HKA

CRUX INSIGHT

An Analysis of Claims and Dispute Causation – from Insight to Foresight

Eighth Annual Report

> ***The most encouraging finding is that the improvements extended across all the main causes of claims and disputes with one, potentially significant exception.***

Contents

Foreword

The purpose of CRUX is to identify and analyse the underlying causes of claims and disputes on capital and infrastructure projects. Better understanding is essential both to dispute avoidance and more effective contract and claims management.

For eight years, our integrated research programme and annual CRUX Insight reports have charted the pattern of conflicts and their heavy toll on projects worldwide. We also propose actions and strategies to minimise disturbance and promote better project outcomes.

CRUX reporting has continued to evolve year-on-year, and the Eighth Annual CRUX Insight Report again builds on previous editions. We have added another 200 or so projects to the cumulative dataset, which now exceeds 2,200 in total. Also, we consulted with the industry over topics that needed further investigation. The two top priorities that emerged from that consultation were artificial intelligence and contract types.

We have conducted our own survey into the role of AI and explain the findings later in the report (see page 39). Meanwhile, the contractual context in claims and disputes is one of three lenses we have used in this year's report to bring the complex web of disturbance to distressed projects into sharper focus:

- Contractual – the conflicts that arise most directly from the contract types and terms themselves, and what effects they may have
- Scale – comparing delivery performance on megaprojects (valued at $1 billion or more) with smaller projects
- Time – how the causes of claims and disputes have changed over time

There is heartening evidence that many types of disputes are afflicting a smaller proportion of projects in recent years – particularly those scheduled for completion in or after 2020. This is despite the sharp spike in claims and disputes related to COVID-19 confirmed in the latest CRUX data. Consistent with these findings, the extensions of time and additional costs claimed by contractors also reduced, though we explain why caution must be exercised in interpreting these results.

Also, there are many exceptions to this apparently positive development, including greater contention over payments and cashflow, as well as regional and sectoral variations. And most factors tend to be amplified on megaprojects, which make up a significant proportion of our HKA claims management and dispute resolution caseload.

After years investigating claims and disputes and sharing the lessons, our data indicates what may prove to be a turning point. We hope that future CRUX Insight reports will substantiate a definitive downward trend in the incidence and impact of conflicts on capital and infrastructure projects.

In the meantime, HKA experts in our regional offices worldwide will continue working with project owners, investors, contractors, and the supply chain to extract further insights and help improve risk management, project delivery and outcomes for all stakeholders. I encourage readers of this report to draw their own lessons from this report and to delve deeper through our free-to-use CRUX Interactive Dashboard.

Renny Borhan
Partner, Chief Executive Officer

Overview

Many and varied uncertainties confront construction and engineering projects, compounding the risk of claims and disputes. But what are the most pervasive causes of conflicts? How do they impact budgets and schedules? And is the pattern of causation and project outcomes, changing over time – worldwide or regionally?

These are some of the fundamental questions addressed in HKA's integrated research programme and discussed in the following chapters of our Eighth Annual CRUX Insight Report.

CRUX now covers a total of 2,204 engineering and construction projects in 114 countries.

This is a unique dataset based on first-hand investigations of claims and disputes by our specialists. The combined capital expenditure (CapEx) of the project works analysed exceeds $2.433 trillion.[1] With an average project value of just under $1.25 billion, a large proportion are megaprojects.[2] Over 200 projects have been added since last year's report – assignments completed by HKA before the mid-July 2025 cut-off for our latest analysis.

Impacts on schedules & budgets

Across all the projects analysed, claimed costs averaged around $85.7 million – or 33.4% of a contract's CapEx budget. The grand total for all sums in dispute amounted to $95.0 billion.

In terms of time, contractors claimed extensions that would typically prolong planned schedules by almost two thirds (65.8%).

For this year's CRUX Insight report, we have also examined how the pattern of conflicts has changed over time and the impact on project outcomes. Our analysis indicates a potential turning point as many types of claim or dispute were less prevalent.

The impacts in terms of time and costs have also reduced at a global level.

For projects with scheduled completion dates in and after 2020, the global average for claimed extensions of time (EOTs) shortened by over 20 percentage points to less than half (48.9%) of schedules. Claimed costs also fell back, by around three points, to just over a quarter (27.7%) of the budgeted costs of the affected contracts/subcontracts. However, there were wide variations between regions.

1 All values in this report are expressed in US dollars

2 Projects with a CapEx value of $1 billion or more

Whereas the Middle East saw major improvements on both counts, claimed costs worsened in Europe, while Oceania faced lengthening overruns.

These findings remain tentative for various reasons – not least the smaller dataset of more recent projects, so the extent of claims and disputes and their overall impacts will not yet be fully apparent.

How has causation changed over time?

Over the full CRUX timeframe, change in scope drove more than a third (34.7%) of claims and disputes on distressed projects. Design-centric problems were the other dominant driver. CRUX identifies three types of design failure – lateness of information, inaccuracy, and incompleteness – each of which impacted around a fifth of projects.

Top 12 factors on all projects in the CRUX dataset

Cause of claim or dispute	Proportion affected
Change in scope	34.7%
Design was incorrect	20.6%
Design information was issued late	20.4%
Design was incomplete	18.4%
Workmanship deficiencies	17.5%
Contract management and/ or administration failure	16.7%
Poor management of subcontractor/ supplier and/or their interfaces	16.5%
Access to site/workface was restricted and/or late	16.3%
Contract interpretation issues	16.2%
Physical conditions were unforeseen	15.5%
Cash flow and payment issues	14.7%
Approvals were late	14.3%

Over recent years, the disturbances caused by the global pandemic reached a similar scale to this almost perennial nexus of underlying causes of conflict. The long and severe aftermath of COVID-19 has become abundantly clear in the data as claims and disputes came to fruition. Around a quarter of projects were affected (see below).

