

Lump Sum Contracting on Western Canadian Oil and Gas Capital Projects: Industry Opinion

**A report submitted to Alberta Finance
And Enterprise**

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Executive Summary

The majority of major construction projects in the oil and gas industry in Western Canada are undertaken in a negotiated cost reimbursable contract. This type of contract is used on limited defined and fast tracked projects.

The main goal of this report is to study the potential for lump sum contracting and to answer the question whether lump sum contracting increase the efficiency and cost and schedule predictability of on major projects in the Western Canadian Oil and Gas sector. Specific objectives of this report are to:

- Determine why Lump Sum contracting has not been favoured.
- Determine the willingness of operating companies and contracting companies to employ Lump Sum contracting strategies.
- Examine the existing industry impressions of the influence of Lump Sum contracting on project outcome.
- Identify the barriers that have prevented the effective use of Lump Sum contracting.

To achieve the above goal and objectives, the researchers chose a two-staged approach beginning with semi-structured interviews and then a survey. The interviews were conducted with a total of 10 senior managers. Common themes and questions stemming from the semi-structured interviews were used to create an anonymous survey. The survey was sent to 30 different companies and administered via email, directing participants to an online survey.

The research findings can be summarized as follows:

- Cost-reimbursable type of contract is the most used in the Alberta Oil and Gas sector.
- Owner's representatives show more interest in lump sum contracting than engineering contractors.
- Cost certainty for the owner, better scope definition and a focused team on same target are some of the advantages that were identified by participants.
- Participants identified some disadvantages such as it is too risky resulting in larger risk premium, cannot fast track and owner must relinquish control of project planning and execution.
- 92% of engineering contractors and 46% of owners believe that lump sum will increase cost of project.
- Industry participants identified the following barriers to implementing lump sum contracting:
 1. Field labour costs/constrictive labour environment.
 2. Stability of weather difficult to predict, thereby making productivity difficult to predict.
 3. Local construction culture favours cost-reimbursable which leaves engineering companies that choose to take on Lump Sum, with little ability to control construction risk.

4. Module size constraints due to limitations with existing transportation infrastructure and no access to major waterways (such as, large rivers and oceans) for shipping.
 5. Client late changes.
 6. Lack of scope definition.
- The majority of engineering contractors did not show interest in lump sum for FEED, while showed considerably more interest in using lump sum for detailed engineering phase. Engineering contractors are also less interested in a full EPC arrangement.
 - The report concludes with a summary and discussion of the findings and recurring themes:
 1. The desire exists for cost certainty on part of the owner.
 2. The desire exists for more clearly defined project scopes than the industry in Western Canadian Oil and Gas is currently providing.
 3. The Alberta labour market has serious challenges involving availability of skilled labour and inability to predict productivity.
 4. Western Canadian Oil and gas has large risks which, in a Lump Sum contracting situation would be met with large risk premiums.
 5. Engineering companies believe the operating company desire for large amounts of involvement in project execution will lead to undesirable events in a Lump Sum contracting situation.
 6. The desire for Fast Tracking is seen as a barrier to Lump Sum contracting.
 7. The desire by the operating companies to transfer risk.

To apply Lump Sum contracting, Western Canadian operating companies must realize that this type of contract is only used where the plans and specifications are complete and the scope of work is well defined. The requirement to have detailed plans and specifications complete before bidding and construction can begin is the biggest obstacle facing the Oil and Gas industry in Western Canada. The flexibility of this contract form is very limited. Any deviation from the original plans and specifications to accommodate a change must be handled as a change order. This may lead to considerable arguments over the cost of scope changes and extras and may create adversarial relationship between the operating company and the contractor.

1.0 Introduction

Mega construction projects in the Western Canada oil and gas sector have Total Installed Costs in excess of CAD \$1 billion dollars with work scopes that are extremely large and complex. In five years (2002-2007), construction projects in the oil and gas sector alone were worth \$146.7 billion (Alberta Economic Development, 2007), a significant portion of the Alberta construction sector and economy. Many of the current and future Alberta oil sands development projects are ranging between \$8 and \$14 billion (CAD) in capital investment each and it is not uncommon for these projects to experience cost overruns up to 100% of the original cost estimates (Jergeas, 2008). If this trend continues, it may impact the viability of the Western Canadian oil industry which employs thousands of construction workers, engineer, suppliers, contractors and support staff.

Many studies have been conducted to identify reasons for and issues contributing to these overruns. Elliot (2005) indicated ineffective contractual arrangements and lucrative contracting environment as contributing factors. The lucrative contracting environment has come as a result of moving to a cost-reimbursable/cost-plus environment to accommodate for fast tracking projects. This has created a demand by Oil and Gas operating companies for a return to Lump Sum contracting. This interest in Lump Sum as a potential solution was found in a study conducted by Jergeas into key factors for determining the successful execution of projects (Jergeas, 2009).

2.0 Background

2.1 *Cost-reimbursable*

The majority of major construction projects in the Oil and Gas industry in Western Canada are undertaken in a negotiated contract format often called cost-reimbursable/cost-plus contract. This type of contract compensates the contractor for the cost it incurs plus some fee. All direct expenses for labor, equipment, and materials, as well as overhead charges required to properly manage the job are reimbursable (Halpin and Woodhead, 1998). The fee is a mark-up in addition to the reimbursable costs as compensation for the use of the contractors' expertise. There are three main types of Cost-Plus contracts:

1. Cost-Plus Percentage
2. Cost-Plus Fixed Fee
3. Cost-Plus Fixed Fee Plus Incentive

Cost-reimbursable contracts are typically used on ill-defined fast tracked projects, where scope and specifications are developed over the duration of the project. They are also used in projects with an expectation of rapid changes. However, this type of contract implies high cost and schedule risks (Von Bronconi, 2004). In these contracts, contractors have no incentive to be efficient and economical, since none of the risk lies with them and they are entitled to charge all justifiable costs. The operating company assumes all the risk, while are not in a position to overtly influence the outcome of the project because the work is performed by a third party. Additional costs, in the form of added resources to control the project and monitor progress, must also be invested by the operator. Contractual complexity, number of interfaces to be managed and

coordination of parallel work imposes its own cost and schedule penalties that may outweigh the benefits of fast tracking.

The fee strategies of cost-plus all come with potential areas of manipulation. Cost-Plus Percentage is very lucrative for the contractor, but is subject to abuse (Halpin and Woodhead, 1998). It provides no incentive to reduce cost: the contractor is being paid a percentage of the total construction costs (Marston, 1996). In Cost-Plus Fixed Fee, there is no incentive to reduce the overall cost of the project. In Cost-Plus Fixed-Fee Plus Incentive, a bonus is paid for dollars saved below the original estimate. However, this provides an incentive to pad the original estimate to increase the likelihood of the contractor benefiting from the bonus.

2.2 Lump Sum

The Lump-Sum format of contracting gives the owner the benefit of knowing the total price that will have to be paid to the contractor for the completion of the construction (subject to additions or deductions to or from the work as the course of construction proceeds) (Marston, 1996). Using the technical specification package and detailed plans provided by the operating company as an estimate basis, the contractor bids a price which covers all work, equipment and services required to complete the project.

2.3 Limitations

Technical specifications and scope for the project must be clearly defined prior to bidding the contract. If the work plan provided by the owner is not comprehensive, the contractor may claim compensation for required work performed outside of the original work scope. As well, changes and modifications made to the original plan by the owner, perhaps based on changing conditions or requirements, are handled by change order and fall outside the Lump Sum agreement. This may lead to considerable dispute or litigation over the time and monetary cost of the changes.

2.4 Why it's better

The advantage of the Lump Sum contract type is that it clearly allocates responsibility to one major contractor who assumes most risk and can control the project's execution, minimizes interfaces and can work with more overlap between engineering and construction phases (Von Branconi, 2004). The major contractor, in accepting that risk, is in a direct position to control the project's execution and can work with more overlap between the engineering and construction phases, thus increasing project efficiency, potentially increasing their margins. The effort expended by the owner company in managing the contractor work is reduced, allowing for lower owner costs (Lang, 1990).

2.5 Behaviour

Lump Sum contracting requires that the client company clearly define the scope of work and technical specifications prior to contracting the project. The contracting company must thoroughly and efficiently plan aspects such as resource loading, constructability of

design, and the construction method to ensure the projects falls below the cost cap of the contract. Lump Sum contracting increases the incentive for efficiency of both the client and the contractor. The major incentive in this situation for both parties is the prospect of a loss. If the client does not fully define their requirements, there may be claims above the agreed upon price, if changes are necessary. The threat of incurring more costs than the client is paying exists if the EPC contractor does not design an easily constructable plant or does not develop an efficient project execution plan.

Lump Sum contracting sets up a potential for loss on both sides of the contract. Alternatively, Cost-Plus incentive contracts are attempting to motivate through the prospect of gain. The contractor knows that all costs incurred, plus the profit already built into the charge-out rates of labour and mark-up on equipment will be paid even if the incentive requirements are not met. There is no potential for loss. The client also expects that the price may change because it is a Cost-Plus contract and the contract will not likely result in a legal battle at the end, no real loss scenario has been set up post-contract. There is no motivation for either party to be efficient in Front-End Loading, construction management, engineering management, labour management, constructability of design, etc. By using Lump Sum contracting to motivate through the prospect of a loss, healthy patterns of behaviour can be set up from the outset of a project, for example, proper front end loading and construction management.

2.6 Project Risk

One of the major purposes of having a successful contractual arrangement is the management of risk. The oil and gas industry is the world's most capital-intensive industry and invests hundreds of billions annually in new projects and maintenance of existing projects (Schroeder and Jackson, 2007). The days of finding cheap hydrocarbons are over. Most discoveries are in hostile environments where risks are higher and costs are huge, as is the case in most mega project developments in Western Canada.

The top 5 major project risks present in Western Canadian Oil and Gas are listed by Schroeder and Jackson (2007) as:

- Technology – ensuring adequate technical definition prior to detailed engineering, and avoiding design flaws.
- Planning/scheduling.
- Organizational – ensuring adequate staffing and effective team integration and interface management.
- Economic – ensuring robust ROI and avoiding cost escalation and budget constraints.
- Scope definition.

Contracting strategy and payment structure should help to mitigate those risks.

3.0 Research Objective/Study Scope

Mega Projects in the Western Canadian Oil and Gas sector have been experiencing significant cost overruns with the potential to jeopardize the economics of these large scale undertakings. Through the literary research conducted, it was determined that there has been limited study on the potential for Lump Sum contracting on private sector projects in this industry. As well, there has been limited study on the attitude and understanding of Lump Sum contracting among senior level project managers, managers and executives.

The hypothesis for this study is that Lump Sum contracting would increase incentive for efficiency of both client and contractor, particularly in Front End Loading and Construction Management, thus making cost and schedule more predictable, as well as end product potentially more reliable. The purpose of the current research project is to:

- Determine why Lump Sum contracting has not been favoured in the Alberta Oil and Gas sector.
- Determine the willingness of operating companies and contracting companies to employ Lump Sum contracting strategies.
- Examine the existing industry impressions of the influence of Lump Sum contracting on project outcome.
- Identify the barriers that have prevented the effective use of Lump Sum contracting.

These objectives will be investigated by studying aspects such as:

- Current contracting strategies employed.
- If company International or local only.
- Contracting culture.
- Project management/change management culture.
- Risk tolerance.
- Project complexity.
- Location considerations.

A vitally important step in this process is to conduct a survey of operating firms and EPC contractors to determine, the current attitudes toward Lump Sum and its barriers. Industry opinion is needed to help research move forward toward solutions for effective implementation. This research may assist in developing a method to make the cost and schedule of capital mega projects more predictable.

4.0 Research Method

The research methodology chosen for this study was two-staged beginning with semi-structured interviews and then an anonymous survey. This investigation was intended to be region and industry specific, as to gain greater appreciation of the factors affecting the contracting strategies of this group. The sample group was chosen from Western Canada (Saskatchewan, Alberta, and British Columbia) and from the Oil and Gas Industry. Most participants were based in Calgary, Alberta, as this is where most head offices for companies participating in oil and gas in Western Canada are located.

4.1 Pre-interviews

First, the semi-structured pre-interviews were conducted with a total of 10 senior managers from oil and gas operating, engineering contracting, and construction contracting firms. Participants were chosen for their specialization in Project Management, their experience with Lump Sum contracting and their extensive work experience both domestically and internationally in oil and gas. Participants had an average of 31 years working experience and most were in senior manager or Vice President level positions. These individuals were selected as a cross-section of the group who could best shed light on the topic of study. These individuals were identified and contacted by telephone or email seeking their participation in the loose form interviews.

The interviews were performed to help guide and form a basis for the subsequent industry-wide anonymous survey that would assess the current understanding of, attitudes towards, and barriers to effective implementation of Lump Sum contracting. Questions were asked about the attractiveness of Lump Sum contracting to their organization, for both Canadian and international contracts, barriers they saw in Western Canada, from a general industry/political environment standpoint and what the other sectors of the industry would have to do to make Lump Sum more acceptable. The same questions were asked of each interviewee to allow for direct comparison of the data, but the participants were encouraged to expand on any points they felt necessary. Steps were taken to ensure validity of the results. The interviewer transcribed the interview and at the end of discussion around each theme question, the transcription was read back to the interviewee to ensure that the paraphrasing captured the intended idea.

4.2 Survey

Structure of survey

Common themes and questions stemming from the semi-structured interviews were used to create an anonymous survey. The survey tool was chosen because participants can respond to questions in more truthful than they would in a personal interview as participants' responses remain confidential.

Sample

The survey was administered via email, directing participants to an online anonymous survey. A recruitment memo, confidentiality agreement and links to survey were distributed between March and May 2010. The survey was sent to 30 different companies in the target group. The respondents had an average of 25 years experience. The respondents were executives, programme and project managers, and engineering managers at oil and gas operating, engineering contracting and construction contracting firms.

What the survey asks

The survey consists of two main sections. One section asks the respondent to provide details about their type of organization, their experience, their role, if their company conducts work internationally, and the most common types of contracts their organization currently employs. This information will serve as a reference point to compare the responses to the second section of the survey and ensure the experiment is context dependent relative to the respondents. The second section of the survey assessed the participant's knowledge and understanding of Lump Sum, opinions on barriers to Lump Sum, addressed disconnects in opinion between the three sectors of industry, and scope and dollar value of Lump Sum interest.

4.3 Reliability and Validity of Research Instrument

Semi-structured qualitative pre-interviews and an anonymous online questionnaire were used to gather data for research into the feasibility of Lump Sum contracting in Western Canadian Oil and Gas. Several guidelines were used to ensure the consistency of application of the research tools. The same questions were asked during interviews to collect the same data and all answer content was verified with subjects before it was recorded. The same questionnaire was administered to participants of the same target group and there was no time limit on completion of the survey form. The results of the research were analyzed in a consistent manner across the same format of question. Participants from all three major industry demographics, oil and gas operating companies, engineering contracting companies and construction companies, were invited to participate to avoid bias from any one group. There was no direct incentive offered to participate, although the participants could chose to receive a copy of the final research results. Since the survey was anonymous, research subjects were able to express their opinions and thoughts without any worry of identification or consequence. The results were collected directly from the online survey by the researcher, without any third party interference, thus maintaining the integrity of the original responses.

5.0 Survey Findings

The following subsections provide the information gathered from the survey questionnaire administered to Oil and Gas Operating companies and Engineering Contractor companies. The information is divided into three subsections:

1. Demographic information of survey participants.
2. Common questions between target groups.
3. Target group specific questions.

Demographic Information of Survey Participants

Survey participants were asked several demographic identifying questions. 75% of the survey respondents from the engineering contractor companies had greater than 25 years experience and 42% of the Operating company respondents had greater than 25 years experience. Figure 1 and 2 below show industry experience distribution for Engineering Contractor and Operating Companies respectively.

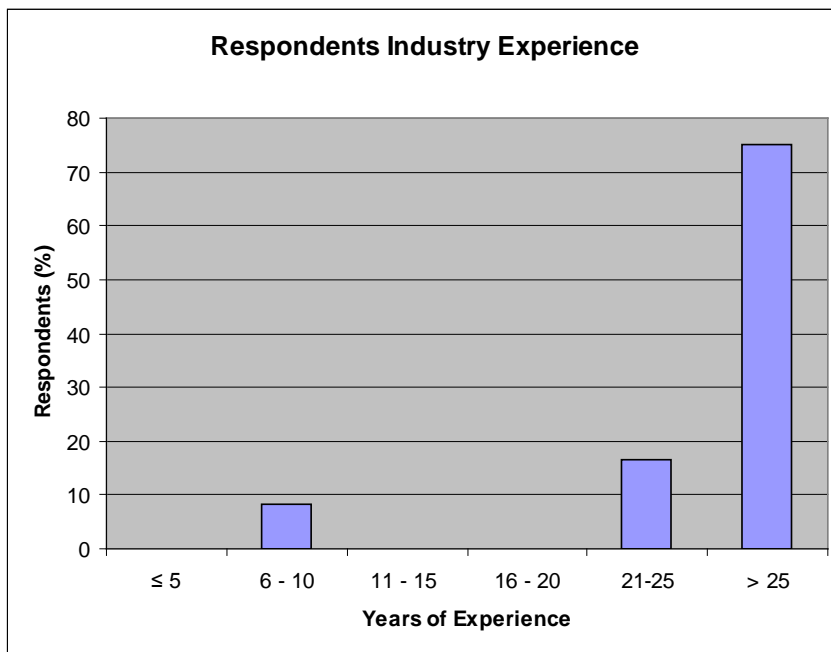


Figure1: Industry Experience Engineering Contractor

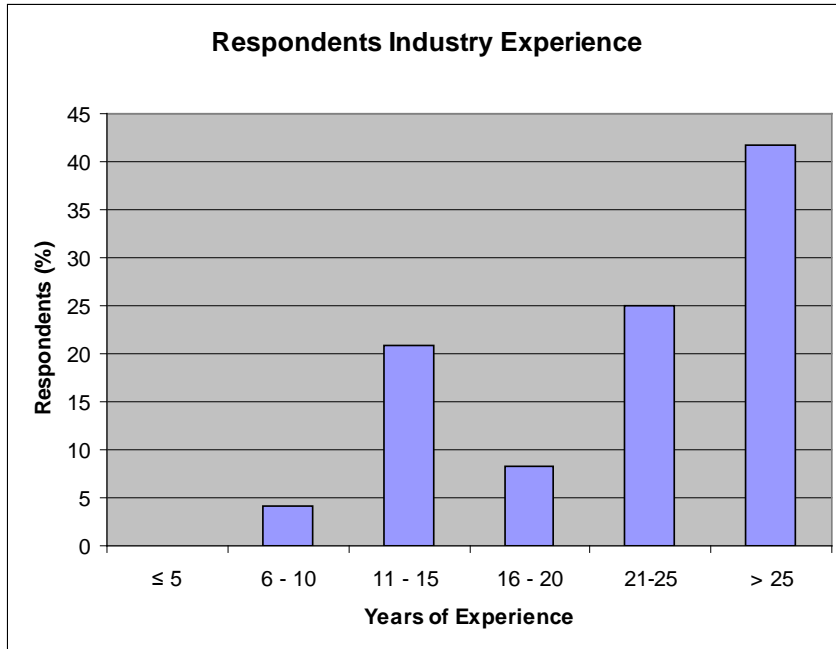


Figure 2: Industry Experience Oil and Gas Operating Company

Position titles varied between respondents but could be broken down into five main categories or seniority levels:

1. Vice President
2. Senior Manager
3. Project Manager
4. Project Controls
5. Other

The category “Other”, includes project engineers and discipline engineers who are not in a lead position with other engineers working beneath them as direct reports. Figure 3 and 4 below illustrate the survey participants’ role in their organization.

