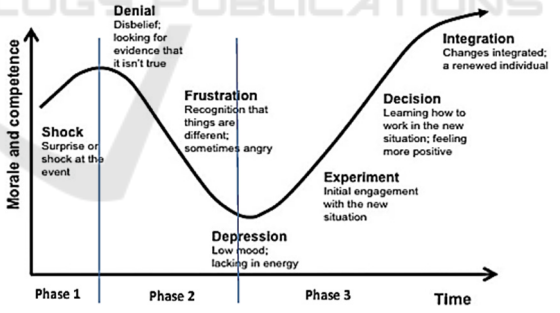

Figure 1: A figure illustrating the curve of an IT Project Manager's personal changes. (Bushuyev et al., 2020: 8).

It is found that in order to manage these problems of the maladaptive defences (Bovey & Hede, 2001) causing resistance to change in phases 1 and 2 successfully, the following rules should be followed (Bushuyev et al., 2020):

1. There must be mutual trust when implementing tasks, social-ethical norms should be followed, and work must be oriented towards fruitful cooperation and commitment.

2. All tasks, roles, jargon, etc., must be clearly defined and explained.

3. There must be good availability for any professional skills that might be needed for the project.

4. There must be a common space where stakeholders can meet and engage professionally, with a minimum set of engagement rules.

The use of specialised agile tools such as Kanban, P2M, Kaizen, and others should be implemented to increase the effectiveness of project implementation. These tools can be used in all aspects of project management, such as development and operations in IT.

2.1.3 Impact on Security

There are two main areas of work in IT; that is, Development and Operations (Ng et al., 2020). Software Development can be completed anywhere by collaborating online with tools such as GitHub or Bitbucket. Operations sometimes need to be on-site, typically at data centres, because tasks that need to be completed usually include the maintenance of Client and Service-Level agreements, as well as the installation, monitoring and maintenance of hardware systems (Pnet, n.d) in order to protect against breakdown and cyber-attacks by installing patches that close off vulnerability and gaps in security. This patch management and the processes related to it are often required to be completed in a controlled environment on-site in order to prevent security breaches.

In order to ensure that project managers can lead their teams by maintaining motivation rather than forcing employees to work, an agile approach should be implemented both in day-to-day project management as well as in crisis. This will accomplish multiple goals, which include that of team motivation as well as others that align with Agile principles. The following considerations have been identified that align with the agile manifesto (Ng et al., 2020):

The first point of concern is that when considering the interactions of individuals, ensure that meetings are made virtual whenever it is possible to do so. Regular meetings should be virtual, and multiple call centres should be set up to ensure a backup of spatially separated service delivery in the event of an outbreak. Next, contract negotiations with clients should be held in which service-level agreements are redefined to include clauses that allow for deviation from the contract under extreme circumstances, such as a pandemic or some other such crisis, in order to focus only on critical business functions rather than maintaining the entire system. Finally, Standard Operating Procedures should be re-examined and altered to promote resiliency when making changes, which requires some level of expertise to anticipate, detect and evaluate shocks.

2.1.4 Employee Exhaustion

The changes COVID-19 has caused in organisations have caused immense stress on employees. Dealing with change is stressful even in normal times (Sutherland & Cooper, 2006). Transitions and other pressures caused by the pandemic have taken an extra toll on the well-being of employees. Due to the inherent need for collaborations in projects, many organisations have minimised face-to-face contact as much as possible and rather implemented full-time teleworking, which has resulted in adjustments being made in the workplace to ensure employees keep up with their tasks.

The exhaustion of employees can be measured by recording the number and types of unfinished tasks an employee has once they have finished working. Trends have shown that employees are likely to prioritise tasks related to COVID-19, resulting in neglect of other everyday tasks. Persistent unfinished tasks are a strong indicator that an employee is exhausted.