With COVID-related claims passing their peak, the complex web of scope change and design can be expected to continue dominating the dispute landscape. However, according to our time-based analysis, even these factors have declined (more or less in tandem), as have many other, but not all, dispute triggers.

Conflicts arising directly from contractual agreements – such as contract interpretation and administration – show an improving if uneven pattern. Meanwhile, other factors have risen in importance, most notably, disagreements over cashflow and payment.

Apart from the caveats already noted above, there are some sharp variations between regions that must be borne in mind. Also, this year's analysis has revealed a divergence in dispute causation and frequency between megaprojects and those of smaller scale. (These issues are explored in dedicated chapters and summarised below.)

Is contract administration improving?

Eight of CRUX's causation factors focus on the contractual agreement and how it is applied. As we reported in 2024, these causes had collectively impacted more than 40% of all projects. But our data also points to a potentially significant improvement in the management and administration of contracts and how they are interpreted, mainly over the last decade (see page 19).

The incidence of these two causes –contract management and interpretation issues – was lower from 2020 onwards. However, they were still the most prevalent contract-related drivers of claims and disputes, affecting 8.5% and 10.4% of distressed projects, respectively. Either or both were more contentious in Africa, Oceania, and the Middle East, and individual countries. In Saudi Arabia, for example, parties clashed over interpretation on 17% of projects that were scheduled to complete or still ongoing in this later period.

3 Fédération Internationale des Ingénieurs-Conseils

4 New Engineering Contract

5 American Institute of Architects

6 Association of Consultant Architects

7 Joint Contract Tribunal

> *"The long and severe aftermath of COVID-19 has become abundantly clear in the data as claims and disputes came to fruition. Around a quarter of projects were affected."*

There was also an apparent fall-off in disputes due to tender errors, contracts' unrealistic expectations, and spurious claims.

What is influencing these developments? Our claims and disputes specialists report an improvement – notably on larger projects – in the training and capabilities of staff in delivery teams. The pandemic and subsequent economic and logistical shocks have also focussed greater attention on commercial risk and the need for more cautious pricing of works by contractors. Legal awareness has been growing so that in-house legal and commercial teams are often consulted earlier before issues escalate.

How does contract form influence outcomes?

This year's report also investigates the performance of projects governed by different forms of contract.

There was an obvious divide reflecting the types of works for which different forms of contract are typically used. Change in scope dominated on FIDIC[3] and NEC[4] contracts, while workmanship deficiencies loomed larger under AIA[5], ACA[6] and JCT[7] (see page 23). This is consistent with previous CRUX findings for project types – and the different patterns of causation that apply to buildings compared with civils and heavy engineering.

Government contract forms had the highest concentration of contract-specific causes, namely, spurious claims, contract interpretation issues, and failures in contract administration or management.

Clashes over contract interpretation also tended to be more common, unsurprisingly, on predominantly bespoke contracts – the largest category. These were also prone to the heaviest overruns on

schedules and budgets compared with the main contract types, although this most likely reflects a correlation between project complexity and contract customisation.

Performance against programmes on FIDIC contracts was closer to the CRUX long-term global norm for all capital and infrastructure projects (65.8% of planned schedules). Claims for extension of time (EOT) averaged 67.2%. The form favoured for international projects faced the lowest cost claims of the main contractual categories at 28.5% of budgets for the relevant package of works. However, the outcomes varied considerably with region and industry.

Covid's full impact becomes clear

A fuller picture of the pandemic's impact on capital and infrastructure projects has become clear as claims and disputes attributed to COVID-19 were raised and resolved over the last couple of years.

Among projects scheduled for completion during or after 2020, around one in four (24.0%) were affected. On megaprojects, this approached a third (31.8%).

There were marked regional differences in the incidence of disputes, reflecting the pattern of shutdowns and the responses of employers. More projects were disrupted in Asia and the Middle East, and a higher proportion of conflicts centred on clauses providing for changes in law. In Europe, force majeure was more often the issue of contention.

As the scope of force majeure and/or entitlement due to viral outbreaks are redefined, contracting parties need to be wary. Contractors should also be mindful of the high standard of proof required to corroborate global claims for lost productivity, delay events and additional costs.

Contention over cashflow and payments

Claims and disputes over cashflow and payment have occurred on around one in seven projects through successive CRUX analyses. There is also evidence – from our time-based analysis – of spikes in this type of disagreement in the wake of both the 2008 global financial crisis and the economic shocks triggered by the Ukraine invasion.

For projects due to complete in or after 2020, this type of dispute occurred on 14.3% of all distressed projects (and more than a fifth of megaprojects – see below). As other causes became less pervasive, cashflow and payment ranked as the fourth most common cause of claims and disputes for all projects. This is despite the peak in COVID-19 claims, suggesting that payment practices have become increasingly divisive.

There would seem to be little prospect of relief in the face of global pressures on project financing and the absence of payment security legislation in regions such as Africa and the Middle East, where cashflow drives claims on a higher proportion of distressed projects.

What changes with projects' scale?

Cashflow, COVID-19 and other sources of conflict were amplified on megaprojects.

Our latest CRUX analysis compared projects above and below the $1 billion valuation threshold, revealing how the prevalence and pattern of claims and disputes shifted with scale.

