A Proposed Projects' Overrun Management Protocol Using Projects Classification Matrix

Abdulwahab Abukwaik, Edna Fallon, and Pat Donnellan
Engineering & Informatics College, National University of Ireland, Galway, Ireland
Email: A.Abukwaik1@nuigalway.ie, enda.fallon@nuigalway.ie, Pat.donnellan@nuigalway.ie

***Abstract*—The impact of project delays is usually intolerable and difficult to recover from. A significant number of projects don't finish on time or aren't completed up to the specified quality and are subject to cost and time overruns. Public projects in the Kingdom of Saudi Arabia (KSA) claimed losses of the order of $ 40 Billion per annum as a result of project overruns and many were delivered below quality standards. A proposed solution involving eight stages was developed in order to tackle most of the project delay issues that were determined by the author and accordingly ranked based on severity and frequency. These stages have detailed processes with control gates so that these projects will be moved steadily meeting all requirements at each entry gate. The eight stages are; the proposal stage, preliminary review & investigation stage, validation stage, classification stage, consultation-a stage, consultation-b stage, kickoff stage, and finally handover/takeover stage. All selected projects will be gathered at the proposal stage and then will be preliminarily reviewed before they move to the stage of validation. In the validation stage, the unnecessary projects will be postponed or canceled by the higher authority of projects which is proposed to be created. The classification stage is a very critical stage where all filtered projects will be classified based on eleven criteria. A scoring method was developed with respect to these criteria. Accordingly each project gets a proper parachuting so that the consultation-A phase would confirm the project's adequacy, readiness, and the availability of all related documents and studies. The Consultation-B stage's role is to link the top country's vision "2030", objectives, and targets. Accordingly, the higher consultants committee will assure the compliance of the government strategy of in-house sourcing plan, technology transfers and national recruiting "Saudization". The last two stages are the "kick-off and the takeover" which will be referred to the contract management, final project review, and proper closing process. The project classification matrix was used as an effective tool for many projects classification in KSA. The paper classified "King Abdullah Stadium" in KSA-2014 Category-A with a score of 44 out 55 which accordingly is subject to the highest project management level of control. The ultimate goal of this new project management protocol is to establish a higher projects authority to assure the implementation of 2030 strategy with special guidance and support with respect to the main project delay factors on the major infrastructural projects.**

Keywords*— *project management, projects phases, projects classification, and process validation

Manuscript received January 6, 2018; revised August 10, 2018.

I. Introduction

It is almost axiomatic of construction management that the project may be regarded as successful if the building is completed on time, within budget, and is of the desired quality [1]. It is commonly said, however, that two out of those three can't often be achieved due to the complexities involved in a construction contract and in particular the many different trades and professions that are commonly involved.

Delays in the completion of projects cause a negative effect on all areas of projects as well as all parties involved therein. The negative effects of delays are reflected in the cost of developments, the revenue from projects and the quality of those projects [2] [3] [4]. The more time taken to complete the job, the higher becomes the cost of construction; as delay means more staff members, more hours of work, more equipment, more plant, more direct and indirect overheads, potential claims between owner and contractor and more interests to be paid to financing institutions. In addition, rental or sale revenues will be lost for the duration of the delay. Other consequences represented are delaying in starting new projects and loss of reputation and credibility. Delays may also affect the quality of work because attempting to push the project activities forward to overcome delays can lead to quality being neglected.

In recent years, Saudi Arabia's construction enterprises increased greatly in many fields. According to a recent analysis, the level of uncompleted projects reached to more than 40% which requires a strong attention [5]. The construction industry has a consistently poor record with respect to the completion of projects on time. (Since it is clear that the majority of construction projects in the Kingdom of Saudi Arabia suffer delays or budget's overrun).

The proposed project management protocol incorporating a classification matrix developed by the author which helps significantly to classify projects based on eleven criteria with a total possible score (0 to 55) points. The scoring classifies the projects to 5-categories "A to E". Each category has a certain level of authority based on the total scoring number. The higher the score number, the higher the level of control to be applied. In this paper, the author's analyzed one of the mega projects which were executed in Saudi Arabia in the year 2016 by using the classification matrix. The project was called

doi: 10.18178/joams.6.3.169-173

King Abdullah Stadium which is located in Jeddah city and considered one of the best international stadiums. The methodology below shows how the protocol was applied by using the developed project classification matrix.

