

Chapter 4

Evaluating the causes and impacts of project delays

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4.1 Introduction

As discussed in the Methodology chapter, the first stage of this research addressed the first two research aims being – determining the correlation that exists between projects and Nigerian oil and gas assets efficiency, Identify and reexamine the leading causes of project delays in the Nigerian Oil and Gas sector. Thirteen project delay causes were identified during the literature research, where Assaf & Al-Hejji, (2006) cited frequent change orders from clients and poor planning as major concerns. However, the survey questionnaires assisted in determining the leading causes and also validate the initially identified ones.

The survey questionnaire was completed by 60 oil and gas stakeholders across the project value chain and the results formed the second stage of the research. In the qualitative interview phases, 10 individuals across 3 stakeholder category – Project Client, Project Contractor and Host Community took part in the exercise, addressing the final two research aims:

1. Examine the impact of these delays to the project efficiency
2. Determine the techniques to arrest and mitigate the delays and their effects.

The deduction is that poor leadership decision from clients, poor project client planning, contractor material supply concerns and bureaucratic government approval process have largely negative effects on projects, giving credence to research by Umutemea & Adebite, (2023) who agreed that poor planning form part of the main culprit.

While the remaining 9 causes were not considered as leading, they were picked up from interview responses and as such, re-considered as root causes or factors to some of the 4 established causes.

4.2 Survey Questionnaire Findings

Of the 60 respondents, 90% had oil and gas industry experience of 5 years and more, representing a good understanding of the industrial climate in terms of projects and operations – see table below, while 66% of them have been involved in projects with budgets beyond \$10million.

Table 1: Questionnaire Participant Industrial Footprint

Select Your Stakeholder Category		
Answer Choices	Responses	
Oil and Gas Professional	71.67%	43
Project Contractor	13.33%	8
Host Community	11.67%	7
Government Representative	3.33%	2
	Answered	60
Years of Experience		
Answer Choices	Responses	
1 to 5 years	10.00%	6
5 to 10 years	21.67%	13
10 to 15 years	35.00%	21
15 to 20 years	10.00%	6
20 years and above	23.33%	14
	Answered	60
Oil and Gas Project Budget Involved		
Answer Choices	Responses	
\$ 1 million - \$ 10 million	33.33%	20
\$ 10 million - \$ 20 million	23.33%	14
Above \$ 20 million	43.33%	26
	Answered	60

As discussed in the previous chapter, this research focused on the highly significant causes as determined by the survey and this decision was made with the pareto chart on Microsoft Excel. Firstly, the significance of project delays on oil and gas facility efficiency was

established as “Very Significant” even when only 20% of the responses tilted toward the “High Significant” mark. This implies that the sample may not agree that delays in project present a high consequence to asset efficiency, although the degree of significance as detailed by Ramesh, (2013) may not be quantifiable.

Only 4 delay causes were deemed highly significant to project delays, given that the high significant bar aligned wholly within the 80% mark of the pareto chart as shown below:

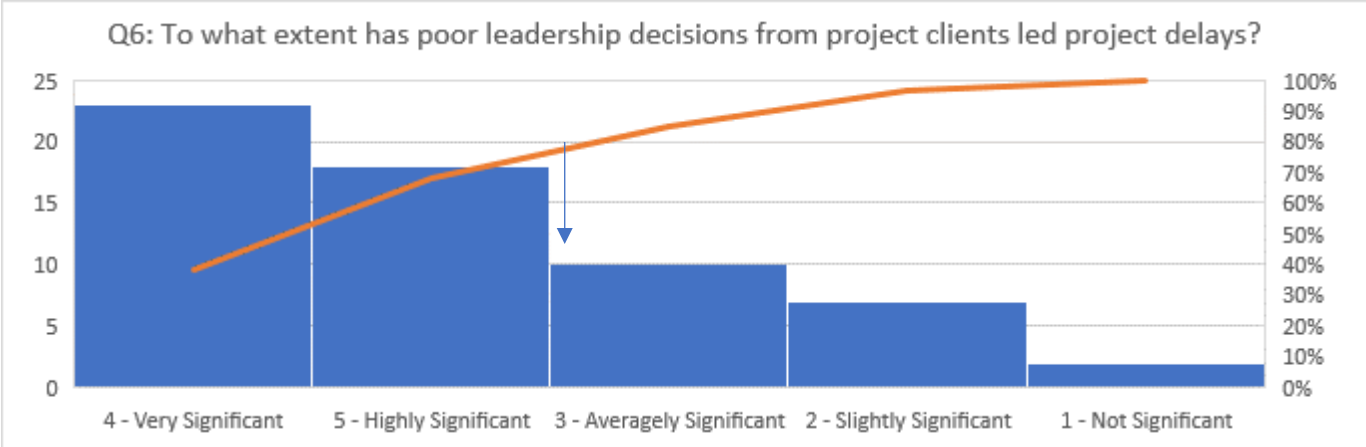


Figure 14 : Leadership Decisions from Project Clients – Pareto Chart

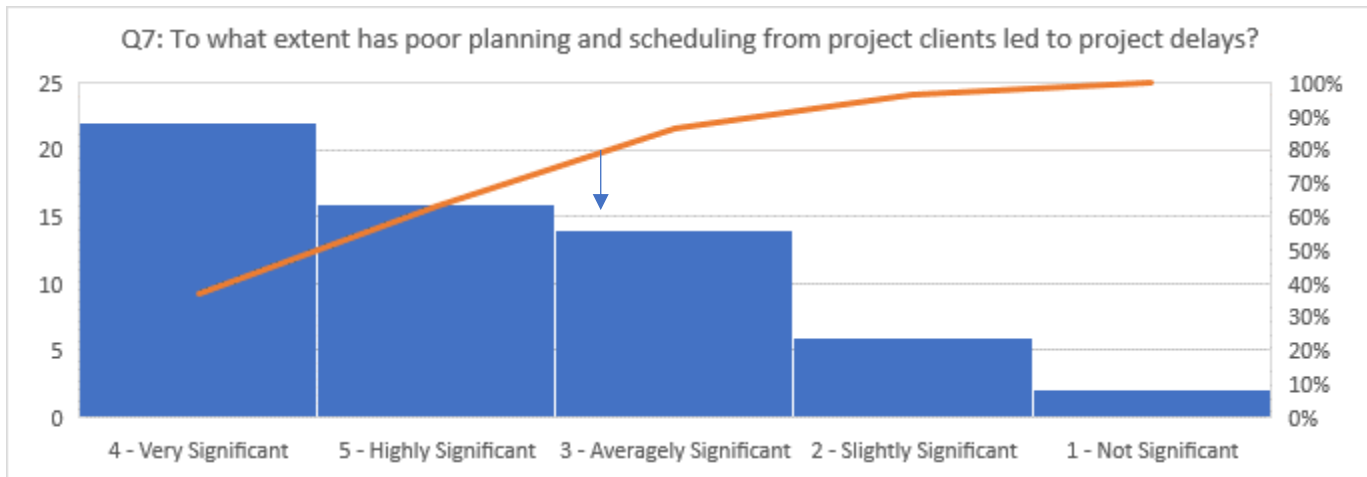


Figure 15 : Poor Planning and Scheduling from Project Clients - Pareto Chart

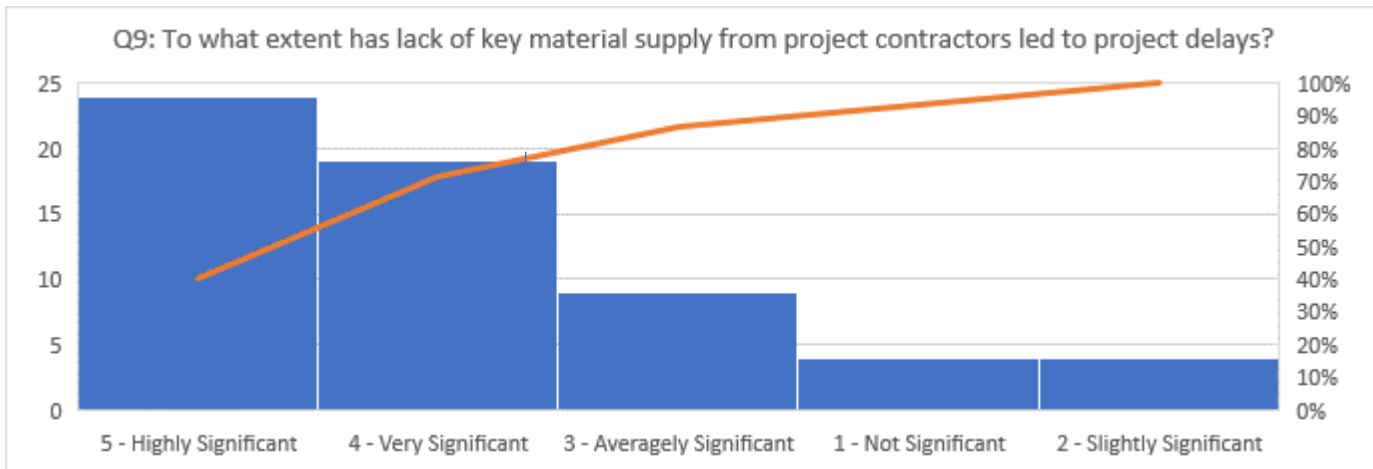


Figure 16: Lack of Key Material Supply from Project Contractors – Pareto Chart

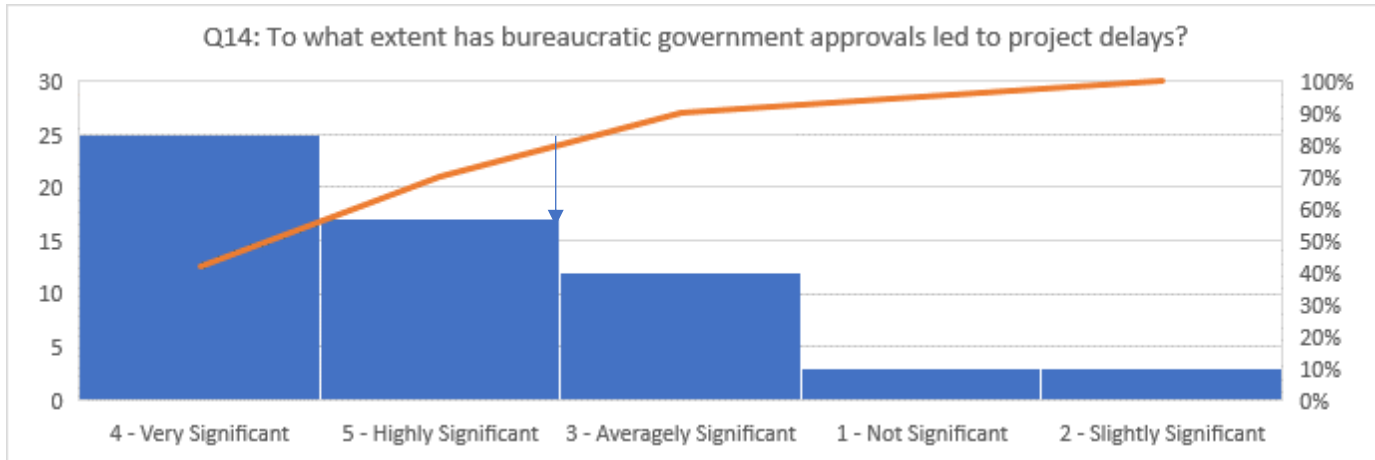


Figure 17 : Bureaucratic Government Approvals - Pareto Chart

These 4 leading delay causes: Poor leadership decisions from project clients, poor planning and scheduling from project clients, Lack of key material supply from project contractors, bureaucratic government approvals; where further examined by interviewing industry experts in order to develop an event recovery model.

