Important Causes of Delayed Projects in Saudi Arabia vs. PIPS: A University Campus Case Study

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Saudi Arabia has been facing issues with completing construction projects on time and on budget. It has been documented that 70% of public construction projects are delayed. A case study was performed, at a University campus in northern Saudi Arabia, identifying the major causes of project delays. The University was experiencing delays from 50% to 150%. The delay factors were gathered from the University Projects Director and five engineers. The University delay factors were then compared to delay factors experienced on Saudi construction projects, identified by performing a literature research. The comparison identified nine causes of delays that both studies documented. The study also proposes a solution to minimize the nine major delay factors. A literature research identified one construction management method, the Performance Information Procurement System (PIPS), has documented multiple times its ability to improve project performance and minimize delays.

Keywords: Project delay, public construction, Saudi Arabia, Best Value, PIPS.

Introduction

"What matter are not budget figures, but what they represent in reality as quality projects and services that people can feel and enjoy." That is what King Abdullah, the Custodian of the Two Holy Mosques, said after Saudi Arabia's financial plan was released on Dec. 23, 2014 (*Arab News*, 2014). Saudi Arabia has been experiencing a construction boom for the past three decades. The construction industry is considered to be a big business, estimated to be worth more than $3.9 trillion yearly worldwide (Jackson, 2010). The estimated nearly investment budget for the Saudi construction industry from 1990 to 2000 was $234 billion (Cordsman, 2000). In 2011, nearly $147 billion was at stake because of nonperforming public projects (*Arab News*, 2011). On the other hand, the Saudi Ministry of Finance allocated about $48 billion for 2,330 projects in 2013 alone. In 2014, the government expected to launch projects worth a total value of more than $66 billion (*Arab News*, 2014). However, the majority of public projects are not completed, and the chronic delays that beset most public projects make Saudi citizens uncertain about the likelihood they will gain any utility from these projects (*Arab News*, 2014). According to Assaf and Al-Hejji (2006), 70% of public projects were delayed in Saudi Arabia. Are delayed projects a new phenomenon in Saudi Arabia? In 1983, Zain Al-Abedien reported that 70% of projects were delayed when the Ministry of Housing and Public Works was responsible for them. Since that time, Saudi Arabia has suffered from project postponement problems. The university campus being used as a case study is considered to be one of these projects. This campus is located in Northern Saudi Arabia and was established in 2005. It has been under construction since 2006.

Problem

The university campus should have been completed in 2012. However, only two buildings of the university campus are operational, despite the fact that, as of 2015, there are 22 buildings in the execution phase. As a result, the percentages of delayed construction were from 50–150%. The stakeholders of university made decisions to solve the problems that were causing delayed projects and slowed construction performance at the university campus.

Methodology

This study depended on a literature review to explore essential factors that caused delays in public construction projects in Saudi Arabia. Stakeholders at the university were interviewed to learn about the delay factors from an owner's perspective. After that, the delay factors at the university were compared with important delay factors around the country, which were collected from extant literature. The comparison showed the important factors that causes of delay projects at case study campus. The study then explained how the Best Value Performance Information Procurement System (BV PIPS) worked. Finally, the results of the study showed that the important delay factors could be solved by using PIPS.

Research Hypothesis and Questions

BV PIPS help solve important delay factors in Saudi Arabia.

1. What are the important delay factors in public projects in Saudi Arabia?
2. What causes delayed projects at the university?
3. What is the relationship of the delay factors in Saudi public projects to the university's projects?
4. How can PIPS mitigate the causes of delayed projects in Saudi Arabia?

Objectives of the Study

1. Show important delay factors in public projects in Saudi Arabia.
2. Find the causes for delays in projects on the university campus.
3. Show how delay factors at the case study university are classified within what was found in the literature review.
4. Show how PIPS can deal with important delay factors to improve project performance in Saudi Arabia.

