Challenges During the Period of Movement Control Order (MCO) Against the Success of Software Development Project Management Deliverables

Surya Sumarni Hussein[1], Fariq Abdullah[2], Azhar Abd Aziz[1], Nur Azaliah Abu Bakar[3], Supratman Zakir[4], Anitawati Mohd Lokman[1,*]

[1] College of Computing, Informatics and Media, Universiti Teknologi MARA, Shah Alam, Malaysia
[2] Dataprep Holding Berhad, Kuala Lumpur, Malaysia
[3] Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia
[4] Universitas Islam, Barat Sumatera, Indonesia

ARTICLE INFO

ABSTRACT

Before it was declared a pandemic in March 2020, the Malaysian government was compelled to begin enforcing the MCO countrywide on 18 March 2020, and the World Health Organization classed the COVID-19 outbreak as a public health emergency. The MCO's implementation significantly impacted the Malaysian economy, resulting in a 17.1% fall in GDP in the second quarter of 2020. Implementation of MCO during the Covid-19 pandemic has direct and indirect effects and implications on project management. This situation also may interfere with the project deliverables since project management is extremely sensitive to rapid changes. The issues that the project manager faces and how the software affects project deliverables have been examined in this study. From the standpoint of a software development project, the researcher will identify the challenges the IT project manager poses and their impact on project deliverables. In this study, we will evaluate whether implementing the MCO during the Covid-19 pandemic has given significant challenges to the IT Project Manager to successfully deliver the software development project. The literature review resulted in challenges; furthermore, the interview with three IT Managers of an ICT company in Malaysia discussed 18 challenges drawn from the analysis of the interviews. Hence, these findings of the innovative study area on software development have provided an enhanced judgment and interpretation on deciding mitigation strategies in the early stage of software development projects during the MCO.

1. Introduction
1.1 Background

The World Health Organization classified the COVID-19 outbreak as a public health emergency before declaring it a pandemic in March 2020 [1-3]. Since then, the local contagion has worsened, with the number of infections and deaths rising drastically every day, forcing the Malaysian government to implement the MCO nationwide beginning on 18 March 2020, a week after the World

* *Corresponding author.*
E-mail address: anitawati@uitm.edu.my

Health Organization declared the pandemic [1,2]. According to the Economic Outlook 2021 Report released by the National Treasury Department of Malaysia, stated that the Malaysian economy received a huge impact that caused the Gross Domestic Product (GDP) to decline by 17.1% in the second quarter of 2020 as a result of the implementation of the MCO [3]. Meanwhile, the unemployment rate has increased to 3.9% compared to only 3.3% in 2019 [4]. The closure of the economic sector caused many companies, especially Small and Medium Enterprises (SME) companies, to lay off employees or face the possibility of shutting down [5].

These are the issues that occur due to the MCO. It has direct and indirect effects and implications on project management. Project management is very sensitive to sudden changes, and these risk factors can interfere with the project deliverables. In this study, the researcher will identify the challenges faced by the project manager during movement control orders enforcement by the government and the effect on project deliverables from the software development project perspective.

Economic turmoil, stringent restrictions, and public health threats are among the issues hindering the successful delivery of any project. IT-related companies had already adopted most of the new norms long before the pandemic. The project team can work anywhere if there is internet access. However, a few studies were conducted regarding the challenges and effects of the software development project. Therefore, this research aims to close the gaps and understand the issues IT project managers face. At the end of this research work, the researcher has been able to provide a recommendation and suggestions for the IT project manager to mitigate and minimise the future impact of such a similar situation.

This study will look at the challenges faced by the project manager in delivering the project during the uncertain situation of MCO. In guiding this research, the research questions are: What challenges may cause the failure of software development project deliverables during MCO? Hence the research question for this study has been answered to identify challenges that may cause the failure of software development project deliverables during the MCO.

2. Literature Review

MCO enforcement contributes negative and positive consequences impacts on project management. However, significant hindrances compared to the consequences of successful project implementation and deliverables are more eminent [6]. This section will discuss the segment involved in this research.

2.1 Implementation of MCO

The virus has spread globally to over 223 countries [7]. Thus, this pandemic necessitated various countries worldwide, including Malaysia, aggressive combating strategies to curb the spread of this disease by implementing the lockdown. Malaysia specifically announced MCO beginning on 18 March 2020. Abiding by the Prevention and Control of Infectious Diseases Act 1988 and the Police Act 1967, this order implies restrictions on social activities [2]. The restrictions imposed during this period were closing government and private premises except for essential services such as water, electricity, broadcasting, banking and finance, security, and many more [6-9].

As the number of COVID-19 cases escalated, governments tightened the regulations by restricting the movement and travel domestically and internationally, which caused international workers not able to enter the country. All kindergartens, public and private schools, including day schools, residential schools, and institutions of learning, were closed. Not only that, but they also complete

restrictions on movement and gatherings nationwide, including religious activities, sports, and cultural and social events [6]. This action had imparted tremendous consequences and implications to psychological conditions, economic sectors, education, socioeconomic impacts, unemployment, and project deliveries [10].

