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Major Factors of Delay in Developing Countries Construction Projects: Critical Review

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Abstract

Delays in Construction projects have been unfortunately the norm especially in developing countries. Such Delays lead projects to miss their targets of schedule and budget. This paper reviews the performance of those countries and analyzes the major time overrun factors. Although there are some similarities in few countries, it is safe to conclude that the most important factors causing time overrun are different from one country to another. Moreover, the industry type project sometimes dictates the highest ranked factors causing the delay. Omani Construction Projects are no different; they suffer from the same phenomena as well. This paper also generates a project management conceptual framework to be used in future research by the author.

Keywords: Construction Delay Factors, Time Overrun Developing Countries.

Introduction

Definition of project management has been discussed in many books and journals “the application of knowledge, skills, tools and techniques to project activities to meet project requirements
(PMBOK, 2008)

Shedding the light at executing phase in project cycle: construction management has been defined as a set of practice that will lead construction activities to be executed in an “effective” and “efficient” manner. It is located at the center of project and company management (Radosavljevic & Bennett, 2012).

Delay in construction phase in a project has been defined by many like (Mubarak, 2005): “delay is an event or a condition that results in work activity starting, or project completion, later than originally planned or an interruption or a hindrance to a planned program.”

In most developing countries like Asian and African countries the construction has been steady despite the world economy and it is a one of the main drivers of their economy. Likewise, the construction sectors in the Middle East have been booming especially when oil prices were healthy.

The preferred goal of project managers is to have a project executed efficiently. Meeting targets of time, cost and quality are their focus. However, those targets are difficult to achieve

due to various reasons which they are originated from different stakeholders, resources, and some other external sources (Sambasivan & Soon, 2006).

The most overruns on time and cost usually occurs in execution phase (Elawi et al., 2015). A study conducted in Saudi Arabia revealing that 70% of construction projects suffered from an overrun in Schedule (Assaf & Al-Hejji, 2005). In more specific City, only 61% of Mecca projects were completed on time (Elawi, et al., 2015). Sometimes the delay reaches 90% like in Malaysia, in MARA projects (Memon et al.,2011). In a case study conducted by (Alnuaimi & Almohsin, 2013) in Omani Construction Projects the delay was around 59% in 2007-2008 period and 42 % in 2009-2010. And for the years after 2011 till 2014, in 40 construction public projects, 38 % of them suffered an over run in schedule (Ruqaishi & Bashir, 2014).

Literature Review

Gulf Cooperation Council (GCC) Countries

Table 1 Shows eight articles with their top causes of time overrun, type of industry, the responsible part for most of the causes and the methodology & data analysis used. Most of those studies picked up the delay causes for their surveys from a collection of literature reviews in the same region. Also, most researchers depended on local experts to redefine the cause's questionnaires to fit geographical location and type of project. Others like (Ruqaishi & Bashir, 2014) in addition to their literature reviews, they conducted a pilot study spread to 10 different organization to ensure that it is applicable.

Author	Country	Type	Top Factors of Delay	Majorly related to	Data Analysis
Abdulaziz M.Jarkas and Jamal H. Younes , 2014 "Principle factors contributing to construction delays in the state of Qatar"	Qatar	Construction	unavailability or shortage of materials , delay in payment process by the employer ,frequent change /variation orders issued by the employer, lack of coordination among design disciplines , difficulties in financing the project by the contractor	Owner	Relative Importance Index (RII) $RII(\%) = \frac{5(n_1)+4(n_2)+3(n_3)+2(n_4)+n_5}{5(n_1+n_2+n_3+n_4+n_5)} *100$
Hassan Emam, Peter Farrel and Mohamed Abdelaal 2015, "Causes of delay in infrastructure projects in Qatar"	Qatar	infrastructure projects	Long response times from utility agencies, major changes in design during construction, ineffective planning and scheduling, infective control of progress, changes in the scope of projects	Contractor consultant	Multiplied Importance Index (RII) $(IMP.I)(\%) = \frac{(F.I)(\%)+(S.I)(\%)}{100}$
Omayma Motaleb, Mohammed Kishk, 2010 "An Investigation into causes and effects of construction delays in UAE"	UAE	Construction	change orders, lack of capability of client representative, slow decision making by client , lack of experience of client in construction , poor site management and supervision	Client	Relative Importance Index (RII) $RII = \frac{\sum_{i=1}^n w_i f_i}{\sum_{i=1}^n f_i}$
Ali S.Alnuaimi and Mohammed a. Almohsin, 2013 Causes of Delay in completion of construction projects in Oman	Oman	Commercial Buildings	first period2007-08 , weather, variations and claims ,change in initial design , not enough funds Second period2009-10 : planning and programming construction work, poor construction experience, shortage in material	Owners	Relative Importance Index $RII = \frac{\sum W}{A * N}$
Sadi. A.Assaf, Sadiq Al-Hejji 2005 "Causes of delay in large construction projects."	Saudi Arabia	Different types	Shortage of labors, delay in progress payment by owner, type of project bidding and award, late in reviewing and approving design documents by owner.	Owners.	Multiplied Important Index $[F.I. (\%) + S.I. (\%)]/100$