Literature Review

Because of the high number of previous studies, there is a large amount of data related to delayed projects. According to Al-sultan (1987), 70% of Saudi public projects faced time overages. Al-Barak (1993) reported that poor estimation practices and a shortage of skilled contractors cause project delays. Also, he believed that the national economy's stagnation was a factor that caused

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delays (Al-Barak, 1993). In 1999, Al-khalil and Al-Ghafly performed research to find the causes of delays in Saudi public utility projects. They investigated among owners, consultants, and contractors to determine who was responsible for project delays. They found that about 60% of projects begun between 1985 and 1994 were delayed. The owner and the consultant often blame the contractor for the project delays. Conversely, a contractor often accuses the owner and consultant of delaying the project (Al-khalil & Al-Ghafly, 1999). Likewise, delayed projects impact both the owner and contractor. The owner loses revenue because of the uncompleted project, which forces him or her to rent temporary premises. Contractors also incur overhead costs because delayed projects keep them from getting another project (Assaf & Al-Hejji, 2006). Other studies mentioned that government departments, as owners of public projects in Saudi Arabia, are affected by the disruption of public development plans, the financial execution plan, and community annoyance caused by the delay of particular projects. Whereas, a contractor is influenced through; increasing period of project, increasing overhead cost, and hindering contractor of finding another business opportunity (Al-Kharashi & Skitmore, 2009). All parties aim to complete construction projects on time. However, many previous studies found major factors that affected the performance of organizations working on construction projects. Al-Karashi and Skitmore found about 112 factors responsible for project delays. They also obtained about 39 more factors from respondents in their study. The authors found 131 total factors, which are listed in the appendix (Al-Karashi & Skitmore, 2009). So, here in this study classified the related causes in four levels: owner-related causes, contractor-related causes, consultant-related causes, and other-related causes. An intensive review of significant, frequent factors that had appeared in previous studies about the Saudi Arabia construction industry was then made.

Owner-Related Causes

Owners play an active role in reducing project delays. Therefore, project period is considered to be a delay factor. Owners often cannot predict how long projects will take (Albogamy et al., 2013; Al-khalil & Al-Ghafly, 1999; Mahamid, 2013). Extension time is one of the owner-related delay factors. The owner approved extension time on 87% of projects (Al-khalil & Al-Ghafly, 1999). In addition, owners postpone making progress payments to other parties, which becomes another delay factor (Albogamy et al., 2013; Al-khalil & Al-Ghafly, 1999; Al-Kharashi & Skitmore, 2009; Al-Mudlej, 1984; Al-Sedairy, 2001; Al-Subaie, 1987; Hazmi, 1987; Mahamid, 2013). Another study found that project orders changed by the owner disrupted contractors' schedules, causing project delays (Albogamy et al., 2013; Assaf & Al-Hejji, 2006). Also, reviewing and approving project documents were mentioned as factors leading to the postponement of projects (Assaf & Al-Hejji, 2006). Also, suspension work in construction projects by the owner affects the project's performance (Al-Kharashi & Skitmore, 2009; Assaf & Al-Hejji, 2006). Also, a tendering system can be considered a significant factor that leads to the success of projects. Lowest bidding, which is the system applied in most Middle East countries, is also considered a reason for the prevalence of project delays in Saudi Arabia (Albogamy et al., 2013; Al-khalil & Al-Ghafly, 1999; Mahamid, 2013). Table 1 shows owner-related factors.

Table 1

Important Owner-Related Delay Factors

No.	Owner-Related Causes of Delay
1	Unrealistic project Period
2	Extension of Time
3	Postponing Progress Payments
4	Changes in Project Orders
5	Failure to Review and Approve Project Documents
6	Suspension Work
7	Lowest Bidding Practices

Contractor-Related Causes

Al-Barak noted that the main causes of contractors' failures were skill shortages, poor estimation practices, and poor decision-making (Al-Barak, 1993). Project duration is also a contractor-related delay factor when the contractors have poor planning and scheduling skills (Albogamy et al., 2013; Al-khalil & Al-Ghafly, 1999; Mahamid, 2013). Qualified contractors may prevent project delays because of their experience, knowledge, and ability to field a trained workforce (Al-khalil & Al-Ghafly, 1999, Assa & Al-Hejji, 2006). Assaf and Al-Hejji (2006) found many factors related to contractors, such as conflicting views about subcontractors' schedules in project implementation and poor subsurface conditions. Some contractors do not expect the worst things that could happen on the worksite, for instance, a high water table. Other recent studies found that a lack of experience and a shortage of manpower are major causes of project delays (Al-Kharashi & Skitmore, 2009; Assaf & Al-Hejji, 2006). Poor site management and supervision are also considered factors in the previously mentioned studies in addition to Mahamid's (2013) study, which has many other negative effects on the construction industry. Moreover, when a contractor has cash flow problems, it will naturally affect the project's completion (Albogamy et al., 2013; Al-khalil & Al-Ghafly, 1999; Al-Kharashi & Skitmore, 2009; Assaf & Al-Hejji 2006). Table 2 contains contractor-related factors.