2.2 Software Development

Compared with other types of projects, a software development project is similar in definition as defined by Project Management Institute (PMI). Software development can be defined as a collective process involved in creating a software program which includes all the phases of the software development life cycle, which revolves around the challenging endeavour carried out by an individual or group of people within the specific objective, constraints of time, cost, and resources that result in new or improved software code that significantly enhances a current or new business process. In addition, Williams and Cockburn [11] state that software development cannot be considered a defined process because too much change occurs when the team is developing the product. It is highly unlikely that any set of predefined steps will lead to a desirable, predictable outcome because requirements change, technology changes, people are added and taken off the team, and so on". ISO and IEC defined developer, which includes development as, "organisation that performs development tasks (including requirements analysis, design, testing through acceptance) during a life cycle process" [12].

According to Espinosa *et al.,* [13], software development project needs to be well-coordinated to produce software of higher quality and at a lower cost. Kraut and Streeter [14] state that successful software development requires tight coordination among the various efforts involved in the software development cycle.

In his articles, Fraser *et al.,* [15] further explained how the software development project fundamentally differs from other kinds of projects. Software is made up of concepts, designs, directions, and formulas. Most software development requires thinking, which increases the complexity and the characteristic of software activities relative to other projects.

2.3 Project Management

Various teams, businesses, and industries start and finish thousands of projects daily. With so many different types of projects, it leads to many ways to manage those projects. In defining project management (PM), Doskočil *et al.,* [16] stated that PM utilised a variety of approaches, strategies, and tools for project planning and management. Projects should be carried out within proposed deadlines using planned resources and cost to achieve the defined goals. The execution of these is the principal goal of PM, whose results should be effectively planned, managed, and implemented. On the contrary, Othman and Ishak [17] interpret PM as applying skills, knowledge, tools and procedures to achieve project objectives in project activities. There should be at least one project manager to manage the project [8,17].

PMBOK 6th defined the project objective as a triple constraint, i.e., scope, cost, and time [18]. Marchewka [19] defined the project goal as the value brought to the organisation in which the project resides. It is clear here that every project expects to meet its goals and objectives. Moreover, to successfully achieve its objectives, Schwaber and Sutherland [20] emphasised team collocation to reduce the communication barrier and smoothen the communication flow.

A good PM ensures that project priorities are closely associated with the company's strategic objectives. Through proper PM, efficient allocation of resources ensures that every resource is

available when needed. The hindrances in all contributing factors provide great challenges to the project managers as the inherent difficulty increases to fulfil the expectation of stakeholders while ensuring smooth and successful deliverables within the controlled constraints [20].

2.4 Technology and Software Project Management

During a pandemic, software project management faces unique challenges due to the remote work environment and the need for increased collaboration and communication [21]. Various items involved in technology and engineering play a crucial role in addressing these issues [22,23]. Some key considerations that can help with this issue are remote collaboration tools, virtual project management, cloud infrastructure, code collaboration and version control, continuous integration, and deployment activities, ensuring security and data privacy in place, and the need to have performance and monitoring and issue tracking [22,23]. However, it is not easy for the organization to consider all the technologies and mechanisms as stated due to many factors involving people, processes, and technology.

3. Methodology

Research designs are a method and strategy used by the researcher to plan how the researcher will construct, implement, and conduct a research study by ensuring all the hypothesis, research question, and information is addressed effectively [24]. For this research work, we designed the study based on the figure in Figure 1. Detail of each phase is explained in the subsection below.
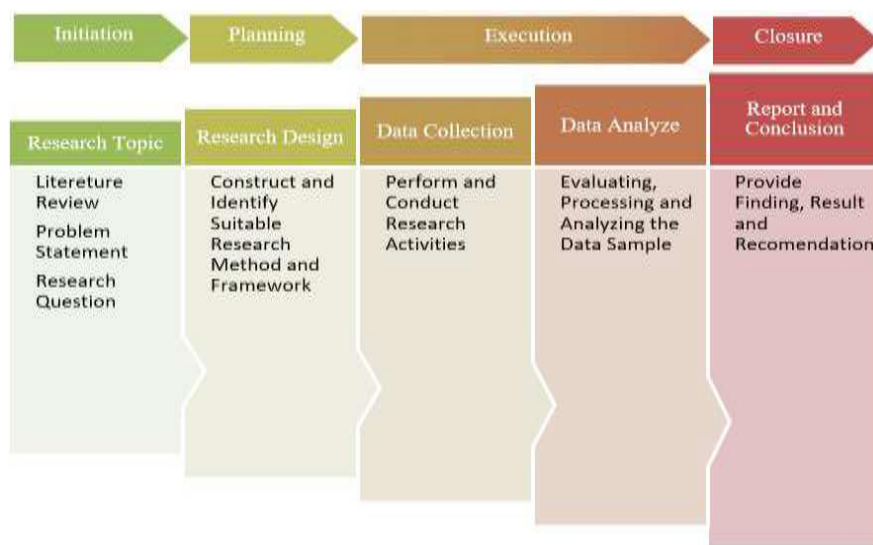

Fig. 1. Research flowchart

3.1 Initiation Phase

The first stage of this research entails the conceptual process of transforming a study idea into a practical and appropriate research strategy. In this phase, time is spent critically reviewing the literature on the topic of interest as follows

i. Issues and challenges in Software Project Delivery
ii. Impact of MCO and COVID-19 pandemic on project management

iii.   Factors to determine the success/failure of project deliverables.

Google Scholar and UiTM Digital Library have been the main platform for searching and obtaining relevant literature material. The topic has been refined until a succinct research issue, question, and objective are determined.

