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New Insights on Avoiding the Causes of Projects Delays: A Framework

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Abstract: In this paper, we study and analyze the reasons behind the delay of some projects. Our aim is shed light on how one reduces the effect of the different obstacles and improves achievement either in quality or time. Different challenges play the main reasons in the stalled project including planning, designing, construction, and weak leaders or poor administrative decisions. We focus on developing a framework that helps in improving the management of the projects and finishing the projects on time. This includes developing a contingency plan and coordination mechanism between internal and external stakeholders. Following the steps of the methodology will help project managers to avoid project delay and solve the problems of the staled ones. Finally, we represent some managerial insights and recommendations that related parties should follow with the projects.

Keywords: Project Management, Internal Stakeholders, External Stakeholders, Project Manager, Stalled projects.

1. Introduction

One of the challenges that any construction company might face is to finish the projects on time and within budget because project delays result in increasing its final cost [1]. The contribution of the construction industry to the growth of the Kingdom of Saudi Arabia's economy is almost 30 to 40% [2]. Between 1990 and 2000, the KSA Government spent around $234 billion on infrastructure projects [3]. These days, the government, in the Kingdom of Saudi Arabia, devotes substantial amounts of funds to several developmental projects that are annually estimated in billions of Saudi Riyals [4]. A vast majority of these projects are overdue in many sectors worldwide. Assaf & Al-Hejji [5] mentioned that there are several factors in construction projects that result in delaying almost 70% of these public sector projects in the KSA. Regardless of the fact that there are penalties set for project delays, as it is a recognized statement in nearly every contract, it is fruitless to see such incidents [6].

The Kingdom of Saudi Arabia, recently, has devoted a lot of money to strategic and large-scale infrastructure projects in different cities [7]. For example, the goal of the Saudi government, stated in the Saudi Vision 2030, is to increase its capacity and to enable 30 million people to visit Makkah for Umrah every year [8]. So, in order to accomplish the vision of the Kingdom 2030, Makkah Roads Initiative had an essential portion in the deal. Therefore, delayed government projects continually cost the government a vast budget, and it restrained people's life, mainly, the nearby residents.

The Ministry of Economy and Planning has established a program entitled (Mashroat) to support project management by applying the latest level of quality standards (international and regulations), and the topmost work practices in this field [9]. The government monitors the large financial assets expenditure, leadership directions, and insightful follow-up of officials for such projects. However, the outcomes do not reflect the lawmakers' level of targets, which results in failure to meet the citizens' requirements as well. The reasons behind delaying and suspending these projects are unclear. Furthermore, work solutions and approaches to monitor these projects are still absent. The absence of project coordination among parties is one of the difficulties that is required to be dealt with specifically.

The objective of this study is to explore and define a clear process and method that assists in avoiding the causes of delayed government projects, develop a workable solution model for such types of projects, and develop a coordination mechanism that assists the parties to work cooperatively and finish the work on time.

The next sections are arranged as follows. Section 2 is for the literature review, Section 3 represents the model development, Section 4 is for managerial insights, and the paper ends with Section 5, which is the conclusion and future extension.