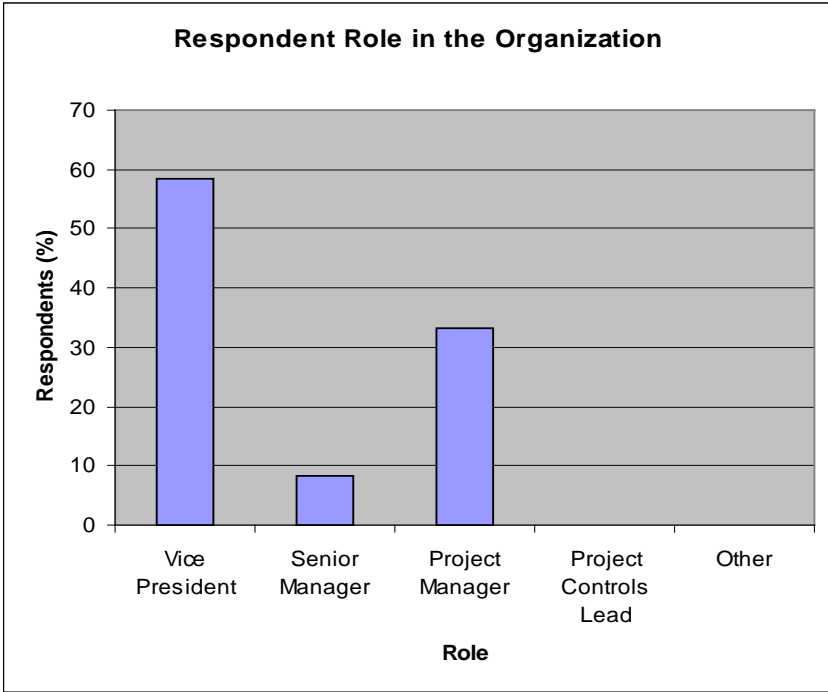


Figure 3: Role in the Organization Engineering Contractor

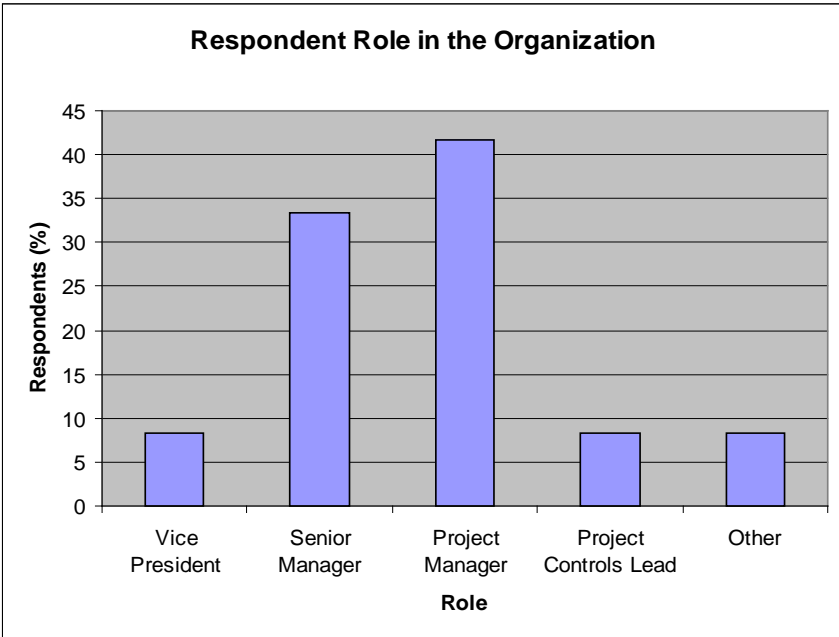


Figure 4: Role in the Organization Oil and Gas Company

It was difficult to get equal numbers of participants at each level from the Engineering Contractors and Operating Companies as can be seen from the above figures. A larger percentage of respondents were at the Vice President level from the engineering side than the operating side. This can be attributed to the type of business each sector of the

industry engages in. The main business of the Engineering Contractor involves the management of projects, whereas the main business of the Operating Company is the management of a natural resource. The result of this is that Engineering Contractors have a larger number of VPs with Project Management backgrounds and the Operating Companies with a larger number of VPs with backgrounds tailored to production.

Participants were also asked if their companies worked internationally or locally only. 100% of the participants' companies from both target groups worked internationally.

Common Survey Questions

Through the next few questions, the researcher wanted to start examining the axial coding around the core phenomenon of contracting strategy:

- the consequences of using the Lump Sum strategy
- the factors that are leading them to use or not use Lump Sum
- the intervening conditions, such as barriers, that influence their contracting strategies

Typical Contracting Strategy

Survey participants were asked to identify the contract type or payment structure they currently engage in at their companies. Figure 5 shows the Engineering Contractor strategies while Figure 6 shows the Operating company strategies.

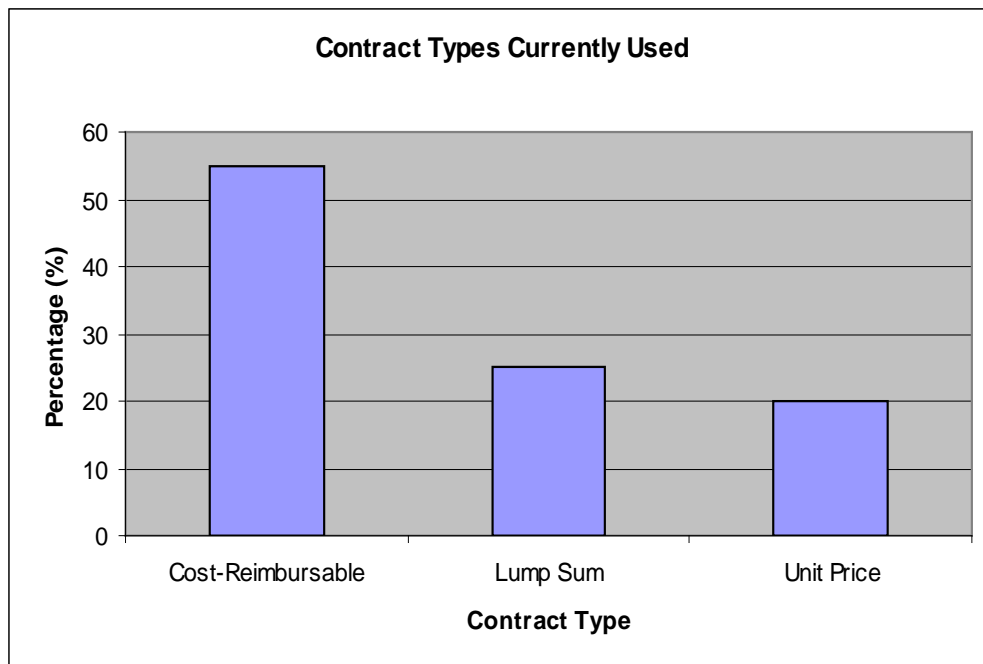


Figure 5: Current Contract Types Used - Engineering Contractor

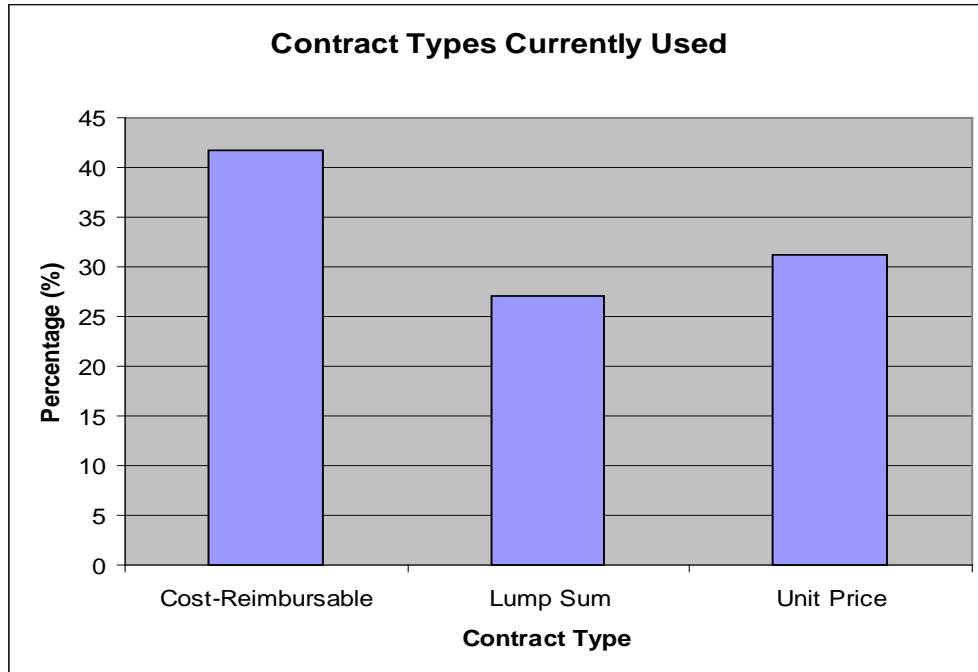


Figure 6: Current Contract Types Used - Oil and Gas Operating Company

Among the engineering contractors who participated, 55% engaged in some form of cost-reimbursable, compared to Lump Sum and unit price at 25% and 20% respectively. It is worth noting that in most situations where the Engineering contractor group stated that Lump Sum was being used it was internationally rather than locally or for portions of a project rather than a whole project. Four respondents, representing four different companies said they engage in cost reimbursable locally and Lump Sum internationally.

Among the operating company respondents, 42% engaged in cost-reimbursable, compared with 27% Lump Sum and 31% Unit Price. It is worth noting that respondents commented that in most situations where Lump Sum is being used, it is for equipment, tanks, and buildings. It is used for these select portions of the project versus the whole project scope. There were also comments that the respondents had just started using Lump Sum at their companies, indicating a recent trend toward using Lump Sum.

Interest in Lump Sum Contracting

Participants were asked to quantitatively state their interest in using Lump Sum contracting strategies, illustrated in Figure 7 and 8. They were then asked to qualitatively explain the perceived advantage or disadvantage of Lump Sum. Operating Companies were noticeably more interested in utilizing this contracting strategy with 91% in favour compared to 62% of Engineering Contractors in favour.

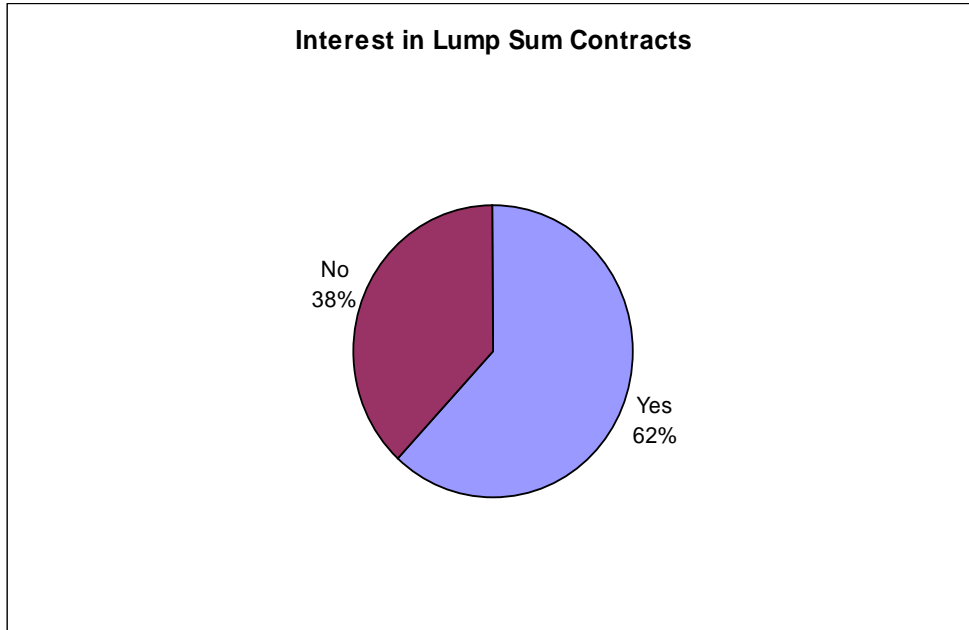


Figure 7: Interest in Lump Sum - Engineering Contractors

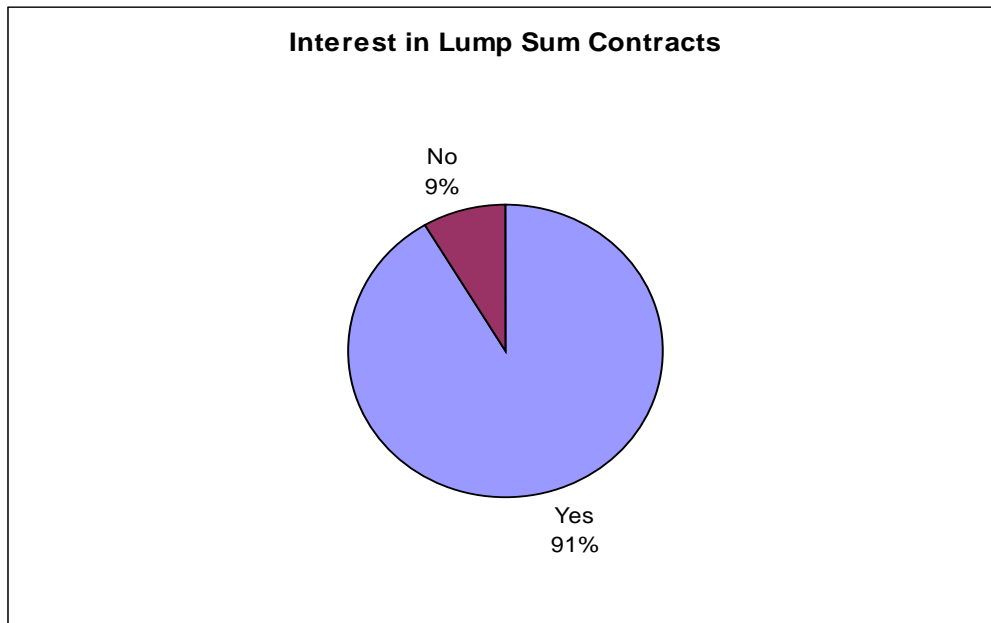


Figure 8: Interest in Lump Sum: Operating Companies

Engineering contractors identified the following advantages and disadvantages:

Advantages

1. Cost certainty for owner.
2. Profits for engineering contractor are higher if the risks are well managed.
3. All parties focused on same target of delivering project on cost and schedule.
4. The project scope is forced to be more clearly defined and agreed upon.
5. Forces proper project planning at all project stages.

Disadvantages

1. As contract complexity and scope size gets larger, the number of risks increase and engineering contractor must apply a larger risk premium which increases investment cost.
2. Too risky because of Alberta labour market challenges.
3. Too risky because of desire for involvement of Alberta clients.
4. Can not fast track (overlap phases) of project.
5. Owner must relinquish control of project planning and execution to contractor at contract award.
6. Engineering contracts do not typically have sufficiently clear definition of detailed scope to enable contractor to accurately predict the schedule and resources need.

Other comments worth noting were made by the Engineering Contractors:

- Only willing to accept Lump Sum for EPCM service, not for Materials/Equipment or construction.
- Will discuss Lump Sum for part of work, for examples engineering, procurement, piping or module fabrication but are reluctant to accept full Lump Sum Turnkey. A main deterrent is being responsible for direct labour on site.
- As contract size grows, number of contractors able to handle the work decreases.
- As the site gets larger, the number of risks increases and the contractor must apply larger risk premiums, thus they believe this method would be more appropriate for smaller pieces of work.
- Would only be interested in Lump Sum if there was a high likelihood that they would win the bid, a low number of bidders, because the proposal is costly to put together.
- Would be interested in sharing risk with another contractor or the client
- Will not do Lump Sum if the client has onerous liquidated damages clauses or if performance guarantees are too difficult.

The operating company respondents were very aligned in their perception of the advantages and disadvantages of Lump Sum contracting:

Advantages:

1. Better cost certainty and control.
2. Transfer of risk to contractor.
3. Decrease of project cost.

Disadvantages:

1. Potential for too many unknown risks.
2. Potential for too many scope changes.

It is worth noting that only 2 respondents listed the above disadvantages.

Figure 9 following, summarizes the distribution breakdown of the Oil and Gas Operating Companies reasons for interest in Lump Sum contracting or the perceived advantages to Lump Sum Contracting. The majority of respondents believe Lump Sum is a way to ensure cost certainty and ensure changes to or escalation of cost is monitored and controlled.