Of the top 15 causes of distress on megaprojects, only one was more commonplace on smaller-scale projects – deficiencies in workmanship.

Change in scope and design-centric failures affected proportionately more megaprojects, as might be expected, given their complexity. The margin was mostly around 10 percentage points, with little difference in the ranking of causes.

Other causation factors became relatively more significant, although – at a global level – the gap between projects of contrasting scale was narrower. Among those that rose in prominence were: contract interpretation issues (impacting 23.4% of megaprojects), cashflow and payments (22.2%), late approvals (19.9%), restricted site access (19.0%), and spurious claims (14.9%).

> ***"The pandemic and subsequent economic and logistical shocks have also focussed greater attention on commercial risk and the need for more cautious pricing of works."***

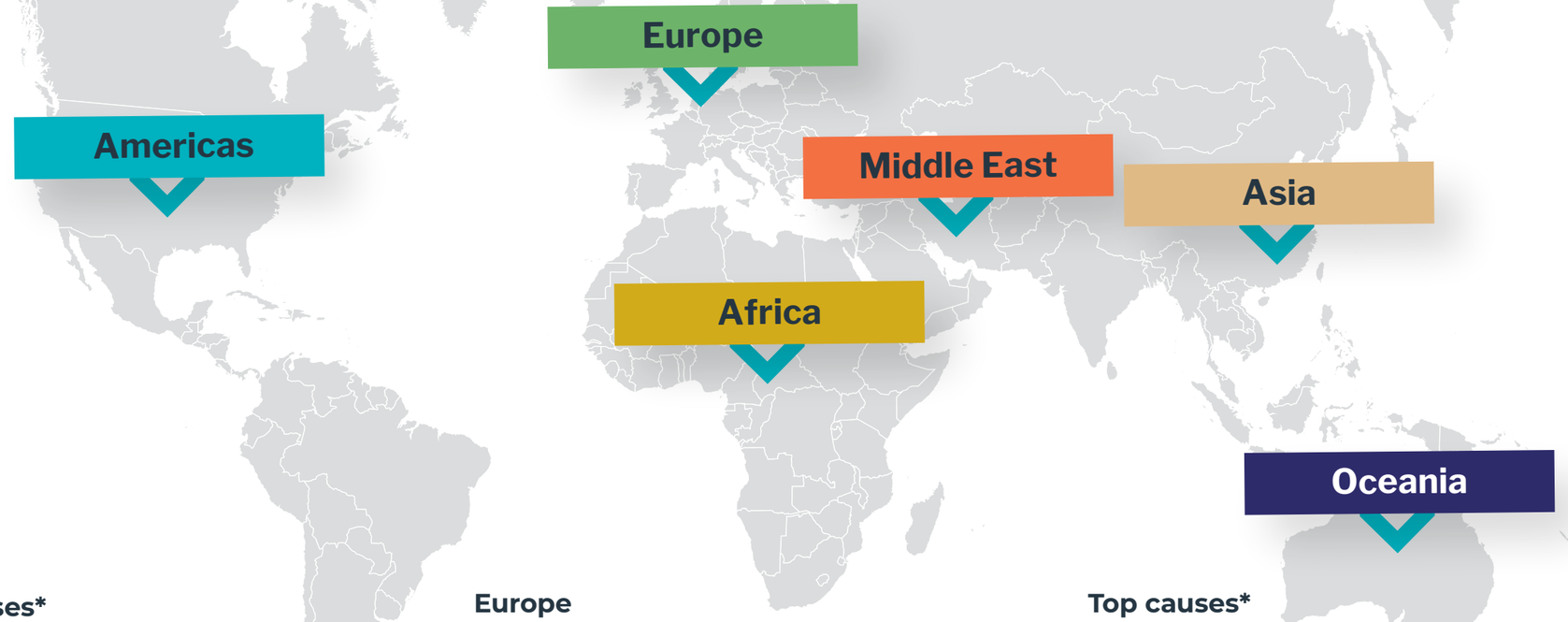
Despite these comparatively high levels, CRUX indicates that the incidence of many underlying causes of claims and disputes have declined over time, and outcomes have also improved. Subject to the major proviso that megaprojects with completion dates after 2020 may still have years to run – and disputes to crystallise – there is a marked divide either side of that milestone.

The data so far shows that the extended time sought by contractors almost halved (from 74.9% to 38.8% of schedules) despite the COVID-19 hiatus. Sums in dispute fell less dramatically (from 10.7% to 8.5% of contract values).