3.2 Planning Phase

The second phase comprises the planning and design of this research work. A suitable research methodology and method have been designed and constructed in this phase to proceed to the next phase. Several factors must be considered before the researcher can choose the best research methodology to be adopted in this research work, namely, (i) Aims of the research, (ii) Norms of the research area, and (iii) The practicality of the methodology used.

As for this research work, a qualitative and inductive approach has been selected as the research method to be carried out for the entire research work. A qualitative method with an inductive approach was selected as it seems adequate for understanding the challenges during the MCO from the perspective of IT Project Managers. Thus, to conduct this research, the scope and criteria need to be considered as follows:

3.2.1 Inclusion criteria

A person who holds the position of IT Project Manager or equivalent roles with five (5) years and above of experience as an IT Project Manager or equivalent roles and previously or currently managing a software development project before and during the MCO period.

3.2.2 Exclusion criteria

A person who does not hold the position of IT Project Manager or equivalent roles with less than five (5) years and above of experience as an IT Project Manager and has never previously or currently managed a software development project before and during the MCO period.

3.2.3 Sampling size

Sample sizes in qualitative research are frequently limited to allow for the degree of specific instance analysis that is essential to the purpose of the study [25]. According to qualitative research experts, there is no simple answer to the issue of "how many," and the sample size is determined by numerous factors [26]. Dworkin [25] recommended and proposed a range of five (5) to fifty (50) participants is enough as the numbers are adequate to provide righteous and quality information for case-oriented analysis. However, considering the limited time frame for this study to be complete, only three (3) IT Project Managers have been interviewed for data collection purposes.

3.2.4 Data collection instrument

The process of acquiring and analysing information to answer the essential assessment question features defined throughout the evaluation process is data collection [27]. For this study, a semi-structured interview was used to gather the data. A set of questions has been drafted based on the literature review of the challenges contributing to project delivery [28].

3.3 Execution Phase

In executing the research questions, the research should start with data collection. A suitable technique should be decided, i.e., an interview with the designated respondent. From the input of the interview session, the data has been analysed. All data collected has been analysed by evaluating and processing the data. For this research, the researcher has adopted a Six Phases of Thematic Analysis method recommended by Braun and Edwards [29] and Ciotti *et al.,* [30]. As for this study, the data collected has been analysed using thematic analysis. Table 1 depicts the sample to analyse the findings using a thematic approach.

Table 1
Sample on analysing interview findings using Thematic Analysis

Text (Excerpt)	Theme (Elements)	Code (Challenges)
"Initially they were a bit hesitant to adopt it because they scare that will take a longer time for them to relearn and then to get the feedback, they wanted but after going through one cycle of modules they can see the benefit of using agile instated of using the waterfall method…" (P1)	Process	Wrong, lack, unclear and unappropriated process, procedure and methodology applied Wrong, lack, unclear and unappropriated process, procedure and methodology applied
"…the team are not available during the weekday because they have another meeting so they need to schedule the meeting on weekend. it is becoming… I think it affecting not only the team member but also the whole organisation la in terms of risk of time management, mental health, and well-being of the overall staff…." (P3)	People	Difficulty in managing time, schedule and plan during MCO compared to before MCO
"…so sometimes the technology failed. Sometimes there is no internet…" (P1)	Technology	Lack of infrastructure and tools to support a remote working environment

3.4 Closure Phases

The final phase is the closure, where a report and conclusion have been established. This research will table the findings and results from the execution phase and provide suitable recommendations based on the analysis of the findings.

4. Result

The finding of the interviews shows there are three (3) Elements (Themes), namely people, process and technology, and 18 Challenges (Code) that can be challenging to ICT Project Managers, as depicted in Table 2. The detailed analysis of the interview arranged into the theme (Elements) is given in the following subsection.

Table 2
Challenges in delivering projects during MCO

Challenges in Delivering the Project During MCO					
Theme (Element)	Code (Challenges)		P1	P2	P3
Process	1.1	The level of effectiveness in communication degraded during MCO compared before MCO	High	High	High
	1.2	Wrong, lack, unclear and unappropriated process, procedure and methodology applied to contribute to the difficulty of managing the project during MCO compare before MCO	High	High	High
	1.3	Project activity and the task is difficult to plan and schedule during MCO and this cause delay in the project deliverables compare to before MCO	Low	Mid	Mid
	1.4	It is difficult to perform effective monitoring and control of team member's activity during MCO compare to before MCO	High	Mid	High
	1.5	It is difficult to assign tasks and activities to a team member during MCO compare before MCO	Low	Mid	High
	1.6	It is difficult to perform user requirement gathering activities with the user and understand the requirement during MCO compare before MCO	High	High	High
	1.7	It is difficult to identify and manage potential risk during MCO compare before MCO	Low	Mid	Mid
	1.8	It is difficult to manage and maintain the quality of deliverables during MCO compare before MCO	High	High	Mid
People	1.9	It is difficult to train and uplift team member's skill sets during MCO compare before MCO	High	High	High
	1.10	The motivation, productivity and focus of team member is more degraded during MCO compared before MCO	Low	High	Mid
	1.11	The degradation and concern over the health and well-being of team members cause a lack of productivity and focus during MCO compare before MCO	High	Mid	High
	1.12	It is difficult to hire a new or find a new replacement of team member during MCO compare to before MCO	Low	Mid	Mid
	1.13	It is challenging for an IT Project Manager to be an effective leader during MCO compared to before MCO	High	High	High
	1.14	It is difficult to get a commitment, cooperation and involvement from the client/customer during MCO compared to before MCO	Low	Mid	Low
	1.15	It is difficult to manage time, schedule and plan during MCO compared to before MCO	Low	Mid	Mid
Technology	1.16	The team member and client/customer have difficulty using and becoming familiar with the technology used during MCO	High	High	High
	1.17	A lack of infrastructure and tools to support a remote working environment causes the failure of project deliverables during MCO	High	Mid	High
	1.18	Rejection of users to use the technology and tools provided during MCO cause the failure of project deliverables	High	Mid	High

