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How Best to Use Lessons from the Past to Optimise EPC Delivery in the Future?

Introduction

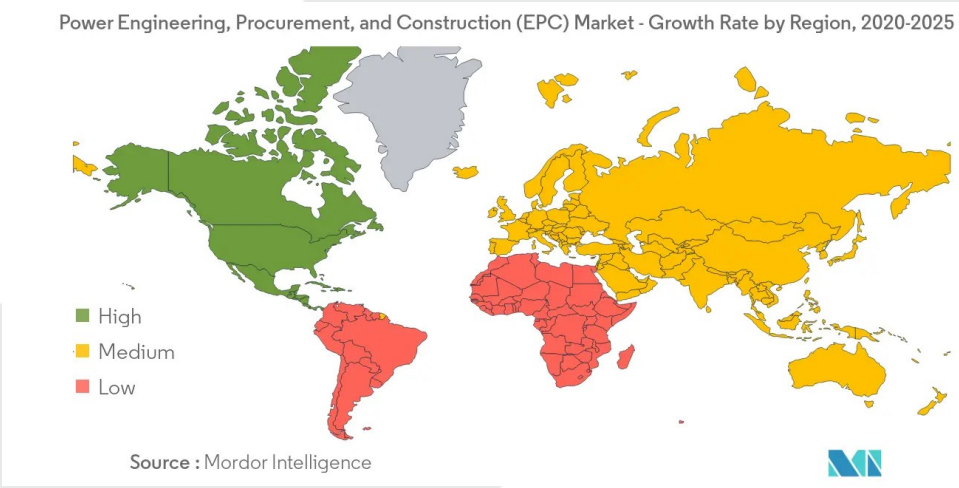
Engineering, Procurement and Construction ("EPC") contracts have traditionally been the most common form of contract used to undertake construction and engineering works by the private and public sector on large scale, complex infrastructure projects across a variety of industry sectors including power, oil & gas, process, transport, water and waste.

EPC contracting is generally considered to be low risk to the client (and consequently the funders) with the contractor taking the burden of the majority of the risk. Indeed, some in the sector refer to such contracts as being "no risk" on the client's behalf.

The global EPC market was estimated to be worth over US$7.5 trillion in 2019[1]. It is reported that only around one in four EPC projects complete within 10% of the deadline for completion and budgeted cost and that 98% of the largest EPC projects come in over budget or are delayed for some reason with 75% of these mega projects being at least 40% behind schedule.

Evidently, therefore, whilst being a well-established method of contracting and delivering complex projects, EPC contracts continue to foster significant claims for delay and disruption and a wider range of claims with costs attached to them.

Steady growth in Oil & Gas EPC contracts is expected until 2027, with spend rising annually at 7% from US$43.66 billion in 2019 to US$75.01 billion in 2027. The continued use, and growth, of EPC forms of contract is expected globally, with higher proportional volumes foreseen in the North American region (largely due to Oil & Gas expenditure) and moderate growth in Europe, Asia and Oceania (with increased infrastructure and energy growth). Low growth is expected in South America and Africa.



The World Economic Forum advised in a 2016 report that a 1% saving in costs within the EPC industry would funnel an extra US$100 billion of discretionary spending into the global economy[2]. It is evident, therefore, that even moderate gains in efficiency and delivery can have significant wider impacts.

[1] Statista

[2] http://www3.weforum.org/docs/WEF_Shaping_the_Future_of_Construction_full_report__.pdf

HKA's CRUX Insight 2020

Overview

HKA's CRUX Insight 2020 is the product of investigations into more than 1,100 projects across 88 countries that generated claims or disputes. Of these, 195 were EPC projects in a range of geographical locations, across a wide range of sectors; Oil & Gas, Industrial, Infrastructure, Power & Utilities and Buildings. The analysis revealed the eye-watering sums of money and time being lost, as well as the patterns of root causes. The average cost claimed, related to delay, disruption and other quantum claims, across the EPC projects investigated was over US$140 million, or 47% of the original contract value, with the average extension of time claimed being 60% of the original contractual period. This paper utilises the CRUX data to establish common causation themes across particular sectors, leading to time and cost claims and disputes in EPC projects. In addition, it examines what steps both clients and contractors can take to reduce the risk of disputes occurring.