Toby Hunt
Partner, CRUX Sponsor

CRUX Global

Claim and dispute causation worldwide



Global

2204 projects
114 countries
$1.25bn average CapEx value

Top causes*

1. Change in scope
2. Design was incorrect
3. Design information was issued late

Africa

61 projects
22 countries
$1.79bn average CapEx value

Top causes*

1. Change in scope
2. Access to site/workface was restricted and/or late
3. Cash flow and payment issues

Americas

703 projects
20 countries
$639m average CapEx value

Top causes*

1. Change in scope
2. Workmanship deficiencies
3. Design was incorrect

Asia

147 projects
24 countries
$4.27bn average CapEx value

Top causes*

1. Change in scope
2. Access to site/workface was restricted and/or late
3. Design information was issued late

Europe

583 projects
30 countries
$420m average CapEx value

Top causes*

1. Design was incorrect
2. Change in scope
3. Workmanship deficiencies

Middle East

531 projects
12 countries
$1.47bn average CapEx value

Top causes*

1. Change in scope
2. Design information was issued late
3. Cash flow and payment issues

Oceania

179 projects
4 countries
$2.74bn average CapEx value

Top causes*

1. Change in scope
2. Access to site/workface was restricted and/or late
3. Design information was issued late

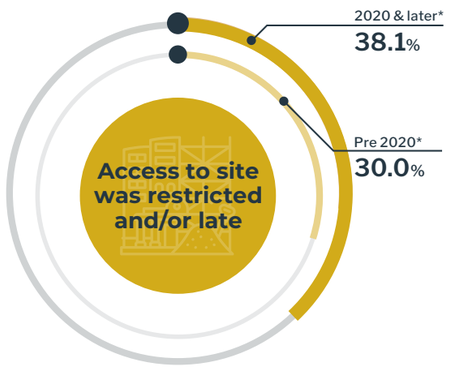
* Rankings based on full period and cumulative CRUX data

Africa

61 projects | **22** countries | **$1.79bn** average CapEx value

Distressed projects across more than 20 countries on the continent have experienced significantly higher cost claims, on average, than other regions. Contractors have also sought longer extensions of time (EOT) than most other regions.

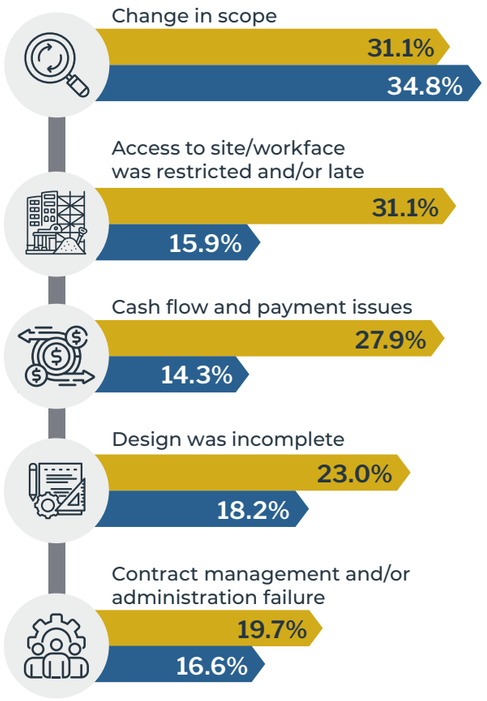
As in other regions, change in scope has contributed to more claims and disputes than any other cause. However, two other problems have loomed far larger here than in the rest of the world. Restricted or late access to sites or workfaces rivalled scope change as a disrupter, while issues over payment and cashflow were the next most common trigger of conflict.



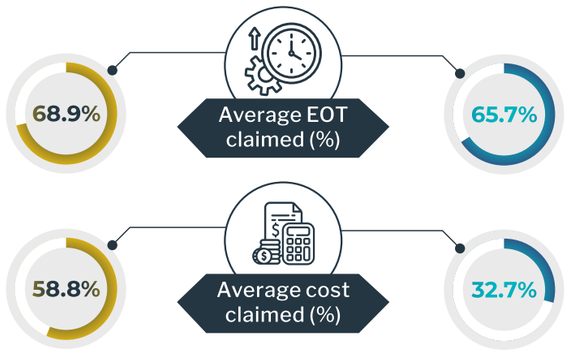
* Projects categorised by scheduled completion dates

Both problems have escalated in recent years. Rows over site access impacted some 38% of projects with scheduled completion dates in 2020 or later. More than 28% saw conflicts over payments. Almost a quarter (23.8%%) had claims or disputes related to COVID-19. There were signs of improvement in the management of approvals and design. However, Africa bucked an apparent global shift toward fewer contract-centric disputes over spurious claims, contract interpretation, and contract management or administration, which continued unabated in Africa.

Top 5 causes of claim or dispute



Africa vs Rest of the World

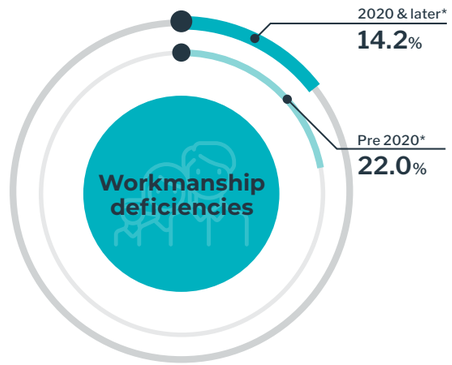


Americas

703 projects | **22** countries | **$639m** average CapEx value

Capital and infrastructure projects in the Americas have consistently returned below-average overruns on schedules and budgets compared with their distressed counterparts in the rest of the world. Many underlying causes of conflict have been less prevalent here – notably, change in scope, the top driver of claims and disputes globally.

Deficiencies in workmanship were the major exception, making this the next most important cause of claims and disputes. More than a fifth of projects across the US (20.6%), Canada (21.4%), and another 18 countries were impacted.