https://www.surveymonkey.com/results/SM-CMgu8ApxwRrnElluwnL4CA_3D_3D

Table 2: Survey questions and Responses

An Approach to Reducing Project Delays and Improve Efficiency in the Nigerian Oil and Gas Industry			
Q1. Select Your Stakeholder Category			
Answer Choices	Responses		
Oil and Gas Professional	71.67%		43
Project Contractor	13.33%		8
Host Community	11.67%		7
Government Representative	3.33%		2
	Answered		60
	Skipped		0
Q2. Years of Experience			
Answer Choices	Responses		
1 to 5 years	10.00%		6
5 to 10 years	21.67%		13
10 to 15 years	35.00%		21
15 to 20 years	10.00%		6
20 years and above	23.33%		14
	Answered		60
	Skipped		0
Q3. Oil and Gas Project Budget Involved			
Answer Choices	Responses		
\$ 1 million - \$ 10 million	33.33%		20
\$ 10 million - \$ 20 million	23.33%		14
Above \$ 20 million	43.33%		26
	Answered		60
	Skipped		0

Q4. In your experience, how significant are project delays on O&G facility efficiency in Nigeria?

Answer Choices	Responses	
1 - Not Significant	1.67%	1
2 - Slightly Significant	3.33%	2
3 - Averagely Significant	25.00%	15
4 - Very Significant	50.00%	30
5 - Highly Significant	20.00%	12
	Answered	60
	Skipped	0

Q5. To what extent has change requests from project clients led to project delays?

Answer Choices	Responses	
1 - Not Significant	1.67%	1
2 - Slightly Significant	18.33%	11
3 - Averagely Significant	33.33%	20
4 - Very Significant	40.00%	24
5 - Highly Significant	6.67%	4
	Answered	60
	Skipped	0

Q6. To what extent has poor leadership decisions from project clients led to project delays?

Answer Choices	Responses	
1 - Not Significant	3.33%	2
2 - Slightly Significant	11.67%	7
3 - Averagely Significant	16.67%	10
4 - Very Significant	38.33%	23
5 - Highly Significant	30.00%	18
	Answered	60

		Skipped	0
Q7. To what extent has poor planning and scheduling from project clients led to project delays?			
Answer Choices		Responses	
1 - Not Significant		3.33%	2
2 - Slightly Significant		10.00%	6
3 - Averagely Significant		23.33%	14
4 - Very Significant		36.67%	22
5 - Highly Significant		26.67%	16
		Answered	60
		Skipped	0
Q8. To what extent has poor project performance measurement from project clients led to project delays?			
Answer Choices		Responses	
1 - Not Significant		5.00%	3
2 - Slightly Significant		13.33%	8
3 - Averagely Significant		41.67%	25
4 - Very Significant		26.67%	16
5 - Highly Significant		13.33%	8
		Answered	60
		Skipped	0
Q9. To what extent has lack of key material supply from project contractors led to project delays?			
Answer Choices		Responses	
1 - Not Significant		6.67%	4
2 - Slightly Significant		6.67%	4
3 - Averagely Significant		15.00%	9
4 - Very Significant		31.67%	19
5 - Highly Significant		40.00%	24

	Answered	60
	Skipped	0
Q10. To what extent has poor estimates from project contractors led to project delays?		
	Answer Choices	Responses
1 - Not Significant		3.33% 2
2 - Slightly Significant		16.67% 10
3 - Averagely Significant		23.33% 14
4 - Very Significant		41.67% 25
5 - Highly Significant		15.00% 9
	Answered	60
	Skipped	0
Q11. To what extent has bad weather led to project delays?		
	Answer Choices	Responses
1 - Not Significant		11.67% 7
2 - Slightly Significant		30.00% 18
3 - Averagely Significant		46.67% 28
4 - Very Significant		10.00% 6
5 - Highly Significant		1.67% 1
	Answered	60
	Skipped	0
Q12. To what extent has poor leadership decisions from project contractors led to project delays?		
	Answer Choices	Responses
1 - Not Significant		5.00% 3
2 - Slightly Significant		10.00% 6
3 - Averagely Significant		21.67% 13
4 - Very Significant		46.67% 28

5 - Highly Significant	16.67%	10
Answered		60
Skipped		0
Q13. To what degree has poor planning and scheduling from project contractors led to project delays?		
Answer Choices	Responses	
1 - Not Significant	5.00%	3
2 - Slightly Significant	10.00%	6
3 - Averagely Significant	38.33%	23
4 - Very Significant	31.67%	19
5 - Highly Significant	15.00%	9
Answered		60
Skipped		0
Q14. To what extent has bureaucratic government approvals led to project delays?		
Answer Choices	Responses	
1 - Not Significant	5.00%	3
2 - Slightly Significant	5.00%	3
3 - Averagely Significant	20.00%	12
4 - Very Significant	41.67%	25
5 - Highly Significant	28.33%	17
Answered		60
Skipped		0
Q15. To what extent has reduced investor appetite led to project delays?		
Answer Choices	Responses	
1 - Not Significant	8.33%	5
2 - Slightly Significant	16.67%	10
3 - Averagely Significant	25.00%	15

4 - Very Significant		33.33%	20
5 - Highly Significant		16.67%	10
	Answered		60
	Skipped		0
Q16. To what extent has delayed passage of the Petroleum Industry Act led to project delays?			
	Answer Choices	Responses	
1 - Not Significant		11.67%	7
2 - Slightly Significant		16.67%	10
3 - Averagely Significant		26.67%	16
4 - Very Significant		26.67%	16
5 - Highly Significant		18.33%	11
	Answered		60
	Skipped		0
Q17. To what extent has in-bound logistics disruption led to project delays?			
	Answer Choices	Responses	
1 - Not Significant		1.67%	1
2 - Slightly Significant		15.00%	9
3 - Averagely Significant		33.33%	20
4 - Very Significant		36.67%	22
5 - Highly Significant		13.33%	8
	Answered		60
	Skipped		0
Q18. To what extent does delay in the planning phase extend overall project duration?			
	Answer Choices	Responses	
1 - Not Significant		3.33%	2
2 - Slightly Significant		13.33%	8