Agile project management is an effective management approach that aims to support adjustment to change within an organisation (Bergmann & Karwowski, 2019). Employees who work in environments that apply agile methodologies experience high levels of autonomy and freedom, as well as equality and iterative delivery of work items. Employees do not need to adhere to long-term plans and are, therefore, more adaptable to change (Koch & Schermuly, 2021), which means they are less likely to experience exhaustion and burnout.

Employees suffering from mental and physical exhaustion are more likely to make mistakes in their work, perform poorly in their duties, and even become physically sick and therefore need to take time off during a critical time (Kim & Wright, 2007).

2.1.5 Critical Success Factors in Managing IT Projects

A research study was conducted in Indonesia by surveying 83 people in various positions and companies that work on IT projects. The study identifies 12 critical success factors (CSF) in IT Project Management, and a further 12 success factors were identified that were deemed to have a lesser impact on project success but that are still important (Wahbi et al., 2020):

Table 1: Critical Success Factors in Managing IT Projects.

	Critical Success Factors	Other Success Factors
1.	The efficient use of an Information Technology Communication tool, such as Zoom, Email, Microsoft Teams, etc.	Intellectual knowledge of technical skills required for the project.
2.	Commitment from the highest levels of management.	Skills relating to technology, networking, and multidisciplinary skills.
3.	Support from heads of the family when working from home.	Experience and knowledge when working with virtual teams.
4.	Perception of the work-life balance by family when working from home.	Composition of the team.
5.	Integrity.	Adaptivity regarding cultural and regional differences.
6.	Being part of a project team that is competent.	Leadership being inclusive.
7.	Leadership skills from managers.	Set goals being achievable.
8.	Tolerance of family to share interior spaces when working from home.	Qualification of leader.
9.	Having team members' roles and responsibilities clearly defined.	Set goals being measurable.
10.	Organisational Culture	The skill sets of team members are diverse.
11.	Comfort.	The freedom to choose work tasks.
12.	Actions by leadership to create and foster trust.	Having changeable goals.

3 METHOD

A narrative literature review was conducted, which found three main areas of concern that affect the management of IT projects during a pandemic which will be used to formulate the framework in Section 4.

3.1 Physical Space and SLAs

One of the big problems faced during COVID was that of working on-site. Certain industries, such as those providing essential services, must stay working to keep society functional, and IT services can be classed as essential, especially when everyone working remotely relies on IT to be able to do so.

As Ng, Navaretnam and Wei (2020) mention, physical locations are important for IT companies, so decisions must be made regarding what must be done when these locations are impaired (Ng et al., 2020). The obvious solution is to have multiple backup locations in case a primary location becomes unusable. However, in the case of a pandemic, the issue is not an entire site becoming unusable but rather the number of people who can work on that site safely to limit the spread of the virus. The South African Government (SA Gov, n.d.) has regulations in place for employers, including rotating shifts and staggered break times, the use of physical barriers where social distancing is not possible, and the use of personal protective equipment (PPE). This must be applied to any situations where employees must work on-site; for instance, in the case of hardware maintenance, the number of employees allowed to work at the same time should be limited, and they should be wearing PPE during that time.

The negotiation of SLAs assists in lessening the burdens on staff by containing clauses that specify the required minimum capacity of services to be provided in such times of crisis rather than requiring all operations to be run as usual.

3.2 Human Resources

It is important to remember that everyone working in an organisation is only human, and meeting their needs will ensure they are productive. COVID was found to impact employee exhaustion (Koch & Schermuly, 2021) (Shamim, 2022). This results from the blending of work and home responsibilities in those working remotely, resulting in longer work hours and the prioritisation of COVID-related tasks over other work tasks. Exhausted employees are less productive and are prone to making mistakes. Measuring tasks can ensure that management can step in and prevent employees from reaching this state.

The organisation should also take steps to prevent the spread of misinformation among employees. COVID was accompanied by an infodemic that should be stopped whenever possible by giving employees reliable information from trustworthy sources to ensure that employees do not undermine the company's efforts to keep them safe by believing and spreading misinformation (WHO, n.d.).