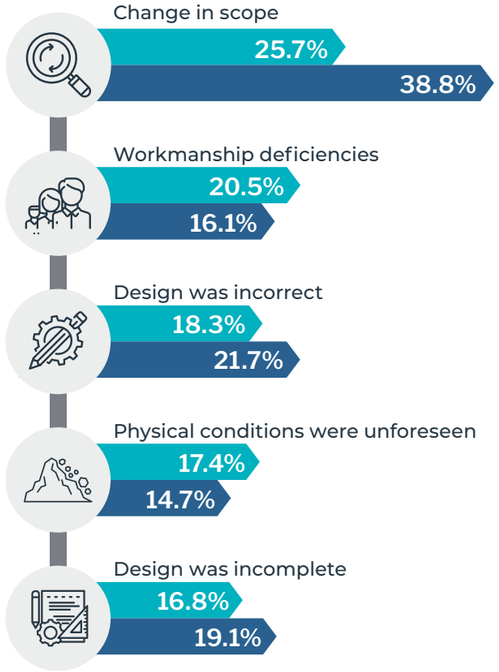
*Projects categorised by scheduled completion dates

A corner may have been turned, however. The evidence from projects scheduled for completion over the last five years, or ongoing, suggests substandard workmanship had declined as a problem. The proportion of projects impacted fell to 14.2% (compared with 22.0% pre-2020).

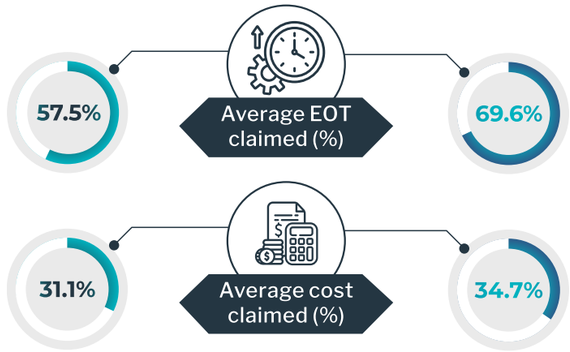
There were also apparent improvements in design performance and the management of subcontractors / suppliers and their interfaces. The Americas (and Oceania) were impacted least by the pandemic. Friction around payments and cashflow seems to have increased, however, reflecting a global trend.

Outcomes were better on projects in this period (at least so far, given some will be still under construction). Contracts in dispute faced overrunning schedules by 44.2% and budgets by 26.8%.

Top 5 causes of claim or dispute



Americas vs Rest of the World



Asia

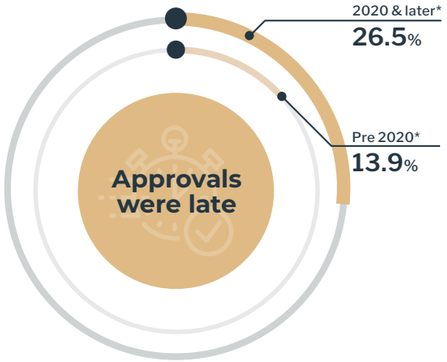
147 projects

24 countries

$4.27bn average CapEx value

Asia has historically seen lower overruns as a proportion of contract budgets than other regions. Claimed EOTs were also below the benchmark for the rest of the world (66.4% of planned schedules).

With typically the largest projects – averaging $4.27 billion in CapEx value – the impact of change in scope was heavier in this region than elsewhere over the full CRUX period. Claims and disputes were also more often blamed on lateness – late or restricted access to sites or workfaces, late design information, and late approvals.

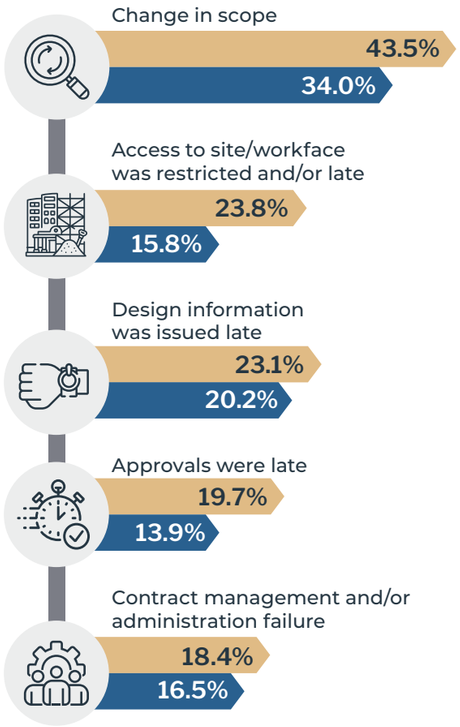


*Projects categorised by scheduled completion dates

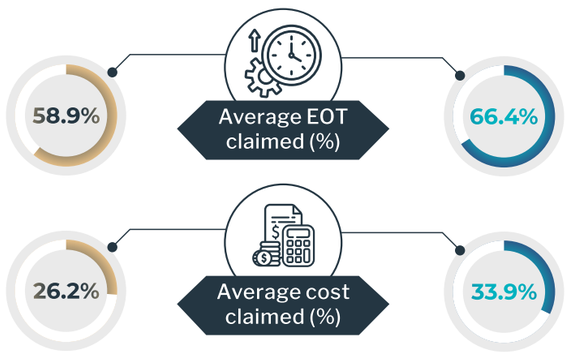
The latter has increased as a source of conflict over recent years. More than a quarter (26.5%) of projects due to complete in or after 2020 were affected – a sharp increase (from 13.9% pre-2020). Asia was also more seriously disrupted by the pandemic than most other regions in this time period: 30.6% of distressed projects had claims or disputes relating to COVID-19.

Over this later period, fewer projects had disagreements over change in scope (30.6%) and the design process, though lateness of design information still affected one in six projects (16.3%). Failures in contract administration or management were less common, but there were more clashes over contract interpretation (up from 7.6% to 12.2%).