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2. Literature Review

Governments invest a lot of money in infrastructure projects to move forward and develop their countries. Different studies have been published to show how and why some of these projects stalled and how they overwhelmed the cost of the government. Rafat et al. [10] listed the most important factors that cause a delay in the United States construction industry. These factors are (1) building authorization approval, (2) order changes, (3) design changes, (4) lack of complete documentation, and (5) inspection pressures. Cannon [11] studied the key issues that might face the construction industry in 2009 and listed the causes of delays in building projects. Most of the delay problems occurred because of the employment of the unskilled workforce by contractors [10, 12]. Troianovski [13] showed that the influx of fresh capital into commercial real estate in the United State helps in reviving stalled projects. This also helps in building and launching new construction (apartments, office buildings, and shopping centers). Wahdan, Farid & Abu Yousef [14] studied and assessed the reasons behind the project delay or stall from the project management point of view. They found that there are 12 causes for project delay, which are (1) Contract and contractual relationships, (2) Financial management of the project, (3) Owner, (4) Project specificity, (5) Design team, (6) Material, (7) Equipment, (8) Labor, (9) Project manager and inspection, (10) Contractor management, (11) Institutional relationships, and (12) Outside factors. Mutua studied the financial implications of stalled public building projects in Kenya. A sample of 12 stalled public projects was used in the study to achieve its objective. The results showed that stalled public building projects lead to wasting public funds that were initially invested in the projects, increasing public expenditure on completion, and losing public funds. Mutua [15] suggested that financial planning, cost management, and control measures should be implemented and adopted in the early stages of the projects to avoid stalling. Eja & Ramegowda [16] studied and investigated the causes, effects, and consequences of why projects fail in developing countries. Their studies focused on what was published in the literature. They found that project may fail due to different reasons such as "poor financial capability, inaccurate costing and corruption, incompetence and lack of knowledge, poor project planning and estimation, poor or lack of communication, poor contracting and contractor practices, frequent design scope changes and errors, socio-cultural and political interference, poor leadership and corruption". Eja & Ramegowda [16] found that the effects of these causes are (1) loss of revenue to the state, (2) project cost overruns, (3) loss of revenue by citizens, (4) substandard infrastructure, and low empowerment to the community. Erzaij, Hatem & Maula [17] used resource management techniques to evaluate stalled construction projects and show how strategic decision-making can help in financing stalled projects. They found that using development and planning software serves and supports strategic decisions in institutions with concurrent stalled projects.

In different studies, Saudi Arabia has been found to invest in many projects to improve the cities and faced some problems in completing them. Assaf et al. [18] studied the causes of delay in large building construction projects in Saudi Arabia and found that there were 56 main causes of delay whereas Al-Khalil & Al-Ghafly [19] highlighted 60 reasons for project delays. Albogamy, Scott & Dawood [20] studied the main causes of public building projects delay in Saudi Arabia. They grouped the causes of delay into four categories, which are (1) owner/client related factors, (2) contractor related factors, (3) consultant related factors, and (4) external factors. The authors found that two of these factors (owner/client and contractor related factors) are the most critical factors that cause the delay of construction projects in Saudi Arabia. Elawi et al. [21] studied the main factors that cause the delay of construction projects in Makkah, Saudi Arabia. Also, they compared these factors with projects around the country as well as other Gulf countries. The authors found that the average delay in Makkah infrastructure projects is 39% of the scheduled projects. Elawi et. al. [21] identified 10 risk factors and grouped them into four main categories, which are (1) land acquisition factor, (2) contractors' lack of expertise factor, (3) haphazard underground utilities (line services) factor, and (4) re-designing factor. Alzara et al. [22] mentioned that 70% of public construction projects in Saudi Arabia are delayed and performed a case study that identify the major causes of delayed projects in the country. The authors gathered the delay factors from the University Projects Director and five engineers and compared those factors to the delay factors experienced on Saudi construction projects. They could identify nine causes of project delay and propose a solution to minimize them. Alzara et. al. [22] found that the Performance Information Procurement System (PIPS) method can help in improving project performance and minimizing delays. Aldosari [23] studied the reasons behind stalling Electronic Health Records (EHR) projects in Saudi Arabia. He found that the project could not be implemented as a result of lacking national policies and standards of health information as well as IT specialists in the healthcare sector. Also, the study showed that employing a proper vendor that has the capability was another reason that led to stalling the project. Readers can also check Kanan [24] for a case study about project delays in Saudi Arabia in Governmental projects.