One significant aspect of EPC contracting is that it allocates a significant portion of delivery and commercial risk with the contractor. This is, of course, part of the commercial bargain between contracting parties and is, or at least should be, priced accordingly within the ultimate agreement with the contractor often having scope (or at least foreseen scope) to benefit from reducing its costs, while the client benefits from having an increased element of fixity to its outturn contract cost. For example, under EPC contracts the contractor will usually accept significant risk with the design and the performance on completion. They would also likely accept physical risks such as unforeseen ground conditions, weather etc but in exchange will price this risk into the contract value and may also have increased flexibility with regards to development of the design, selection of materials and suppliers etc.

As such, it would be expected that the frequency and extent of contractual claims from the contractor to the client under an EPC contract would be lower than would be expected from other contracting models, such as Design & Build, Remeasurement etc. From the CRUX analysis this expectation is borne out:

	Average of EOT claimed (%)	Average of Cost Claimed (%)
EPC	60%	47%
All non-EPC projects	75%	57%

As expected, both the periods of delay and the cost claims made under EPC contracts are noticeably lower than those of non-EPC contracts, reflecting the generally accepted understanding of the shift of delivery risk from the client to the contractor. However, while largely reduced from non-EPC contracts, there still remains highly notable durations and amounts claimed, with nearly 50% of original contract amounts being claimed. This appears to be disproportionate to the principle of risk allocation underlying an EPC arrangement.

EPC Causation

The CRUX data set includes "primary" and "secondary" causation. In simple terms, primary causations are those deemed to have been the direct causation linked to specific claims. Secondary causations are contributory factors that led towards, but may not actually directly have caused such claims.

It is of interest that, while there is a noticeable differential between the periods of delay and proportional cost claimed between EPC and non-EPC contracts, the actual primary and secondary causations show a remarkable correlation between contracting types:

EPC projects		All non-EPC projects	
Cause of claim or dispute	Primary %	Cause of claim or dispute	Primary %
Change in scope	12%	Change in scope	12%
Design information was issued late	8%	Design information was issued late	7%
Contract interpretation issues	7%	Design was incomplete	7%
Design was incomplete	6%	Design was incorrect	6%
Physical conditions were unforeseen	6%	Contract interpretation issues	6%
Access to site/workface was restricted and/or late	5%	Access to site/workface was restricted and/or late	5%
Design was incorrect	4%	Contract management and/or administration failure	5%

PC projects		All non-EPC projects	
Cause of claim or dispute	Secondary %	Cause of claim or dispute	Primary %
Contract interpretation issues	7%	Contract management and/or administration failure	8%
Contract management and/or administration failure	7%	Contract interpretation issues	7%
Poor management of subcontractor/supplier and/or their interfaces	6%	Poor management of subcontractor/supplier and/or their interfaces	7%
Change in scope	5%	Change in scope	6%
Approvals were late	5%	Level of skill and/or experience	5%
Level of skill and/or experience	5%	Claims were spurious, over-inflated, opportunistic and/or unsubstantiated	5%

This analysis shows that, while the risk and commercial relationship between parties differs under EPC contracts to other forms, the top primary and secondary causations show almost perfect correlation i.e., there does not appear to be anything specific to EPC contracting that differentiates the root basis of claims presented for delay and cost claims.

This suggests that parties in procuring and delivering EPC contracts do so without making provision or adjustment for the specific requirements and nuances of EPC contracts.

The data includes a level of granularity of causation that can be useful in pin-pointing specific areas of concern. These levels can be combined in groups to show general areas of concern. For example, the three “design” related causations combined identify primary causation of claims and disputes on 18% of EPC projects:

EPC projects	
Cause of claim or dispute	Primary %
Design information was issued late	8%
Design was incomplete	6%
Design was incorrect	4%
Total	18%

Together these are the highest combined causation group, which therefore warrants monitoring and controls being established. Parties entering into an EPC contract should review and assess the design deliverable requirements, establish realistic planning and ensure sufficient resources are in place to achieve the required timescales, to the requisite quality.