Top 5 causes of claim or dispute



Asia vs Rest of the World



Europe

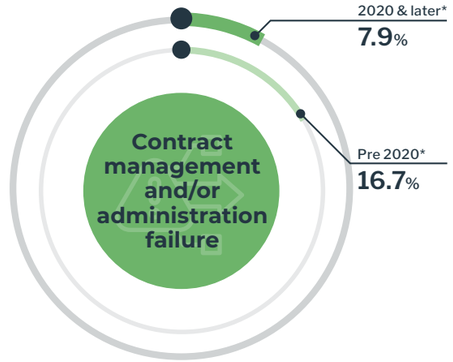
583 projects

30 countries

$420m average CapEx value

Distressed projects have faced shorter schedule overruns resulting in EOT claims in Europe than in the rest of the world, but monetary amounts in dispute were higher, as a proportion of initial contract values. The only region where change in scope is not the dominant cause of conflict, Europe saw nearly one in three projects impacted by design error.

With the building sector accounting for 55% of the projects analysed, deficiencies in workmanship affected more than a quarter of all projects, not far behind change in scope.

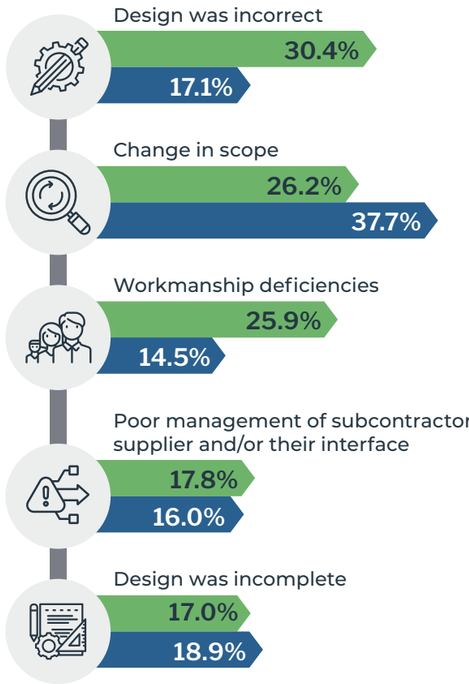


*Projects categorised by scheduled completion dates

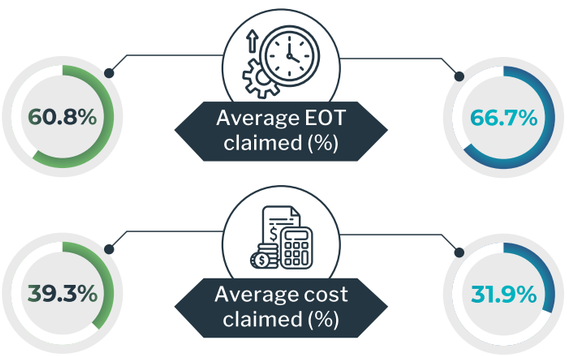
There is evidence of a modest reduction in the prevalence of these and other problems on projects carried out more recently, but Europe still compared poorly with other regions on workmanship (with a fifth of projects still suffering disagreements over defects). Arguments over COVID-19's impact were limited to less than a fifth (19.4%) of projects.

Change in scope was no less disruptive on projects scheduled for completion in 2020 and subsequent years. However, European projects did share in the almost universal improvement in how contracts are managed, administered and interpreted. Other factors less likely to result in conflict over this later period included staff's level of skill or experience, how subcontractors and suppliers were managed, and unforeseen physical conditions.

Top 5 causes of claim or dispute



Europe vs Rest of the World

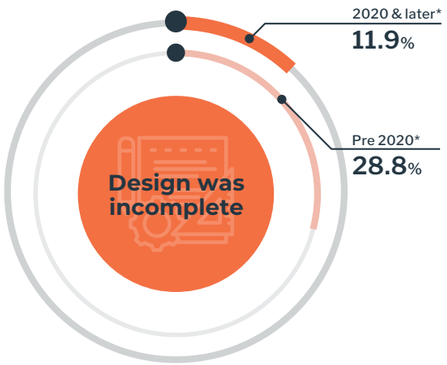


Middle East

531 projects | **12** countries | **$1.47bn** average CapEx value

Close to the global norm for sums in dispute, projects in the Middle East have faced the longest schedule overruns. Change in scope was far more disruptive than in most other regions, driving claims and disputes on almost half of projects – with little difference between megaprojects and those of smaller scale.

Late design information and approvals also generated far more conflict than elsewhere. However, comparing later projects with their predecessors, both these problems and contract-related disputes became less common. Nevertheless, lateness was still the main design-centric failure, disrupting more than a fifth of projects (22.6%).