4.1 Process

The theme with the most challenges identified is the "Process" theme. The project assigned to the team involved processes that needed to be followed and managed. In managing software

development projects, many activities are involved in the process. The interviews that have been conducted have revealed eight (8) challenges. However, during MCO, P1 stated that it is difficult to perform user requirement gathering activities with the user and understand the requirement during MCO compared to before MCO. P2 and P3 also raised the same issues, and P2 highlighted that MCO also affected the quality of deliverables due to difficulties in managing the project. This is also related to the level of effectiveness in communication degraded during MCO compared to before MCO. Below is the detailed analysis discussed regarding the process element.

(a) The level of effectiveness in communication degraded during MCO

According to participants, a very low degree of effective communication existed amongst project team members during MCO. The fact that everyone on the team works from home during the MCO and can only communicate and collaborate on projects using video conferencing software is one of the grounds reasons for their assertion. Additionally, because their attention is diverted frequently, team members recurrently misunderstand what is being presented. When other team members argue about the topic, others are not even in front of the computer. As a result, it was necessary to have additional briefing meetings to ensure that everyone on the team understood the topic under discussion. Quoted feedback from participants regards to the challenge is shown in Table 3.

Table 3
Participant's feedback for Theme No. 1, Code No. 1.1

Participant's feedback on the level of effectiveness in communication degraded during MCO
"I think communication is something that needs to be improved…"
"Very difficult to convince and get the understanding from the user…"
"When you are talking, but they are missing during the conversations. You have been facing another problem of miscommunication…"

(b) Wrong, lack, unclear and unappropriated process, procedure and methodology applied

Clear and accurate processes, procedures, and methodology are essential to ensuring that every task is founded on and guided by the appropriate standards. Team members would feel disoriented and lost without it. Furthermore, the IT Project Manager will not be able to keep things under control and ensure effective and successful project delivery. This is because each team member will adopt methods and techniques that they feel are suitable and effective for him alone, without considering that the methods and techniques are not suitable for other team members. IT Project Managers must play an important role as an agent of change and educators to ensure the client understands why the changes are important and must be accepted. Quoted feedback from participants regards to the challenge is shown in Table 4.

Table 4
Participant's feedback for Theme No. 1, Code No. 1.2

Participant's Feedback on Wrong, lack, unclear and unappropriated process, procedure and methodologies applied
"Initially, they were hesitant to adopt it because they were scared that it would take longer to relearn and get the feedback they wanted. But after going through one cycle of modules, they can see the benefit of using agile instated of using the waterfall method…"
"We need to depend on the situation. Certain project is a short term and then customers require it fast and has been rushing time..."

(c) Project activity and the task are difficult to plan and schedule during MCO, and this causes a delay

Very intriguing due to the variety of viewpoints the participants have expressed regarding this challenge. This task received a low rating from one participant and a medium rating from the other two. For instance, requesting team members to report on their activities, tasks, and project progress updates during the MCO was deemed to be quite challenging, as the participants in the interviews clearly stated. Before the MCO, the team leader was responsible for updating and providing progress reports to the IT Project Manager; however, during the MCO, the IT Project Manager was required to collect feedback and progress reports from each team member. Quoted feedback from participants regards to the challenge is shown in Table 5.

Table 5
Participant's feedback for Theme No. 1, Code No. 1.3

Participant's Feedback on Project activity and the task are difficult to plan and schedule during MCO, and this causes a delay
"Before this, I can straight away get my report from the developer lead or the solutions architect without going to the developers to get the answers..."

(d) Difficult to perform effective monitoring and control of team members

All participants in this challenge agreed that control and monitoring are crucial to ensuring that the work quality and implementation always match expectations and accomplish the stated objectives. By monitoring each project activity carried out and the efforts and outcomes produced by team members, the IT project manager must ensure that his team is consistently productive and that the objectives are reached. Quoted feedback from participants regards to the challenge is shown in Table 6.

Table 6
Participant's feedback for Theme No. 1, Code No. 1.4

Participant's feedback on the difficulty to perform effective monitoring and control of team members
"They work from home so they are not following the schedule. I mean normal working hours. So sometimes they turn on the computer or what you thought their working on, but actually, maybe they are sleeping..."
"I think during the MCO the monitoring needs to be more thorough on the IT Project Manager side..."
"I normally monitor every day. Every day means we need to check on their progress whether got any difficulty or not then have to bring up for discussion..."

(e) Difficult to assign tasks and activities to a team member

The ability to assign tasks is a vital project management competency that any IT Project Manager should possess. A competent IT Project Manager balances a team member's level of responsibility and competency. The participants' views on this task were divided. Some reported having trouble delegating and allocating tasks to team members since some appeared to use COVID-19 as a justification to refuse or avoid doing them. It is exceedingly challenging to demonstrate whether or not the assertion that COVID-19 impacts them is accurate. While for another participant, this challenge is not very relevant. Tasks may be delegated in a highly structured and simple manner since team members are very cooperative. Quoted feedback from participants regards to the challenge is shown in Table 7.