The table below ranks the top 15 elements of causation of disputes across all EPC projects analysed for the CRUX report, combining primary and secondary Causations.

Cause of claim or dispute	Primary	Secondary	Score	Rank
Change in scope	78	24	102	1
Contract interpretation issues	44	30	74	2
Design information was issued late	51	17	68	3
Contract management and/or administration failure	28	30	58	4
Physical conditions were unforeseen	40	17	57	5
Design was incomplete	43	14	57	5
Approvals were late	30	24	54	7
Poor management of subcontractor/supplier and/or their interfaces	25	26	51	8
Design was incorrect	35	14	49	9
Access to site/workface was restricted and/or late	40	9	49	9
Level of skill and/or experience	21	22	43	11
Materials and/or products were delivered late	25	17	42	12
Claims were spurious, over-inflated, opportunistic and/or unsubstantiated	25	14	39	13
Cash flow and payment issues	18	18	36	14
Shortage of skilled and non-skilled workers	16	18	34	15

As can be seen, worldwide, across all sectors, the standout cause of disputes is “Changes in scope” closely followed by “Contract interpretation issues”. These two issues alone were found to be the primary or secondary cause of 17% and 14% of disputes on EPC projects respectively.

Both causes above, likely relate to the quality and complexity of the client's documentation, insofar as the project is not adequately defined and specified. It is of paramount importance that the client sufficiently fixes and sets out the clear parameters of what is required, be it in relation to performance, design detail, process and everything in between.

The occurrence of these two key causations strongly suggests that clients are not investing enough time and resource into defining and fixing the scope before going to tender. Alternatively, particularly in oil and gas or energy from waste projects, it may be the case that sufficient investigation or engineering has not been carried out into the quality or type of the feedstock to be used, resulting in significant changes to the plant or process being required after the contract is entered into. If the specification issued to the contractor is later found to be inadequate or to contain errors, changes will become necessary.

Changes in Scope

One of the key aspects of an EPC contract is the lack of client flexibility. The overall model, one that places the majority of control to the contractor, is not naturally attuned to providing the ability of the client to make changes without incurring significant cost. Accordingly, the often-stated mantra of EPC contracting for clients is to define the requirements and not to change them. It is apparent from the CRUX data that this does not happen as often as clients would like, or that the EPC contract expects.

It is interesting to note from the CRUX data that all but one of the sectors have changes in scope as the leading primary cause of claims and disputes (with the Oil & Gas sector peaking at 16% of primary causation). Industrial, however, included change of scope as the eighth-ranked primary causation, at only 5%. Instead, the

Industrial sector's lead primary causation is "Poor management of subcontractor/supplier and/or their interfaces", along with the perennial "Design information was issued late".

What this points to is that the Industrial sector has far fewer changes to the scope than all others. This could be explained by the nature of the EPC contracts, which are often turnkey process driven projects i.e., the contract is awarded with a performance specification (for example a specific number of widgets to be produced to a defined specification in a set period). Once set, a client is less likely to want to amend this base requirement as it often fits into a wider commercial picture.

A possible impact of this lowering of prevalence of Changes to scope in the Industrial sector can be seen in the general figures. As set out below, the Industrial EPC projects in the CRUX data shows a significant reduction in both claimed EoT and cost, both as percentages of the original period/contract amount compared to the EPC average for all project types. Indeed, it is the case that the Industrial EPC projects have the lowest averages for both EoT and cost to all of the other sectors for EPC contracts.

	Average of EOT claimed (%)	Average of Cost Claimed (%)
EPC	60%	47%
Industrial EPC	46%	17%

It seems, therefore, that Changes to scope are significant both in prevalence of occurrence but also level of impact for EPC contracts.

In construction/fabrication type projects clients often want, and indeed need, an element of flexibility to allow changes to be made, which could be due to a range of influences including funding, other stakeholders, commercial landscape changes etc. However, clients should carefully assess the risk of its need to change aspects of the work post-contract. It appears from the data that investment taken pre-contract to fix the requirements will reap benefits in reducing exposure to additional cost and time claims once the project is underway.