3 - Averagely Significant	41.67%	25
4 - Very Significant	28.33%	17
5 - Highly Significant	13.33%	8
	Answered	60
	Skipped	0
Q19. To what extent does delay in the execution phase extend overall project duration?		
	Answer Choices	Responses
1 - Not Significant		3.33% 2
2 - Slightly Significant		13.33% 8
3 - Averagely Significant		40.00% 24
4 - Very Significant		30.00% 18
5 - Highly Significant		13.33% 8
	Answered	60
	Skipped	0
Q20. To what extent does delay in the close-out phase extend overall project duration?		
	Answer Choices	Responses
1 - Not Significant		10.00% 6
2 - Slightly Significant		20.00% 12
3 - Averagely Significant		38.33% 23
4 - Very Significant		31.67% 19
5 - Highly Significant		0.00% 0
	Answered	60
	Skipped	0

On phase related delays which were the closing questions in the survey – See table above Q18-Q20, the impact of delays in the planning phase in relation to overall project schedule overrun was judged as very significant by 28.33% of respondents while 30% of respondents agreed that the execution phase is very significant to project delays. Both phases also recorded 13.33% score each on the high significant mark as compared to the close-out phase with 0% HS.

This implies that the planning and execution phase of oil and gas projects (Concept, FEED and EPC) are quite critical to project delivery timeliness as agreed by (Sabri, et al., 2017).

In the next section discusses the process and output of the interview sessions in other to answer the closing questions of the research aims and objectives.

4.3 Interview Session Findings

This stage was involved open and closed ended questions with 10 participants. Similar to the survey questionnaires, the interview commenced with an understanding of the participant’s industry of practice, designation, years of experience and stakeholder category as shown below.

Table 3: Participants Information

Industry of Practice	Number of Persons	Stakeholder Category	Year of Experience/ Involvement
Oil and Gas	9	5 Project Client	Minimum 5years
		4 Project Contractor	Maximum 21 years
Wook Working	1	1 Host Community	8 years

The years of involvement in the industry was also examined with the highest being 21 years while the lowest was 5 years and averaged at 11.7years – see Table 4, Year of involvement row, validating the experience levels of the participants. The project specific questions asked during the interview and summarized responses are as follows:

Q4: Have you been involved in oil and gas projects that exceeded completion timeline?

When asked if they have been involved in projects that spanned beyond the agreed timeline in Q4 of the session, 90% of the participants i.e., 9 out of 10, confirmed that they have been involved in such (see table 4 below, row Q4 Code), thus agreeing with the existing literature research that delays are not entirely new in the Nigerian oil and gas cl

Poor communication between parties – client, contractors, government and community players stalled most of the projects according to respondents. On the other hand, the 10% (see table 4 below, row Q4 Code), that did not experience this such project delay revealed that adequate buffers were present in the project schedule, implying that the PERT was employed as recommended by PMI, (2021).

This was said to have been managed by revising the project expectations with the stakeholders, however, this did not go without additional cost on the part of the client and contractor.

Q5: What are your thoughts on the impact of project client leadership decisions on project delays?

Here 80% agreed that the leadership decisions from the client standpoint can be deemed poor (see table 4 below, row Q5 Code). This still points back to lack of clear communication, with the client company working almost in isolation with the project contractor. Additionally lengthy approval processes even with client companies stalled projects, even when (Sweis, et al., 2020) might have implied this on the government end. Another concern was poor negotiating power, in that the representative at the round table did not have the required power to make changes because the major players were in Lagos or Abuja and were not collocated.

Q6: What are your thoughts on the impact of project client planning on project delays?

Nine of the interviewees revealed that project client planning has been below par in line with claims by (Umutemea & Adegbite, 2023) in the literature review chapter, adding that lack of competence in this area has led to project delays. Also, poor alignment with project scope has affected projects because the end users (production operators) is not fully considered during scope definitions – see row Q6 Code. There is need to involve all parties in top bottom approach such that issues with the scope can be picked up earlier on in the planning phase (APM, 2019).

Q7: What are your thoughts on the impact of material supply from project contractors on project delays?

All participants agreed that materials supplied to projects are critical to the success of projects, see row Q7 code above. They added that this has not been completely seamless and could well be the biggest cause of project delays in the industry as highlighted by (Egwim, et al., 2021; Alshibani, et al., 2023; E&T, 2023). From delayed delivery to material mismatch and quality concerns, this has been a recurring decimal in the industry.

On how this can be resolved, delivering of at least 80% of materials required to complete projects should be on site before commencement. Another participant suggested that EPC contractor should not be allowed to handle material delivery thereby reducing workload and increased separation of power. In addition, lowest bidder concerns which was discussed in the literature review chapter was highlighted by another participant, while suggesting that the material bidding process should be awarded to the “lowest realistic bidder”.

Material specification mismatch was also examined with suggestions that samples be made available to client company in addition to robust quality control for optimum alignment between parties.

A good look at this concern reveals that a properly implemented Kraljic Matrix can be beneficial when deciding on materials to have stocked and the right quantity and quality and time in line with Baily, et al., (2005).

Q8: How do you perceive the relationship between government approvals and project delays?

The response from participants gave credence to Sweis, et al., (2020) who added that that bureaucratic approval process is a key concern in terms of project delays. It was also revealed that new players (clients and contractors) have found it increasingly difficult to navigate the government approval terrain. Nine out of ten feedback reflected the negative nature of government approval processes, see row Q8 Code in the table above.

Even for the more experience players, joint venture relationships still lack some level of communication leading to disruption across the project value chain. One example which came up was on a project which required government approval due to environment impact. The status of this request was not made abundantly clear to the requester, who had to persist in order to pry out information from government parastatals.