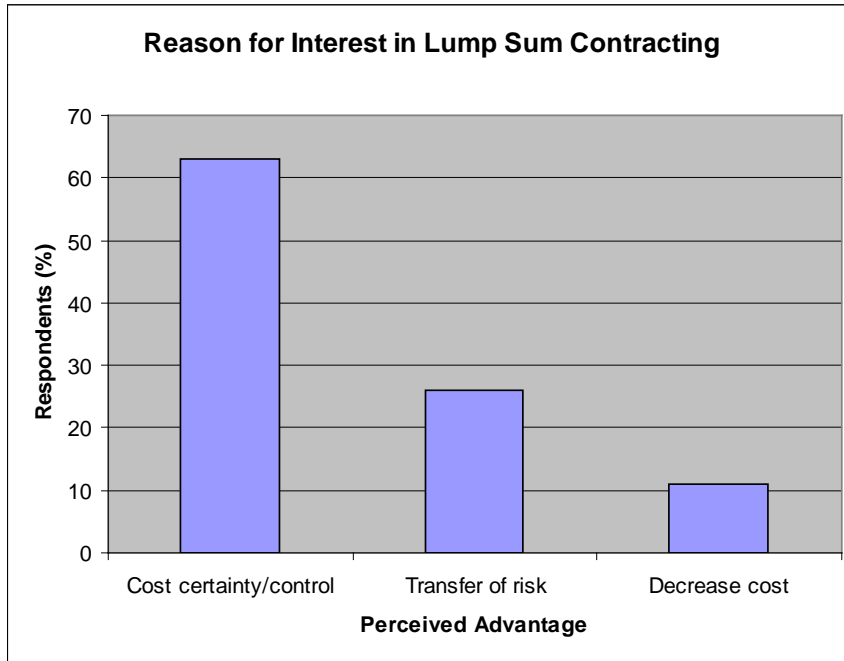


Figure 9: Advantage to Lump Sum: Oil and Gas Operating Companies

Other comments worth noting were made by the Operating Companies:

- Lump Sum works as long as commercial liabilities are in place.
- Lump Sum will mitigate the risk of cost overrun.
- Minimize site supervision required by operator during construction.
- Lump Sum is only feasible if the up front detailed work is complete.
- Contractor has greater incentive to minimize costs and has accountability for performance.
- Lump Sum hedges against inflation.

Effect of Lump Sum on Project Cost

The effect that the use of Lump Sum contracting will have on project cost was seen very differently between the engineering contractors and operating companies. The highest number of people from both groups perceived a potential cost increase; however, the split was 46% of operating respondents compared with 92% of engineering respondents. The distribution of owner respondents showed the perception of effect on cost is not unified across the Western Canadian operating company population. See Figures 10 and 11 below:

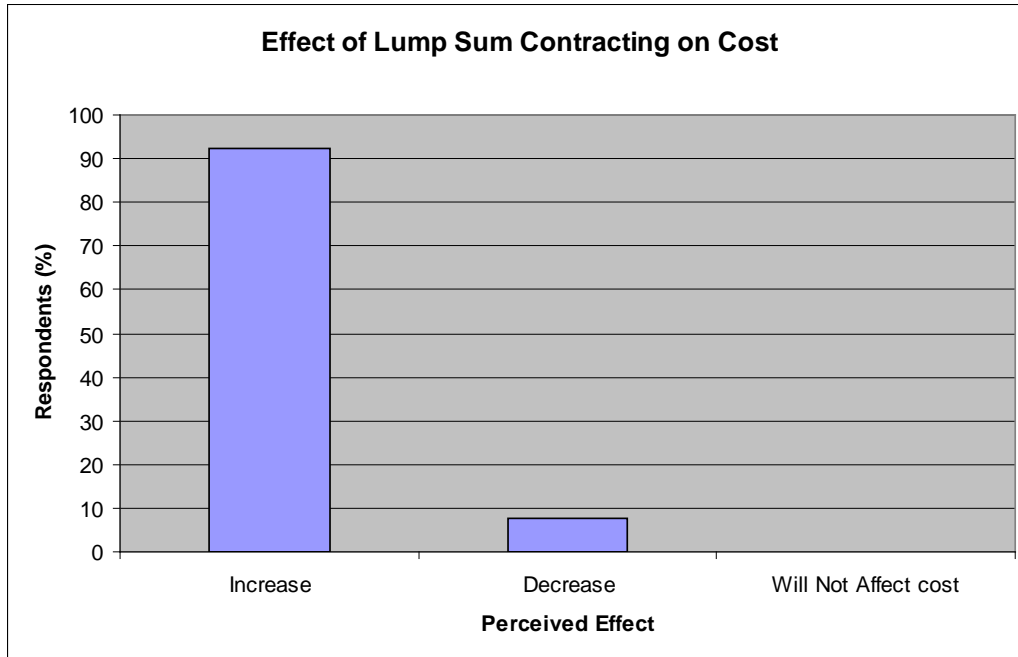


Figure 10: Effect of Lump Sum on Cost – Engineering Companies

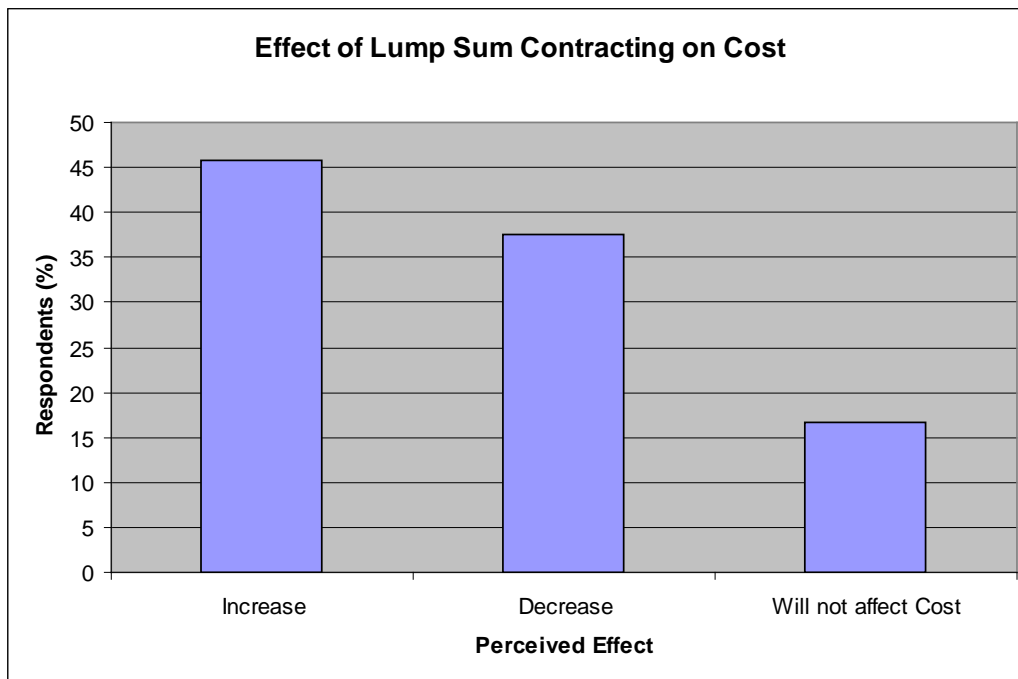


Figure 11: Effect of Lump Sum on Cost - Oil and Gas Operating Companies

When asked to qualify their quantitative answers, the engineering contractors provided the following reasons for cost increases for opting to Lump Sum arrangement:

1. Large risk factor employed to account for labour, owner interference and scope changes, and market factors. – 92%
2. Construction contractors will not take the risk on productivity. - 8%

Engineering Contractors who believed that Lump Sum will decrease cost provided the following reason: “will control against cost increases because all stakeholders are held responsible for work”.

Operating companies gave the following reasons for cost increases due to Lump Sum:

1. Contractor risk premium for assuming all risk. – 50%
2. Due to scope changes. – 21%
3. Due to incomplete scope definition. – 7%
4. High demand for contractors in industry because of economic growth. – 14%
5. Lump Sum may be an inappropriate contracting strategy in some cases. – 7%

Operating companies also gave the following reasons for their perceived decrease in cost as a result of implanting Lump Sum strategy:

1. Scope would be well managed so fewer changes. – 50%
2. Efficient project delivery by contractor. – 25%
3. Fix cost at beginning, contractor must manage risk. – 13%
4. Competitive bidding will drive cost lower. – 13%

It is to be noted that in both scenarios, increase and decrease in cost, respondents are observing that economic growth would affect the Lump Sum price. Low economic growth would result in more contractor competitive bidding and thus lower prices, and higher economic growth would result in more owner competition for contractors and thus higher prices.

The minority who perceived “no effect on cost” made the following observations:

1. A complete and clear scope of work will cause no change in cost.
2. In Lump Sum situations, the contractor will provide the owner with a higher performing team so the work gets done to a higher quality standard and faster. Lump Sum also establishes a ceiling to the project cost that does not exist in cost reimbursable.
3. Requires defined scope and good execution, compared to cost reimbursable. Cost reimbursable is perceived as cheaper, but the lack of efficiency makes costs climb to about the same as the risk premium contractors build into Lump Sum.

Another observation of note made by both respondents with all three responses is that it is hard to predict if the Lump Sum contract price will be higher or lower than a cost reimbursable contract for the same piece of work, even though it may look higher initially because of the upfront risk premium. The reason for this is that often lower productivity occurs on cost reimbursable jobs because there is no direct risk to the contractor, thus

the upper limit of the end price is never known. The Lump Sum risk premium may balance the lower productivities associated with cost reimbursable. It was also observed that Lump Sum contracts could be an effective tool for operating companies during a down market.

Lump Sum Contract Use

Participants were asked if their companies have used Lump Sum contracting in Western Canada and internationally and the dollar value of each. They were also asked to identify if there was anything that makes international projects more conducive to effective use of Lump Sum contracts than Western Canada.

Engineering Contractors opinion of Lump Sum use in Western Canada and internationally are illustrated in Figure 12 and Figure 13. Operating company opinions are expressed in Figure 14 and 15.

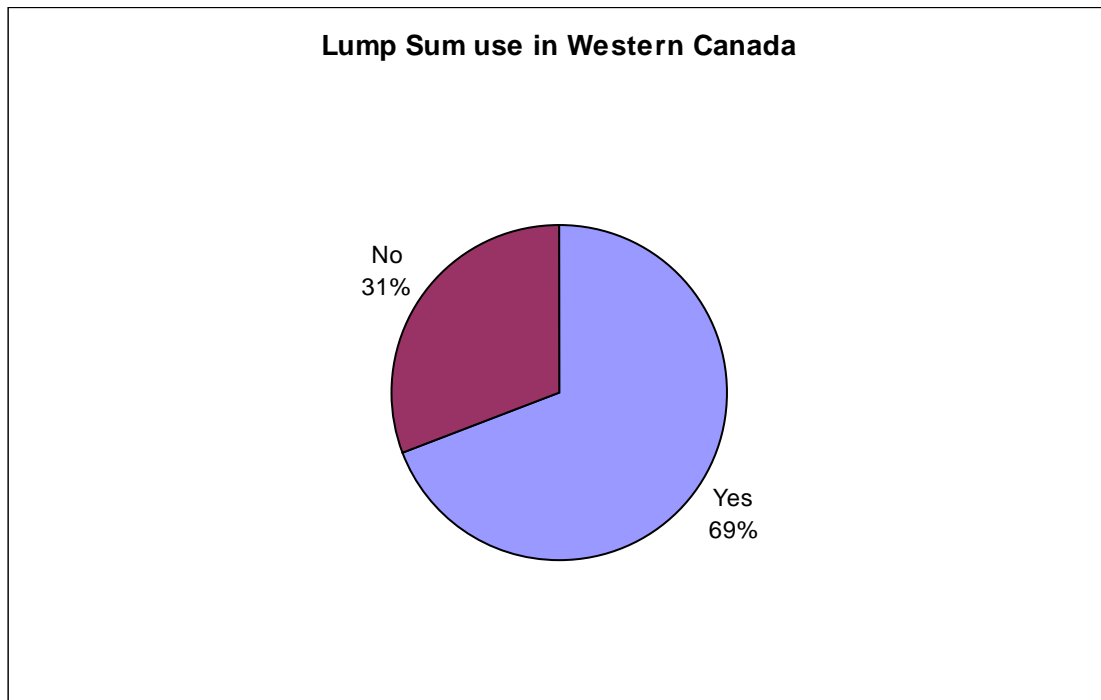


Figure 12: Lump Sum Use in Western Canada – Engineering Contractors

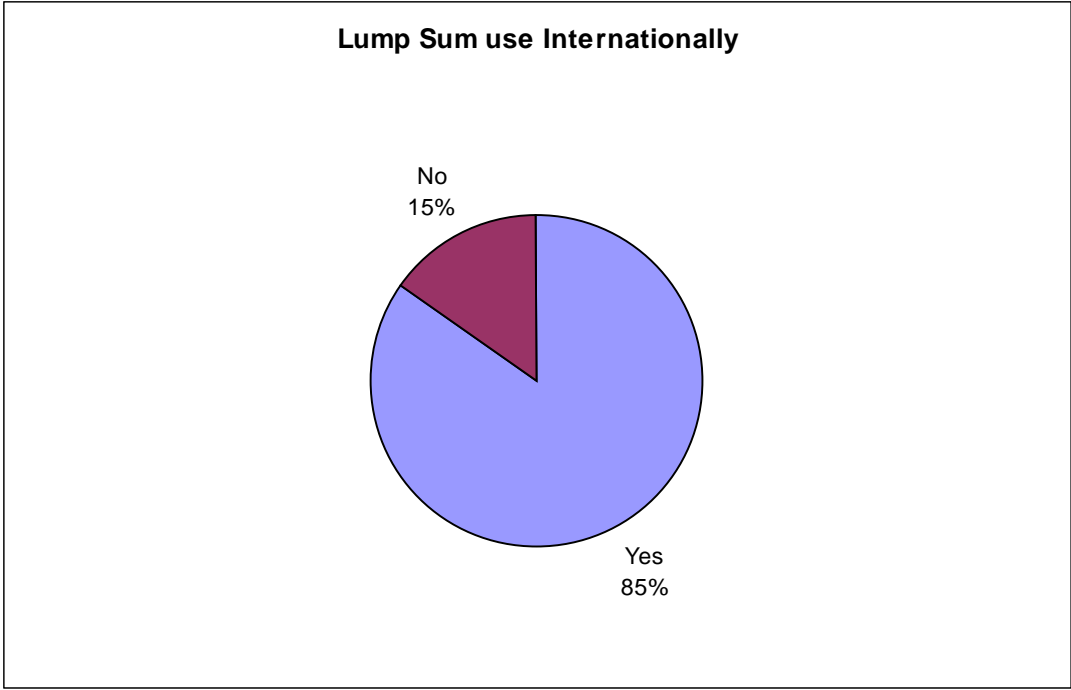


Figure 13: Lump Sum Use in International - Engineering Contractors

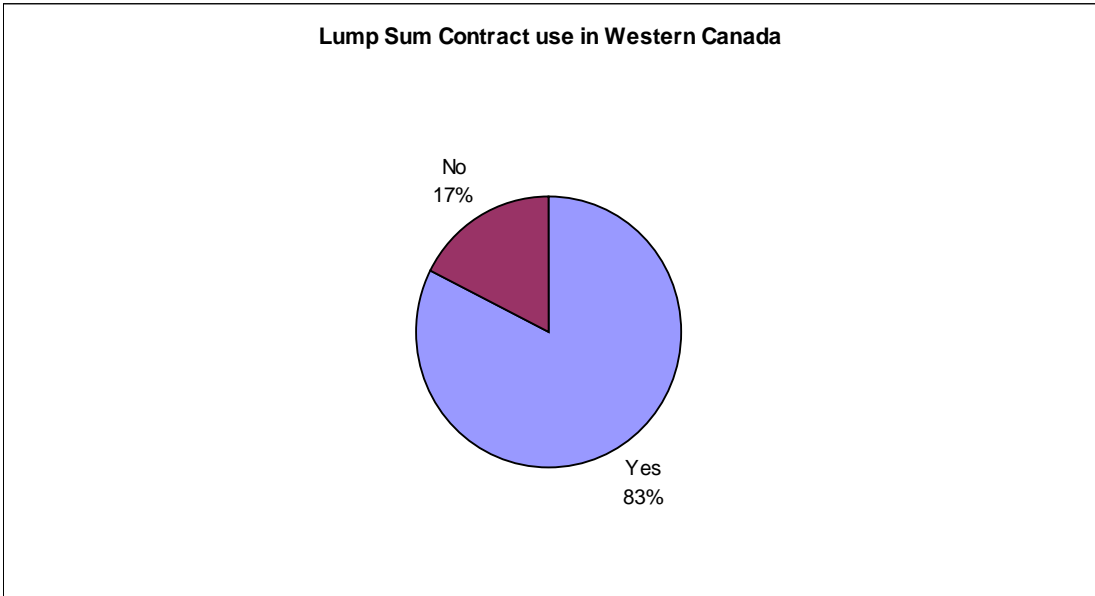


Figure 14: Lump Sum Use in Western Canada – Operating Companies

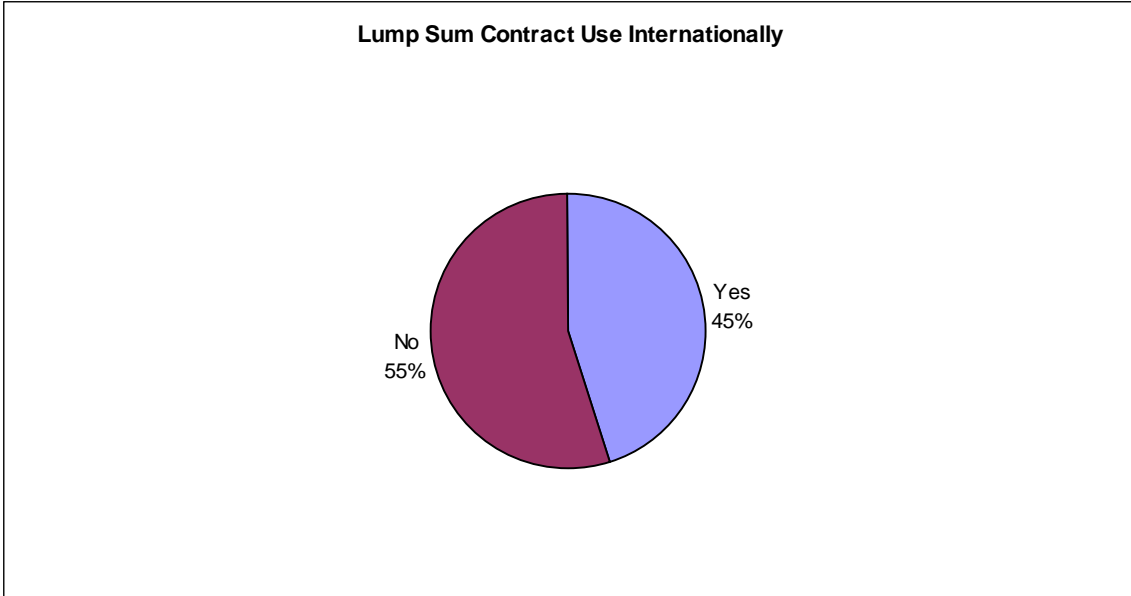


Figure 15: Lump Sum Use Internationally – Operating Companies

The maximum dollar value of Lump Sum projects the respondents were aware of having been conducted at their companies in Western Canada and Internationally are expressed below in Figures 16 through 18. 56% of Engineering Contractors would or could not reveal the value of the Lump Sum contracts they had performed in Western Canada. The same percentage would not reveal the dollar value of International Lump Sum contracts they had performed.