(Ghazi Saad A Elawi, Mohammed Algahtany, Dean Kashiwagi and Kenneth Sullivan, 2015). "Major factors causing construction delays in Mecca"	Mecca-Saudi Arabia	infrastructure projects	Land acquisition – contractor's lack of expertise- redesigning-line services	Owner	N/A
Abdullah Albogamy, Darren Scott , Nashwan Dawood, 2012) "Addressing construction Delays in KSA"	Saudi Arabia	Public building projects	Low performance of the lowest bidder contractor in the government tendering system, delays in Sub contractor work, poor qualification skills and experience of the contractor technical staff, poor planning and scheduling of the project by the contractor, delay in progress payments by the owner...	Contractor	Multiplied Importance Index $[F.I. (%) + S.I. (%)]/100$
Koushki, K, Al-Rashid and N. Kartam, 2004. "Delays and cost increases in the construction of private residential projects in Kuwait"	Kuwait	Private residential projects	changing orders, financial constraints and owners' lack of experience in the construction ,	Owner	N/A

Table1. Peer reviews of GCC countries in causes of delays.

However, there is one study conducted in Mecca, Saudi Arabia, the authors have not relied on previous studies. They picked up the causes from their experience and based on "real time quantitative performance analysis" (Elawi, et al., 2015).

Questionnaires were used in the data collection process in the listed studies except for three, most of them having between 42-65 possible causes, one reached up to 73 possible causes (Assaf & Al-Hejji, 2005).

(Koushki et al., 2004) used a qualitative approach by interviewing 450 People while (Elawi, et al., 2015) used quantitative analysis of 49 projects (Alnuaimi & Almohsin 2013) analyzed formal records of stakeholders.

There are several observations by the author while reviewing the studies. Response rate was very low in (Emam et al., 2015) paper 37 out 212, authors have decided to for interviews consequently in (Ruqaishi & Bashir, 2014) study, the response rate was as low as 28%, the author thinks, although efforts have been made to improve that by giving the respondents the option of returning the questionnaire soft or hard copies. Also, in the paper, Surveys have been sent to "project managers" only, the researcher recommends having wider population like site engineers, planners and other key personnel in order to have more comprehensive findings.

The findings have been ranked according to their importance, starting from the most cause contribute to the delay from point view stakeholders (client, contractor, consultant). Then it is finalized to have an overall most important cause. Assaf & Al-Hejji (2005) listed their findings as per the type of stake holder.

Since there are many stakeholders involved in construction business, these causes were categorized into groups: six and eight groups. While others, delay factor groups were categorized into four: Employer/owner/client related factors, contractor related factors,

consultant related factors and external related factors (Emam et al., 2015; Ruqaishi & Bashir, 2014; Albogamy et al., 2012; Sambasivan & Soon, 2006)

On the other hand, (Assaf & Al-Hejji, 2005) have gone for nine categories that included: Project, Design, materials, equipment, labors and external.

Asia

In some selected papers in this region, it could be seen that questionnaires have been used to collect data containing a smaller number of possible causes or factors than to researches looked at in GCC region. However, those factors were derived from past literature reviews just like papers in GCC.