There is a general sense that when it comes to government, shelve it, because there is a high change that that might be the end of the road for the project, as they can be termed negative stakeholder who are impeding project growth for reasons still unclear (PMI, 2017).

Although there is not much that the companies can do on this concern, there is still need for constant engagement with these ministries to get the best out of the project, despite the fact that the success of the project is for the collective good of the government and all other stakeholders.

The idea of digitalizing the ministry approval process should be considered, as manual paperwork forms a large part of what is currently practiced.

Q9: What are your thoughts on effects of project delays on oil and gas asset efficiency?

All participants agreed that project delays are detrimental to oil and gas facilities in terms of reliability reduction, capacity decline, poor ROI and ROA, see Q9 row in the table above. It affects the financial components particularly for the client and project company. This aligns with SMRP BOK, (2020); Ramesh, (2013) and further justifies the need for this research exercise. The believe is that if this projects are properly monitored and the recommondations here-in are adopted, there is a high chance that the delay trends begin to reverse in the Nigerian oil and gas project climate.

Q10: Are there any other concerns in your experience regarding oil and gas project delays?

This was asked to determine other low hanging issues that could metamorphose into bigger concerns if not addressed early. One was identified as lack of clarity of job role thus emphasizing the importance of the responsibility assignment matrix. The importance of top executive boots-on-field will improve the understanding of the challenges faced on the front-line, if possible, collocation can yield better results.

Poor transfer of knowledge with the industry was highlighted as negatively impacting project delivery. The knowledge gap between retiring professionals and new-hires without linking professionals with significant experience on the job can be counter-productive.

The planning phase should also detail the process of high the right skill match while paying the prevalent labor chargers in line with international benchmark.

Finally, oil theft which the government is currently clamping on had led to poor yield from project and operations companies, impacting on their willingness to commit to capital investments in the country.

4.4 Findings Discussions (Risk Bowtie Model Analysis)

From the analysis carried out and the information gathered in the quantitative and qualitative phase, attention is now on the codes generated during the thematic analysis of the interview sessions.

Table 4: Interview Session Summary and Code Table

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10
Designation	Maintenance Team Leader	Production Operator	Construction Supervisor	Commissioning Engineer	Wood Worker	Construction Engineer	Field Completion Rep.	Plant Engineer	Project Completion Engineer	Project Coordinator
Stakeholder Category	Project Client	Project Contractor	Project Client	Project Client	Host Community	Project Client	Project Contractor	Project Client	Project Contractor	Project Contractor
Year of Involvement	14	11	21	7	8	15	7	5	20	9
Q4: Have you been involved in O&G projects that exceeded completion timeline? <i>Participant Summary</i>	Yes. The Project was reviewed, delay causes identified and corrections implemented	No. Adequate buffer was provided	Yes. Community disturbance. Payment issues	Yes. Poor communication between parties. Proper agreement required between labour and contractor.	Yes. Poor communication between host community, client company. Proper alignment is required in this space.	Yes. Contractor did not plan for the land terrain. Underground water affects work progress.	Yes. Config Software issues. Required expat skills from the US.	Yes. Contractual issues, increasing cost.	Yes. Approval was gotten for a revised completion date.	Yes. All parties reviewed and revised completion date. Additional cost incurred.
Q4 Code	Q4-1: Yes	Q4-2: No	Q4-3: Yes	Q4-4: Yes	Q4-5: Yes	Q4-6: Yes	Q4-7: Yes	Q4-8: Yes	Q4-9: Yes	Q4-10: Yes
Q5: What are your thoughts on the impact of project client leadership decision on project delays. <i>Participant Summary</i>	Lack of adequate leadership leads to delays and increases cost. Stakeholders need to be carried along.	Bureaucracy from client company, leading to lengthy decision making.	Parties negotiating was not empowered to make decisions. Those empowered could not make it to project sites due to security concerns.	Client company seemed to work in isolation.	Leadership is okay, doing their best in terms of project safety.	There is need for flexible contract to compensate for frequent decision changes.	Funds availability impacting decision making.	Client oversight important for project success. Client leadership has been so far good.	Materials concern caused project delay. Long lead items did not arrive early.	Clients have bad impression of contractors. Detailed understanding between both parties are required.
Q5 Code	Q5-1: Poor - Increasing cost	Q5-2: Poor - Bureaucratic	Q5-3: Poor - no negotiating power	Q5-4: Poor - no synergy	Q5-5: Good leadership	Q5-6: Poor - flexible plans	Q5-7: Poor - Fund availability	Q5-8: Good - Monitoring required	Q5-9: Poor - material plans poor.	Q5-10: Poor - lack of trust between parties