Figure 16 - Maximum Value of Western Canadian LS Projects – Engineering Contractor

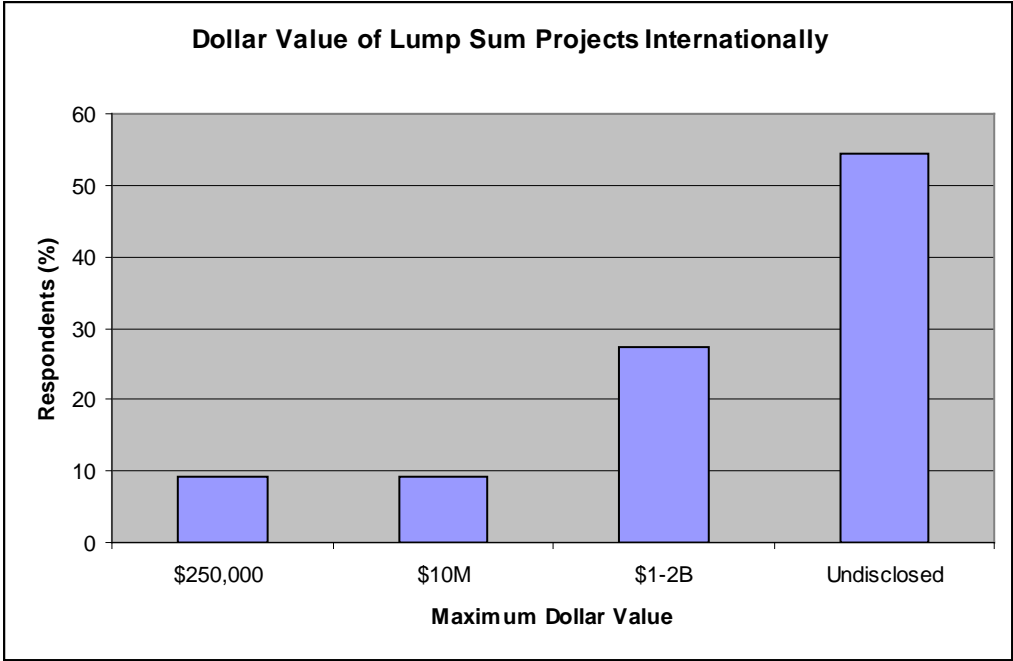


Figure 17 - Maximum Value of International LS Projects – Engineering Contractor

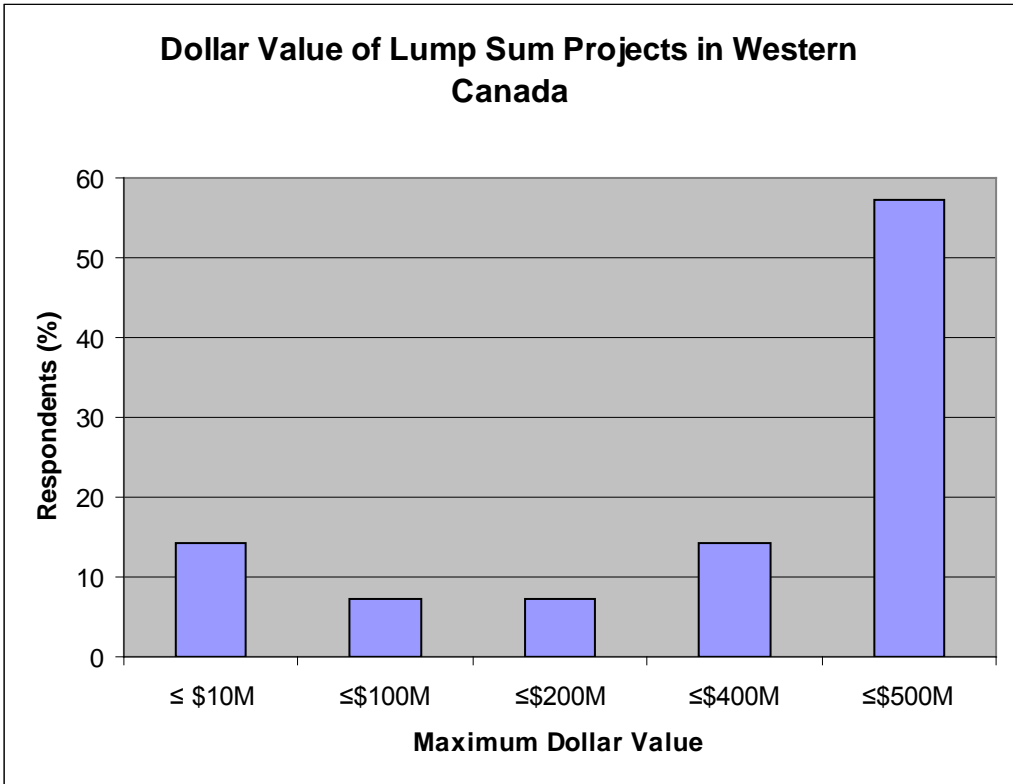


Figure 18 – Maximum Value of Western Canadian LS Projects – Operating Company

Only three Operating company respondents quoted dollar values for international projects:

- \$35M
- \$250M
- \$2B

Engineering Contractors provided the following reasons for making international projects more conducive to Lump Sum.

1. Low labour and supervision cost / no restrictive labour market.
2. Construction contractors willing to work Lump Sum or unit rate and take the risk on labour productivity.
3. Owner more thoroughly defines scope of work and scope is frozen prior to handover to contractor.
4. Not many clients make late changes internationally.
5. Owner gives up control of planning and execution of the work to contractor. Owner involvement is characterized as auditing.
6. Ocean ways for large module transportation.
7. Local Western Canadian Construction Companies will not accept Lump Sum contracts.
8. International market players on all sides of the business are much more used to the Lump Sum environment and know how to manage it.
9. Internationally, there is an opportunity to make more money in a Lump Sum contracting situation if prepared correctly than cost-reimbursable.

Operating companies provided the following reasons for making international projects more conducive to Lump Sum.

1. International contractors have more experience in delivering projects under Lump Sum contract terms.
2. Lump Sum is better understood by all parties internationally and the owners particularly have more understanding of their role in managing contractors in a Lump Sum situation.
3. Easier to find bidders willing/able to accept Lump Sum contracts.
4. May be easier to obtain external funding for projects since costs are perceived to be capped.

Barriers to Lump Sum Contracting in Western Canadian oil and Gas

From the semi-structured pre-interviews conducted with Senior Managers to form the basis of the final survey, a list of barriers to using Lump Sum contracting in Western Canadian Oil and Gas was developed. The barriers suggested by the interviewees are listed below:

7. Field labour costs/constrictive labour environment.
8. Stability of weather difficult to predict, thereby making productivity difficult to predict.
9. Local construction culture favours cost-reimbursable which leaves engineering companies that choose to take on Lump Sum, with little ability to control construction risk.
10. Module size constraints due to limitations with existing transportation infrastructure and no access to major waterways (such as, large rivers and oceans) for shipping.
11. Client late changes.
12. Lack of scope definition.

Survey participants were asked to rank each barrier in order of importance and identify any barriers on the list that they felt were not important or would not impact the industry's ability to use Lump Sum contracting. Below are the rankings given to each barrier by respondents. The chart legend represents the barriers numbered as listed above.

A significantly higher percentage of Engineering contractors rated barriers two and four as irrelevant to Lump Sum feasibility, than any other barrier. As can be seen from Figure 19 below, 54% felt that transportation infrastructure module constraints was not a barrier to Lump Sum and 31% felt stability of weather conditions was not a barrier to Lump Sum. Operating Company respondents also felt that barriers two and four were not challenges, with 46% and 50% respectively rated them as not important. A high percentage of operating companies, 29%, also felt that barrier one, field labour costs and constrictive labour environment was irrelevant, while only 15% of contractor respondents ranked it as irrelevant (Figure 20). This marked a significant disconnect between the target groups.

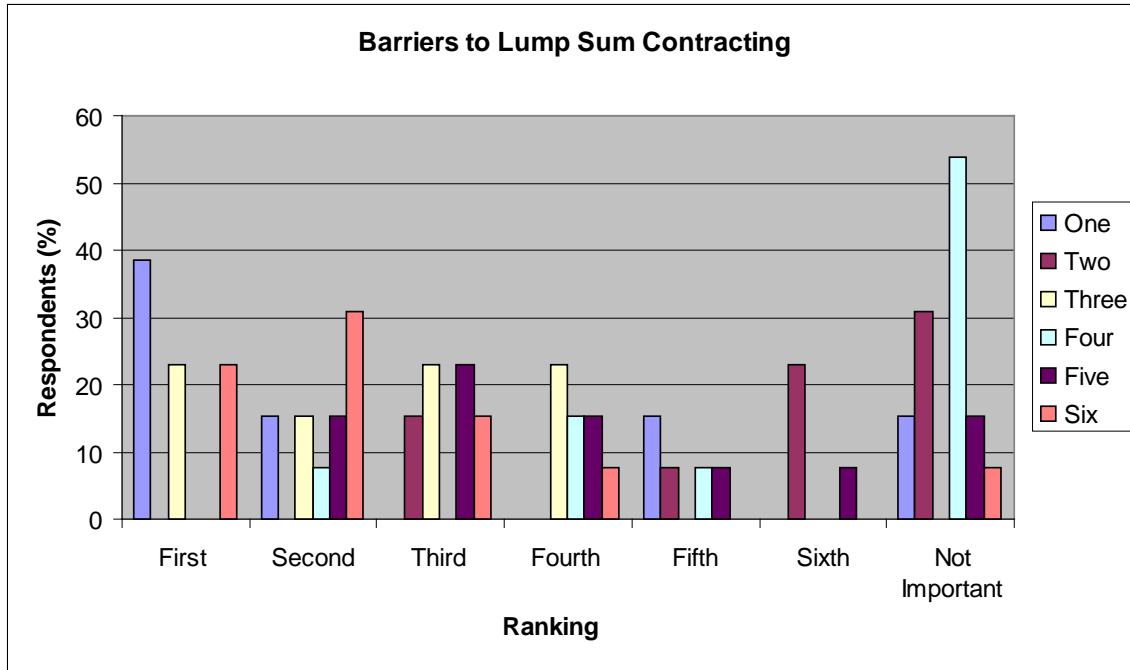


Figure 19: Ranking of Barriers to Lump Sum Contracting – Engineering Contractors

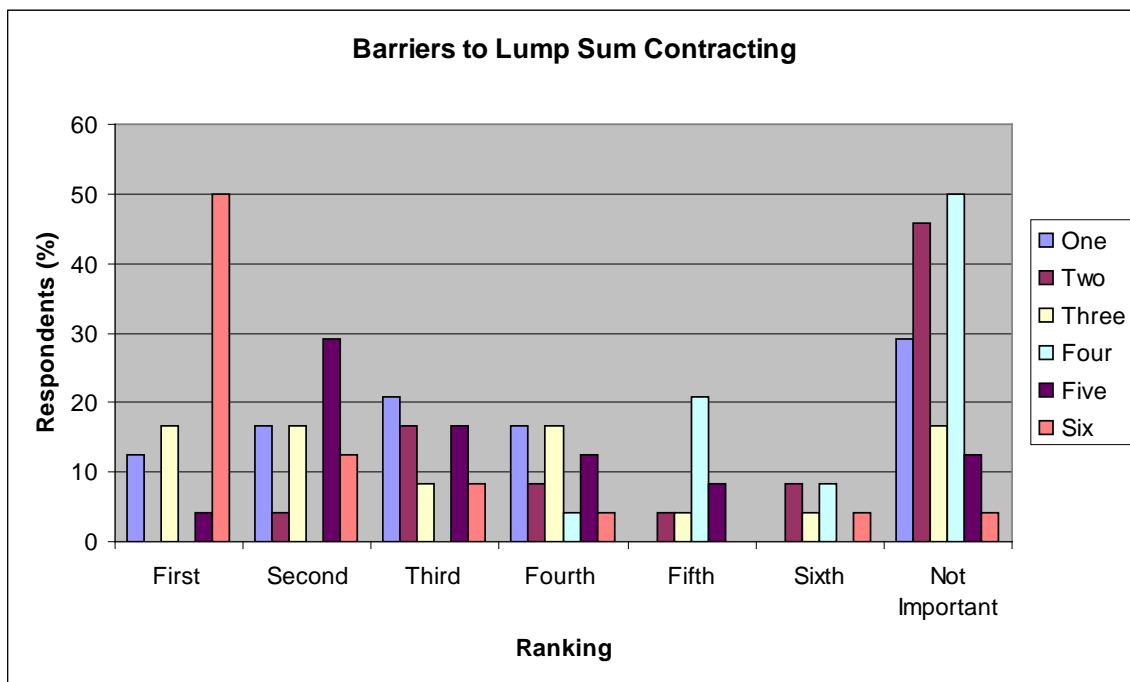


Figure 20: Ranking of Barriers to Lump Sum Contracting – Operating Companies

To determine which barriers were considered most important, a weighting strategy was developed. Each ranking from first to sixth was given a weight of from six down to one. For example, a ranking of one was given a weighting of six and a ranking of second was given a weighting of five and so on. This weighting process gives the most importance to the highest rankings, but does not discount lower rankings. Tables below 1 & 2 show the break down of weighted importance by barrier for Engineering Contractors and

Operating companies. Figures 21 and 22 show the graphical representation of the weighted ranking of barriers normalized so they can be directly compared.

Additional barriers suggested by the Engineering Contractors were:

1. Limited availability of skilled workforce and supervision.
2. Lack of experience of local companies with handling the risks associated with Lump Sum.
3. Desire by owners for involvement in the planning and execution of work.
4. Excessively high construction indirect costs.
5. Turnover rate in Calgary has diluted the talent pool in the province. Because of the need for more people, many marginal people have been added at all levels of industry.
6. High cost of field labour versus shop labour.
7. High demand of shops on module corridors.
8. Labour is 10 times more expensive locally than internationally.
9. There is an adversarial environment locally instead of a collaborative one.

Additional barriers suggested by the Operating Companies were:

1. Mismanagement of risks by all parties.
2. Poor upfront planning.
3. Poor management of change.
4. Productivity varies significantly with geographical area, productivity factor is often underestimated.
5. Companies are eager to fast track projects and do not allow for projects to properly follow the gated process, leaving a significant number of uncertainties. This leads to project price climbing.
6. Operating companies have become so accustomed to cost-reimbursable that they have forgotten how to manage a Lump Sum contract.
7. Fast tracking will not be possible with Lump Sum contracting and there is an operating company desire for Lump Sum.
8. Field labour resource availability is limited and expensive.
9. Lack of proper management skills for Lump Sum in both construction and engineering.
10. Lack of effective competition amongst the contractors and engineering companies.
11. Contractors do not want to accept the risks associated with Lump Sum contracting.

Barrier		One		Two		Three		Four		Five		Six
Weighting	Ranking	Respondents	Weighted Importance	Respondents	Weighted Importance	Respondents	Weighted Importance	Respondents	Weighted Importance	Respondents	Weighted Importance	Resp
6	First	5	30	0	0	3	18	0	0	0	0	3
5	Second	2	10	0	0	2	10	1	5	2	10	4
4	Third	0	0	2	8	3	12	0	0	3	12	2
3	Fourth	0	0	0	0	3	9	2	6	2	6	1
2	Fifth	2	4	1	2	0	0	1	2	1	2	0
1	Sixth	0	0	3	3	0	0	0	0	1	1	0
WEIGHTED TOTAL			44		13		49		13		31	

Table 1: Engineering Contractor Weighted Importance

Barrier		One		Two		Three		Four		Five		Six
Weighting	Ranking	Respondents	Weighted Importance	Respondents	Weighted Importance	Respondents	Weighted Importance	Respondents	Weighted Importance	Respondents	Weighted Importance	Resp
6	First	3	18	0	0	4	24	0	0	1	6	12
5	Second	4	20	1	5	4	20	0	0	7	35	3
4	Third	5	20	4	16	2	8	0	0	4	16	2
3	Fourth	4	12	2	6	4	12	1	3	3	9	1
2	Fifth	0	0	1	2	1	2	5	10	2	4	0
1	Sixth	0	0	2	2	1	1	2	2	0	0	1
WEIGHTED TOTAL			70		31		67		15		70	