Table 7
Participant's feedback for Theme No. 1, Code No. 1.5

Participant's feedback on the difficulty to assign tasks and activities to a team member
"They can give many reasons to delay the project. Like they say they can have been affected by covid virus…"
"The team members working in silo and discussion very hard to do online, require the availability of all the team member…"

(f) Difficult to perform user requirement-gathering activities with the user and understand the requirement

All participants unanimously agreed that meeting client requirements during MCO is extremely challenging. The requirements-gathering phase of a project's life cycle is crucial since it determines how software and applications have been developed. This phase was previously seen as crucial before the MCO was implemented, even when this activity was carried out face-to-face. The project team frequently encountered difficulties while comprehending the customers' needs. Due to challenges at this stage, software development projects frequently fail to be executed within the given time frame. Additionally, the project team and the client team could not have a face-to-face meeting to have a complete discussion throughout the deployment of the MCO. Quoted feedback from participants regards to the challenge is shown in Table 8.

Table 8
Participant's feedback for Theme No. 1, Code No. 1.6

Participant's feedback on the difficulty to perform user requirement gathering activities with the user and understand the requirement
"Very hard because people's understanding is quite a different base on their experience. Depends on their programming knowledge, so they understand the requirement that needs to be explained…"
"In the face-to-face, you got a whiteboard in the meeting room so you are easier to explain and easier to show the screen so that I mean normally the design or requirement…"

(g) Difficult to identify and manage potential risk

On average, the participant has no problem managing risk during the implementation of the MCO. All emerging and existing risks can be identified and registered. Any problem regarding the risk has been brought to the bettor and debated. Mitigations and the workaround have been immediately proposed for approval. Quoted feedback from participants regards to the challenge is shown in Table 9.

Table 9
Participant's feedback for Theme No. 1, Code No. 1.7

Participant's feedback on the difficulty in identifying and managing potential risk
"Managing risk and issue remotely have a delay when you are doing it online…"
"For IT not really. other industry not sure, because IT everyone most have used IT technology…"

(h) Difficult to manage and maintain the quality of deliverables

The outcome of every project management endeavour defines its success. There is no compromise when it comes to quality. It does not matter if there were management issues, how the project was carried out, or whether it was delivered early, on time, or late. Each participant was

granted the same approval for this challenge. Quoted feedback from participants regards to the challenge is shown in Table 10.

Table 10
Participant's feedback for Theme No. 1, Code No. 1.8

Participant's feedback on the difficulty in identifying and manage potential risk
"I think this one is something that the management also agrees that the deliverables, although the deliverables are we can meet the deliverables but usually the quality suffers…"
"Not say affect quality. it takes a longer time to achieve the quality…"

4.2 People

People play an important role in ensuring that the project has been delivered accordingly. The interviews that have been conducted have revealed eight (8) challenges. Since this challenge's theme is "People," i.e., users, clients, or team members, it is connected to the challenge of the "Process" theme described above. It is because "People" must comprehend the "Process" that has already been established to follow and execute to accomplish their duties and functions efficiently. Below is the detailed analysis discussed regarding the people element.

(a) Difficult to train and uplift team member's skill sets during MCO

All participants gave the same opinion, which is high for this challenge. Providing training to team members or users during MCO is very difficult because it must be carried out via video conference. According to the participant, an online training session can be very difficult to understand, especially to introduce a new system that has never been used before by the user. Quoted feedback from participants regards to the challenge is shown in Table 11.

Table 11
Participant's feedback for Theme No. 2, Code No. 2.0

Participant's feedback on the difficulty of training and uplift team member's skill sets during MCO
"It just that we need to reteach the development team on the processes that are changing between when you are doing waterfall and when you are doing agile…"
"For new system normally user faces difficulty on how to use especially on training session. Not easy to understand on the new system because normally they want people to guide them one to one session for training…"

(b) The motivation, productivity and focus of team member is more degraded during MCO

Participants' opinions were mixed. One strongly agreed, another disagreed, and one chose neutral in rating this challenge. Motivation, productivity, and focus by team members are indeed impacted. According to the participants, the team members' focus was affected because even though they were used to working online before, the situation was very different when the MCO was implemented. If before, they were the only ones who worked at home, and other family members either went to school or worked, but during the MCO, all family members are in the same place, at home. This, at the same time to some extent, impacts their concentration and focus because they need to pay attention to the needs of the family first before they can concentrate on work. Even so, based on the participants' comments, the flexibility given to team members is rewarded with them extending their working hours. If previously they only worked eight (8) hours, according to the official working hours, when the MCO is implemented, they are ready to work until late at night. This is to

replace hours lost due to unavoidable interruptions. Quoted feedback from participants regards to the challenge is shown in Table 12.

Table 12
Participant's feedback for Theme No. 2, Code No. 2.2

Participant's feedback on the motivation, productivity, and focus of team members is more degraded during MCO
"If you are talking about productivity from my experience during MCO and before MCO, the productivity is it doesn't change. the team members still produce the same output still delivers the same deliverables…" "Because we work from home it takes longer hour…"

(c) The degradation and concern over the health and well-being of team members cause a lack of productivity and focus during MCO

This challenge was considered highly by almost all participants. The outbreak of COVID-19 is frightening, and there is no denying that many are directly and indirectly affected. Some team members are infected, and some are also affected because their immediate family members are infected. Some team members died due to this virus. This somewhat interferes with the smoothness of the project because some tasks that have been assigned have to be postponed or handed over to other team members, especially if the affected one involves a senior team member. According to participants, difficult tasks performed by senior team members require more junior team members to complete them. Quoted feedback from participants regards to the challenge is shown in Table 13.