<p>Q6: What are your thoughts on the impact of project client planning on project delays?</p> <p><i>Participant Summary</i></p>	<p>Not properly done, lowest bidding contractor selected at the planning/ execution phase.</p>	<p>Giving projects to newcomers may be counterproductive. The client should plan and award projects to established contractors.</p>	<p>Most times, the end users (operators) are not properly aligned and informed of project scope.</p>	<p>Rates planning a 4 out of 10, citing material damage in-transit due to poor planning</p>	<p>Planning is okay. Execution is the problem, too many frequent changes.</p>	<p>Material planning is very important, factoring inflation, local currency devaluation.</p>	<p>Incompetent personnel. Leading to planning issues.</p>	<p>Planning helps avoid cost overrun, reducing exposure.</p>	<p>Major test equipment were not on ground when test and analysis were required, faulting planning.</p>	<p>Competent and experienced planners required</p>
<p>Q6 Code</p>	<p>Q6-1: Poor - lowest bidder</p>	<p>Q6-2: Poor - difficult for new entrants</p>	<p>Q6-3: Poor - scope definition issues</p>	<p>Q6-4: Poor</p>	<p>Q6-5: Good - however execution issues</p>	<p>Q6-6: Poor - material planning</p>	<p>Q6-7: Poor - incompetence</p>	<p>Q6-8: Poor</p>	<p>Q6-9: Poor - material planning</p>	<p>Q6-10: Poor - incompetence</p>
<p>Q7: What are your thoughts on the impact of material supply from project contractors on project delays?</p> <p><i>Participant Summary</i></p>	<p>Affects projects. The contractor handling labour should not handle material. All materials should be in stock before project commencement.</p>	<p>It's a major issue. 80% of materials should be available before commencement of project.</p>	<p>Another headache. Lowest bidder issues especially from vendors not pre-qualified due to urgency of need.</p>	<p>Material delays due to damage in transit. Rainwater damage electronic components. Poor packaging.</p>	<p>Samples should be examined before agreement with suppliers are made</p>	<p>Negatively impacts projects. Some of these delays have pushed projects into the dreaded rainy season.</p>	<p>Material coordination required. Detailed logistics plan required.</p>	<p>Leaving supply management to the contractor alone has proved counter productive. Clients should weigh in to help foreign suppliers navigate the Nigerian climate.</p>	<p>Material of poor quality provided. Sample examination and quality control required.</p>	<p>Big issue, material mismatch. Proper quality control required.</p>
<p>Q7 Code</p>	<p>Q7-1: Poor - affects project delivery.</p>	<p>Q7-2: Poor - material availability issue.</p>	<p>Q7-3: Poor - lower bidder issues.</p>	<p>Q7-4: Poor - material packaging concern.</p>	<p>Q7-5: Poor - samples required.</p>	<p>Q7-6: Poor</p>	<p>Q7-7: Poor - material management</p>	<p>Q7-8: Poor - monitoring required</p>	<p>Q7-9: Poor - quality issues</p>	<p>Q7-10: Poor - quality issues</p>
<p>Q8: How do you perceive the relationship between government approvals and project delays?</p> <p><i>Participant Summary</i></p>	<p>Can be a concern if the government is not carried along earlier before commencement.</p>	<p>New players find it hard to navigate the government approvals climate. Information are not readily available on printed media.</p>	<p>No clear communication from government on expectations of clients and contractors. The government bodies behave as though they are doing the project team a favour.</p>	<p><i>No response from participant.</i></p>	<p>Government should hands-off bidding processes and not influence contractor selection.</p>	<p>In JV projects, more synergy is required. Trust and integrity between parties can improve this process.</p>	<p>Proper relationship management between parties are required.</p>	<p>Some materials have environmental impact. Government may clamp-down on keep materials due to their environmental concern, without providing clear feedback.</p>	<p>Bureaucratic process, not within the control of the company but early engagement with JV partners can reduce its occurrence.</p>	<p>Direct proportion - Government policies affecting material shipment in-country. Approval processes should be digitalized.</p>

Q8 Code	Q8-1: Poor	Q8-2: Poor - difficult for new entrants	Q8-3: Poor - communication issues		Q8-5: Poor - influencing decisions.	Q8-6: Poor - lack of synergy.	Q8-7: Poor - relationship management issues	Q8-8: Poor - no clear feed back	Q8-9: Poor - largely bureaucratic.	Q8-10: Poor - lack of fully digitalized process.
Q9: What are your thoughts on effects of project delays on oil and gas asset efficiency? <i>Participant Summary</i>	Delays in projects erodes asset efficiency	Negatively affects efficiency, output, reducing profit and ROI.	Delay might make projects not address capacity or safety concerns.	Affects production output negatively.	Delay in one project can potentially affect the next one in the series, affecting productivity negatively.	It is a setback for production companies.	Delayed benefit realisation.	Capacity limitation for expansion projects - delayed facility safety.	Financial impact. Increased overhead cost. Reducing efficiency and denting company reputation.	Leads to reliability problems, reduced throughput.
Q9 Code	Q9-1: Negative effect	Q9-2: Negative effect on ROI	Q9-3: Negative effect - delayed safety	Q9-4: Negative effect	Q9-5: Negative effect - productivity.	Q9-6: Negative effect	Q9-7: Negative effect - benefit realisation	Q9-8: Negative effect - reduce capacity	Q9-9: Negative effect - reputation	Q9-10: Negative effect - reduce reliability
Q10: Are there any other concerns in your experience regarding oil and gas project delays? <i>Participant Summary</i>	Proper clarity of job role is important. Decision makers may be in Lagos or Abuja, with insufficient boots-on-field but making changes without clear understanding of the concerns.	Poor transfer of knowledge within the industry, affecting project delivery. Knowledge gap between retiring professionals and new hires.	Proper planning required. Hiring the right persons and paying them the prevailing labour charges.	<i>No response from participant.</i>	Oil theft concerns. Live digital pipeline monitoring project should be considered.	Poor welfare package for project workers.	<i>No response from participant.</i>	Too many uncertainties due to ever changing government policies. Poor road infrastructure leading to logistic bottlenecks.	Poor pay program for project workers. Pay should form part of planning phase with solid agreements in place.	Local contractors are exploiting the local content laws while hiring nationals but with pay structure that is nothing compared to international counterparts.
Q10 Code	Q10-1: Collocation issues	Q10-2: Poor knowledge transfer.	Q10-3: Hiring process deficiency.		Q10-5: Oil theft	Q10-6: Poor pay package		Q10-8: Volatile government policies.	Q10-9: Poor pay package.	Q10-10: Poor pay package

The table 5 to 8 below shows the deduction from the responses provided by participants, including the recommendations they provided on the four main project delay causes, being – poor client leadership decisions, poor project client leadership, key material supply issues, bureaucratic government approval processes.

Table 5: Issue, Response and Recovery - Client Leadership Decisions, adapted from de Ruijter & Guldenmund,(2016).