Table 2: Owner Companies Weighted Importance

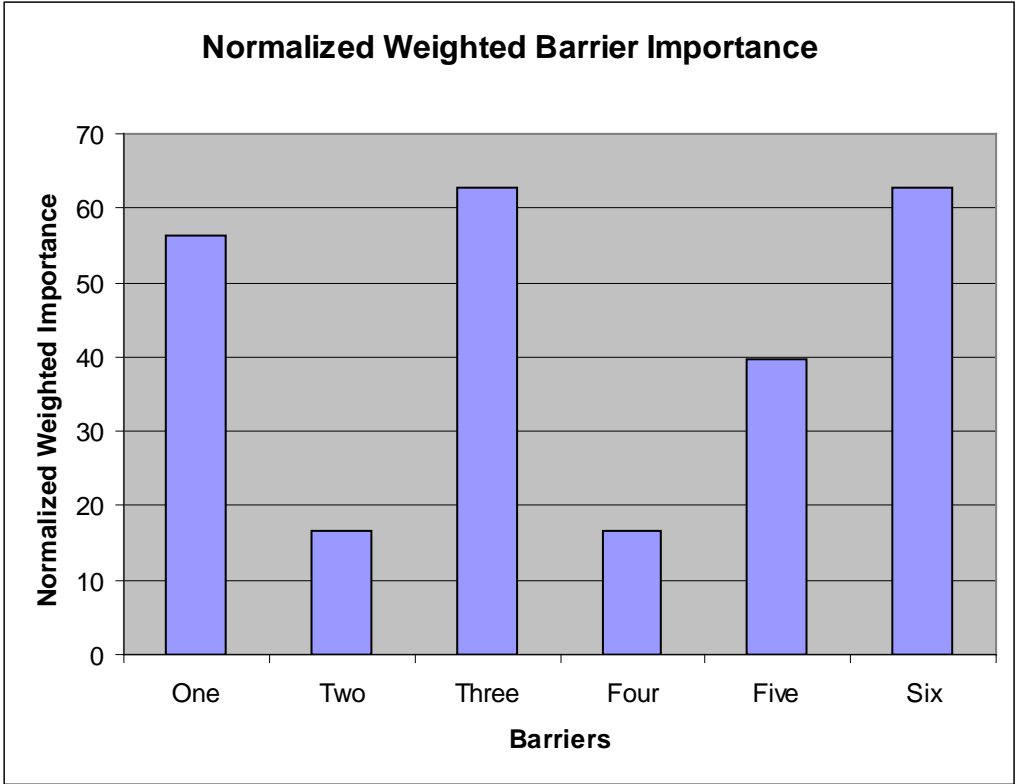


Figure 21: Normalized Weighted Importance of Barriers – Engineering Contractor

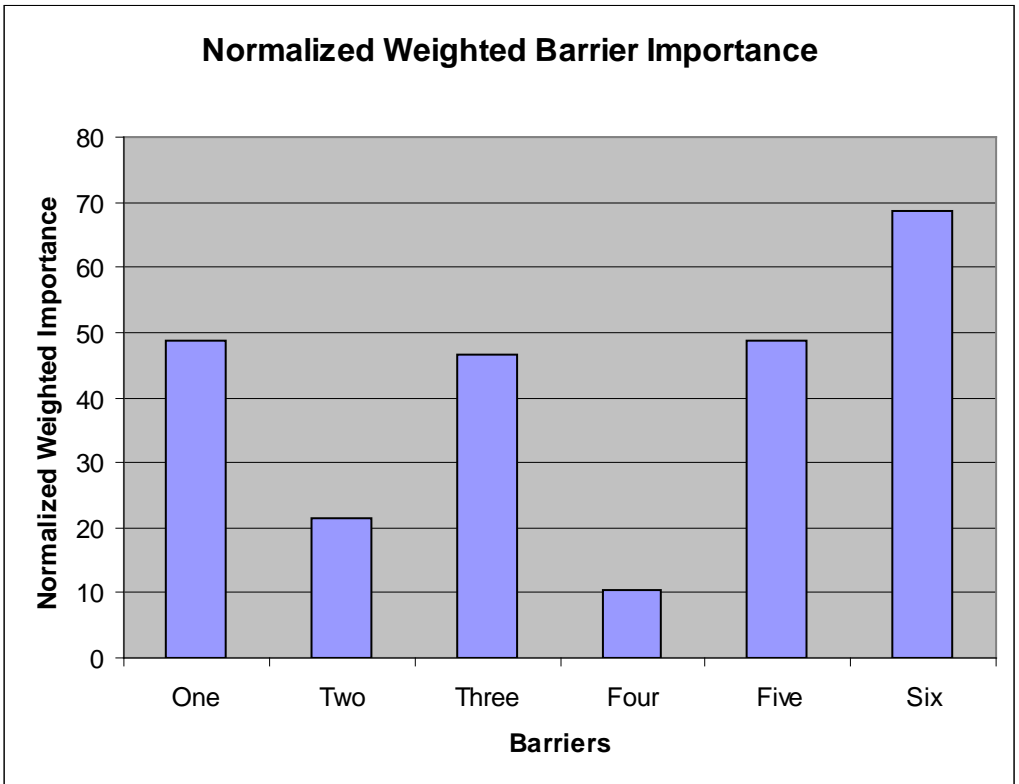


Figure 22: Normalized Weighted Importance of Barriers – Operating Company

Lack of Experience

Respondents were asked if they believe there is a lack of experience on all sides of the industry (engineering contractor, construction contractor, and operating company) in Western Canada, with regard to employing Lump Sum contracts, which prevents Lump Sum contracting from being a feasible option. Figure 23 and 24 show the Engineering Contractor and Operating Company responses respectively.

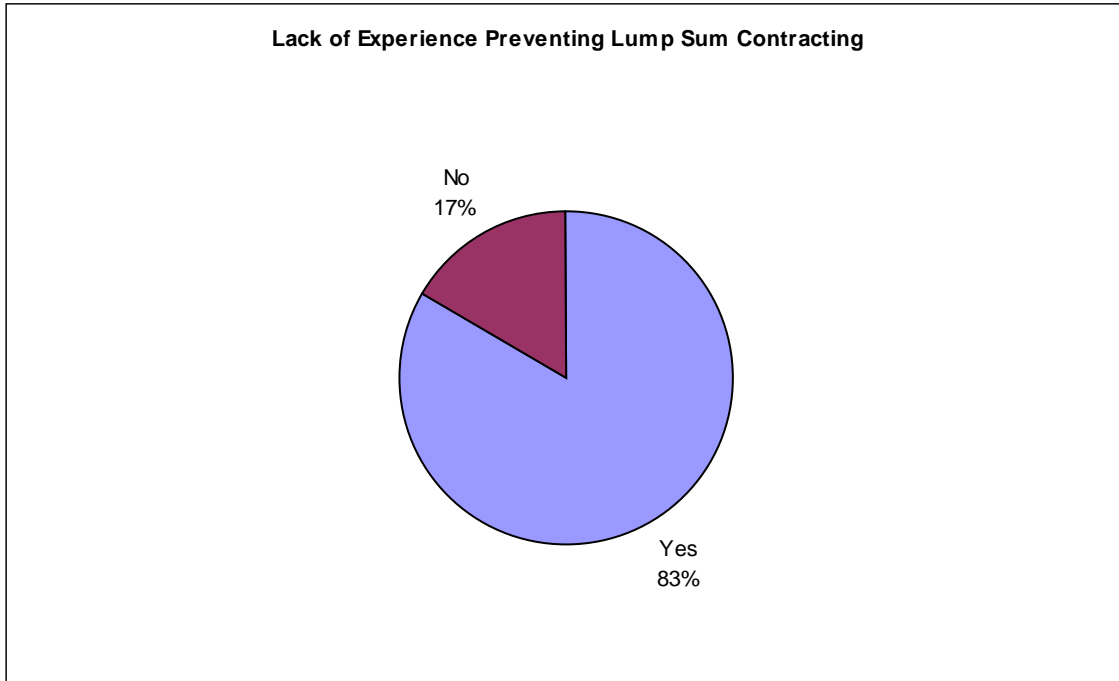


Figure 23: Lack of Experience – Engineering Contractor

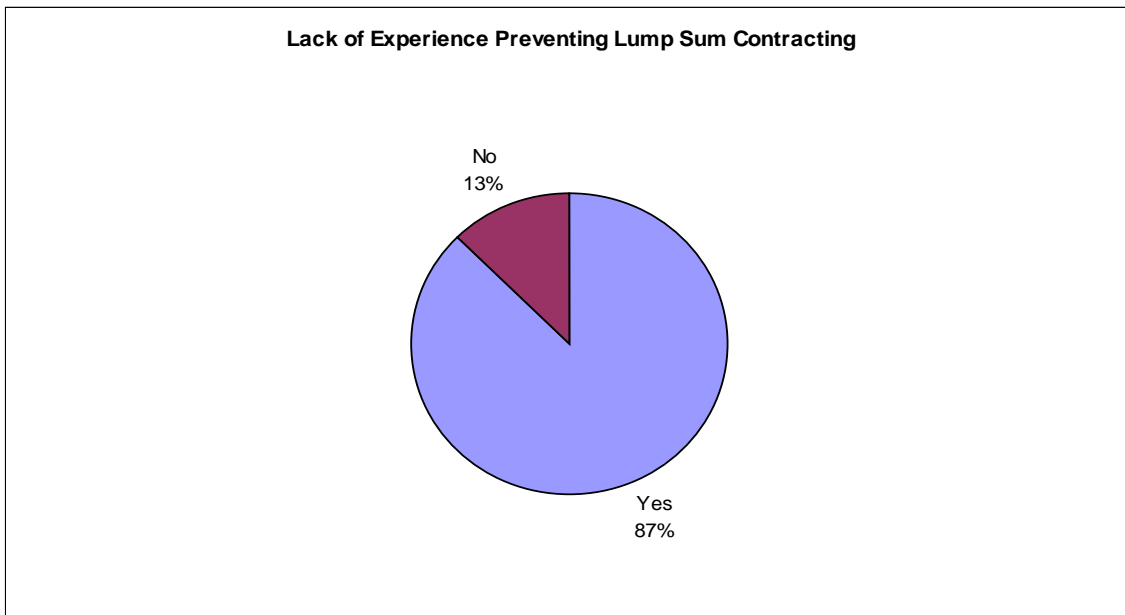


Figure 24: Lack of Experience – Operating Company

Respondents were asked if they feel there are sufficient companies in Western Canada capable of putting together Lump Sum bids, so as to create enough competitive bidding to enable one to judge the validity of Lump Sum proposals. Figure 25 and 26 show the target group responses.

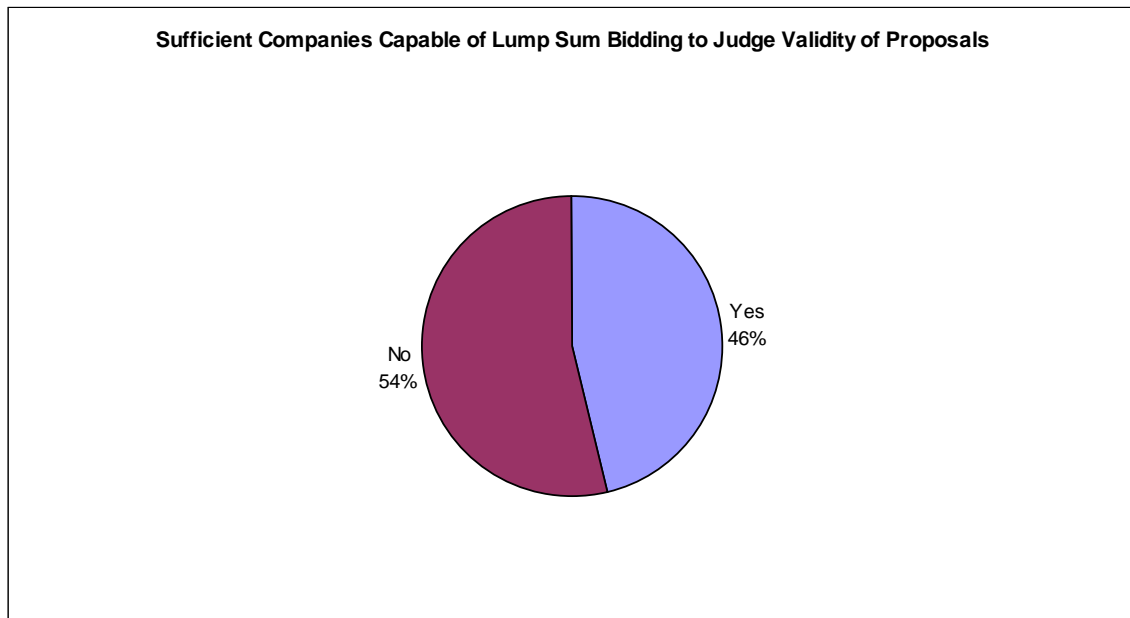


Figure 25: Sufficient Companies Capable of Lump Sum Bidding – Engineering Contractor

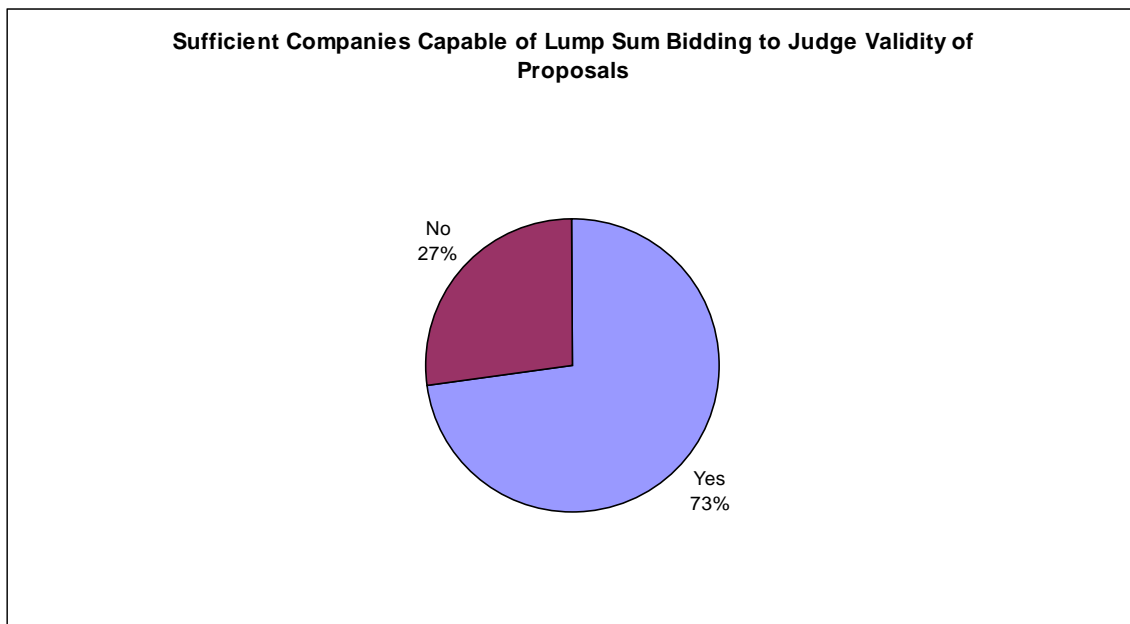


Figure 26: Sufficient Companies Capable of Lump Sum Bidding – Operating Company

Operational Design Input

In pre-interviews, one of the reasons for difficulty in achieving a frozen design and scope, as stated by the engineering contractors, was operational input too late into the design process. To determine when the target groups felt operational input was appropriate and when input should be limited to ensure smooth project execution, both groups were asked at what stages operations should and should not have a say in the design. Table 3 represents the Engineering Contractor responses. Table 4 shows the Operating Company responses.

Stage At Which Input Should be Limited	Respondents (%)
1. After FEED Phase	67
2. After Detailed Engineering	17
3. Operations should have input at all stages	17

Table 3: Stage at Which Operational Input Should be Limited – Engineering Contractor

There were quite insightful additional comments provided by the Engineering Contractors in the qualitative responses to the questions that are worth taking note of. Many of the comments involved themes of experienced personnel, accountability, proper up-front scoping:

1. Operational team providing input should be lead by someone with significant experience in project execution.
2. Input level depends on the impact of the change. In a Lump Sum situation the changes would be submitted by change order therefore it is in the owner's best interest to limit them.
3. Operations should be involved in all stages of the project, but they must be held accountable for their involvement (cost, schedule, scope and commercial).
4. If the project is properly scoped, operations should have no more need for input after the FEED phase.
5. Should have input after FEED phase only if required to ensure functionality.

Stage at Which Input Should be Limited	Respondents (%)
1. After Conceptual Design Phase	17
2. After DBM Phase	8
3. After FEED Phase	38
4. After Detailed Engineering	8
5. Operations should have input at all stages	29

Table 4: Stage at Which Operational Input Should is Limited – Operating Company

Additional Comments provided by the Operating Company participants involve the same themes are the Engineering Contractor respondents, experienced personnel, accountability:

1. Most respondents who said that Operations should have input at all stages, commented that the ability of operations to make major changes in later phases should be severely restricted to only key revisions necessary for proper design functionality and should be held accountable for the cost of the changes.
2. A dedicated and experienced operations staff should be involved in the design.

Project Manager Empowerment

Both target groups were asked their opinions on the level of empowerment given to Project Managers at the operating companies. The potential lack of empowerment of PMs was a repeated theme from the pre-interviews. The interviewees felt that Operating Company Project Managers were not given enough authority to adequately control their project and avoid unnecessary late changes. The anonymous survey responses are below in Figures 27 and 28.

The issue of lack of empowerment is clearly seen as an issue among project managers on both sides of the industry as the responses are nearly identical between the two groups. 77% of Engineering Contractors and 79% of Operating Company respondents felt that PMs on the owner side, are not given enough control over the project they are managing to ensure it is executed in an efficient and organized manner.