II. Project Management Protocol Stages

A. Proposal Stage

In this stage, it is assumed that the large and small organizations across the kingdom start to put their annual project plan. Each organization works individually at this stage depending on the agreed visions and set objectives on which such projects have to be inspired and formed. The list of the initiated projects to be grouped and further reviewed by the specialists employed by those organizations, and then to be approved as per the allocated annual budget and the objectives set. The final list is expected to have projects which are classified, i.e. "A, B, C, D and E". Projects which are tagged as A and B may be managed completely by the higher authority of projects in the kingdom.

B. Preliminary Investigation:

After the initiation stage, a big group of projects to be listed and organized in a way that would help the specialists (Projects high authority) to investigate whether these projects are meeting the organization's vision and objectives or not. In this stage, it is also expected to highlight the priority level and time completion plan for each project in order to help for the classification in later stages.

The eleven steps below elaborate in detail the recommended classification that is to be used for the governmental projects in the kingdom of Saudi Arabia. Each step has 5-levels with 5-ratings from "1 to 5" based on correspondent factors. The total summation of this number is equal to 55 points, where the weight of each step may vary from one organization to another according to the organization vision and objectives.

Eleven Projects Classification Criteria and Scoring:

1. Cost & budget
2. Priority & importance: Vision of 2030
3. Technical difficulties
4. Level of involvements and authorities involved
5. Location & geographical challenges
6. Category. "infrastructural, industrial, health, sport, education, tourism, military& defense, public residential and others"
7. Experience availability. "in house or out sourcing"
8. Project time duration. "tight, flexible or challengeable"
9. Familiarity, frequency, & repeatability:
10. Quality, Safety & Environment:
11. Risk Surroundings:

Table I below shows the 11 projects criteria and their corresponding factors that are scored from "1 to 11 %". The category's weights % is to be agreed by the head of the organization and his specialists to assure a fair scores contribution and to reflect the real impact at the end.

TABLE I. Projects Classification Matrix - Case of King Abdullah Stadium in Jeddah City

Projects Classification Matrix:

* Weights vary based on the nature of the project & other criteria

	"Proposed Project" King Abdullah Stadium	Scores	*Category's weight	Adjusted Score
1	**Cost & Budget:**		10%	
	a- Very high expenditure> SR 500 M	5		5
	b- High expenditure < SR 500 M	4		
	c- Medium expenditure < SR 100 M	3		
	d- Low expenditure < SR 50 M	2		
	e- Very low expenditure < SR 10 M	1		
				5
2	**Priority & Importance:** Vision of 2030			
	a- High priority, a big part of 2030	5	10%	5
	b- Med. Priority	4		
	c- Normal	3		
	d- Good to have, at any time	2		
	e- Not important, in 5 years span	1		
				5
3	**Technical Difficulties:**			
	a- Very difficult & complicated	5	10%	
	b- Difficult	4		4
	c- Average	3		
	d- Easy	2		
	e- Very simple concept	1		
				4
4	**Level of Involvements,** Authorities get involved:			
	a- Very high involvement, > 7 authorities	5	10%	5
	b- High, 4 to 6 authorities involved	4		
	c- Average, around 3 authorities	3		
	d- Manageable within Ministry or Authority	2		
	e- Manageable within organization or department.	1		
				5
5	**Location & Geographical challenges:**			
	a- Critical, important and vital	5	5%	5
	b- New Developed cities	4		
	c- Main cities	3		
	d- Small cities or towns	2		
	e- Country sides or rural areas	1		
				2.5
6	**Category:** Infrastructural, industrial, health, sport, education, tourism, military/defense, public residential and others			
	a- Health & education	5	5%	
	b- Urgent infrastructures	4		
	c- Residential projects	3		
	d- Industrial cities & projects	2		
	e- Tourism & sports	1		1
				0.5
7	**Experience Availability:** "In-house or outsourcing"			