Table 13
Participant's feedback for Theme No. 2, Code No. 2.3

Participant's feedback on the degradation and concern over the health and well-being of team members cause a lack of productivity and focus during MCO
"Some of them infected COVID so now the team is not there so we cannot do the meeting, we cannot do some testing, discussion…" "They need to schedule the meeting on weekend. it is becoming I think it affecting not only the team member but also the whole organisation in terms of risk of time management, mental health and well-being of the overall staff…"

(d) Difficult to hire a new or find a new replacement for team member during MCO

This challenge was described as simple by the participants. According to the participants, finding replacements or adding project team members during the MCO is not difficult. Although the country's borders are closed and skilled foreign labour cannot enter the country to meet the project's needs, it opens a new opportunity. The implementation of the MCO requires employees to work from home, which is a positive thing that is described as an attractive factor for employers to get qualified and interested employees easily. Employers also do not need to think long or plan a budget to bring in skilled labour from abroad into the country. This, at the same time, reduces the financial burden of the company. Quoted feedback from participants regards to the challenge is shown in Table 14.

Table 14
Participant's feedback for Theme No. 2, Code No. 2.4

Participant's feedback on the difficulty of hiring a new or find a new replacement of team member during MCO
"Before the MCO yes, we had a bit of difficulty getting the developers because the company's policy was you have to come to the office and you have to do the development at the office. So, during the MCO surprisingly we found out that it was a bit easier to find the developers because the requirement is only looking at the experience of the developer. we don't require them to be in the office as long as they have a proper internet connection and they have their laptop. So, they can do their work remotely. so that where we start to hire a lot of foreigners outside of Malaysia to cover for our development works…"

(e) It is challenging for an IT Project Manager to be an effective leader during MCO

All participants strongly agreed with this challenge. Managing a project during the MCO is very challenging and tests the ability of an IT Project Manager to manage risks that have never been debated, discussed, and have any references before. All project team members were also not equipped with knowledge about this kind of scenario before. Quoted feedback from participants regards to the challenge is shown in Table 15.

Table 15
Participant's feedback for Theme No. 2, Code No. 2.5

Participant's feedback on the challenge for an IT Project Manager to be an effective leader during MCO
"…for monitoring, if you use the tools for monitoring, I think it is similar for both before and after MCO because everything on your task depends on what has been recorded in the system but where we have a discussion session that the difficult part as when we do an online session. Especially when we have to involve a big group of team members…"

(f) Difficult to get commitment, cooperation and involvement from the client/customer during MCO

This challenge is low for all participants. All participants agreed that the involvement of customers and team members during the MCO was satisfactory and effective. Quoted feedback from participants regards to the challenge is shown in Table 16.

Table 16
Participant's feedback for Theme No. 2, Code No. 2.6

Participant's feedback on the difficulty of getting commitment, cooperation and involvement from the client/customer during MCO
"…for me usually from my observation usually the same. if the participant, the client who needs to participate in the meeting even though they do it online, they are there but sometimes they get a call, they get a telephone call, they still need to answer that call and they still sometimes they need to go somewhere else to discuss so they leave the online meeting. it is the same as face-to-face so when you do the meeting face to face sometime the team members, and the clients need to go out for another meeting. I think the best thing about remote with the clients is that you the client can be can still listen in while doing other works without joining fully but they can still listen also there is a recording of the meeting so they use it as a reference…"

(g) Difficult to manage time, schedule, and plan during MCO compared to before MCO

Participants define this challenge as a medium. Managing time, schedules and plans is not difficult. Although it seems difficult at the beginning of the MCO implementation, it is getting better

and more satisfying. After all, the activity of re-planning plans and schedules is a common thing to do even before the MCO. Quoted feedback from participants regards to the challenge is shown in Table 17.

Table 17
Participant's feedback for Theme No. 2, Code No. 2.7

Participant's feedback on the difficulty to manage time, schedule, and plan during MCO compared to before MCO
"…the team are not available during the weekday because they have another meeting so they need to schedule the meeting on weekend. it is becoming… I think it affecting not only the team member but also the whole organisation la in terms of risk of time management, mental health and well-being of the overall staff.…"

4.3 Technology

Shifting from working in the office before MCO to working at home during MCO involved technology savvy, especially in using the communication application for meetings and discussions. From the interviews conducted, P1, P2, and P3 highlighted the same challenges that the team member and client/customer have difficulty using and familiar with the technology used during MCO. P1 and P3 also stated that users' rejection of using technology and tools provided during MCO caused the failure of project deliverables. A lack of infrastructure and tools to support a remote working environment causes the failure of project deliverables during MCO and becomes one of the challenges of delivering software development projects. Below is the detailed analysis discussed regarding the technology element.