Murali Sambasivan, Yau Wen Soon, 2006 "Causes and effects of delays in Malaysian construction industry"	Malaysia	Construction	contractor improper planning , contractor poor site management , inadequate contractor experience , inadequate client finance and payments for completed work, problem with subcontractor, shortage in material , labor supply , equipment availability and failure , lack of communication between parties , mistakes during construction stage	Relative Importance Index (RII) $RII = \frac{\sum W}{A * N}$
Long Le-Hoai, Young Dai Lee, Jun Yong Lee(2008) "Delay and cost overruns in Vietnam large construction projects: A comparison with other selected countries"	Vietnam	Different construction industries	Poor site management and supervision , poor project management assistance, financial difficulties of owner, financial difficulties of contractor, design changes.	Multiples Importance Index $IMP.I. = F.I. \times S.I.$
Bon-Gang Hwang, Xianbo Zhao, Si Yi Ng(2012) "Identifying the critical factors affecting schedule performance of public housing projects"	Singapore	Public housing	Site management , coordination among various parties, design changes by owners during construction, availability of labors on site, availability of material , availability of staff to manage projects.	Multiples Critical Index (RII) Criticality Index(CI) = E x FI
Hemanta Doloi, Anil Sawhney, K.C. Iyer, Sameer Rentala.(2011) "Analysing factors affecting delays in Indian Construction Projects"	India	Construction	Delay in material Delivery by vendors, non availability of drawing/design on time, financial constraints of contractor, increase in scope of work, obtaining permissions from local authorities.	Relative Importance Index (RII) $\frac{\sum w}{A \times N}$
Kartik Kalkani, Shakil Malek.(2016) "Analyzing causes of Delay in construction projects"	India	Different construction industries	clearance on Delay, Drawing revision and clearances from consultant/client/PMC, incompetency of labor, unrealistic planning and not using monitoring and controlling tools & technologies, lack of leadership qualities in managers, procurement planning and procurement process.	Relative Importance Index (RII) $RII = \frac{\sum W}{A * N}$

Table2. Some Peer Reviews in causes of delays in some countries Asia.

In Sample size, (Doloi, et al., 2011) argues that although the sample is small, the quality of responses is high because of relevant experience. Similarly, to some GCC papers, response rate in (Hwang, et al., 2012) was low (31.3%), which is very similar to (Le-Hoai, et al., 2008) study as well.

Africa

In some selected African countries, the sample size and response rate are relatively higher than the previous discussed in other regions. Number of possible factors used by selected studies is less than 30.

Author	Country	Type	Factors of Delay	Data Analysis
Yaw Frimpong, Jacob Oluwoye, Lynn Crawford.(2002) "Causes of delay and cost overruns in construction of groundwater projects in a developing countries: Ghana as case study"	Ghana	GroundWater Project	Monthly payment difficulties from agencies, poor contract management, material procurement, poor technical performances, escalation of material prices.	Relative Importance Index $\frac{\sum_{i=1}^5 a_i \cdot n_i}{\sum_{j=1}^N x_j} \times 100$
A.Omoregie,D .Radford (2006). "Infrastructure Delays and cost Escalation: causes and effects in Nigeria"	Nigeria	Infrastructure	Financing and payment of completed works, poor contract management, Delays, changes in site conditions, inaccurate estimates, shortage of materials, imported materials & plant items, additional works, design change, subcontractor and nominated supplier, weather, non-adherence to contract conditions, mistakes and discrepancies in contract document	Mean severity index and the standard error
Henry Alinaitwe, Ruth Apolot ,Dan Tindiwensi(2013) "Investigation into the causes of delays and cost overruns in Uganda's Public Sector Construction Project"	Uganda	Public	Changes to scope of work, delayed payments to contractors, poor monitoring and control, high cost of capital, political insecurity and instability.	Multiplied Importance Index $IMP.I = F.I \times S.I. / 9 (\%)$

Table3.Some Peer Reviews in Africa

Research Methodology

The framework shown below is an empirical one that have been used by past researchers.

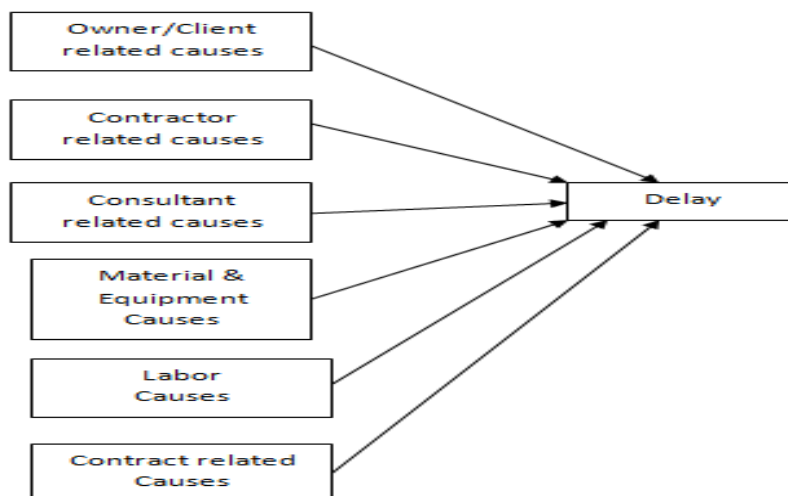


Figure1. Empirical framework of past studies

Objectives

The objectives of the study are:

1. To review the construction projects performance in developing countries.
2. To analyze the underlying causes of time overrun in projects.
3. To investigate the similarities of the top delay factors in the developing countries.
4. To investigate the most time overrun factors in Oman construction projects.
5. To generate a project management conceptual framework

Finding & Analysis

GCC

Looking in depth at the causes, one could see that they are different from one country to another, and even they are different in the same country, and (Emam, et al., 2015), have confirmed such in their critical review paper. Alnuaimi & Almohsin (2013) have done their studies in two periods and clearly the findings were different. One reason concluded that it is because those studies were not done in the same type. However, one common cause found to be the change of orders. These are modifications in design in construction phase and variations in general. Although (Assaf & Al-Hejji, 2005) have not ranked the causes found in overall regardless of stakeholder (Owners, Contractor, Consultant), they found that “Change orders by owners” are the common cause between all parties. Those significant causes are perceived differently from different stakeholders.

Owners are not only responsible for change of orders but also for other important factors mention in table 1, this is what most authors highlighted and emphasized on, owner related factors.

Elawi,et al (2015) analysis of GGC studies , it is found that 50% of delay causes were by owners followed by the contractors of 36%. Despite the above, one must not ignore the contractor contribution to the delays like the study done in oil and gas business by (Ruqaishi & Bashir, 2014).

Asia

Results listed in table.2, revealed that contractors have more burdens on their shoulders especially the main construction contractor. Poor site management has been the most ranked important cause of time overrun in those countries (Ruqaishi & Bashir, 2014). Although (Doloi, et al., 2011) listed material shortage as the top ranked cause, in the same paper factor analysis has been used to provide comprehensive correlation and group them as principle factors (Le-Hoai, et al., 2008). 10.97% of total variance for the liner component, site management comes second overall in causing a construction project a time overrun.

Also, one common cause seen is lack of communication between all stakeholders, especially if there are many different ethnic groups working at the same project, like the case in Singapore (Hwang et al., 2012). Moreover, (Kalkani & Malek, 2016) have found this is one of the key causes between all industries (Industrial, infrastructure and Real Estate) in India.

Unlike to GCC region, change of order is not in the top three causes, however it is still one of the key important factors contributing to project performance. Also, the most important causes are not coming from client/owners like in GCC region, they are mostly from Contractors.

Although there is some significance agreement between these countries in causes of time and cost overrun, the claim still stands that there is still gap and differences between diverse locations.

Africa

There is more similarities in the key causes of time overrun within the African countries than others discussed, to the level that (Omorieg & Radford, 2006) and (Frimpong, et al. , 2002) findings are the same for the top two factors: Monthly payment to the completed works and contract management. Also, (Alinaitw, et al., 2013) second ranked cause is the same as the first one of formers. Surprisingly enough, the studies have been done in different country and different construction industries. This might be due to similarity of the stakeholder accountable of those causes, Owner, (Frimpong, et al., 2002) argue that is due to bureaucracy governments run on. For contracts, usually it is awarded to the lowest bidder, and according to (Omorieg & Radford, 2006), to politicians and high-profile personnel who possess low project management skills and as results causes time and cost overrun.

Change of order is still a key factor as it could be seen from (Alinaitw et al., 2013) as the first important one that has the highest impact on time overrun.