	a- Not available at all	5	10%	
	b- Very limited	4		4
	c- Partially available, with major help	3		
	d- Available, with minor help	2		
	e- Fully available, managed locally.	1		
				4
8	**Project Time Duration:** "tight, flexible or challengeable"			
	a- Very short, challenged	5	10%	5
	b- Short	4		
	c- Average, realistic based on all parties	3		
	d- Relaxed, 10% extra from the CPS	2		
	e- Stretched, 10-30%	1		
				5
9	**Familiarity, Frequency& Repeatability:**			
	a- Unfamiliar, new concept "never applied"	5	10%	
	b- Conceptually clear, needs a partner	4		4
	c- Adaptable with experts	3		
	d- Familiar, manageable	2		
	e- Very familiar, repeated	1		
				4
10	**Quality, Safety & Environment:**			
	a- Top measures is expected, world's benchmarking	5	10%	
	b- High standards, national benchmarking	4		4
	c- Fair, average within acceptable RFQ	3		
	d- Economical, value for money, lowest standard	2		
	e- Low, standards not required	1		
				4
11	**Risk Surroundings:**			
	a- Huge factors affecting success	5	10%	5
	b- Many factors affecting success	4		
	c- Limited factors affecting success	3		
	d- Normal, risks are managed	2		
	e- No risk	1		
				5
	Total Score			44

C. Validation Stage

The validation stage is one of the most important stages due to the fact that after this stage, the project is going to move on designated paths which will usually be difficult to back-track for re-correction. This would be the real path in the future. Hence, it is very crucial to apply detailed analysis, if needed, and confirm the most realistic ranking from "A to D".

It is expected that some projects will be completely canceled, delayed and some to be called earlier. Some projects in the list, especially the infrastructural once, would impact so many critical projects if they didn't commence on time or at least start early.

D. Classification Stage

Reaping the early benefits with regard to the 8-stages of developing the government projects would start appearing here. The gained scores in the previous Table I would definitely help to parachute each project in the right zone. For example, the new King Abdullah stadium which was developed by ARAMCO "Arabian American Oil Company" was given a total score of 44 points which means that the higher authority of the projects in the kingdom of Saudi Arabia is recommended to take it over in full from A to Z.

It is also possible to apply many existing projects here in this developed table to examine its efficacy in light of logic and sense when compared to the previously taken decisions.

Table II below contains 5 categories "A, B, C, D, and E"; each one of them represents a certain zone that was created for a specific project management conditions. Each zone has its own level of authorities and accountabilities towards its end target.

TABLE II. CLASSIFICATION CATEGUIRIS "A, B, C, D, E"

	Points	Level of Authority	Index Range		
1	44 – 55	Managed by high Authority of KSA	75%	100%	A:
2	35 – 43	Managed by higher level within Authority	64%	73%	B:
3	30 – 34	Managed by higher level regional office	55%	68%	C:
4	25 – 29	Managed by local office	45%	53%	D:
5	< 25	Managed by allocated office	<	44%	E:

- *Category-A:*

This is the highest category and has the highest roles of responsibility for all projects to be executed within the kingdom's borders. The zone has a range of points "44 points to 55 points".

- *Category-B:*

The projects scores that fall between "35-43" will be located in this category and it is recommended to be managed by the higher level of authority within the ministry. Some roles and tasks will be managed by the higher level. However, the core responsibility of the project manager will be done by this allocated team.

- *Category-C:*

The medium size projects will usually be located in this category's zone. The projects in this zone will not require a high level of project management skills. The time schedule as and the budget are reasonable to be handled by a regional team within the ministry and they could get any needed support from the higher level of the project authority's hierarchy system. The zone here represents all scores between "30-34".

- *Category-D:*

The local engineering or project team could handle most of the activities needed for small-medium size projects which will be scored between "25-29". Most of the projects here seemed to be neither critical nor urgent in the project charter. It is usually expected to take any required support from the higher functional level of authority.

- *Category-E:*

Very small projects, routine/repeated projects and those which are completely manageable within the capability of that department would be classified as E-projects. Around 50% of annual projects are expected to fall under this category. The expected budget is to be less than SR 10 million and such projects have no impacts on 2030's vision. The given score to this category is for all projects below 25 points.

Table II above contains of 5 categories "A, B, C, D, and E"; each one of them represents a certain zone for a specific project management conditions. Each zone has its own level of authorities and accountabilities towards its end target.

E. Consultation A- Stage

After the classification of a particular project, the project will be moved to the initial stage of consultation. The consultation-A will resume the role of the second verification process to avoid the conflict of interest as well as to double check from different views ensuring whether the classification which was made is perfect or not in the previous stage. The group of consultants who are supposed to work under the high projects authority would be appointed to assure the adequacy and readiness of all project documents as part of their roles and responsibility. The first draft of the project charter is expected to be ready for further investigation in the upcoming stages.