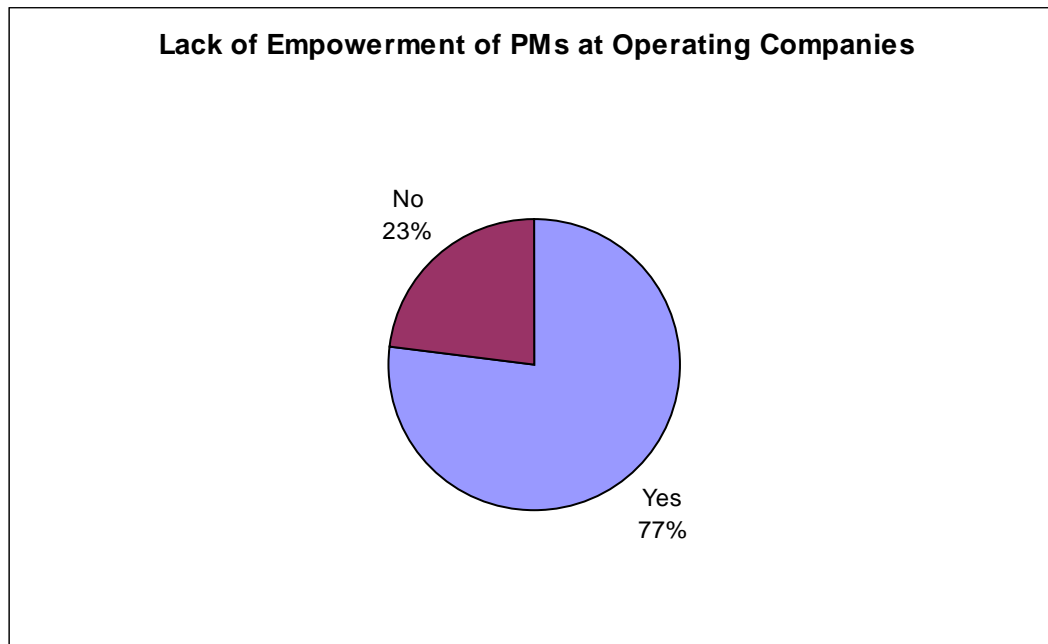


Figure 27: Lack of Owner Project Manager Empowerment - Engineering Contractor

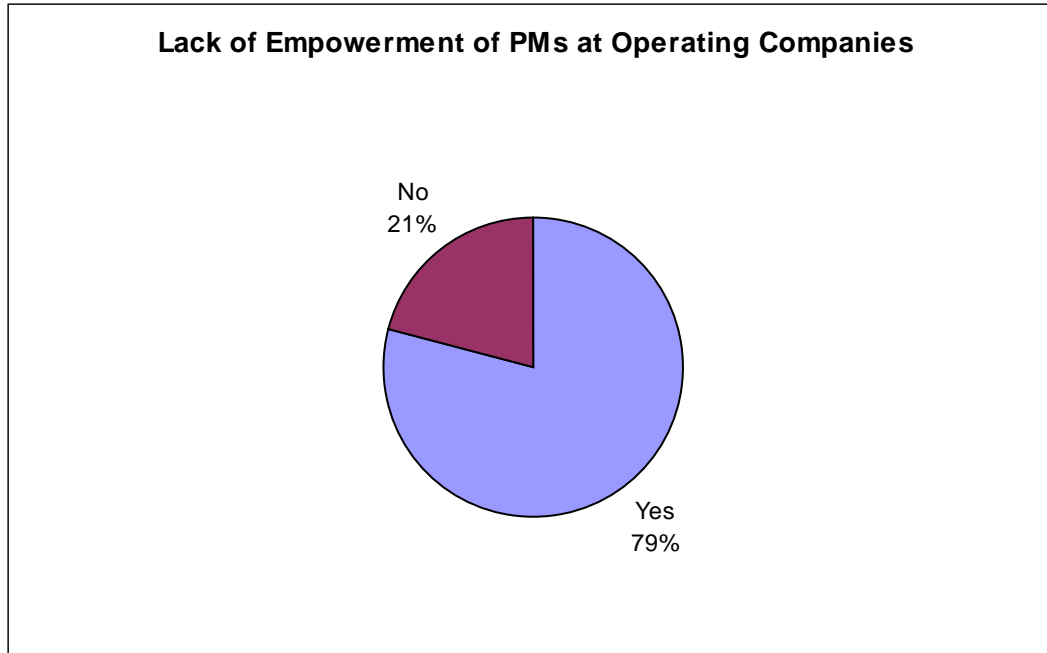


Figure 28: Lack of Owner Project Manager Empowerment – Operating Company

The engineering contractor respondents made qualitative statements explaining the context of their answers. A common theme among the responses was that owner company operational departments are given too much authority to make changes to the project scope on which the AFE was based that are functionally unnecessary. The below responses are a selection showing the insightful common threads among response.

- Owners project managers are not empowered enough to execute the project that the AFE was based on. Other owner company stakeholders are free to make changes/additions to the original scope of work as the project progresses, resulting in delays and cost overruns.
- The project should be defined, estimated and delivered as originally conceived at the completion of FEED. “Improving” the project through the EPC stage leads to delays, cost overruns and results in quality issues.
- The project managers are not empowered enough to say no to inconsequential late changes from the Business Unit.
- Operational departments at client companies are given too much power to be involved in the project process even though they lack the understanding of project management principles.

Operating company participants were asked if they noticed this lack of empowerment at their own companies and what they believed the reason for this lack of confidence in Project Managers stems from. A common theme among 60% of respondents was a lack of project management methods experience and knowledge within the Business Units. Lack of trust was between the Business Units and the Project Management departments were another large theme. It was noted that the Business Unit leaders often felt the project managers were lying to them about the actual cost of the facility. It was

mentioned that this lack of trust could have stemmed from miscommunications and past project overruns without proper documentation available to explain the overruns. The common threads of responses are below.

1. Lack of Business Unit (BU) Project Management Experience.
2. Business Units not following proper gated process.
3. Miscommunication from PMs to operational groups and misunderstanding of impact of late changes.
4. It is harder for BU to get the projects approved by upper management with the real price, so they create a lower unverified budget price and blame PMs when the project does not come at the budgeted amount.
5. Not enough involvement of BU personnel upfront.
6. Lack of support from management for Project Managers.

There were a few respondents who made the comment that the “Business Unit lead” on the project is the owner of the scope and can make any changes they like. From the demographic section of the paper, the author knows that a few respondents were from the operations side of the owner companies. These individuals who made this comment were most likely from that side of the business. These differences of opinion lead to another interesting area of future study, the dynamics of a project within an operating company, who has authority over what phases/scopes of work, and how would this look ideally.

Application of Lump Sum

Respondents were asked how they were willing to apply Lump Sum in the future: what financial ranges they were willing to supply contracts for and what scopes of work they were willing to perform. Figures 29 and 30 show the financial ranges and Figures 31 and 32 show the scopes of work.

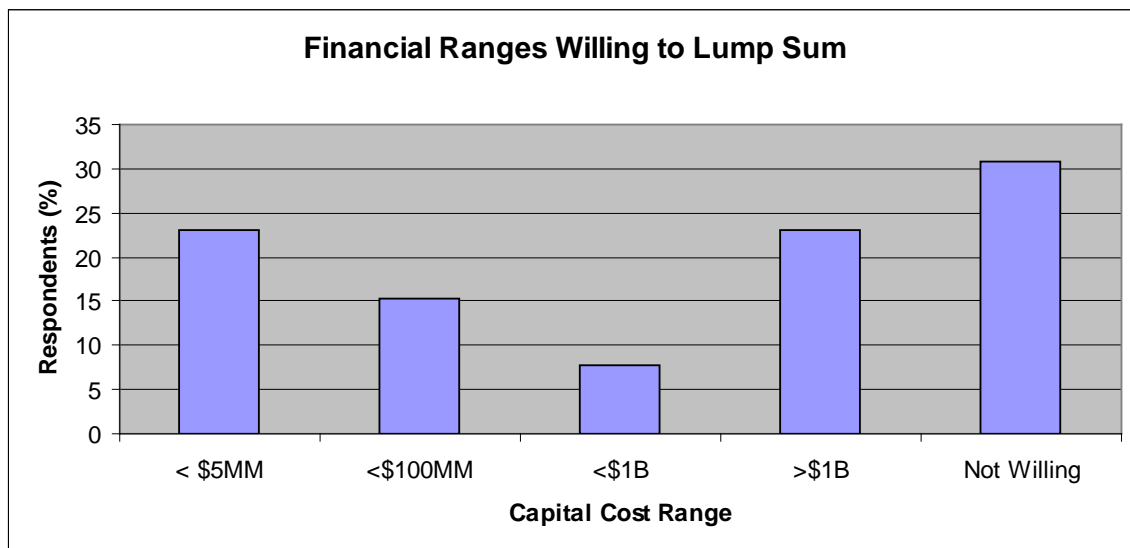


Figure 29: Financial Ranges – Engineering Contractor

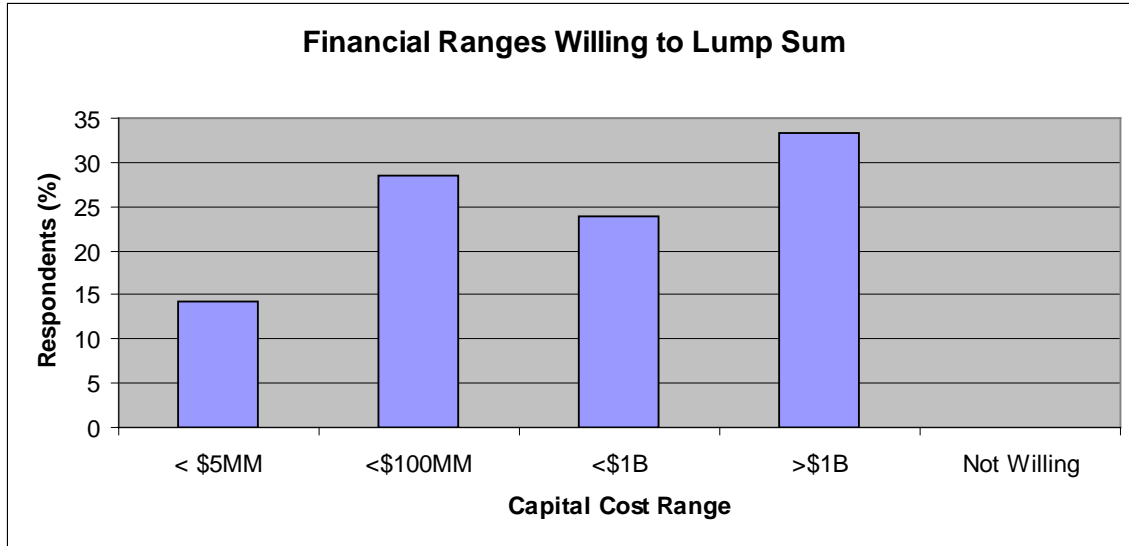


Figure 30: Financial Ranges – Operating Company

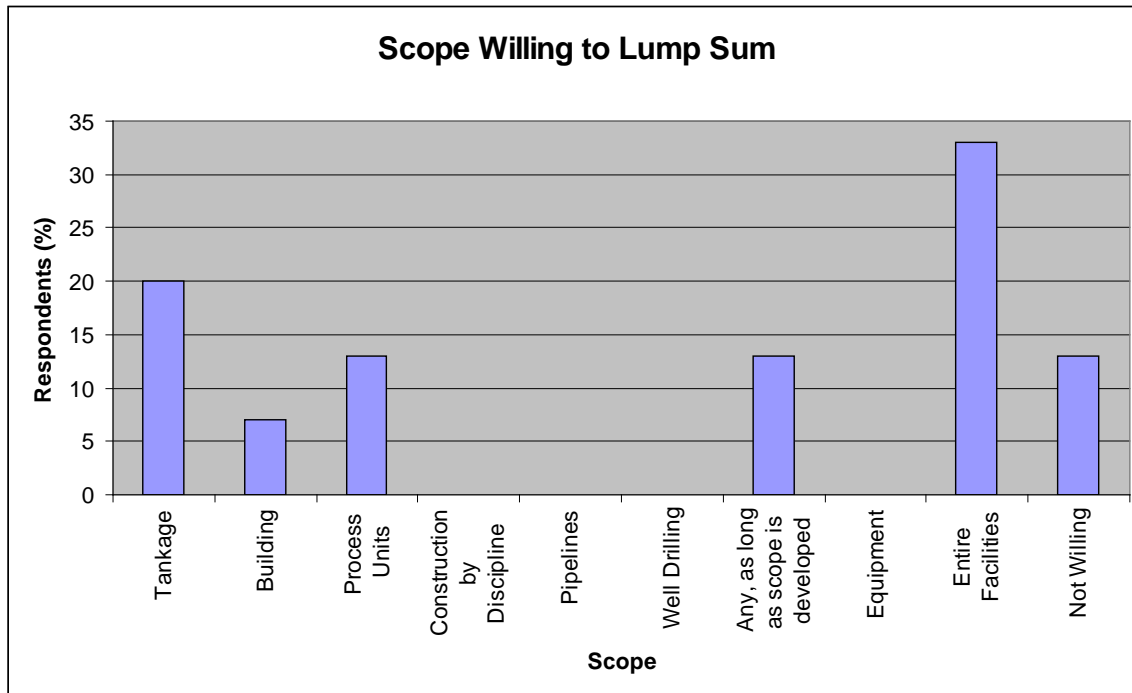


Figure 31: Scopes to Lump Sum – Engineering Contractor

A clarification made by one engineering contractor respondent who was willing to Lump Sum entire facilities, commented that their company was only willing to do so using their internal construction division as they did not trust the abilities and efficiency of external contractor firms.

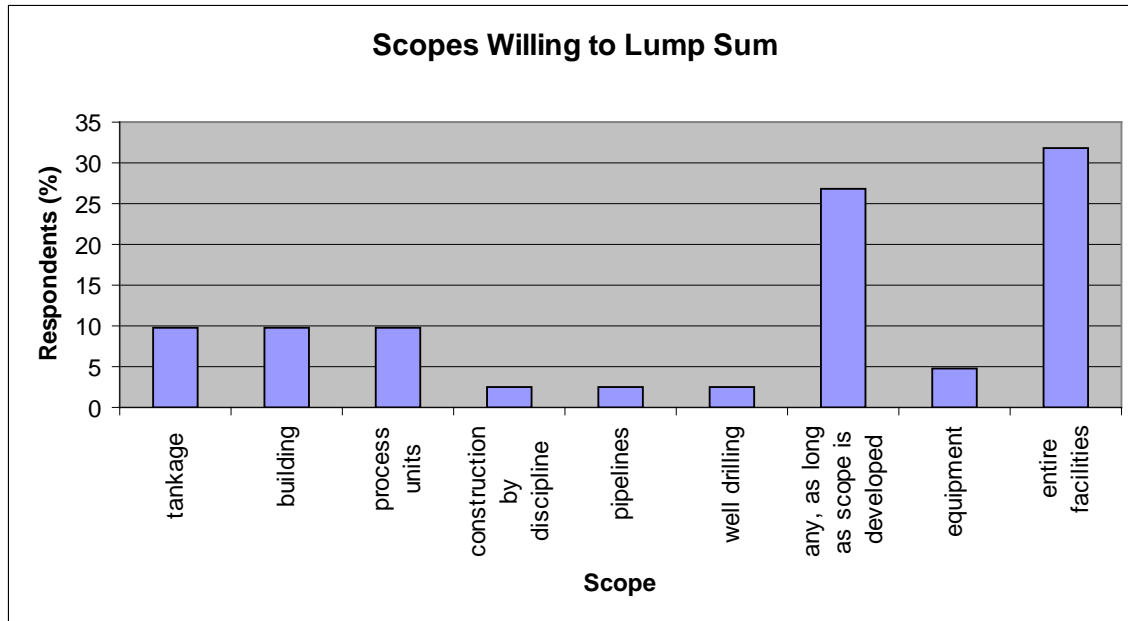


Figure 32: Scopes to Lump Sum – Operating Company

A clarification made by one owner company respondent who was willing to Lump Sum any scope, as long as it was developed, excluded plant revamp.

Target Group Specific Questions – Engineering Contractors

Lump Sum Contracting by Project Phase

Engineering Contractor participants were asked about their specific interest in Lump Sum contracts for different phases of a project:

1. FEED Phase.
2. Detailed Engineering Phase.
3. Construction Phase.
4. Full EPC Contract.

Their responses are in the figures below. The majority of Engineering Contractors did not show interest in Lump Sum for FEED as can be seen from Figure 33.

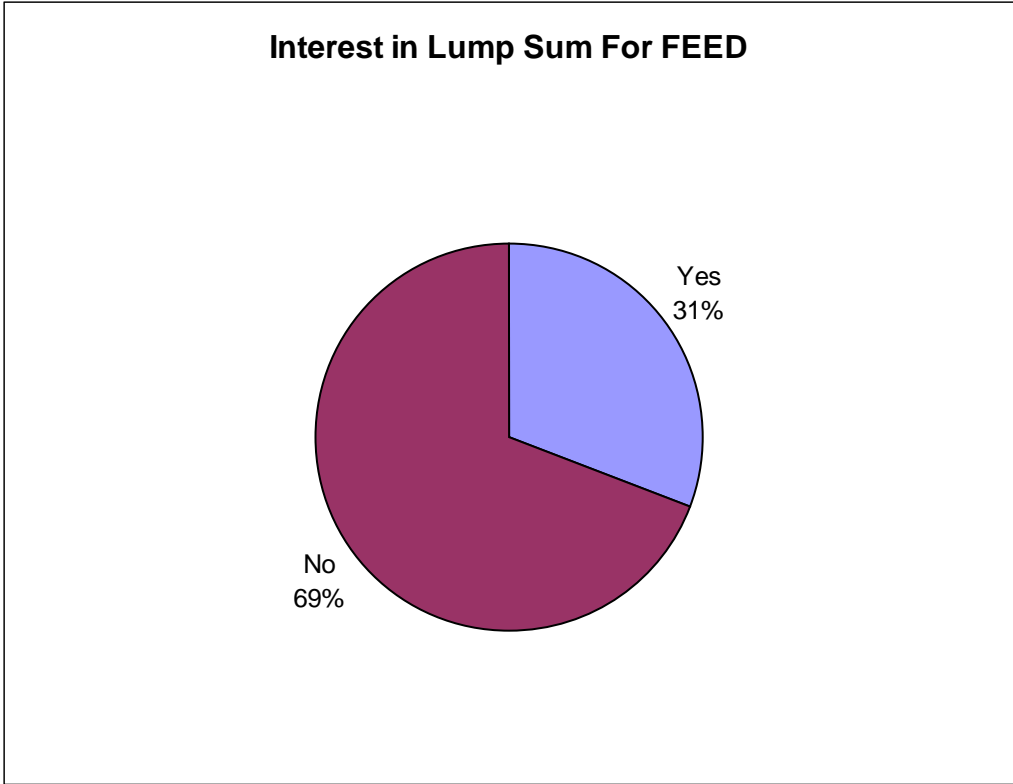


Figure 33: Interest in Lump Sum for FEED- Engineering Contractors

The main two reasons for not preferring Lump Sum for FEED by engineering contractors are shown in Figure 34.