Table 2

Important Contractor-Related Delay Factors

No.	Contractor-Related Causes of Delay
1	Shortage of Skilled Workers
2	Poor Estimation Practices
3	Making Poor Decisions
4	Project's Duration
5	Contractors' Qualification
6	Conflicts with Subcontractors' Schedules
7	Poor Subsurface Conditions
8	Lack of Experience
9	Manpower Shortage
10	Poor Site Management and Supervision
11	Cash Flow Problem

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Consultant-Related Causes

The previous studies revealed that some of the delay factors can be linked to a consultant. According to Assaf and Al-Hejji (2006), a consultant is responsible for project delays by producing design documents and reviewing and approving design documents (Albogamy et al., 2013; Assaf & Al-Hejji, 2006). Moreover, consultants are connected with diverse factors that cause project delays, such as failing to find mistakes and discrepancies in design documents and rigidity about deals (Assaf & Al-Hejji, 2006). In addition, consultants need to have high levels of experience in order to perform their roles. Projects also often require hiring of a number of consultants (Albogamy et al., 2013; Al-Kharashi & Skitmore, 2009). Table 3 shows consultant-related factors.

Table 3

Important Consultant-Related Delay Factors

No.	Consultant-Related Causes of Delay Factors
1	Failure to Produce (or Producing Faulty) Design Documents
2	Failure to Approve Design Documents
3	Mistakes and Discrepancies in Design Documents
4	Dealing Rigidly
5	Consultant Performance
6	Inadequate Number of Consultancy Employees

Other Causes

It is hard to classify some factors under the three main categories of owner, contractor, and consultant. For example, a delay in material delivery is considered a factor that has a degree of impact on project duration (Assaf & Al-Hejji, 2006). In construction projects, although it is difficult to coordinate among construction parties, communication and coordination increase the project's chances of success. Conversely, increasing rework—doing a job more than one time—reduces project schedule control (Mahamid, 2013). Table 4 contains other factors that delay projects.

Table 4

Other Important Delay Factors

No.	Other Causes of Delay
1	Material Delivery Problems
2	Communication and Coordination Failures
3	Rework

The literature review showed that there are 27 significant, frequent factors that cause delays in construction projects in Saudi Arabia. There are six factors related to the project's owner, nine factors related to contractors, nine factors related to consultants, and four others that cause of delays in Saudi public projects.

Interview of the Owner at the Case Study University (CSU)

In an interview with the director of department of projects and five engineers at the CSU was conducted on 14-15 March, 2015 via Skype. It was discovered that of a total of 22 projects at the university, 17 were delayed. There were also 15 projects under construction on the university campus. There are another eight projects that are currently in the design stage. However, the planned operation of the university campus should have begun in 2012. Conversely, two buildings were operational until 2015. Hence, the percentages of delay in overrun time at the university were between 50% and 150%. It was also found that 99% of the university projects overran projected costs. So, the delay of construction projects at the university was caused by many factors that have links to the owner, contractors, consultants, and other factors.

Owner-Related Causes at the CSU

It is obvious that there is no clear vision for projects. Also, there were only incomplete ideas when the university planned its construction projects. As a result, most of the university's projects do not reflect reality. There are huge projects with unrealistic requirements. Because of this, after a contractor delivers a building, it is found that its design is not appropriate for use, which happens because the designers had been controlled by the owner during the design stage. In addition, 88% of the university's projects are not well thought out, and these projects' budgets do not correspond with their design requirements. Consequently, when selecting a contractor, the owner often makes the decision to remove some work from the project in order to get the contractor price closer to the budget. The owner will find someone to complete these works later. This action delayed projects at the university because the removed works were based on work being done by the first contractor. For example, the first contractor may need the air duct system to be completed, which is removed from first contractor's works to another bid, to install a false ceiling. Consequently, the tendering system takes a long time to sing with a contractor and adds to the difficulty of governmental proceedings. Other factors are also related to the owner.