(a) Difficulty using and familiar with the technology used during MCO

Nevertheless, challenges and constraints faced by IT Project Managers are in terms of the availability of knowledge of the use of IT facilities and IT infrastructure, especially from the customer or user side. Before the MCO, all tasks were carried out in the office, so all the necessary IT facilities and infrastructures, such as the Internet and computers, were available. During the MCO, the change in the way of working impacts users who do not have the skills or experience to work in an online environment. Quoted feedback from participants regards to the challenge is shown in Table 18.

Table 18
Participant's feedback for Theme No. 3, Code No. 3.1

Participant's feedback on the difficulty using and familiarity with the technology used during MCO
"…for the beginning, they had issues with using… how to use new tools like zooms, google meet or other proprietary software. Certain companies have this security policy where certain software is not able to install. So, they might need to wait for IT to settle it. That one is the beginning of MCO…"

(b) Rejection of users to use the technology and tools provided during MCO

The participants' feedback, supported by the previous literature studies, also agrees that there is a rejection of technology by users for reasons that are unfamiliar and difficult to understand how to use some technology essential for the online working environment, such as video conference applications and collaboration tools. Quoted feedback from participants regards to the challenge is shown in Table 19.

Table 19
Participant's feedback for Theme No. 3, Code No. 3.2

Participant's feedback on the rejection of users to use the technology and tools provided during MCO
"…For new system normally uses the difficulty on how to use la. especially training session. they got no easy to understand la. on the new system. because normally they want people to guide them. one to one session to training…"

(c) Lack of infrastructure and tools to support a remote working environment

Some users use the excuse of the lack of infrastructure, such as computers and internet at home, and the failure of the employer to provide them with such facilities does not perform the required tasks assigned to them. Unavailability of infrastructure and facilities also occurs on the employer's side. Some companies do not have the basic facilities to support the needs of employees to work online. Among the issues raised by the participants was the absence of a Virtual Private Network (VPN) to allow employees to access the file server or development server setup in the office. Quoted feedback from participants regards to the challenge is shown in Table 20.

Table 20
Participant's feedback for Theme No. 3, Code No. 3.3

Participant's feedback on the lack of infrastructure and tools to support a remote working environment
"…so sometimes the technology failed. sometimes there is no internet…"

From the analysis of three interviews, it is interesting to note that the three key elements and 18 challenges identified can influence software development deliverables during the MCO phase. Hence the challenges listed in Table 2 will act as a guide for the project manager to prepare if a similar occasion occurs in the future.

5. Conclusion

Challenges are common in any project. It does not matter whether the project is an infrastructure project, engineering, or even software development. Project risk exists and needs to be managed well and wisely by the project manager so that the objectives, goals, and delivery of a project can be implemented according to the desired cost, scope, and quality. COVID-19 and the movement control order, although the magnitude of the impact and implementation is very large, it is only part of the problems and risks that need to be dealt with as best as possible. This paper presents the findings indicating that three (3) key elements, namely, people, process, and technology, were identified from the literature review and data collection from interviews. Eighteen identified challenges were then categorised into these three elements. The objective of this study is to identify the challenges faced by IT Project Managers when the implementation of MCO has already been achieved.

Thus, these findings of the innovative study area on technology. Highlighting on software development, it has potentially provided an enhanced judgment and interpretation to guide IT Project Managers in deciding mitigation strategies in the early stage of software development projects in the event of another scenario such as the MCO occurring in the future.

Acknowledgment

References

[1] Aziz, Noor Azah, Jamal Othman, Halyna Lugova, and Adlina Suleiman. "Malaysia's approach in handling COVID-19 onslaught: Report on the Movement Control Order (MCO) and targeted screening to reduce community infection rate and impact on public health and economy." *Journal of Infection and Public Health* 13, no. 12 (2020): 1823-1829. https://doi.org/10.1016/j.jiph.2020.08.007

[2] Tang, Kuok Ho Daniel. "Movement control as an effective measure against Covid-19 spread in Malaysia: an overview." *Journal of Public Health* 30 (2020): 583-586. https://doi.org/10.1007/s10389-020-01316-w

[3] Chief Economist and Fiscal and Economics Division. "Economic Outlook 2021." *Ministry of Finance Malaysia* (2021).

[4] Hasbullah, N. A., and A. Ab Rahman. "The role of stakeholders in safeguarding people's economic welfare during the COVID-19 pandemic from the perspective of Islamic Economy." *The Journal of Muamalat and Islamic Finance Research* 17, no. 3 (2020): 71-89. https://doi.org/10.33102/jmifr.v17i3.285

[5] New Straits Times. "40 per cent SMEs will shut down if there is full-scale MCO." *New Straits Times*. May 19, 2021. https://www.nst.com.my/news/nation/2021/05/691422/40-cent-smes-will-shut-down-if-there-full-scale-mco.

[6] Esa, Muneera Binti, F. S. Ibrahim, and E. B. Kamal. "Covid-19 pandemic lockdown: The consequences towards project success in Malaysian construction industry." *City* 25, no. 2 (2020). https://doi.org/10.25046/aj0505119

[7] Ray, Ram L., Vijay P. Singh, Sudhir K. Singh, Bharat S. Acharya, and Yiping He. "What is the impact of COVID-19 pandemic on global carbon emissions?." *Science of The Total Environment* 816 (2022): 151503. https://doi.org/10.1016/j.scitotenv.2021.151503

[8] Jie, C. Y., and N. Mat Ali. "COVID-19: What are the challenges of online learning? A literature review." *International Journal of Advanced Research in Future Ready Learning and Education* 23, no. 1 (2021): 23-29.