3. Model development

As seen in the literature, researchers have developed different methods and tools as well as studied the reasons behind the delayed projects to overcome stumbling government projects. Although project managers can use those methods, some of them are difficult to apply or need more resources to manage. Also, most projects, especially governmental

projects, struggle when they are executed [25]. To overcome this problem, organizations or governments must avoid and include all expected problems that they might face in their project document and set the actions that will be followed to control them. One of the goals of this work is to establish an integrative tool that is built from different proposed tools from the literature that would help in solving projects' problems.

As mentioned earlier, this study focuses on defining an easy and clear process and methods that help in avoiding the causes of stumbling government projects. The method consists of two steps, which are developing a contingency plan and a coordination mechanism, which helps all stakeholders to work together and accomplish the work on time (see Figure 1). The two stages are discussed below.

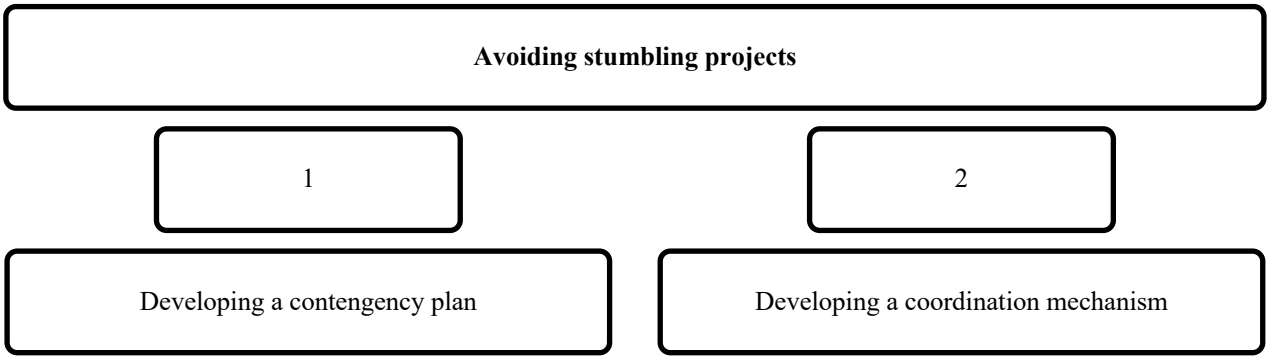

Fig. 1. Avoiding stumbling projects

3.1 Developing a contingency plan

To develop a contingency plan, one should identify project problems and avoid them in the early stages. This can be done using different methods and tools such as Brainstorming (to anticipate problems that a project might encounter), SWOT Analysis (i.e., Strengths, Weaknesses, Opportunities, and Threats), and Projects History Analysis (See Figure 2). This stage should be clear to the project managers before starting the project.