Process monitoring in this stage is to be tackled by the high projects authority until the project reaches the kick-off destination in order to avoid any delay in the "initiation stage". It is also recommended to set and accept the accountability and functional deployments before moving to the next step.

F. Consultation B- Stage

In this stage, all roles and policies will be applied and linked to the top vision, objectives, and targets. Accordingly, the higher consultants assure the compliance of the government strategy of insourcing plan, technology transfers and national recruiting "Saudization". The project's charter should be very comprehensive and approved before it moves to the next stage. The project charter is going to cover the aspects below:

(Project objectives & goals, Project full scope, Project deliverables, Project imperatives, Project assumptions, Project constraints, Project drawbacks & consequences, Project risks measurements & mitigation plan, Project internal stake holders, Project external stake holders, Project span off teams, Project budget summary, Project CPS "Milestone plan" Project highest priorities, and Project handover report).

The group of consultancies will set the project's KPI in case the project is going to impact the top vision "2030". This could include all projects which were classified earlier (A, B and C). These projects are expected to be monitored monthly and to have a peer review by defined members who are called the project committee.

The high project authority will decide whether the project is going to have a project management contractor to be managed by the allocated project team supervised by professional consultant office.

G. Kick-Off Stage

Having said the above, it is obvious now that the project is ready to be awarded to the main contractor or to a group of contractors according to many factors. For example, the level of risk, availability of qualified parties, the capacity of the project management team and other factors that may exist during this stage.

It is worth mentioning to apply a high international level of contracts such as "FIDIC" contract to be easier for managing the project and to include all technical and commercial aspects.

The project team now has the green light to commence the project and everything is ready in hand. The project manager is responsible for managing all activities within his scope, appoint the project administrator to frequently review the contract/contracts, and apply all conditions on time. The monthly reports to be edited and reviewed before its submission to the higher authority highlighting all KPIs as per the initial agreement.

H. Takeover Stage

The last part before the official startup is the part of handover/takeover of the project. The project contractor at this stage tries to complete the project as early as possible because any single day of delay counts and affects the net profit.

The role of the project management office or the consultant is vital to preserve the owner "Client" right from any contract's breach that may happen due to the low performance or the negligence of the contractor. The consultant at this stage has to make a very comprehensive snag list that would cover all aspects of the project quality related matters.

The snags list is expected to be practical and doable within agreed time frame. In case the snags list has completely covered the observations, the consultant is only responsible for approving it and allows the owner to start taking over the project. It is highly advisable to keep from 5-20% bank guarantee for a period of 1- year after the takeover's date. This year allows the owner to witness and have a general evaluation of the project quality in general due to the fact that some critical issues may appear at later stages where the contractor wouldn't be available. Fig. 1 below illustrates the conceptual flow of all concerned projects from the first stage to the end.

III. Results

As a result of the eight stages of the projects management protocol, the performance of the public projects is expected to be better, faster and within the normal budget variation. Many underperforming projects would be eliminated at earlier stages and most of the

unqualified contractors wouldn't be short-listed. Most of the missing parts of the scopes would be realized early and accordingly, the projects budget initiation would be more accurate and reliable.

There is a clear need of the creation of a higher authority of projects in the kingdom of Saudi Arabia in order to regulate the protocol. This is particularly the core in relation to the public sector because of the sheer scale of the projects involved and also the limited technical capabilities of both the owners and contractors.