The CSF above show that in IT PM, many social factors influence a project's success, which must be kept in mind (Wahbi et al., 2020). Teams should be formed with careful consideration to ensure that they work well together and yet not so well that they cause problems (Bushuyev et al., 2020).

3.3 Agile Approach

All these factors should be accomplished while following agile methodologies. Agile focusses on

change. It assumes that change is always a factor and that everything should be based on change; therefore, it promotes rapid adaptability in times of uncertainty to produce something of value (Wangsa et al., 2022).

Daily meetings with stakeholders to discuss progress and changes and Kanban boards to collaborate are methods used in Agile. Agile is already widespread in IT, especially in software development, and has shown many benefits. By adopting this as a management framework as well, personnel are likely to become more used to the concept of change. This means that when needing to adapt to significant changes, such as those caused by the pandemic, people are more likely to respond positively in more productive ways, such as humour and anticipation, rather than maladaptively, such as with denial and disassociation (Bovey & Hede, 2001).

The Agile PM framework has principles that guide management in running projects in such a way that changes are expected and incorporated into the daily routine. This is done by following the Agile Manifesto by stating how projects should develop and what should be prioritised.

4 RESULTS AND DISCUSSION

There are many factors to consider. Throughout the framework, the CSF listed in Table 1 must be kept in mind to continue implementing the project successfully while protecting the health and safety of employees.

The framework illustrated below in Figure 2 combines concepts into a comprehensive set of instructions that allow an organisation to manage IT projects effectively during a pandemic like COVID-19.

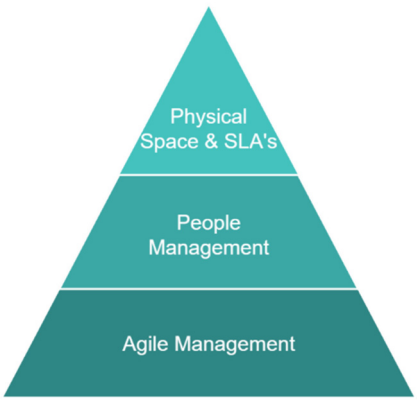

Figure 2: The proposed Framework for IT Project Management during COVID-19.

This framework has the bottom-most stage being the most important and the top-most stage being the least important. Agile Management is the most important stage, as it forms the basis of the stages that follow. The people management stage is built upon the Agile methodology and requires that it be in place. Likewise, the final stage of Physical Space and SLAs requires that the previous two stages are in practice. This is because agile management must take into account the practices of the organisation as a whole, which guides the management of personnel. Physical Spaces and SLAs are much easier to manage and change than the mindset of an organisation and must therefore be built upon the basis of the other two tiers.

4.1 Agile Management

The most important aspect of Agile is adaptability. This stage is fulfilled by ensuring that the organisation follows Agile principles. This will fulfil four central values: Trust, Flexibility, Empowerment, and Collaboration. Agile is already used in software development, as it combines traditional aspects with modern requirements to use an iterative approach to continually improve the work at hand. These principles are also used in project management, as outlined in the Agile Manifesto (Bergmann & Karwowski, 2019). This ensures that when changes must be made, especially in the field of IT and when a crisis such as a pandemic occurs, employees are adaptable and prepared to accept and implement the change. The type of change that will be faced in times of crisis cannot be foreseen, but by adopting an agile methodology, people become used to the concept of change, and when facing sudden change that cannot be avoided, are more likely to respond efficiently and effectively rather than maladaptively. This is done mainly by having regular meetings, which should be made virtual whenever possible and using agile tools such as Kanban boards to assist in this approach.

This is accomplished by fulfilling the following (Bergmann & Karwowski, 2019):

1. **Approach All Project Management with an Iterative Approach.** This will ensure that nothing is set in stone, as factors covered in the planning phase will be revisited throughout the project, allowing for adaptive changes.