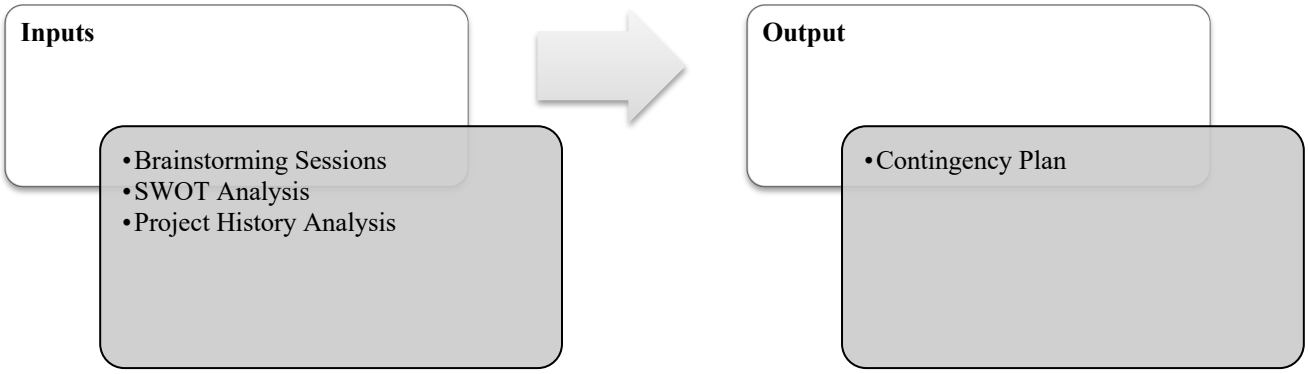

Fig. 2. Contingency plan process

a) ***Brainstorming:*** it would be used to anticipate the occurrence of problems that a project might encounter. [26] Al-Samarraie & Hurmuzan [26] defined brainstorming as "is one of the techniques for fostering group creativity by which ideas and thoughts are shared among members spontaneously in order to reach solutions to practical problems".

b) ***SWOT Analysis:*** this tool can be used in order to develop and improve projects' strengths and opportunities and, on the other hand, to avoid the projects' weaknesses and threats (Figure 3). It also helps project managers to complete projects on time and within budget [27].

c) ***Projects History Analysis:*** it is an approach of evidence analysis that uses projects' history, especially the ones that relate to the new project. Projects managers should use the History Analysis to examine all project aspects in detail in order to make sure that the project runs as expected and is also within the predefined budget. Different tools can be used to analyze the history of the related projects such as the Fishbone Diagram (Figure 4), which helps in defining the cause and effect of the problem, giving a comprehensive list of causes to find the root of the problem, and in providing projects' managers with a better understanding of the problems and making sure they do not just

partially solve a problem.