Clients have a number of options at their disposal to mitigate or reduce these risks. Primarily, clients must ensure that sufficient time and effort is expended in the specification and FEED phases of the project. This will ensure that the specifications that form the basis of a contract are sufficiently detailed, contain sufficient certainty and when implemented, will meet all of the requirements to reduce the need for changes in scope. If this is not a realistic prospect due to time, resource or other constraints, clients may adopt a slightly different procurement route which is better suited to the level of information that can be provided at FEED stage. Clients may elect to utilise a two-stage tender process that will allow more client input in the detailed design phase, allowing the client to continue expanding its requirements without a commitment being made by the contractor as to time and cost of delivery, meaning disputes are less likely to arise.

Contract Interpretation

With reference to the high level of contract interpretation causation, the majority of EPC contracts are entirely bespoke. As such, it is likely that issues around contractual interpretation are predominantly due to a lack of clarity and certainty in the conditions and specifications. Further, due to the contracts being bespoke, it is unlikely that there will be a great deal of legal precedence to assist the parties to interpret the conditions of the contract. This inevitably leads to the parties adopting polarising views on matters, frequently leading to a dispute.

In the wider construction industry, it is generally accepted that the most effective way to reduce the overall risk to projects is to use standard forms of contracts with amendments to suit the project's circumstances. This is likely to reduce ambiguities, fairly allocate risk and use clauses which have largely been tested in the courts and therefore have legal precedence. However, in EPC contracts standard forms do not appear to have been subject to widespread adoption with bespoke contracts continuing to be the predominant choice. Although this is understandable given the significant value and complexity of many EPC projects, to reduce the risk of interpretation issues, clients should consider adopting a standard form such as FIDIC Silver Book or, alternatively, ensure that bespoke contracts are drafted clearly and without any ambiguity. This will, in turn, leave very little room for interpretation by either party and thus reduce the occurrence of disputes.

Of course, care should be taken when using a standard form as they are usually (almost always) amended to suit the parties' requirements. Often these changes are the inclusion of additional clauses and it is not uncommon for these additional clauses to be ambiguous or even directly contradictory to the un-amended terms. This is often seen where a client attempts to tighten up the standard form, ensuring the contractor shoulders a greater portion of risk. They also often add prescribed procedure or administration in a contract that, in some cases, makes the contract un-useable from a practical aspect.

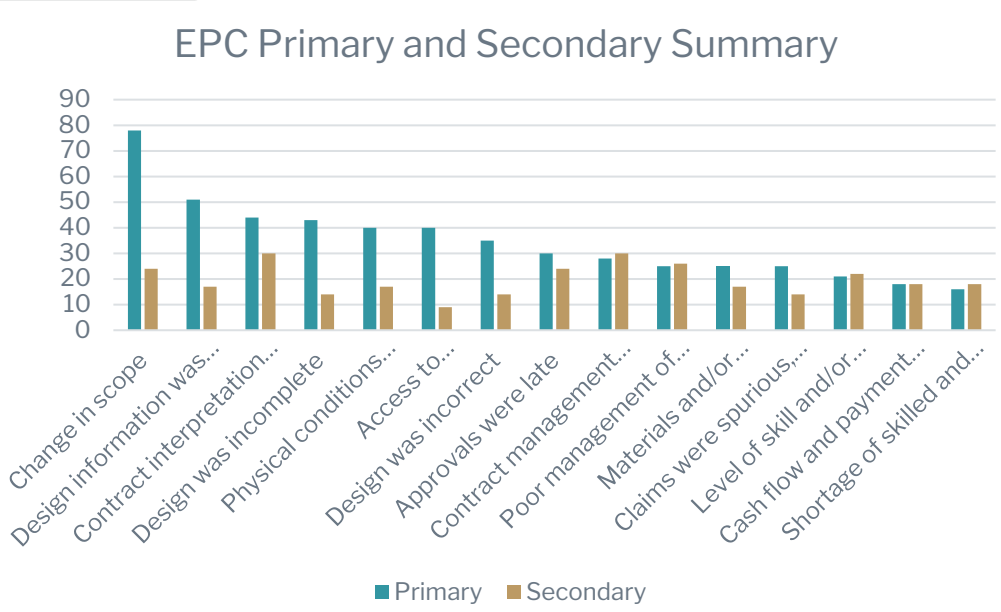
As such it is of crucial importance that EPC contracts are both thoroughly reviewed and, in addition, "stress tested", with varying example theoretical issues worked through, so the contractual mechanisms can be checked for their sufficiency. This is best done both pre-contract by the client and soon post-contract with the client and contractor.