Contractors who want to obtain university projects must have classifications from the Ministry of Municipal and Rural Affairs. There are five classes, and each class shows the highest financial limit within the contractors' abilities. Owners may also make the decision to prevent low-class contractors from partaking in the competition by merging similar projects into one tender. However, that method increases the projects' sizes, which limits the university's ability to monitor them. Additionally, it is clear that there are poor organization within the project management department. Although there is no ability to manage many projects simultaneously, it is clear that there are many too many projects to progress through the implementation process. In addition, some delayed projects were found to need approval in order to use a particular system. However, the holder of authority was not a specialist, which led to slow approval. Also, the owner's employees were responsible for delaying projects at the university because they delayed progressive payments to the contractors. Table 5 shows owner-related delay factors at the CSU.

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Table 5

Owner-Related Delay Factors in the CSU

No.	Owner-Related Causes of Delay at CSU
1	Lack of Vision
2	Design Requirements Do Not Reflect Reality
3	Designer is Controlled by Owner
4	Lack of Project Budget
5	Wrong Decision-Making by Owner
6	Not Following the Conditions Solidarity Among Contractors
7	Inadequate Project Management Department
8	Late Review and Approval of Design Documents by Owner
9	Changing Consultant During Implementation
10	Delay in Progress Payments to Contractors

Contractor-Related Causes at the CSU

The literature review found that one common delay on university projects was poor contractor performance. One project is separating itself from its contractor because of poor performance, the contractor's lack of qualifications, and a conflict among company partners. Withdrawing from a construction project sometimes requires procedures that can take up to ten years to complete. In addition, another contractor-related factor is a lack of experience. Although contractors must review the proposal and inform the owner about items that are not mentioned in the proposal, contractors and consultants discovered many items that were not mentioned in the project proposals but were uncovered during implementation. Besides, despite contractors have about two months after selecting a contractors and before signing contracts, the contractor do not utilize that time for reviewing proposals to find any luck of works. Moreover, most contractors on the university's projects lacked project-management skills. For example, risks that could cause damage to projects were not clear to some project managers. The size of these projects often exceeded the contractors' ability. In addition, some contractors had too many projects, and that affected their ability to finish projects on time. Also, contractors suffered from a shortage of manpower. Additionally, contractors delayed the payment of salaries to their laborers, which delayed projects when the laborers stopped working. Table 6 shows contractor-related factors at the CSU.

Table 6

Contractor-Related Delay Factors in the CSU

No.	Contractor-Related Causes of Delay at CSU
1	Poor Contractor Performance
2	Conflict Among Company Partners
3	Contractor's Inadequate Qualifications
4	Lack of Contractor Experience
5	The Proposal Was Not Studied by the Contractor
6	Contactor Lacked Project Management Skills
7	Ability of Contractors
8	Concurrent Projects
9	Shortage of Manpower
10	Delayed Payment to Laborers

Consultant-Related Causes at the CSU

Poor consultant performance was also one of the causes of delay at the CSU. Some consultants would like to extend their contract with the owner and, therefore, delay projects. Hence, some works were suspended by the consultant without a convincing reason. In addition, another delay factor is that many mistakes are often discovered in the blueprints during the implementation stage. Also, it is found that there is lack of consultancy employees and that causes delay construction at the university. However, when the consultants' contracts have been finished and the projects have been delayed, the university's owner has resorted to contracting with an international consultant for all of the university's projects, which will save about $8 million, as opposed to contracting with more than one local consultant. In addition, when the owner contracts with one consultant for all campus projects, it reduces the extension of contracts for each project on campus if one of these projects is delayed. However, when a new consultant begins work, he or she is faced with some difficulties, such as the fact that most construction is already underway and that he or she needs time to understand what is going. Table 7 shows consultant-related factors at the CSU.

Table 7

Consultant-Related Delay Factors at the CSU

No.	Consultant-Related Causes of Delay Factors at CSU
1	Sub-par Consultants
2	Delay Projects to Extend His/Her Contract with Owner
3	Lack of Consultancy Employees

Others Causes of Delay at the CSU

Others causes of delay are some factors that are not related to the three construction parties. Bidder procedure was one of the factors delaying university projects. Also, some parts of the procurement system are not clear, which makes employees spilt projects into multiple stages, which causes delays. Additionally, there are a large numbers of projects around Saudi Arabia that lack the necessary materials. For example, one contractor could not supply granite because there was high demand for it from contractors. Moreover, new regulations from the Ministry of

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Labor caused a shortage of manpower, as opposed to older regulations that helped contractors find manpower easily. Table 8 contains other delay factors at the CSU.