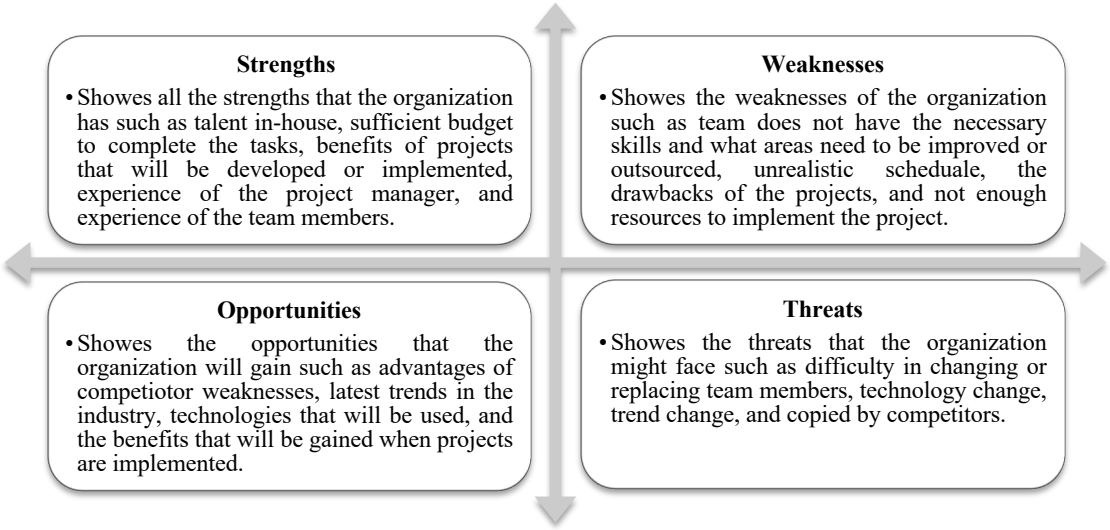

Fig. 3. Example of SWOT Analysis Questions in Project Management

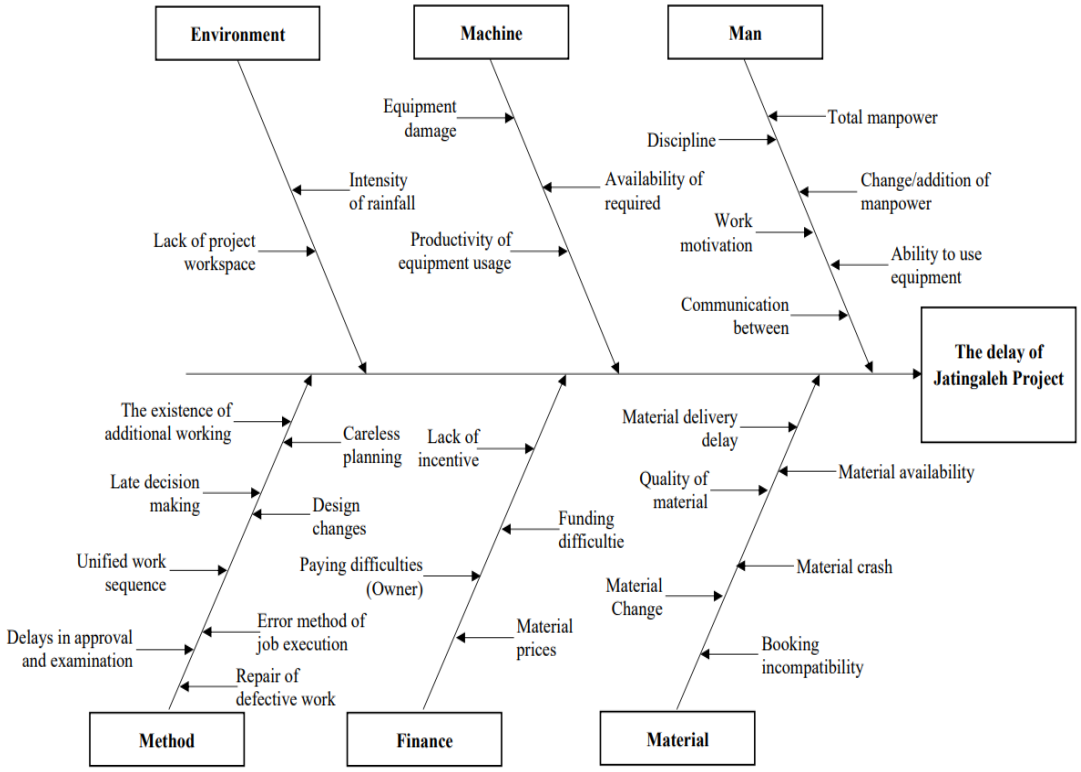

Fig. 4. Fishbone diagram example of factors that causes project delay [28]

Inputs from the previous stage (problem identification) should be available to have a comprehensive contingency plan that consists of the identified problems, solutions and actions that will be followed if any of the identified problems occurred, the time effect on project completion of each problem, the cost of implementing the solution, cost of each problem, priority (shows the importance to solve that problem), and the responsible person (see Table 1).

Table 1 below summarizes all the identified problems that relate to a specific project and represents a summary of a comprehensive contingency plan. As mentioned earlier, inputs from Brainstorming Sessions, SWOT Analysis, and old Projects History Analysis (using Fishbone Diagram) help in developing the comprehensive plan. A project manager should incorporate all identified expected problems (Inputs) that might affect the project to come up with proper solutions and actions (output: contingency plan) that will be followed if the problems occurred. This plan should be in

meticulous detail that shows how the manager can overcome the situation.