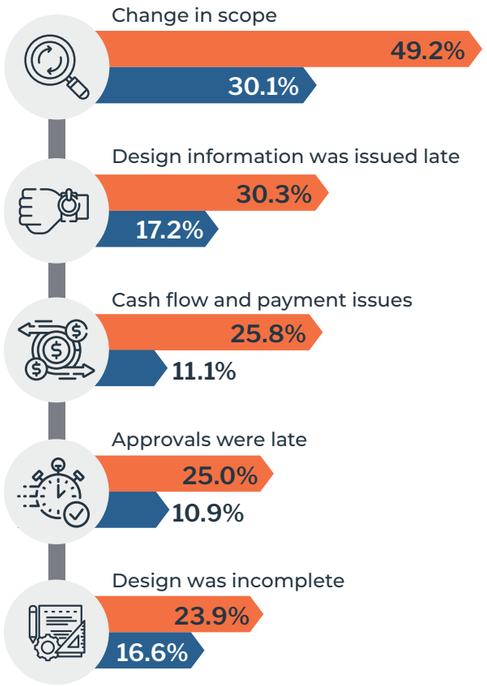


*Projects categorised by scheduled completion dates

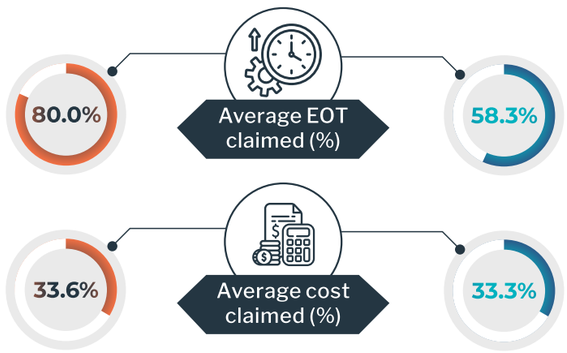
Most other factors arose less often on projects due to complete in or after 2020. However, cashflow and payment issues persisted, affecting almost a quarter (23.8%). The impact of the pandemic was greater even than in Asia. After scope change, only COVID-19 triggered more claims and disputes, affecting 35.7% of these later projects.

Nevertheless, there was a significant improvement in outcomes within this smaller sample of projects. Average EOTs were around half their pre-2020 level (at 46.7% of planned schedules) and claimed costs (at 20.8%) more than 10 points below the long-term global benchmark.

Top 5 causes of claim or dispute



Middle East vs Rest of the World

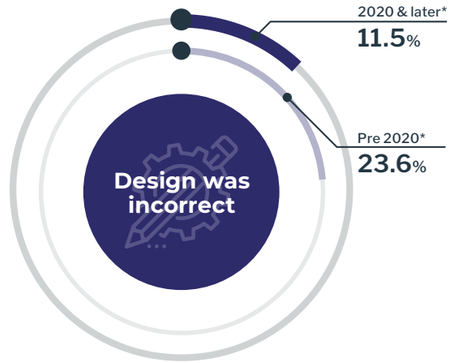


Oceania

179 projects | **4** countries | **$2.74bn** average CapEx value

As a region with a high proportion of large-scale projects (averaging $2.74 in CapEx value), Oceania experienced greater conflict over change in scope. Yet claims for extended time and costs have historically been lower than in other world regions.

Site and workface access also posed more problems across these 179 projects, concentrated in Australia and New Zealand. While design failures were on a par with the rest of the world, contract interpretation and administration tended to be more contentious.

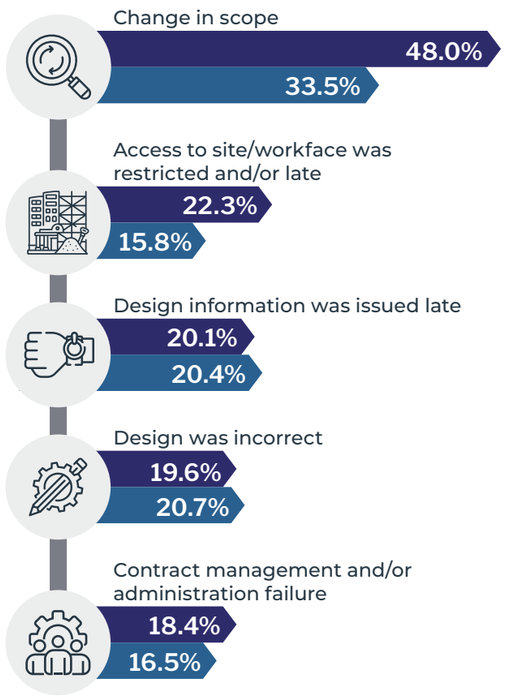


*Projects categorised by scheduled completion dates

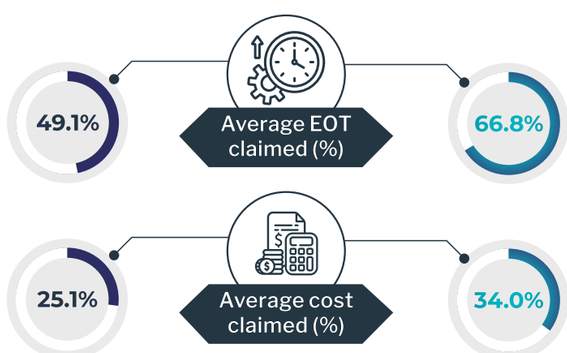
The region had the lightest COVID-19 impact; (affecting 15.4% of projects). However, restricted access and clashes over contract interpretation have triggered more disputes in recent years. Each impacted nearly a quarter (23%) of projects due to complete in or after 2020. Late approvals also increased, affecting almost a fifth of these projects (19.2%). Design-related failures were less common than pre-2020, as were disputes over how contracts were administered (down from 17.3% to 3.8%).

This smaller sample of 26 projects faced significantly longer overruns (60% of contract schedules). In contrast, the average sum in dispute on what were predominantly megaprojects was much lower (at 13.3% of contract budgets).

Top 5 causes of claim or dispute



Oceania vs Rest of the World



Turning a Corner?

Dispute causation overall and over time

The CRUX dataset is unmatched for depth and breadth, covering more than 2,200 construction and engineering projects worldwide – and a taxonomy of 39 distinct causes of claims and disputes.

By definition, only projects that have experienced claims or disputes (and been analysed by HKA specialists) are included. Built up over years of rigorous analysis based on consistent criteria, CRUX is more authoritative than a survey of opinion. However, as this knowledge bank is cumulative and most projects span multiple years, it is not designed to provide an annual snapshot of recent or emerging trends.