[9] Ali, Mohd Nazry, Wahyunah Ghani, Amirul Haiman Abdul Rahman, and Maslin Masrom. "The ICT implementation in the TVET teaching and learning environment during the COVID-19 pandemic." *International Journal of Advanced Research in Future Ready Learning and Education* 27, no. 1 (2022): 43-49.

[10] Das, Debadyuti, Ashutosh Sarkar, and Arindam Debroy. "Impact of COVID-19 on changing consumer behaviour: Lessons from an emerging economy." *International Journal of Consumer Studies* 46, no. 3 (2022): 692-715. https://doi.org/10.1111/ijcs.12786

[11] Williams, Laurie, and Alistair Cockburn. "Agile software development: It's about feedback and change." *Computer* 36, no. 6 (2003): 39-43. https://doi.org/10.1109/MC.2003.1204373

[12] Singh, Raghu. "International Standard ISO/IEC 12207 software life cycle processes." *Software Process Improvement and Practice* 2, no. 1 (1996): 35-50. https://doi.org/10.1002/(SICI)1099-1670(199603)2:1<35::AID-SPIP29>3.0.CO;2-3

[13] Espinosa, J. Alberto, Sandra A. Slaughter, Robert E. Kraut, and James D. Herbsleb. "Team knowledge and coordination in geographically distributed software development." *Journal of Management Information Systems* 24, no. 1 (2007): 135-169. https://doi.org/10.2753/MIS0742-1222240104

[14] Kraut, Robert E., and Lynn A. Streeter. "Coordination in software development." *Communications of the ACM* 38, no. 3 (1995): 69-82. https://doi.org/10.1145/203330.203345

[15] Fraser, Steven D., Frederick P. Brooks Jr, Martin Fowler, Ricardo Lopez, Aki Namioka, Linda Northrop, David Lorge Parnas, and David Thomas. "No silver bullet" reloaded: retrospective on" essence and accidents of software engineering." In Companion to the 22nd ACM SIGPLAN Conference on Object-Oriented Programming Systems and *Applications Companion*, pp. 1026-1030. 2007. https://doi.org/10.1145/1297846.1297973

[16] Doskočil, Radek, Stanislav Škapa, and Petra Olšová. "Success evaluation model for project management." *E+ M Ekonomie a Management* 19, no. 4 (2016): 167-186. https://doi.org/10.15240/tul/001/2016-4-012

[17] Othman, Mohd Hilmi, and Nur Aini Ishak. "The Project Manager's Challenges During Covid-19 Pandemic." *Journal of Advanced Mechanical Engineering Applications* 2, no. 2 (2021): 1-8.

[18] Baratta, Angelo. "The triple constraint, a triple illusion." In *PMI® Global Congress 2006*. 2006.

[19] Marchewka, Jack T. *Information technology project management: Providing measurable organizational value*. John Wiley & Sons, 2016.

[20] Schwaber, Ken, and Jeff Sutherland. "The scrum guide." *Scrum Alliance* 21, no. 1 (2011): 1-38.

[21] Al-Habaibeh, Amin, Matthew Watkins, Kafel Waried, and Maryam Bathaei Javareshk. "Challenges and opportunities of remotely working from home during Covid-19 pandemic." *Global Transitions* 3 (2021): 99-108. https://doi.org/10.1016/j.glt.2021.11.001

[22] El Khatib, Mounir M., Salma Al Hashimi, and Maitha Al Ketbi. "Impact of Remote Work on Project Management Cases from UAE Construction Sector." *Journal of Service Science and Management* 16, no. 1 (2023): 30-43. https://doi.org/10.4236/jssm.2023.161003

[23] Garro-Abarca, Victor, Pedro Palos-Sanchez, and Mariano Aguayo-Camacho. "Virtual teams in times of pandemic: Factors that influence performance." *Frontiers in Psychology* 12 (2021): 624637. https://doi.org/10.3389/fpsyg.2021.624637

[24] Vaus, David de. *Research Design in Social Research*. SAGE, 2011.

[25] Dworkin, Shari L. "Sample size policy for qualitative studies using in-depth interviews." *Archives of Sexual Behavior* 41 (2012): 1319-1320. https://doi.org/10.1007/s10508-012-0016-6

[26] Megel, Mary Erickson, and Judith A. Heermann. "Methods of data collection." *Plastic Surgical Nursing: Official Journal of the American Society of Plastic and Reconstructive Surgical Nurses* 14, no. 2 (1994): 109-110. https://doi.org/10.1097/00006527-199406000-00014

[27] Braun, Virginia, and Victoria Clarke. *Thematic analysis*. American Psychological Association, 2012.

[28] Alhojailan, Mohammed Ibrahim, and Mohammed Ibrahim. "Thematic analysis: A critical review of its process and evaluation." *West East Journal of Social Sciences* 1, no. 1 (2012): 39-47.

[29] Baker, Sarah Elsie, and Rosalind Edwards. "How many qualitative interviews is enough." *National Centre for Research Methods Review Paper* (2012).

[30] Ciotti, Marco, Massimo Ciccozzi, Alessandro Terrinoni, Wen-Can Jiang, Cheng-Bin Wang, and Sergio Bernardini. "The COVID-19 pandemic." *Critical Reviews in Clinical Laboratory Sciences* 57, no. 6 (2020): 365-388. https://doi.org/10.1080/10408363.2020.1783198