Table 1: Comprehensive contingency plan

Problem Identification Method	Identified Problems	Solution/ Action	Time Effect (Delay in days)	Solution Cost	Cost ($)	Priority (H, M, L)	Responsibility
1 Brainstorming Sessions	$a_{1,1}$	.....	$t_{1,1}$	$s_{1,1}$	$c_{1,1}$	.....	.....
	$a_{1,2}$	.....	$t_{1,2}$	$s_{1,2}$	$c_{1,2}$	.....	.....
	$a_{1,2}$	.....	$t_{1,2}$	$s_{1,2}$	$c_{1,2}$	.....	.....
	. .	.....	. .	. .	. .	.....	.....
	$a_{1,n}$	.....	$t_{1,n}$	$s_{1,n}$	$c_{1,n}$	.....	.....
2 SWOT Analysis	$a_{2,1}$	.....	$t_{2,1}$	$s_{2,1}$	$c_{2,1}$	.....	.....
	$a_{2,2}$	.....	$t_{2,2}$	$s_{2,2}$	$c_{2,2}$	.....	.....
	$a_{2,3}$	.....	$t_{2,3}$	$s_{2,3}$	$c_{2,3}$	.....	.....
	. .	.....	. .	. .	. .	.....	.....
	$a_{2,n}$	.....	$t_{2,n}$	$s_{2,n}$	$c_{2,n}$	.....	.....
3 Projects History Analysis	$a_{3,1}$	.....	$t_{3,1}$	$s_{3,1}$	$c_{3,1}$	.....	.....
	$a_{3,2}$	.....	$t_{3,2}$	$s_{3,2}$	$c_{3,2}$	.....	.....
	$a_{3,3}$	.....	$t_{3,3}$	$s_{3,3}$	$c_{3,3}$	.....	.....
	. .	....	. .	. .	. .	....	....
	$a_{3,n}$	.....	$t_{3,n}$	$s_{3,n}$	$c_{3,n}$	.....	.....

The first column of the comprehensive contingency plan (Table 1) includes the problem identification method (Brainstorming, SWOT Analysis, and Projects History Analysis). After that, in the second column, the identified problems ($a_{i,j}$, where i = problem identification method 1, 2, and 3, and j = the identified problem 1, 2, 3 … n) under each method should be listed. Then, the project manager should list down all solutions and actions that are required to solve the problems followed by the time effect ($t_{i,j}$) in days of that problem on the deadline of the project (this will affect the cost of the project). The next step is to find the cost of each solution ($s_{i,j}$) followed by calculating the cost of each of the identified problems and entering its value in the Cost column ($c_{i,j}$). The last two columns represent the priority or importance to solve the problem (depending on its effect on the project), and the responsibilities (who will solve the problem and apply the corrective action), respectively. A high priority should be given to the problem that has a high impact on the cost of the project.

To find the cost of each of the identified problems, one should add the cost of each solution that will be applied to the cost of the delay of the project, which is represented by Equation 1.

$$c_{i,j} = s_{i,j} + \alpha t_{i,j} \quad (1)$$

Where $c_{i,j}$ is for the cost of the identified problem j under method i, $s_{i,j}$ is for the cost of applying the solution to solve the identified problem j under each method i, α represents the cost of each day the project is delayed, and $t_{i,j}$ represents the time that is required to implement the solution or how many days the project will be delayed if that problem occurred.

The cost of these problems should be added if any of them occurred, and the solutions were implemented as it affects the total cost of the project. Also, all these should be archived for future analysis when needed.

3.2 Developing a coordination mechanism

The coordination mechanism (second step), which involves managing the day-to-day operations of a project, making sure the resources are aware of deadlines and tasks that fall under their responsibility, managing meeting minutes, etc., includes initiating a Project Management Office (PMO) and developing a communication process and methods (Figure 5).

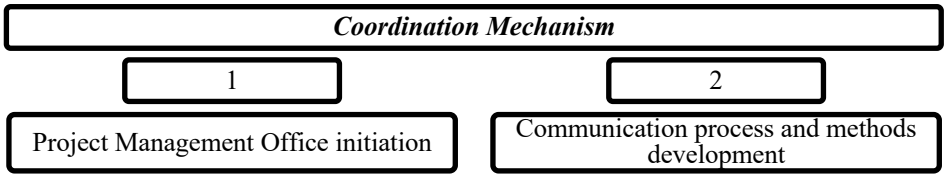

Fig. 5. Coordination mechanism

a) ***Project Management Office (PMO):*** this office should be established to manage the project from the beginning until the end, ensure that the project is being run according to the plan, and control unexpected events (if they do exist). Specialized individuals, who have experience in different areas related to the project, should be hired. The PMO must be run and managed by the project manager. (see Figure 6)