"EPC contracts continue to foster significant claims for delay and disruption and a wider range of claims with costs attached to them."

Design Issues
The most frequent second-ranked primary causation was "Design information issued late". With the exception of the Power and Utilities sector this primary causation ranked in second place in all other sectors. Similar to issues with Changes in scope, this goes to exemplify the importance of clients sufficiently planning their deliverables, usually made via an engineering company that frequently both manages aspects of the design and also the administration of the contract.

When entering into an EPC contract it is evidently important to ensure that the programme of works includes, or in some way addresses the need for elements of design input at certain stages. It is of equal importance that the client and its engineer understand prior to entering into such a contract what will be needed and when, and key deliverables be set out within the agreement between the client and engineer to ensure any such transfer into the EPC contract be met and upheld as required.

Secondary Causation
As may be expected, the primary causations are predominantly driven by the "harder" factors such as Changes in scope, Design information issued late, Access to site etc. whereas the secondary, or contributory causations generally represent the "softer" factors such as Contract management and/or administration failure, Contract interpretation issues and Poor management of subcontractors and/or their suppliers.



This analysis identified that the primary and secondary causes of disputes are somewhat variable across various industry sectors and different geographical regions, and that there is more general consistency with the secondary factors compared to the primary causation. One such variance can be found in disputes resulting from a lack of experience in the relevant projects. The CRUX data identifies that a lack of experience was a combined causation factor in 13% of disputes on EPC projects in the Power & Utilities sector compared to just 4% on Oil & Gas projects, not making the "top 15" causations.

The Power & Utilities sector includes renewables markets such as on and offshore wind and solar projects which are rapidly growing with a range of pioneering technologies being adopted and new businesses attempting to get a foothold in the market. By comparison, the Oil & Gas sector has been established for many decades and has a wide range of reliant and experienced contractors. It is likely that, as a result of the new businesses entering the renewables sector, there is a knowledge gap ultimately resulting in additional claims and disputes.

Clients may reduce the risk of disputes relating to a lack of experience by completing detailed pre-qualification of contractors to ensure that all contractors have suitable experience in delivering significant EPC projects in the relevant market. Clients may also consider further disaggregating the projects to smaller work packages, let directly to suitably qualified specialists. This will bring additional risks that need to be managed, including reduced liability for each contractor due to smaller contract values, greater complexity in allocating fault to a single contractor and interface management. Notwithstanding that, with suitable management systems in place, the breakdown of the contract to smaller packages of works could significantly reduce the risk of disputes on power and utility projects.

Management Issues (Client and Contractor)
Aside from Contractual interpretation issues, the two predominant secondary causation factors are "Contract management and/or administration failures" (client-side failures) and "Poor management of subcontractors and/or their interfaces" (contractor-side failures). Interestingly, these contributory factors closely match those in non-EPC projects:

	CM and admin failure (client) - Secondary (%)	Poor management of S/C (contractor) - Secondary (%)
EPC	7%	6%
Non-EPC	8%	7%

This identifies there is no discernible difference in the influence as to how the contracting parties manage their contracts in leading to claims and disputes, by way of contributory effect, between EPC and other contracting methods. This is worth review for several reasons. The first being that, given the shift of risk and responsibility to the contractor under EPC, one might expect matters arising from client contract management and administration failures to reduce and, conversely, causation arising from the contractor's poor management of subcontracts and their interfaces to increase.

The empirical data shows this expectation to be unfounded. As such it suggests two important points. The first being that clients should not enter into EPC contracts and expect they can significantly ease back on their contract management and administration i.e., they still need to effectively manage those aspects and should ensure sufficient resource is provided. Investment by the clients in this area will reap reward in reduced and lower frequency of claims and disputes.