Table 8

Other Delay Factors at the CSU

No.	Other Causes of Delay at the CSU
1	Material Delivery Problems
2	The Bidder System
3	Unclear Procurement System
4	New Worker Regulations

The results showed that there were 27 factors that delayed projects at the university. These factors were shown from the owner's perspective. Of the 27 delay factors, nine were owner-related, 10 were contractor-related, four were consultant-related, and four others were also found at the university.

Data Analysis

The previous study found 131 delay factors. In addition, there were 27 important factors that delayed public projects in Saudi Arabia. An interview was conducted with owner of the CSU, and that interview revealed 27 delay factors that delayed projects at the university, with a rate ranging between 50% and 150%. When the university delay factors were compared with important delay factors in Saudi Arabia, it was found that nine delay factors from the CSU matched important delay factors in Saudi Arabia, as shown in Figure 1. The nine important delay factors are shown in Table 9.

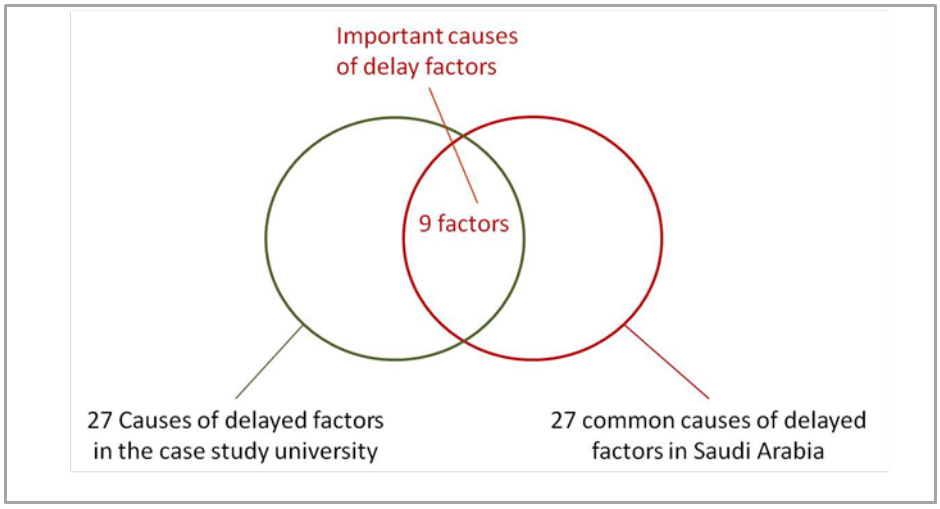

Figure 1: Comparison of the case study university's delay factors with those found in the literature review

Table 9

Important Delay Factors at the CSU

No.	Important Causes of Delay at the CSU	Related to
1	Late in Reviewing and Approving Design Documents	Owner
2	Delay in Progress Payments to Contractors	Owner
3	Poor Contractor Performance	Contractor
4	Contractor's Lack of Qualifications	Contractor
5	Lack of Contractor Experience	Contractor
6	Shortage of Manpower	Contractor
7	Lack of Consultancy Employees	Consultant
8	Material Delivery Problems	Other
9	Bidder System	Other

Definition of Best Value Approach and Performance Information Procurement System (PIPS)

BV PIPS was created at Arizona State University (ASU) in 1991 as part of his PhD dissertation. BV PIPS utilizes expertise in all aspects of life to minimize risk and increase performance through the use of logic and common sense. BV PIPS relies on a special workplace environment that minimizes decision-making, management, direction, and control (Kashiwagi, 1991, 2010). PIPS has been tested over 1,800+ times on $6.3 billion in project value ($4 billion in construction projects and $2.3 billion in non-construction professional service projects), with a 98% success rate in six different countries and 31 states. PIPS increases a project's efficiency and performance while minimizing risk compared to the low-price bid. The PIPS process consists of four phases: pre-qualification (optional), selection, clarification, and execution, as shown in Figure 2.