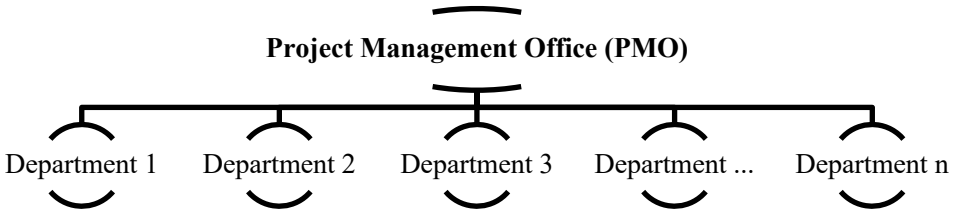

Fig. 6. Project management office (PMO)

As seen in Figure 6, the PMO includes different departments and each one is responsible for specific tasks and activities that relate to its specialty. To do this, clear roles and responsibilities for each department must be identified.

b) ***Communication process and method:*** the second part of the coordination mechanism is to define all possible communication methods between stakeholders (internally and externally) as well as to have a clear process that shows how the communication will be conducted between them. Table 2 below represents some examples of the communication methods that can be followed.

Table 2: Examples of communication methods

Project workbook	Minutes of meetings
Meetings	Bulletin boards
Seminars and workshops	Memos
Newsletters	Hallway discussions
Status reports	Specification documents

Project Workbook is used by the project manager to monitor the status quantitatively at any point and also to collect information about work. Meetings could be held daily, weekly, and monthly with all stakeholders either external or internal. Seminars and workshops are most probably conducted at the beginning of the project with external stakeholders. A newsletter is used to communicate regularly with subscribers and deliver information through messages by email. The messages can contain simple text or a structure composed of images and formatted text. A status report is a simple document that exists between the project manager, the client, and the internal team to periodically update all parties involved as to where the project is, in relation to where it should be at that point in time. Minutes of meetings written record of weekly meetings. Bulletin boards are used to post and display information related to the project. Memos are used for internal communications regarding procedures or official business within an organization. Hallway discussions explore how to organize and decorate a hallway, including storage options, display shelving, and gallery wall arrangements. Specification documents are the information on technical design, development, and procedures related to the requirements it outlines.

Now, a project manager should identify the relationship between all internal and external parties or stakeholders of the project by following Table 3.

Note that IS_i and ES_i, where i = 1, 2, … n, represents the Internal Stakeholder and External Stakeholder, respectively. In order to fill in Table 3, the project manager should give each communication method (listed in Table 2) a number. Then, these numbers should be inserted into the table to show how the Internal Stakeholders and the External Stakeholders are going to communicate with each other. For example, if the communication methods listed in Table 2 were numbered as seen in Table 4, Table 3 will be represented as seen in Table 5.

Table 3: Identifying the relationship between Internal and External Stakeholders

		Internal Stakeholder					**External Stakeholder**				
		IS_1	IS_2	IS_3	…	IS_n	ES_1	ES_2	ES_3	…	ES_n
Internal Stakeholder	IS_1										
	IS_2										
	IS_3										
	. .										
	IS_n										
External	ES_1										

Stakeholder	ES_2										
	ES_3										
	. .										
	ES_n										

Table 4: Numbering the communication methods

1	Project workbook	6	Minutes of meetings
2	Meetings	7	Bulletin boards
3	Seminars and workshops	8	Memos
4	Newsletters	9	Hallway discussions
5	Status reports	10	Specification documents