The second aspect is that contractors seem to have equivalent subcontract and interface capabilities across all contracts. These types of responsibilities are generally always a contractors risk (albeit to varying degrees of exposure depending on the commercial model) however under EPC contracts, sitting at one end of the risk-allocation spectrum, any impacts or losses due to such failures have little recourse for mitigation or recovery and directly impact bottom-line profit. As such it is in the contractor's direct commercial interest to ensure effective planning and management is in place for their subcontracts and interfaces on EPC contracts, which are often extensive, by both contributing to its financial recovery and for reducing the number of claims and disputes with the client.

Unforeseen Physical Conditions

A further noteworthy element of causation is that of Unforeseen physical conditions that ranks as the 5th highest cause of claims and disputes across EPC contracts in general but ranks 2nd in Power & Utilities projects and 1st for projects in the Americas. This may seem surprising at first view, given the general position in EPC contracts whereby the contractor takes on board the risk of the ground conditions.

Changes in ground conditions to those expected can have far reaching and highly impactful consequences, sometimes resulting in changes to structural designs and often to project delays, with the enabling and foundation works frequently being on a project's critical path. As such contractors will look at all options available if such unforeseen conditions are encountered, even under EPC forms.

Each contract allocates risks related to physical conditions, and particularly ground conditions, differently. An example is the FIDIC Silver Book which is arguably the most used standard form of contract for EPC projects. The standard form states, at sub-clause 4.10, "the condition of the Site (including Sub-Surface Conditions) shall be the sole responsibility of the Contractor and the Contractor is deemed to have obtained for itself all necessary information as to risks, contingencies and all other circumstances which may affect the Works...". This clause is usually the subject of heavy negotiation between the parties, often

resulting in a more traditional foreseeability test being adopted. This arrangement sees the risk of unforeseeable ground conditions remaining with the client.

On occasion this negotiation turns the other way, and the client manages to include a provision whereby the contractor accepts responsibility for all information provided by the client and subsequently relied upon in establishing the tender. Whilst the client may consider this absolves it of any risk in respect of ground conditions this is often shown not to be the case. Unless such a provision is worded very carefully there may exist possible contractual (or ex-contract legal) routes to relief for a contractor should unexpected conditions be encountered.

There are many ways to avoid or minimise claims and disputes relating to ground conditions, all of which require foresight and careful planning at a very early stage of the project. One such option that clients could adopt is to conduct a comprehensive site investigation in the FEED stage to ensure that there is no need for assumptions to be made as to what conditions may be encountered in the substrate. This will provide a level of certainty for both parties and may achieve better value for the client than would be the case if the contractor was required to consider this area of work as a risk item, or indeed if the issue was subject to an extensive and costly dispute. If a dispute arose, the presence of an extensive investigation that the contractor was aware of would stand as robust evidence that the conditions encountered should have been foreseeable by the contractor. Alternatively, depending on the procurement model, it may be plausible to allow the intended contractor to conduct detailed, on-site, investigations before finalising its time and cost submissions. This will allow the contractor to allow sufficient amounts for any groundworks and reasonably enable the client to pass the absolute risk of ground conditions onto the contractor, removing the need for a foreseeability test. This is, however, only likely to be plausible once a contractor is selected and will add a necessary additional action with possible time consequences and costs overall. Careful planning and risk assessment is therefore required when evaluating the possible benefits and opportunities that may arise from such a programme.

Summary

The CRUX research has shown that the average cost claimed in an EPC dispute is over US$140M with the average EOT claim being around 60% of the initial programme. As a result, it is clear that investment in the early stages of the project to properly and clearly define the requirements, in addition to ensuring the contract is well-drafted, will be worthwhile to mitigate the risk of a significant dispute with the potential to involve a significant time and cost overrun.

Although the above actions will help to reduce a staggering 25% of the disputes on EPC projects, it is essential to look at some of the causes relating to the other 75% of disputes.

If you require any further information, please contact Charles Wilsoncroft at charleswilsoncroft@hka.com.