Oman

Author	Country	Type	Factors of Delay	Data Analysis
Nasser Alamri, Omar Amudi, Gibri Njie ,2017 "Analysis of construction delay causes in DAMs Projects in Oman"	Oman	DAMs	Severe weather conditions, change orders , uncertainty in ground condition, poor site management , executive bureaucracy in client organization, feasibility study didn't cover all aspects.	Multiplied Importance Index $[F.I. (\%) * S.I. (\%)]/100$
Adekunle Sabitu Oyegoke, Naseer Al Kiyumi,2017 "The causes, impacts and mitigations of delay in megaprojects in the Sultanate of Oman"	Oman	Mega general projects	selection of the lowest bid; the financial condition of the main contractor ; delay in decision-making by the client ; and poor construction planning by the main contractor	Relative Importance Index $\frac{\sum W}{A \times N} (0 \leq RII \leq 0.8)$
Mohammed Ruqaishi and Hamdi A. Bashir, 2014 "Causes of delay in construction projects in the oil and gas in the gulf cooperation council countries : A case study"	Oman	Oil & Gas	poor site management and supervision by the contractors, problems with subcontractors, inadequate planning and scheduling of project by contractors , poor management of contractor's schedules, delay in delivery of materials, lack of effective communication among project stakeholders	The Kruskal-Wallis test $KW = \frac{12}{N(N+1)} \sum_{i=1}^k n_i^2 - 3(N+1)$
Ali S. Alnuaimi and Mohammed a. Almohsin,2013 "Causes of Delay in completion of construction projects in Oman"	Oman	Commercial buildings	first period2007-08 , weather, variations and claims ,change in initial design , not enough funds Second period2009-10 : planning and programming construction work, poor construction experience, shortage in material	Relative Importance Index $RII = \frac{\sum w}{A * N}$

Table4: Past studies in Oman

The Omani government construction projects were worth 5.2bn in 2014 and 6.0bn in 2016 which accounts for 10% of Gross Domestic Product of the year. Regardless of sector or type of construction industry, the on-going and planned projects are estimated with 163.5bn which is as twice as the country annual GDP. (Oxfordbusinessgroup.com)

Despite the attempts of diversification in the economy recently, Oman still depends heavily on oil production and its industries. According to the Annual Statistical bulletin from Oman national center for statistics & information, the production of oil was averaged 970.6 K barrels per day accounting for 84% in 2014 and 68 % in 2016 of the government revenues.

Since Oman is a developing country like any other neighboring country, many projects are in progress and many of them are yet to go underway. It also struggles with same phenomenon of overruns.

Mega Construction Projects in Oman of public and private sectors suffer from time & cost Overrun (Oyegoke & Kiyumi, 2017) listed five important projects that didn't complete on the agreed date. One of them has a delay as many as over six years.

In a case study conducted by (Alnuaimi & Almohsin, 2013) in Construction Projects, the delay was around 59% in 2007-2008 period and 42 % in 2009-2010.

And for the years after 2011 till 2014, in 40 construction public projects, 38 % of them suffered an over run in schedule (Ruqaishi & Bashir, 2014).

In (Ruqaishi & Bashir, 2014) article, although poor site management is the top cause of the study, it has been emphasized that early involved of vendors in the early stage of project especially in design phase is very vital. Ruqaishi & Bashir (2014) have found such factor to be distinctive in oil and gas business.

Moreover, it is been found that organization size or ownership has quite low effect on major schedule performance factors and likewise the perception of different stakeholders has little impact on the highest ranked delay causes.

Material management is one of the top delay factors in this study and that is aligned with the findings in oil and gas projects across the world.

In contrast with other industries in GCC area, this paper shows the contractors and vendors are more responsible for the time overrun in the project cycle.

Alnuaimi & Almohsin (2013) have done their studies by analyzing formal records of stakeholders in two periods and clearly the findings were different. The reasons concluded that because these studies were not done in the same type and have significant sample and size different. Moreover, the authors argue that the results from the first period were comprised by hurricane Guno which affect not only the contractual agreement but also the duration of the project. Also, the authors' states that most of those delay factors could be solved by the owner. One of his recommendations is to sign an agreement with Project management office to ensure the projects are done within time and budget.

One of the recent papers published on Mega projects, is by (Oyegoke & Kiyumi, 2017). It focuses on those Mega infrastructure projects by the government that have an effect on the nations of Oman. 53 completed questionnaires were used to analyze the data and were distributed to fairly balanced stakeholders. The highest ranked time overrun factor is the selection of the main contractor/s for execution. The authors argue that such huge projects need better system to select the executer since these projects needs more skilled manpower and rich experience. It has been observed that such factor is very rare to be in the top of the list among all types of construction.

The highest ranked delay factors are significantly different between Client and the contractors and that is different from the paper of (Ruqaishi & Bashir, 2014), where there is quite agreement. Oyegoke & Kiyumi (2017) states that there is "blame" culture exist between the client and the contractor.