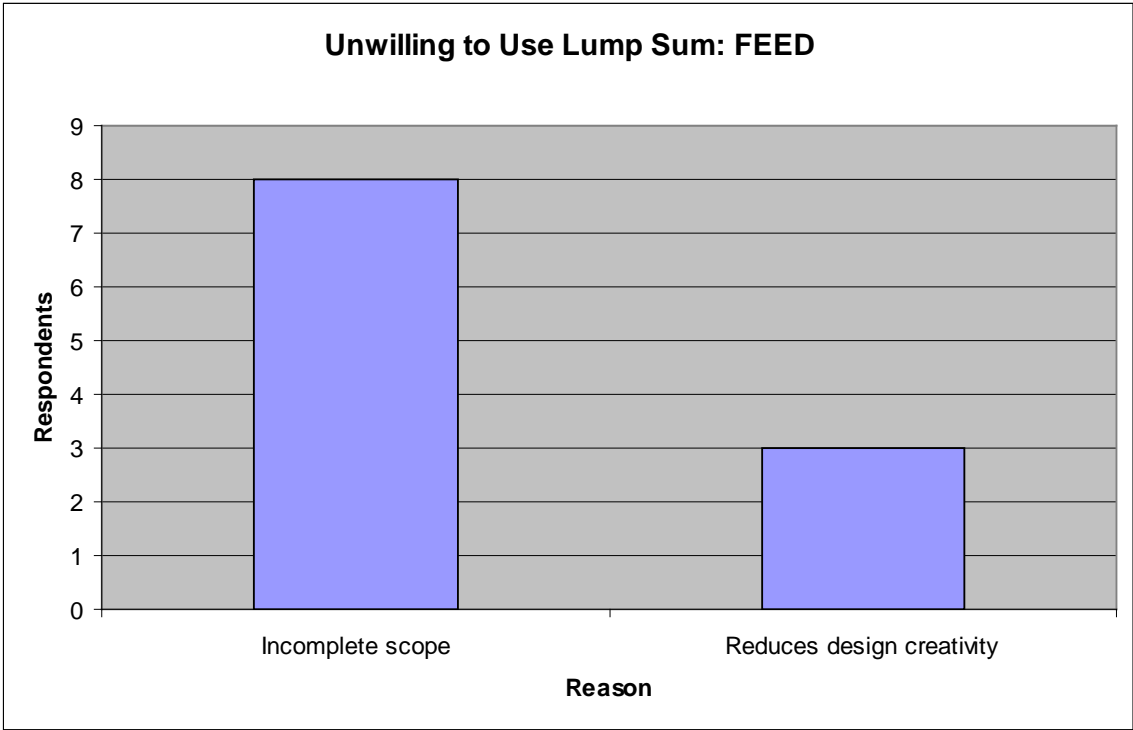


Figure 34: Reasons for not preferring Lump Sum for FEED - Engineering Contractors

An additional common comment of note was that Lump Sum for FEED is not the best approach for the client companies as it is much more cost effective to define the scope of the project and the overall project execution strategy on a reimbursable cost basis.

Engineering Contractors showed considerably more interest in using Lump Sum for the Detailed Engineering phase See Figure 35.

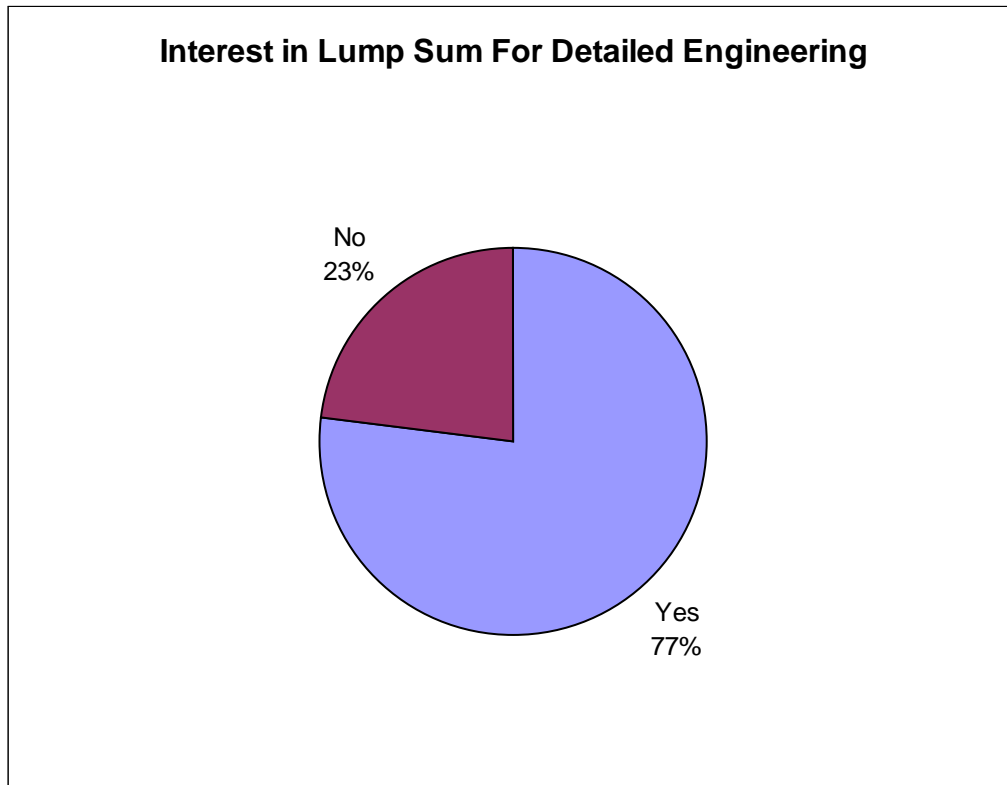


Figure 35: Interest in Lump Sum for Detailed Engineering

The engineering contractors were interested in Lump Summing this phase because the work can be controlled as it should be clearly defined from FEED Phase. It is to be noted that the minority who showed no interest in Lump Sum for detailed engineering identified "incomplete scope" and "too many unknown risks" as the main reasons.

This survey also shows that Engineering Contractors are less interested in Lump Sum arrangement for Construction phase. See Figure 36.

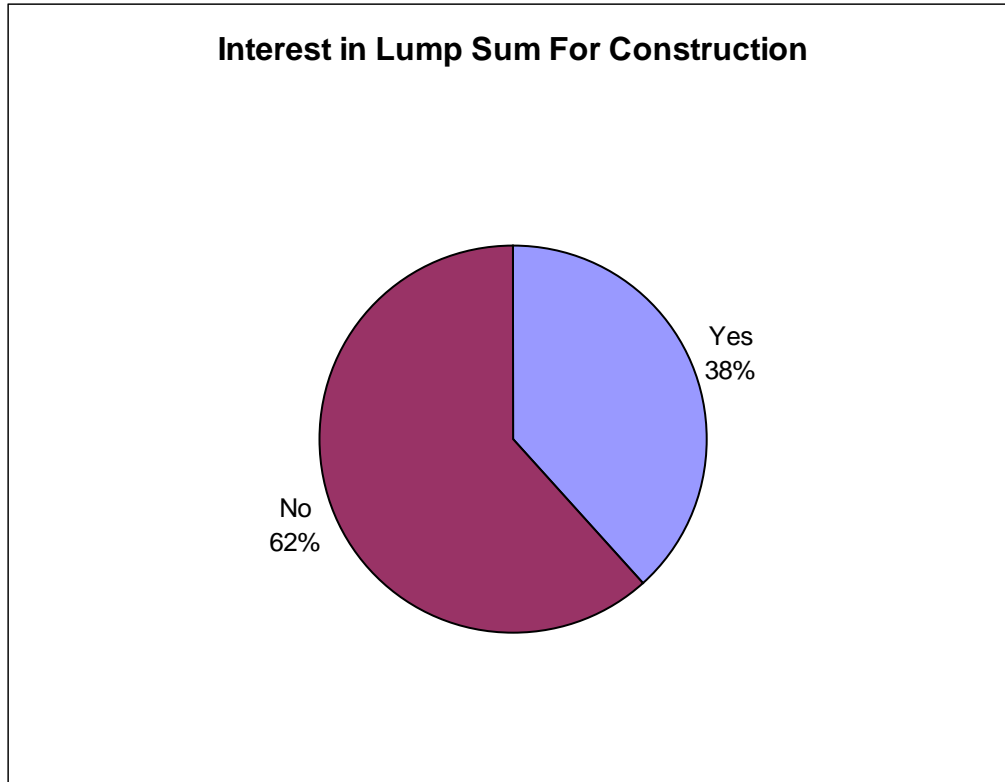


Figure 36: Interest in Lump Sum for Construction – Engineering Contractors

Respondents who said “Yes” qualified their response by the statements below. They would only agree to a Lump Sum contractual arrangement if:

1. Construction contractors willing to commit to Lump Sum contracts were available.
2. An arrangement could be reached with the operating company where if construction productivity goes down for a reason out of the control of the engineering/construction contractor they will be compensated.
3. The contract was for small pieces of work only.

Respondents, who said “NO”, identified the main reason as; including direct field labour cost is too risky for reasons outside the control of the engineering contractor:

1. Lack of skilled resources.
2. Lack of skilled construction supervision.
3. Poor productivity.
4. Rigid work organizations (unions).
5. Weather conditions.
6. Construction contractors are not willing to share the risk of Lump Sum.

Many appear prepared to take the risks on growth of quantities but not on productivity and feel the amount of risk premium associated with productivity fluctuations built into the proposal will make the Lump Sum price more expensive to the owner than cost-reimbursable.

An additional reason given was that in the current state of the construction environment, it is hard to define how much construction supervision the owner companies should have. They may want to supervise on site more than is built into the fixed price.

Engineering Contractors are less interested in a full EPC arrangement, with numbers almost matching those given for the construction phase. See Figure 37.

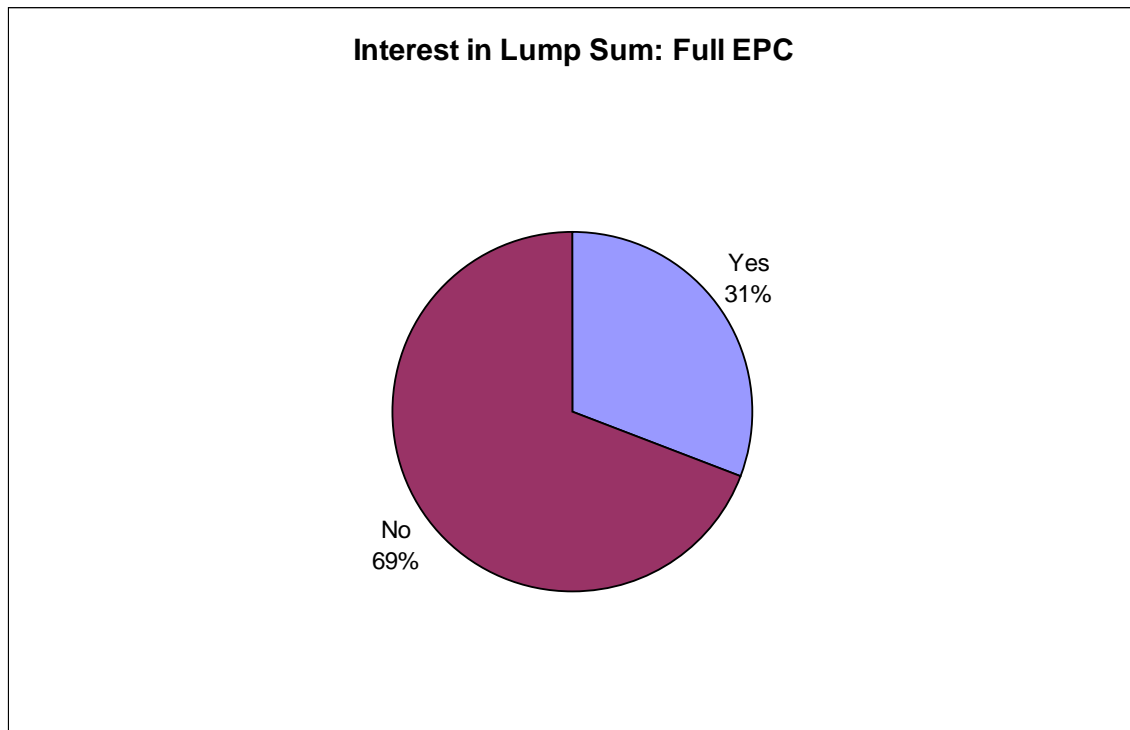


Figure 37: Interest in Lump Sum for Full EPC – Engineering Contractors

The reasons for both yes and no were the same as those given for construction, implying that the major risk to a Full EPC contract is the construction phase. One respondent made the comment that they have had a positive experience performing a full EPC Lump Sum contract sharing the risk with another company. This may be an interesting avenue to pursue since a recurring theme found in this research was concern over levels of risk and the distribution of risk when using a Lump Sum contract.

Respondents were also asked if they had an Internal Construction division. Their answers are in Figure 38 below.

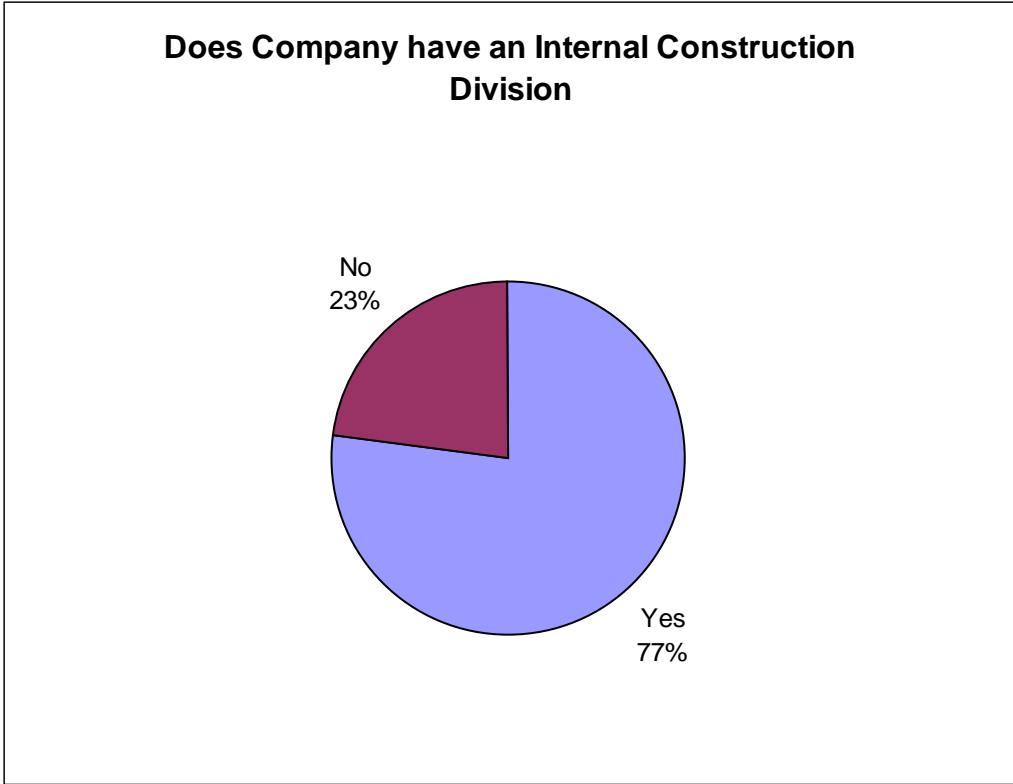


Figure 38: Internal Construction Division – Engineering Contractors

The respondents were also asked if they felt Western Canada Oil and Gas was riskier than oil and gas internationally, from a Lump Sum perspective. Their quantitative answer can be seen below in Figure 39. It is interesting to note that the percentages for yes and no are exactly the same as the percentages for having an internal construction division and those who do not. It is possible that those whose companies have an internal construction division have done much more international Lump Sum work. Therefore, they may have an increased knowledge and perspective on the risk levels internationally versus Western Canada.

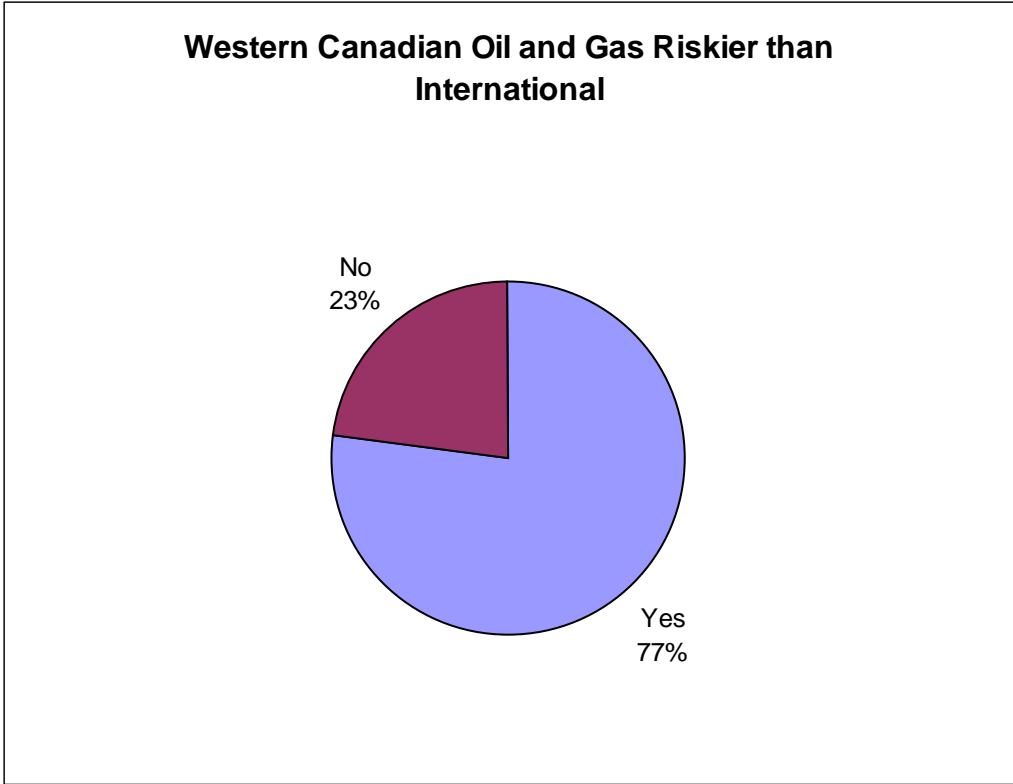


Figure 39: Western Canadian vs., International Risk - Engineering Contractors

Based on answers given during pre-interviews, the engineering contractor respondents were asked if they felt Western Canadian oil and gas clients want a higher level of client input on projects, compared to international clients. Their answers are summarized in Figure 40. Engineering contractors generally agree that Western Canadian Oil and Gas clients want a higher level of input than international clients. It is interesting to note that the percentages who felt that Canadian clients wanted a higher level of input when compared with international clients match the percentages of those who had performed Lump Sum contracts internationally in the past. This result could imply that those who have performed international Lump Sum contracts have a greater understanding of the differences between the two types of clients, than those who have not done international Lump Sum projects.