2. **Enable Constant Collaboration Between Stakeholders to Ensure Customer Satisfaction and Team Understanding.** This step is essential for this framework, as any big change requires that all parties are informed and can make key decisions based on this new information. Team members also require clear communication daily in order to work

effectively and efficiently. Such interactions between the individuals involved in the project are more important than the processes and tools used, as they will make the best use of available resources. During a pandemic such as COVID-19, full use should be made of available technologies for remote work, such as online meetings, and collaborative tools like Git to prevent the spread of disease.

3. Break Up Projects Into Smaller Segments which Are Then Prioritised and Tackled in order of Priority. In this way, large projects can be completed part by part, allowing each part to be completed and tested before it is added to the whole.

4. Prioritise Working End Products Over Comprehensive Documentation. Documentation is important, but when facing an emergency situation, the focus should be on ensuring that the main requirements of the project are met, as documentation can still be completed after the deadline.

4.2 People Management

People are precious resources and are integral to the success of a project. As such, it is of vital importance that they are managed effectively in order for them to be productive and safe.

1. Compose Effective Teams. Project team members should be carefully selected to ensure that they have a diverse skill set that complements each other and that they can work well together but not so much that they form cliques to the detriment of the project. This ensures that in times of crisis, team members can depend on each other to be productive and effective without being reduced to petty social conflicts (Bushuyev et al., 2020).

2. Combat Employee Exhaustion: Use consistent unfinished tasks as a metric to detect when employees are exhausted and susceptible to poor performance (Sutherland & Cooper, 2006) so that employee burnout can be reduced, especially at times when staff shortages can result in significant damage to an organisation being strained by a crisis such as a pandemic. This ensures that employees are mentally healthy and keep up productivity.

3. Combat Misinformation: This is accomplished by raising awareness about it and educating employees about correct information distributed by proper authorities (WHO, n.d). Misinformation can undo any policy or guideline an organisation has in place. Hence, it is important to pre-emptively combat this and ensure that employees are well-informed and aware of the facts at all times and can stay as safe as possible.

Once the People Management aspect of the framework has been addressed, and the foundational aspects that should be in place during normal circumstances have been implemented, the framework will address pandemic-specific changes.

4.3 Physical Space and SLAs

The final tier of the framework addresses the changes that must be made once the pandemic does affect the organisation (Ng et al., 2020):

1. Managing the Physical Workspace. Physical on-site spaces should be increased to ensure adequate space for employees to work together when necessary while maintaining enough distance to be safe. Suppose a large enough space is not available. In that case, this can even be implemented by way of splitting up separate rooms with ventilation so that while team members need to work together on a project in close communication, they will not be in direct contact in close quarters.

2. Negotiate SLAs. Negotiate agreements with clients to make provisions for extreme circumstances such as COVID-19 to ensure that in such cases, requirements for the project shrink to only require core services rather than entire system maintenance. This ensures that critical services stay running rather than straining resources to maintain non-critical systems resulting in unaffordable downtime.

5 CONCLUSIONS

In conclusion, this paper has found three main areas of concern regarding the effects of COVID on IT PM: physical space, human resources, and the agile approach. Using these identified areas of concern, a framework was formulated that aims to help protect on-site and remote employees during a major and prolonged disease outbreak. It was found that the combination of these methods by using the framework in Section 4 offers the best scenario for keeping workers safe during a situation such as the COVID-19 pandemic.

This paper first introduced the problem in the introduction and then conducted a narrative literature review of related works on the topic of dealing with COVID-19 in IT PM. This was used to formulate a framework to help solve the identified problems, and then the framework was presented and discussed.

Limitations of this research that could be handled in future works entail surveys gathered from IT companies to further explore each topic mentioned in this paper in depth to determine how effective such a

framework is in the industry and how it can be improved upon.

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