Table 5: Relationship between the Internal and the External Stakeholders

		Internal Stakeholder					**External Stakeholder**				
		IS_1	IS_2	IS_3	…	IS_n	ES_1	ES_2	ES_3	…	ES_n
Internal Stakeholder	IS_1	1	6	2	…	8		6	2	…	8
	IS_2	3	5	4	…	2			5	…	
	IS_3		7	3	…	4				…	4
	. .	. .	. .	. .	… …	… …	. .	. .	. .	… …	… …
	IS_n		9	10	…	8		9	10	…	8
External Stakeholder	ES_1		6	2	…	8	6	3	2	…	8
	ES_2			5	…		7	2	2	…	4
	ES_3				…	4		6	5	…	4
	. .	. .	. .	. .	… …	… …	. .	. .	. .	… …	… …
	ES_n		9	10	…	8		9	10	…	8

Table 5 summarizes how Internal and External Stakeholders communicate with each other. For example, all IS_1 communicate with each other using a project workbook where minutes of meetings, meetings, and memos are required when IS_1 communicates with IS_2, IS_3, and IS_n, respectively. This is applied to all Internal Stakeholders. Besides, the table shows that IS_1 will not communicate with ES_1 where it communicates with ES_2, ES_3, and ES_n using minutes of meetings, meetings, and memos, respectively. Finally, the table represents the communication methods that can be used by the External Stakeholders to communicate with each other.

The communication between the Internal Stakeholders and the External ones could be the same or different. In other words, Internal Stakeholders can use one method to communicate with all External Stakeholders or use different methods when communicating with different stakeholders. Also, the communication method between one Internal Stakeholder and one External Stakeholder could be the same going in both directions or could be different. For example, IS_1 and ES_2 should communicate with each other using minutes of meetings, or IS_1 should communicate with ES_2 using minutes of meetings where ES_2 should communicate with IS_1 using a different method such as status reports.

4. Managerial Insights

This section represents some of the managerial insights that project managers and stakeholders should know and follow before they start working on any project. These insights can be summarized as follows:

1. Project managers should conduct some analysis such as project history and SWOT analysis to identify external and internal factors that might affect the project and cause delays. This step is very critical if some of the external factors might heavily affect the project completion time.
2. Project managers should use all identified problems from previous projects to build the contingency plan. This plan helps to reduce the response time if something actually happens.
3. The contingency plan helps the project managers to solve the problems in a very short time and avoid any additional costs. If the contingency plan was not developed, the project will be delayed, and this will cost the company a lot of money.
4. Communication methods between all Stakeholders involved in the project should be defined clearly before the project starts. This helps in reducing time and effort and clarifying the way how the communication should be

conducted. Also, it helps in reducing conflicts between parties.

5. Establishing a PMO helps in enhancing the coordination and communication between all parties involved in the project.

5. Conclusion

Governments are making great efforts to provide budgets and funds to launch and implement new projects that cost a huge amount of money. In the Kingdom of Saudi Arabia, a vast budget was approved and set to work on different projects around the Kingdom in different areas to move the country forward. Unfortunately, failed or stalled projects became a phenomenon in the government's projects, which effectively wastes money and time. As a result, leading to delays or failure to achieve visions and goals. The cause of the problem of project delay includes poor coordination, the unclear scope of work, raised price of material, shortage in equipment, shortage in manpower, and use of improper equipment.

To avoid the problems of stalled projects, responsible organizations should develop a contingency plan using different tools and methods as well as develop appropriate coordination mechanisms that can be done by initiating a Project Management Office and establishing a clear communication process and method. This will help in managing the project properly, avoiding conflicts between internal and external stakeholders, finishing the project on time, and maintaining its costs.

This paper represented a framework that helps project managers to identify the problems that might face any projects, especially governmental ones, in the early stages, and how the effects of these problems can be reduced, avoided, or eliminated. This paper can be extended by conducting a survey to test the effectiveness of the model. Also, incorporating additional tools that help in identifying the problems could be another extension. Another addition to the proposed work could be made by considering the effect of project manager learning experience on project delay.

Conflict of interest

The authors declare that there is no conflict regarding the publication of this paper.

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