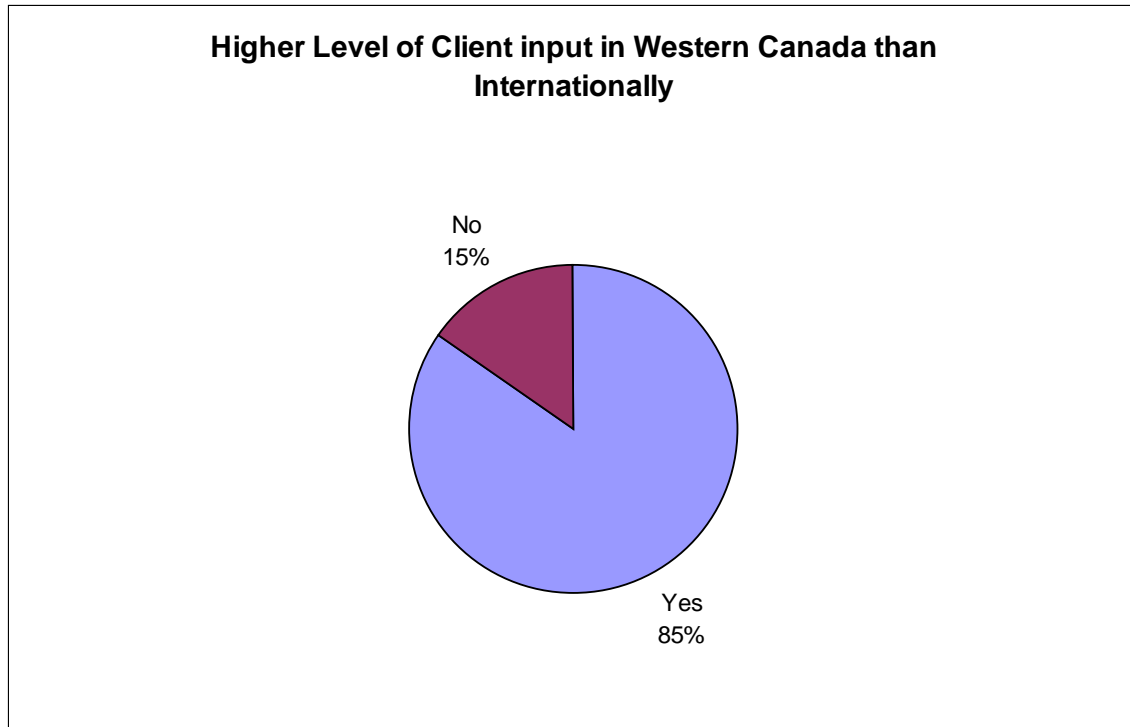


Figure 40: High Level of Client Input – Engineering Contractors

Target Group Specific Questions – Oil and Gas Operating Companies

Owner Company Input

Pre-interviews had revealed that those engineering contractors interviewed believe Lump Sum contracting works well internationally because the owners are willing to be hands-off after the initial scoping of the project. The anonymous survey of engineering contractors revealed that a broad range of engineering contractors feel the same. The operating company respondents were asked if they feel their company engages in this type of activity when conducting projects and what they believe the reasons behind this behaviour are. As can be seen in Figure 41, the majority of operating company respondents believes they do participate in this type of behaviour.

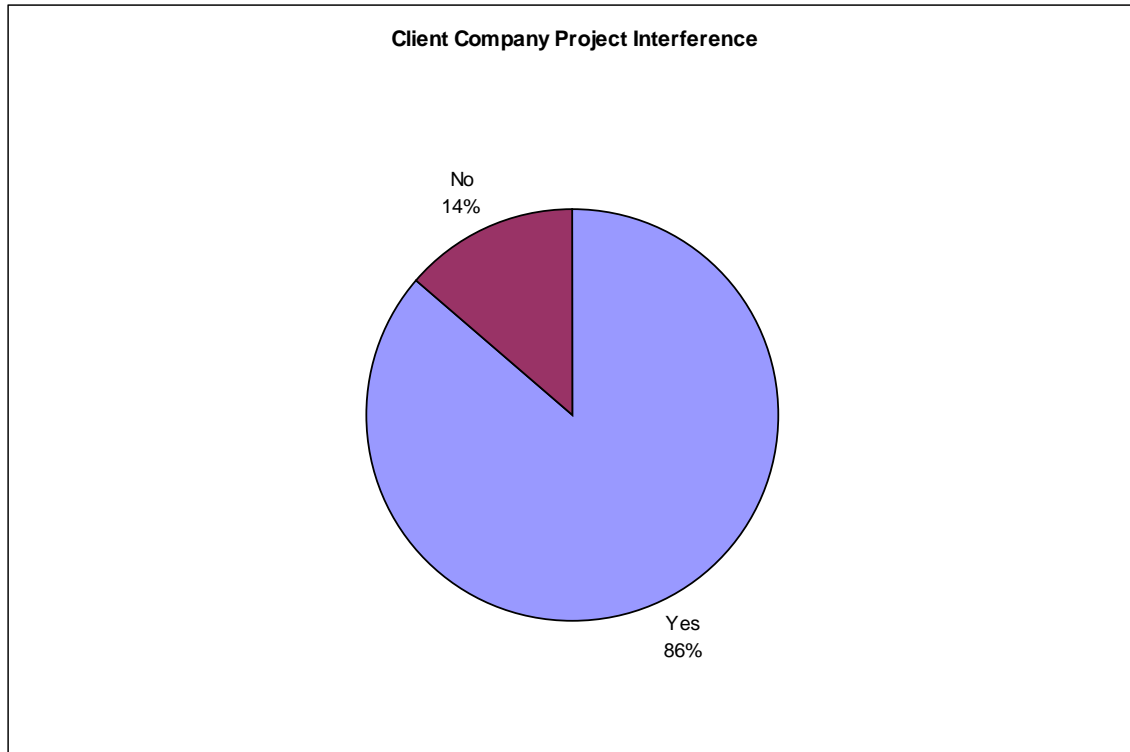


Figure 41: Operating Company Project Interference – Operating Company

The major themes of the reasons given for this behaviour pattern of interference are poor initial scope definition, resulting in late changes and improperly distributed decision-making authority within the operating companies. Individuals with little understanding of the requirement for scope freeze and the impact of the changes they make are able to maintain influence over the project throughout all phases. Additional clarification of these themes and other insightful notes are given in the comments below:

1. Lack of proper initial scoping and standard definition require the owner to make changes later in the development process than would be ideal. In a Lump Sum contracting situation, this is a recipe for disaster.
 - Bad scoping is often due to involving key stakeholders too late in the project development process, i.e. field operations, maintenance, etc, resulting in some changes that are necessary, but could have been identified earlier.
 - Owner companies try to fast track their projects without freezing their requirements properly as the design evolves.
 - Budgets are released late in the year which does not leave enough time to do upfront detailed planning. There is no steady development of projects. Once budgets are released, projects are forced to accelerate quickly, bypassing the front end planning stage.
 - Facility design is often forced to move forward (fast-tracking) before the subsurface information is verified or the economics of the project calculated.

2. Decision-making authority is not properly distributed by the executive team resulting in the wrong people interfering with the project process.
 - The project managers are willing to be hands-off but the Business Unit and operational departments within the organizations have influence over the project and do not understand the need for a frozen scope and no late changes.
 - The flow of money from operational groups to the project team is the main root cause for not having sufficient and proper delegation of authority with the owner companies.
3. Internationally, development plans are required by local governments before the project is allowed to proceed. This forces owners to define projects early. This is not done in Western Canada and often projects are allowed to move forward before all the required information is defined or acquired.
4. EPC want too much owner “hands-off” in Lump Sum contracts, mistaking Lump Sum for turn-key. Clients do not define the scope properly and need to respect the gated process and complete all early gates before proceeding.
5. The stubborn behaviour on both sides. The owner enforces unachievable expectations and the engineering company exploits the weaknesses (poor scope definition upfront) of the operating company.
6. When Alberta existed in a heated economy, there was a perceived lack of skilled management at the engineering shops. Owner companies decided they needed to take more control over their projects. This lead the owners to become accustomed to directing the contractors work. This has lead to the feeling that they know how to better manage a project than the contractor companies, whom they ironically hire for their expertise in executing projects.

Operating Company Late Changes

During pre-interviews, late changes to project scope emerged as one of the themes that may cause Lump Sum contracting issues within Western Canadian Oil and Gas. Three main reasons were found from the pre-interviews:

1. Changes in the understanding of the business needs, by the client.
2. Market/business changes.
3. Technical aspects were originally less understood (because many projects within Western Canadian Oil and Gas involve new technologies in an immature market).

The operating company respondents were asked to select what they felt was the main reason for late change requests being sent to engineering. They were also asked to add any reasons they felt were missing. Figure 42 shows the distribution of their responses.

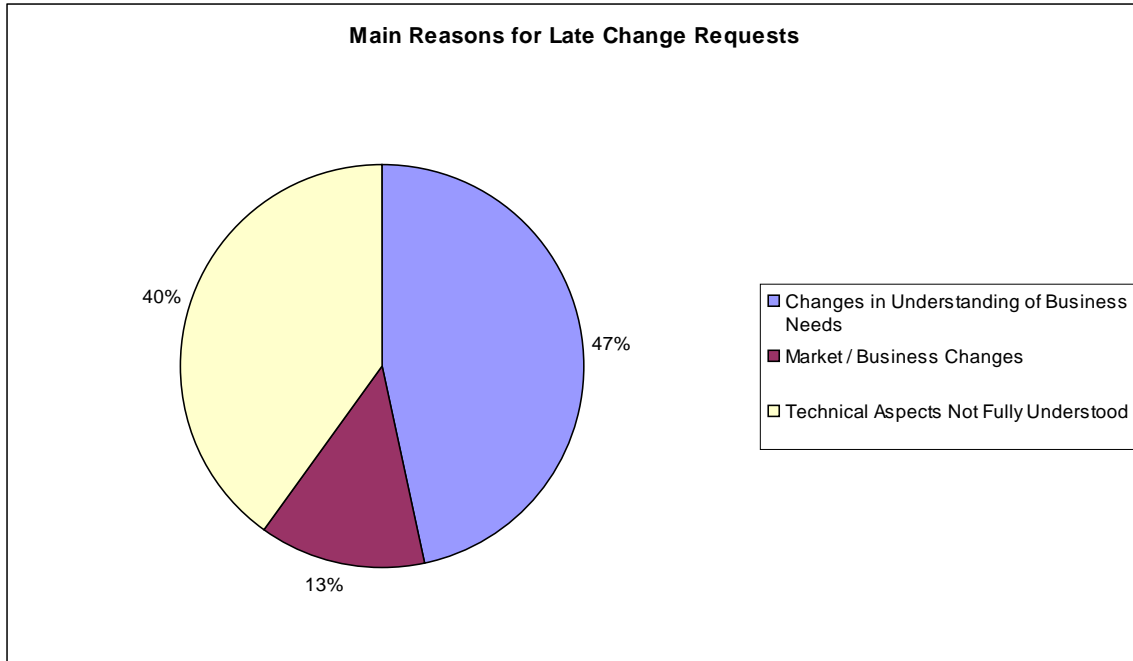


Figure 42: Main Reasons for Late Change Requests

Missing reasons added by the respondents:

1. Often there is very little understanding of the business requirements for the project and no plan for what project success would look like. Very little understanding of how cost, schedule and scope are intertwined.
2. Fast tracking causes the late changes. The schedule allows insufficient time for the engineers to design properly and does not allow for proper constructability reviews during the engineering phase.
3. Not sufficiently involving all required stakeholders and subject matter experts early.
4. Lack of adequate definition of and understanding of risk.

6.0 Discussion of Findings

6.1 Sample of Professionals

The position titles reported by the professionals indicated a large number of individuals with a high number of years of industry experience. 75% of the survey respondents from the engineering contractor companies had greater than 25 years experience and 42% of the Operating company respondents had greater than 25 years experience. Gathering the responses from this section of the industry was important as the study wanted to gain a picture of the opinions of people in positions of decision-making authority and organizational influence. This high level of authority could be seen in the roles of the participants. 66% of engineering contractor respondents were of the senior manager level and above, while 41% of operating company respondents were of the senior manager level and above.

6.2 Current Contractual Strategy

The current contractual strategy in Western Canadian oil and gas was substantially cost-reimbursable. 55% of engineering contractors utilized cost-reimbursable and 42% of operating company respondents utilized cost reimbursable contracting. Respondents listed every type of contract they used and qualified their Lump Sum usage by saying that it was mainly used for international projects, equipment purchase or small portions of the scope in Western Canada, rather than being the main strategy on projects. It can therefore be noted that in the majority of companies, cost-reimbursable is currently the main strategy on larger projects.

6.3 Interest in Lump Sum Contracting

This question represents a major disconnect between the operating companies and engineering contractor companies. 91% of operating companies compared to 62% of engineering contractors were interested in using Lump Sum contracting as a contracting strategy in Western Canada.

Upon review of the qualitative comments from both target groups major themes emerged. These themes subsequently began recurring over the course of the survey in the qualitative explanation of their points of view, both for and against Lump Sum contracting. Themes found were:

- The desire exists for cost certainty on part of the owner.
- The desire exists for more clearly defined project scopes than the industry in Western Canadian Oil and Gas is currently providing.
- The Alberta labour market has serious challenges involving availability of skilled labour and inability to predict productivity.
- Western Canadian Oil and gas has large risks which, in a Lump Sum contracting situation would be met with large risk premiums.
- Engineering companies believe the operating company desire for large amounts of involvement in project execution will lead to undesirable events in a Lump Sum contracting situation.
- The desire for Fast Tracking is seen as a barrier to Lump Sum contracting.
- The desire by the operating companies to transfer risk.

6.4 Effect of Lump Sum on Cost

This topic appears to be another source of disconnect between the engineering contractors and operating companies. While the majority of respondents from each company felt that Lump Sum contracting would increase cost, 92% on engineering contractors compared with 46% of operating company respondents. 38% of operating company respondents versus 8% of engineering contractor respondents felt that Lump Sum contracting would decrease cost. The major reason for the perceived cost increase amongst both contractors and owners was the large risk factor that would have to be applied to combat labour unpredictability, owner interference, incomplete scope and scope changes. Even among those who said the cost would decrease or would result in

no cost change, the same themes prevailed of desire for scope definition, efficient execution planning and risk transfer. The theme of construction contractors unwilling to accept lump sum contracts in order to enable engineering contractors to partner with them to accept full EPC contracts was introduced.

What can be drawn from these results is that there is a perceived high level of risk associated with executing projects in Western Canada. The topic of Lump Sum contracting brings the existing challenge areas to the surface since risks must be accounted for upfront. The use of cost-reimbursable contracts masks the risks.

6.5 Current Lump Sum Contract Use

A larger majority of engineering contractors had used Lump Sum contracts internationally, than used them in Western Canada. A smaller majority of operating companies had conducted Lump Sum contracting internationally as compared to those who had performed them in Western Canada. The majority of engineering contractors would not disclose the dollar value of the contracts they had performed so it is hard to draw any conclusions about experience levels when compared with operating companies.

The majority of respondents felt Western Canada was a riskier project environment than internationally. The major themes increasing the risk in Western Canada were lack of experience in delivering projects in that type of environment, and the same labour unpredictability, owner involvement in project execution, late changes, poor scope definition and cost-reimbursable construction environment as previously mentioned.

6.6 Barriers to Lump Sum Contracting

The major barriers were seen as:

- Lack of scope definition.
- Local construction culture favours cost-reimbursable and as a result the engineering companies can not manage construction risk.
- Field labour cost and predictability.
- Client late changes.

Lack of scope definition was ranked as the largest barrier by both groups, but there was slight disconnect in the distribution of the remaining issues. The engineering contractors ranked local construction culture as an equal problem to lack of scope definition, with labour cost as a close third. The operating companies ranked lack of scope definition well above the other values, with late changes and labour cost equal with construction culture as fourth. This result shows disparity in what the target groups see as a major issue.

There was a slight disconnect in the major themes distilled from the additional barriers stated by the two target groups. The majority of comments on additional barriers stated by the engineering contractors were consistent and revolved around labour issues: the limited availability of a skilled workforce due to talent dilution, high labour cost, and lack

of experience with handling the risks associated with Lump Sum. The major themes observed from the operating company barriers were more diverse. Many did revolve around labour resource issues but desire for fast tracking, poor planning and management of change, and lack of desire among contractors to accept the project risks.

This result indicates that labour market concerns are highly on the minds of both groups, but more on the mind of the engineering contractor who would have to absorb this risk in a Lump Sum contracting situation.

6.7 Industry Experience

Both target groups overwhelmingly felt there was insufficient experience to make a Lump Sum contracting solution feasible. This result shows a large perceived experience and education deficit with respect to the managing of Lump Sum contracts. This would have to be overcome in order to make Lump Sum contracting feasible.

When asked whether there were sufficient companies capable of Lump Sum bidding, there was a slight disconnect between the target groups. A large majority of operating company respondents felt that there were sufficient companies in the industry with the knowledge to bid Lump Sum. The engineering company respondents were almost split in half in their opinion of whether there were sufficient companies capable of Lump Sum bidding. Since the answers were in such disparity, it is difficult to draw conclusions from the results. The qualitative reasons behind their opinions were not asked. Pursuing qualitative responses on this topic would be a good area for future study to determine the reasons behind this large disparity.

6.7 Operational Design Input

The majority of respondents thought that owner operational department should have a say in the project design in FEED phase or earlier but input should be limited after FEED stage. 67% of engineering contractors and 63% of operating company respondents felt operational input should be limited at FEED phase or earlier. The difference between the two target groups was that 29% of the owner company respondents believed that operational groups should have input at all stages of the project.

In the qualitative response section, the majority of the comments from both target groups revolved around the idea that operational departments should be involved throughout the project but that input should be strictly limited at later stages of the project execution process to only key, functionally necessary changes. There was also the desire to have the operational input leader be someone with significant experience both technically and in the project execution process.

6.8 Project Manager Empowerment

The majority of respondents in both target groups felt that owner company project managers are not given enough authority over their projects to ensure effective and efficient execution.

7.0 Concluding Remarks

To apply Lump Sum contracting, Western Canadian operating companies must realize that this type of contract is only used where the plans and specifications are complete and the scope of work is well defined. The requirement to have detailed plans and specifications complete before bidding and construction can begin is the biggest obstacle facing the Oil and Gas industry in Western Canada. The flexibility of this contract form is very limited. Any deviation from the original plans and specifications to accommodate a change must be handled as a change order. This may lead to considerable arguments over the cost of scope changes and extras and may create adversarial relationship between the operating company and the contractor.

Lump Sum type of contract provides little cost risk to the operating company and shifts the risk of performance to the contractor. For this reason, public agencies in Canada and international owner organizations tend to prefer the Lump Sum-type contract. It is extremely important that the plans and specifications given to the contractor by the owner be as complete as possible. The EPC contractors and subcontractors should be careful in analyzing bid documents and in preparing the cost estimate.

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