The second recent paper on Mega projects were on DAMs by (Alamri & Amudi, 2017) and those type of projects have an average delay of 45% according to (Flyvbjerg, 2014) Questionnaires were used to collect the data from different stakeholders distributed yet again fairly to all of them . The response rate was quite good at 77%. External factors were the top factor in such study, severe weather conditions

Two giant Cyclones hit Oman between 2007-2010 and that resulted in heavy rain which resulted in delaying these DAM projects. Moreover, Oman is famous for speedy Wadis which affect the delivery of such projects. Alamri & Amudi (2017) argue that although this is an external factor, it could be minimized by having better site layouts, better documented information on the weather status and better drainage system for those DAMs especially that are under construction. Change of orders was second in the list affecting the schedule

performance, which is in lined with the most of GCC countries findings, and that is under the responsibility of the Owner.

Both top two delay factors are similar for those with (Alnuaimi & Almohsin, 2013) paper in the first period. It is fair to say that Guno Cyclone has affected many different projects in Oman.

All in All, different type projects have different time overrun causes in Oman. Owner/Client organizations have a great deal of responsibilities to ensure a good schedule performance. Crucial Decisions must be made on time to avoid project delay. Change of order is one of the top causes in projects in Oman and it seems doesn't improve greatly over time.

Contractor has a share of such responsibility. They need to ensure enough funding available before accepting a huge contract. Skilled staff must be priority among the overall manpower.

Conceptual Framework

Figure 2 shows conceptual model on the process of managing a project during its life cycle developed by the author. The researcher is going to use such in his future articles.

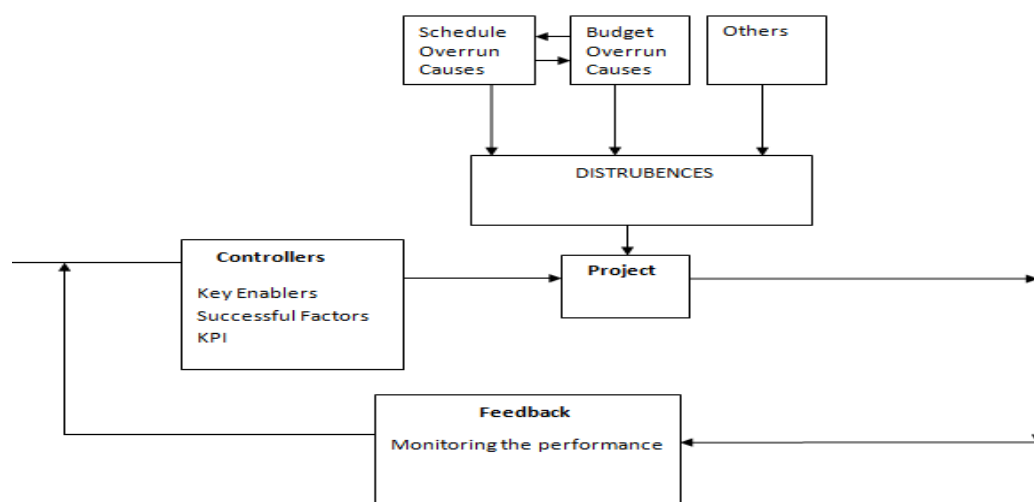


Figure2. Conceptual model of project management process

Contribution

This paper has revealed the key causes of time overrun of construction projects in developing countries including Oman. Understanding those top causes could lead to solutions and eventually avoid time and cost overrun of the project. Elaboration in investigating the root causes of the time and cost overrun factor will help mitigates the risks involved in project delivery.

A conceptual framework got generated by the researcher in the project management process. This Framework represents the holistic view of the project cycle which is unique among the literature on project management.

Conclusion

This paper reviewed a good number of past studies across the developing countries on the major factors of time overrun in the construction projects.

Although there is some significance agreement between these countries in causes of time and cost overrun, the claim still stands that there is still gap and differences between different contexts.

In the infrastructure and commercial projects, (change of orders) by the client is the most common delay factor in the those developing countries.

This study also has investigated all papers done in Oman including recent papers dated 2017. Different type projects have different time overrun causes in Oman. Owner/Client organizations have a great deal of responsibilities to ensure a good schedule performance. Crucial decisions must be made on time to avoid project delay. Change of order is one of the top causes in projects in Oman, which is line with other developing countries.

Recommendations for Efficient Project Delivery

- Materials and procurement management to be top priority.
- Early involvement of key personnel of contractors and vendors in design phase of the project.
- Change of scope must be minimized.
- Frequent progress meetings especially with main construction contractor.
- Lesson learned from past projects must captured and stored properly so the new project team could benefit from them.
- All interfaces of the projects must be managed properly. Competent interface engineers to be obtained.
- Use the latest construction modeling technology

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