Issues (Causes)	Prevention (Barriers)	Unwanted Condition	Mitigation (Barriers)	Cascading Unwanted Event (Consequences)
Q5-2: Bureaucratic process within client company	Re-evaluate approval process	Poor project client leadership decisions	Q5-6: Adopt flexible contracts that are resilient to changing climate.	Q9: Extensive project delays, eroding facility reliability and reducing asset efficiency.
Q5-7: Lack of adequate project funding	Robust budget covering project lifecycle. Seek fundings through loans or other instruments.			
Q5-10: Lack of trust of project contractors	Clear communication plan and implementation.			

Table 6: Issue, Response and Recovery - Client Leadership Decisions, adapted from de Ruijter & Guldenmund,(2016).

These tables were then leveraged to create the corresponding response and recovery bowtie for each scenario. The bowtie model, with roots in safety management and a combination of the fault and event tree (de Ruijter & Guldenmund, 2016), provides additional layer of protection against unwanted events. Figure 18, for example, the event at the centre is “poor project client leadership decisions”, one the left are blue discs with serve as barriers to the issues at the far-left boxes. Having the barriers in healthy state, is expected that it prevents poor leadership decisions from manifesting, i.e., if approval processes are re-evaluated and fitness for purpose is determined, it should address the bureaucratic processes within the client company.

On the other hand, to the right side of the unwanted event are also blue disc (adopt flexible contracts, resilient to changing organisational climate), serving as mitigative barriers to control the situation, so that it does not lead to extended delays capable of eroding facility reliability, efficiency and delayed benefit realisation.

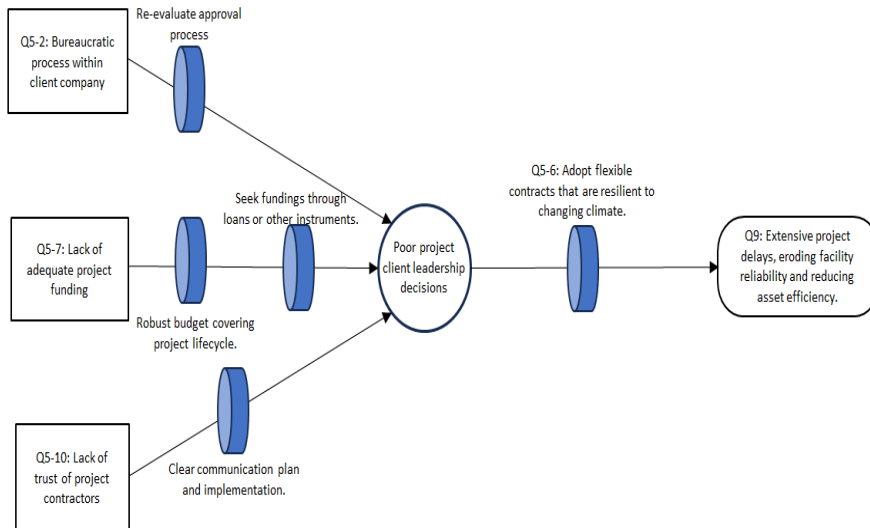


Figure 18: Adapted Bowtie Response and Recovery - Client Leadership Decisions.

Table 6 to 8 below follow similar approach with 5 with a corresponding bowtie as well as the sample codes per Table 4: Interview Session Summary and Code Table in the 4.3 Interview Session Findings Section.

Table 7: Issue, Response and Recovery - Project Client Planning, adapted from de Ruijter & Guldenmund,(2016).

Issues (Causes)	Prevention (Barriers)	Unwanted Condition	Mitigation (Barriers)	Cascading Unwanted Event (Consequences)
Q6-1: Selecting lowest bidding vendor.	Close attention to bidding process, selecting the lowest realist bidder. Pre-qualify contractor following best practices.	Poor project client planning.	Q6-7, Q6-10: Continue planning team training and evaluation.	Q9: Extensive project delays, eroding facility reliability and reducing asset efficiency.
Q6-2: Poor scope definition	Clear communication to all stakeholders including those on the shop floor (end users).		Share lessons with work team.	
Q6-7, Q6-10: Planning skills deficiencies	Train planning team especially on materials planning and kitting.			

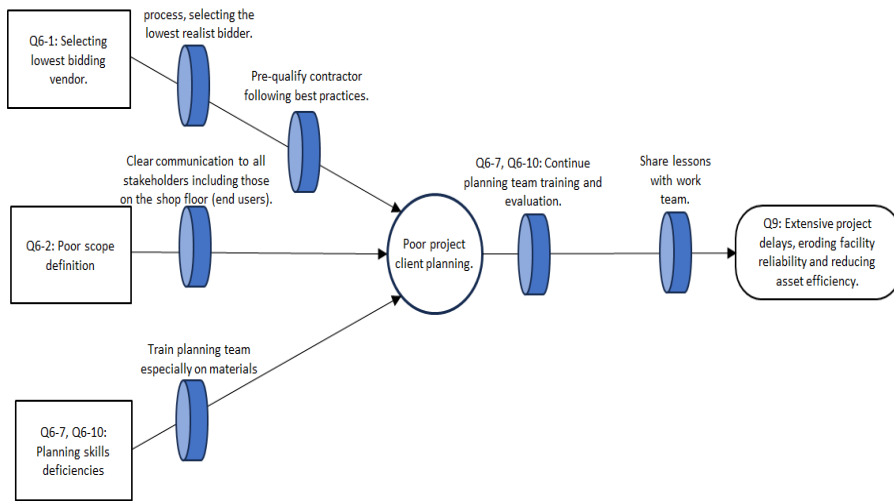


Figure 19: Adapted Bowtie Response and Recovery - Project Client Planning

Table 8: Issue, Response and Recovery - Key Materials Supply, adapted from de Ruijter & Guldenmund,(2016).