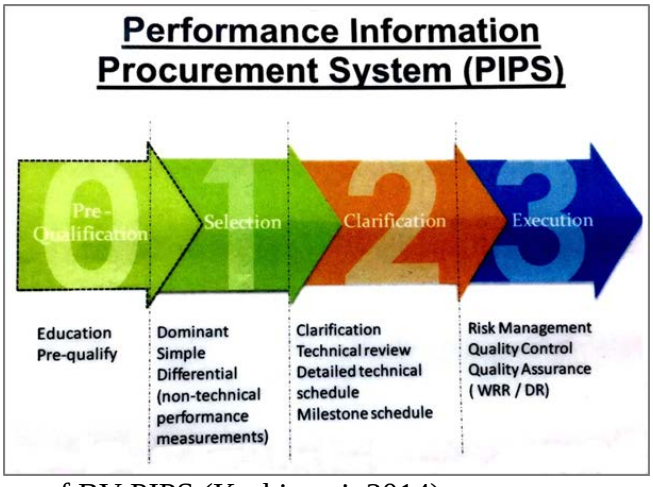

Figure 2: The four phases of BV PIPS (Kashiwagi, 2014).

- Pre-qualification phase: This phase is optional. The pre-qualification phase educates vendors about BV PIPS and how to submit performance information via metrics.
- Selection phase: There are four filters to find the Best Value vendor for a project. In filter 1, vendors should submit their price and project capability, which consists of three documents:

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level of expertise (LE), risk assessment (RA), and value added (VA). Additionally, each of these documents should be a maximum of two pages. Filter 2 is an interview filter to determine the vendor's expertise. It should be used to interview those who will do the work, such as the project manager, to see if he/she can see into the future. The interview assists the committee in determining if a vendor has a clear vision for the work. This interview should be as short as possible. In Filter 3, the committee prioritizes criteria, giving weighing them a specific amount. Weighting could use percentages or numbers from 1–10. Filter 4 is a dominance check to find the BV vendor who provides lowest cost and information to minimize risk.

- Clarification phase: The vendor should clarify their offer and plan. Moreover, this phase should show what is outside of the project's scope and simplify the proposal to be clear about what will be done and what will be accomplished. The vendor should submit a detailed technical schedule and a milestone schedule. In this phase, the owner and vendor should clarify everything related to the project.
- Execution phase: During implementation work, the vendor should submit a weekly risk report (WRR) and a director's report (DR). The WRR is submitted as an Excel document that outlines the project's pathways and any deviation from the initial plan in terms of cost, time, and quality. In addition, this report provides a milestone schedule, risk management plan, and performance measurements. The DR consists of a set of multiple WRRs and details for each vendor's performance and any risk that needs attention.

BV PIPS vs. Important Delay Factors in the Case Study in Saudi Arabia

This study shows that there are nine important delay factors that can be considered common to projects in Saudi Arabia. However, these nine important delay factors can be solved via BV PIPS. This analysis shows that BV PIPS can deal with these delay factors, as shown in Table 10.

Table 10

How BV PIPS Can Solve Important Delay Factors in Saudi Arabia

Important Causes of Delayed Projects in Saudi Arabia (CSU)	**Treating the Important Causes of Delayed Projects**					
	BV	**Performance Information Procurement System (PIPS)**				**How the Solutions Prevent Delay Factors**
		P-Q	**S**	**C**	**E**	
Bidder System (Low Price)		√	√	√	√	PIPS Relies on Performance
Poor Contractor Performance			√	√		Level of Experience, Interview, Risk Assessment
Lack of Experienced Contractors			√	√		Level of Experience, Interview, Risk Assessment
Shortage of Manpower			√			Risk Assessment,
Contractor's Qualifications		√	√	√		Qualification of Vendor, Level of Experience
Material Delivery			√	√		Risk Assessment, Show Plan B
Approval of Design Documents by Owner	√					Creating Best Value Environment
Delay in Progress Payments to Contractors	√		√	√		Creating Best Value Environment, Risk Assessment
Lack of Consultancy Employees			√			Experience of Vendor Mitigates Factor

BV: Best Value Environment in Organization **P-Q**: Pre-Qualification **S**: Selection **C**: Clarification. **E**: Execution

The first of these delay factors is the bidder system, which based on lowest price. This factor can be solved by changing the bidder system to PIPS, which uses many phases to select the highest-performing vendor who is the best value. PIPS is a procurement system that relies on performance to find the best value vendor, contrary to the current bid system in Saudi Arabia that relies on lowest price.