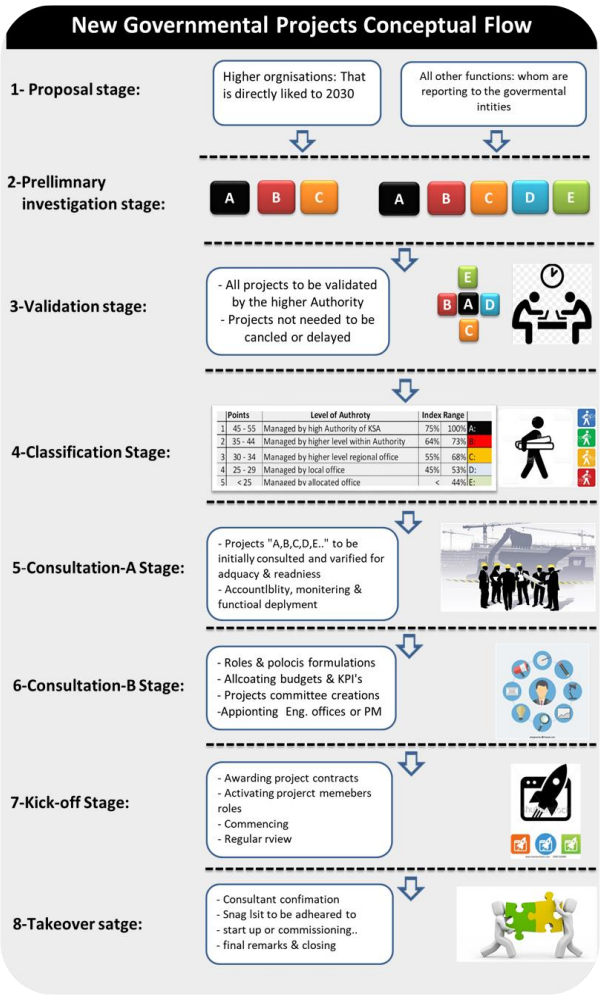

Figure 1. Proposed projects management protocol

IV. Discussions

The majority of the delayed projects in Saudi Arabia were public projects. The overrun in both time and budgets were common in general and the impact is still observed and even increased proportionally with an excess amount of projects after the huge capital deployed starting in 2007. The proposed protocol was carefully prepared after evaluating the top critical delay factors that were initially obtained, analyzed, and validated by the author which was successfully published in Rome conference [6]. The eight proposed stages have tackled the top 20 factors of delays that were mostly agreed by projects experts, main contractors, and consultants.

This research has a comprehensive principle of considering the major effects of these delay factors toward the time, cost, quality, and safety. Each stage in this protocol was prepared carefully to eliminate firmly the possibility of delay factors occurrence and repetition during the project cycle to assure a safe projects handover at the final stage.

Adapting the new proposed management protocol supported by the novel concept of Projects Classification Matrix is expected to improve both the public projects delivery time and the costs overrun by 60-70% based on the quality of the protocol implementation. The new management protocol was developed to tackle the top 20 critical factors of delay which were discovered by the author in his previous Paper.

Acknowledgment

Big thanks to the ministry of education for giving me this chance of the higher education and helping me to excel in the rest of my life. Special thanks for all who supported me during the stage of data collections and analysis.

References

[1] S. A. Assaf, M. Al-Khalil, and M. Al-Hazmi, "Causes of delays in large building construction projects," *ASCE J Manage Eng*, vol. 11, no. 2, pp. 45–50, 1995.

[2] W. Alaghbari, M. Razali, S. Kadir, and Ernawat, "The significant factors causing delay of building construction projects in Malaysia," *Engineering, Construction Architectural Management, Malaysia*, vol. 14, no. 2, pp. 192–206, 2007.

[3] M. Al-Khalil and M. Al-Ghafly, "Delay in public utility projects in Saudi Arabia," *International Journal of Project Management, Saudi Arabia*, vol. 17, no. 2, pp. 101-106, 1999.

[4] H. Xiao and Proverbs, "The performance of contractors in Japan, the UK and the US: A comparative evaluation of construction cost," *Construction Management and Economics*, USA, 2002; vol. 20, no. 5, pp. 425-435.

[5] I. Falqi, "Delays in project completion: A comparative study of construction delay factors in Saudi Arabia and the united kingdom," MSc disertation in (Project Management), Heriot-Watt University School of the Built Environment, 2004.

[6] A. Abukwaik, E. Fallon, and P. Donnellan, "The analysis of project delay factors using the double-roof house of quality," in *Proc. of the Fifth International Conference on Advances in Civil, Structural and Environmental Engineering-ACSEE 2017*. Institute of Research Engineers and Doctors.

KSA, Jeddah, (Born in 12-1978).

B.S. in Mechanical Engineering 2002

M.S. in Industrial Engineering 2007

Ph.D. Candidate in Industrial Eng. & Lecturer 2015

PMP certified, Member in American Eng. Society. 15 years of experience in PM, Engineering, & Manufacturing