Issues (Causes)	Prevention (Barriers)	Unwanted Condition	Mitigation (Barriers)	Cascading Unwanted Event (Consequences)
Q7-1, Q7-2: Materials unavailable.	Q7-1, Q7-2: minimum of 80% of materials required should be available prior to commencement of project.	Key materials supply issues.	Key materials supply issues.	Q9: Extensive project delays, eroding facility reliability and reducing asset efficiency.
Q7-9, Q7-10: Poor material quality	Q7-5, Q7-9: Samples verified before supplies are made.		Share lessons with work team and update plan.	
Q6-7, Q6-10: Poor material logistics.	Q7-4: Confirm packaging requirements Develop and adopt suitable logistic and supply chain plan.			

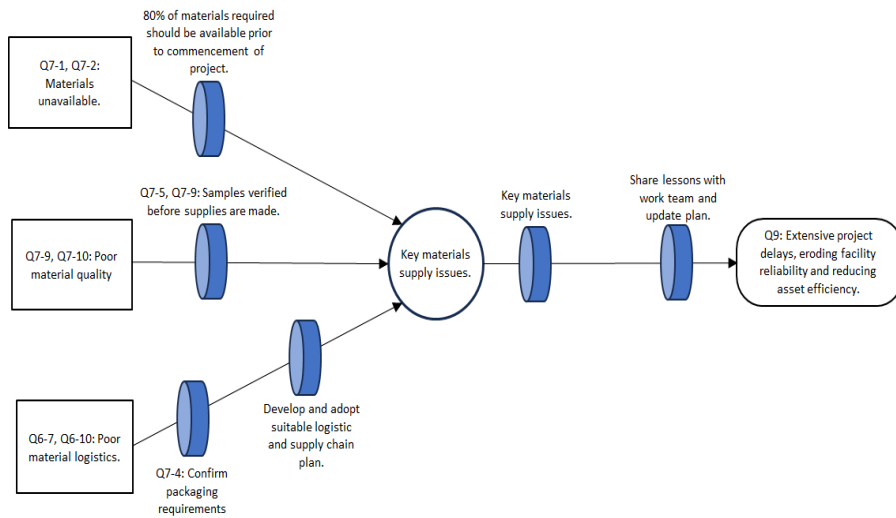


Figure 20: Adapted Bowtie Response and Recovery - Key Materials Supply.

Table 9: Issue, Response and Recovery - Bureaucratic Government Approval Process, adapted from de Ruijter & Guldenmund,(2016).

Issues (Causes)	Prevention (Barriers)	Unwanted Condition	Mitigation (Barriers)	Cascading Unwanted Event (Consequences)
Q8-2: New entrant difficulty.	Q8-10: Digitalize approval processes for ease of use	Bureaucratic government approval processes.	Continues monitoring and checks for policy updates.	Q9: Extensive project delays, eroding facility reliability and reducing asset efficiency, delayed benefit realization.
Q8-7: Poor venture relationship management	Q8-3, Q8-2: Early communication and engagement with government officials		Share lessons with work team and update plan.	
Q8-7, Q8-8, Q8-9: Lack of synergy, no clear feedback	Q8-3, Q8-2: Early communication and engagement with government officials			

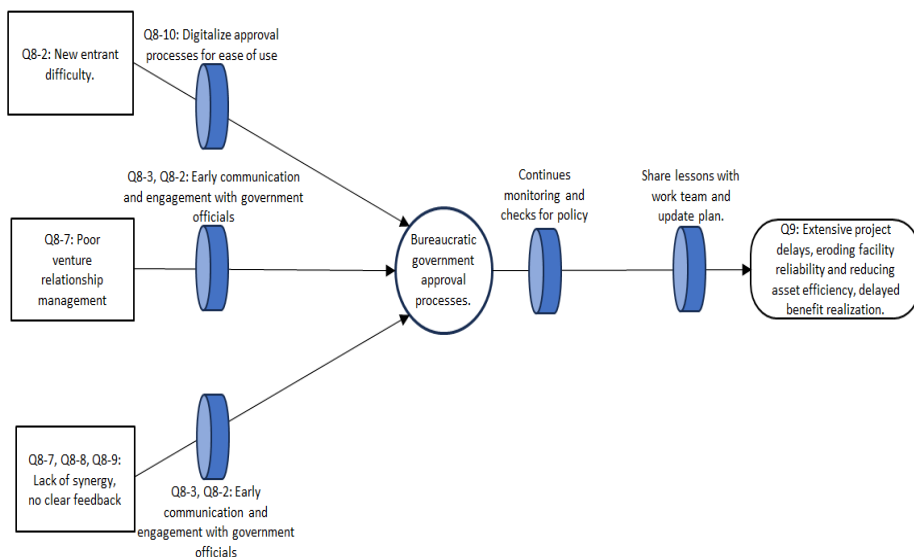


Figure 21: Adapted Bowtie Response and Recovery - Bureaucratic Government Approval Processes

This tool is aimed at addressing the concerns related to the 4 major causes of project delay. It could help organizations streamline their operations and improve efficiency. It could also be beneficial in reducing wastes in the project and organizational value chain. The next chapter concludes this research with a summary of key pointers, while indicating areas of further studies with the project management and delay reduction space.

4.5 Summary

The first stage survey questionnaires did assist in determining the major causes for concern as regards project delays. Prior to that, the correlation between projects and oil and gas assets efficiency were deemed very significant, implying the link between them. The second research aim of identifying the leading causes were determined, where 4 out of the 13 per literature were captured as major concerns. Moving to the interview phase, the correlation between project delays and oil and gas asset efficiency was re-validated with all participants agreeing to the link they share.

Poor planning from the clients, lack of supply of key materials were considered even more significant as they are said to have stalled projects in this climate. Some of the ideas on curbing this concerns lied within effective competency verification, material quality

planning, effective communication with stakeholders and early order of long lead items. The closing highlighted declining knowledge transfer, lack of job role clarity, poor contract worker welfare and pay package, crude oil theft amongst others. In the next chapter, discusses the concluding part of this research with a summary of what was carried out, how it was interpreted and the degree of exactness of the research questions solutions.