The second and third delay factors are poor contractor performance and lack of experienced contractors, which can be solved in the selection phase of PIPS. This phase has many filters that determine the level of vendor experience. Also in this filter, vendors should submit risk-assessment documents that show the vendors' capability to see risks that could affect projects and how the vendor can mitigate risks. Moreover, the interview with the people who will do the work—or the project manager—will show if vendors have poor contractor performance or lack experience. The interview assists owner to recognize if contractors have clear vision of projects. Additionally, poor contractor performance can be reduced by implementing the clarification phase. In this phase, a vendor who has already been selected clarifies their offerings and planning process. The vendor should identify the scope of the work and submit a detailed technical schedule and a milestone schedule. That will show if the vendor can complete the work.

The fourth delay factor is shortage of manpower, and that should be clarified in the risk assessment as a risk. Vendors should show how they can deal with this problem in the selection phase.

The fifth delay factor is a contractor's qualifications, and that can be solved in the pre-qualification phase that informs vendors about Best Value and shows them that BV PIPS relies on performance and how they must check their level of performance through numbers and matrices. In addition, during the selection phase, the vendor's experience level is discovered, which solves the contractor's qualification delay factor.

The sixth delay factor is material delivery, and that can be solved in the selection and clarification phases. Risk assessment documentation in the selection phase should solve this delay factor. Expert vendors can see this problem and provide a plan B if necessary. Also, in the clarification phase, vendors should give detailed plans to show how they can mitigate the material delay factor.

The seventh and eighth delay factors are the approval of design documents by the owner and delay in progress payments to the contractors. These two delay factors can be solved via building a Best Value environment within the organization. Best Value depends on penalty principles related to common sense. Best Value decreases management, decision-making, and control by utilizing expertise and increasing transparency. These are principles that assist owners in utilizing expert opinion to increase the approval rate of design documents. When an organization increases transparency and decreases control, the organization's progress increases, which solves delays in progress payments to contractors. Also, expert vendors will identify this problem as a risk in their risk assessment documents during the selection phase and clarify it in clarification phase, which assists in the solution of delays in progress payments to contractors.

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Finally, the ninth delay factor is a lack of consultancy employees, and this problem is solved in the selection phase. In this phase, the owner finds an expert vendor who has a high performance level and can complete works that already prove his or her abilities during the selection phase. So, expert vendors do the work well, which reduces the need for consultancy employees.

Conclusion

Important delay factors, which caused delays to projects in Saudi Arabia, can be solved via the application of BV PIPS. Most importantly, delay factors are solved through phases. These phases have many filters that help owners find good vendors based on their performance. These filters prevent delays in the construction of public projects in Saudi Arabia by using only select, high-quality contractors. Nine important delay factors were found by comparing important delay factors found in a literature review with those found at the CSU. One of these factors is the low bidder system, which caused the delay of many projects in Saudi Arabia. So, when the bidding system is changed to PIPS, it will prevent other delays from happening. Seven of these important delay factors can be prevented when the level of experience and risk assessment documents are submitted via vendors. This study introduces BV PIPS to stakeholders at the CSU to implement PIPS in the CSU projects.

Appendix

Client-related causes of delay

1. Owner's interference
2. Owner's personality
3. Negotiation by knowledgeable people
4. Delay in progress payments by owner
5. Late in revising and approving design documents by owner
6. Poor coordination by owner with the various parties during construction
7. Excessive bureaucracy by owner's administration
8. Clarity of scope of change
9. Delay in the settlement of contractor claims by owner
10. Poor coordination by owner and other parties
11. Conflicts between joint-ownership of the project
12. Delay to furnish and deliver the site to contractor by owner
13. Difficulties in obtaining work permits
14. Variations in quantities
15. Suspension of work by owner
16. Delay in approving sample materials by owner
17. Delay in approving shop drawings by owner
18. Uncooperative owner with contractor complicating contract administration
19. Delay in issuance of change orders by owner
20. Owner's failure to coordinate with Government authorities during planning
21. Non-payment of contractor claim
22. Interference by owner in the construction operations
23. Poor communication by owner and other parties
24. Lack of finance to complete the work by client
25. Slow decision making by owner
26. Owner's poor communication with construction parties and government authorities
27. Key personal replaced

Contractor-related causes of delay

28. Rework due to errors during construction
29. Delay in site mobilization
30. Internal company problems
31. Company organization
32. Other work on hold
33. Loose safety rules and regulations within the contractor's organization
34. Ineffective scheduling of project by contractor
35. Cash flow management
36. Improper construction methods implemented by contractor
37. Inefficient quality control by contractor
38. Increased number of projects
39. Increase in contractor's overheads

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40. Poor site management and supervision by contractor
41. Delays in sub-contractors' work
42. Delay in the preparation of contractor submissions
43. Improper technical study by contractor during the bidding stage
44. Ineffective planning by contractor
45. Ineffective contractor head office involvement in the project
46. Replacement of key personal
47. Delay of field survey by contractor
48. Conflicts between contractor and other parties (consultant and owner)
49. Conflicts in sub-contractors' schedules in execution of project
50. Contractor's poor coordination with the parties involved in the project
51. Inadequate contractor's work
52. Poor communication by contractor with the parties involved in the project
53. Poor communication by contractor with other parties
54. Poor coordination by contractor with other parties
55. Difficulties in financing project by contractor
56. Ineffective control of the project progress by the contractor
57. Frequent change of sub-contractors because of their inefficient work
58. Frauds
59. Inefficient Work-break down structure
60. Poor qualification of the contractor's technical staff
61. Contractor experience

Consultant-related causes of delay

62. Delay in performing inspection and testing by consultant
63. Delay in approving major changes in the scope of work by consultant
64. Poor coordination between consultant and other parties
65. Poor communication between consultant and other parties
66. Late in reviewing and approving design documents by consultant
67. Inflexibility (rigidity) of consultant
68. Company organization
69. Replacement of key personnel
70. Conflicts between consultant and design engineer
71. Frauds
72. Internal company problems
73. Inadequate experience of consultant

Materials-related causes of delay

74. Delay in materials delivery
75. Late procurement of materials
76. Damage of sorted material while they are needed urgently
77. Changes in materials prices
78. Changes in materials specifications
79. Shortage of materials required

80. Late in selection of finishing materials due to availability of many types in market
81. Shortage of construction materials in market
82. Delay in manufacturing special building materials

Labor-related causes of delay

83. Low productivity level of labor
84. Shortage of contractor's administrative personnel
85. Personal conflicts among labor
86. Nationality of labor
87. Inadequate equipment used for the works
88. Shortage of technical professionals in the contractor's organization
89. Shortage of equipment required
90. Failure of equipment
91. Shortage of supporting and shoring installations for excavations
92. Low productivity and efficiency of equipment
93. Low level of equipment-operator's skill
94. Lack of high-technology mechanical equipment
95. Shortage of manpower (skilled, semi-skilled, unskilled labor)
96. Poor qualification of the contractor's technical staff assigned to the project
97. The required labor skills are not available
98. The required equipment and tools are not available
99. Low skill of manpower

Contract/relationships-related causes of delay

100. Ineffective delay penalties
101. Unavailability of incentives for contractor for finishing ahead of schedule
102. The objective of the project is not well defined
103. Legal disputes between various parties
104. The scope of work is not well defined
105. Type of construction contract
106. Conflict between contract documents
107. Type of project bidding and award (negotiation, lowest bidder)
108. Inadequate definition of substantial completion
109. Lack of communications between the parties
110. Original contract duration is too short
111. Inappropriate overall organization structure linking all parties to the project
112. Major disputes and negotiations

Others

113. Quality management system and assurance control
114. The consultant attempting to hide their mistake when the quantity amount changes
115. Insufficient allowance for employees' holidays in the schedule
116. Inadequate original contract duration

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117. Lack of clarity of drawings and specifications
118. Client need to analyze the causes of change
119. The lack of experienced engineers engaged by consultants for high-tech work
120. Insufficient numbers of contractors to build the increasing number of construction projects in Saudi Arabia
121. Insufficient consideration of the behavior of people
122. Lack of regular meetings
123. Unclear scope of work to be done by staff contractors
124. High turn-over of personnel in Saudi Arabia
125. Insufficient study of all the details and capacity of the contractor before selection by client
126. Overdependence on the lowest tender amount in contractor selection
127. Discrepancies between bill of quantities, specifications and drawings
128. Level of salary of consultant staff
129. Lack of ethics
130. Delayed salary payments to staff
131. Designer engineer selection of special building materials not available in the local market.

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