However, recognising these unique characteristics, we continue to develop and add value to CRUX. For this year's report we have analysed projects on a time basis – mostly categorising them by their scheduled date for completion (rather than when claims and disputes were presented or resolved).[8]

A turning point in claims and dispute avoidance?

We re-examined projects on several different bases, including five-year time windows for their end dates. While each revealed interesting insights, a pre/post-2020 comparison provided more robust sample sizes and findings.

Comparing projects due to end before or during 2019 with those that had later completion dates revealed some significant differences. In the latter period, the prevalence of many triggers for claims and disputes reduced sharply – by around a third in many cases and almost half for some. And there was a corresponding reduction in the global average for extensions of time (EOTs), with a typically smaller drop in claimed costs.

Probably the most encouraging finding is that the improvements extended across all the main causes of claims and disputes with one, potentially significant exception. We welcome this development, but with some caution. Among other considerations, it should be noted that around twice as many projects fell in the earlier period than that since 2020. There are also variations between regions and projects of contrasting scale.

8 Where project start/end dates were not recorded – these projects have been excluded from the time-based analysis. For further information, see Methodology.

A significant shift in the pattern of causation

Cause of claim or dispute	Pre-2020* Ranking	Pre-2020* Affected projects***	2020 & later Ranking**	2020 & later Affected projects***
Change in scope	1	36.5%	1	28.2%
Design information was issued late	2	22.9%	5 ↓3	14.2%
Design was incorrect	3	22.3%	3	15.4%
Design was incomplete	4	20.8%	10 ↓6	11.4%
Workmanship deficiencies	5	17.5%	9 ↓4	11.6%
Access to site/workface was restricted and/or late	6	16.8%	6	12.8%
Contract management and/or administration failure	7	16.8%	12 ↓5	8.5%
Poor management of subcontractor/supplier and/or their interfaces	8	16.5%	13 ↓5	8.5%
Physical conditions were unforeseen	9	16.3%	8 ↑8	11.9%
Contract interpretation issues	10	15.1%	11 ↑1	10.4%
Approvals were late	11	14.8%	7 ↓4	12.4%
Cash flow and payment issues	12	14.3%	4 ↑8	14.3%
COVID-19 related causes	32	2.0%	2 ↑30	24.0%

*The ranking for projects due to end before 2020 corresponds closely to that for the entire CRUX dataset, but the percentages of affected projects are typically 1-2% higher. This reflects the improvement post-2020. Some historical projects lacking clear completion dates have also been excluded from this analysis.

**As causes are ranked by their prevalence prior to 2020 (with the addition of COVID-19), the ranking for the later period is not in sequence

*** Percentage of projects with claims or disputes mainly due to each cause

How has the ranking of causes changed?

The ranking of projects scheduled to complete prior to 2020 corresponds closely to the overall ranking for the full CRUX period (on page 19). Slightly higher proportions of projects were affected by most factors, reflecting the general improvement seen post-2020.

From 2020 and onwards, however, there were some notable movements up and down the ranking – beyond the outsized effect of COVID-19.

- **Scope change and design:** Research by HKA and others has consistently shown how change in scope drives more disputes than any other individual cause. Recent CRUX Insight reports have also highlighted the disruptive impacts of late, inaccurate and incomplete design information. Collectively, these design-centric problems affected more projects than scope change, with which they are often inextricably linked. So, it is highly encouraging to see reductions across this tangled web of causation, with the prevalence of each of these four factors reducing by around eight percentage points. While change in scope remained the top factor, incomplete and late design dropped down the ranking.
- **Workmanship deficiencies:** Defective work was less of a problem, particularly on projects approaching completion in the last few years. But prevalence varied with scale. Deficiencies in workmanship were more common on smaller projects than megaprojects (see page 27).
- **Approvals and access:** Despite the apparent downward trend, the most recent evidence indicated a possible reversal for conflicts over restricted access. As late approvals declined more slowly than other causes, they became a relatively more significant source of contention, rising in the ranking.
- **Contract interpretation and management:** The extent of the apparent reduction in these types of disputes surprised some of our consultants. It is important to bear in mind that the analysis revealed some sharp regional variations (see page 21). Also, many claims stemming from various other underlying causes ultimately lead to legal arguments over the provisions of the contract.
- **Cashflow & payments**: An exception to the general trend, this trigger – always more prevalent in some regions – has climbed the global ranking. Moreover, further analysis of the most recent pattern of causation suggests this problem may be growing on projects overall and especially on megaprojects amid tougher global economic conditions (see page 37).

> ***Claims for additional time might have been expected to increase, given the impact of the pandemic. Counterintuitively, it may have been conducive, at least in some regions, to wider acceptance of delays, including some not directly caused by COVID-19.***

More progress on time than costs

Our analysis points to a global turning point in the toll from claims and disputes, at least in terms of the additional time sought by contractors.

A reduction of more than 20 points in average EOTs – to less than half (48.9%) planned schedules – would mean either a significant gain in delivery performance or in the propensity to agree time extensions since 2020. (Claims for additional time might have been expected to increase, given the impact of the pandemic. Counterintuitively, it may have been conducive, at least in some regions, to wider acceptance of delays, including some not directly caused by COVID-19). On a global basis, this shortening of claimed overruns was sustained across narrower time windows (notably, 2014-19, before the pandemic).

However, the regional variations were quite wide – ranging from just over five percentage points in Europe (62.9% of schedules pre-2020 vs. 57.7% after) to

How project outcomes changed over time

Pre-2020*	2020 & later*
$1.37 bn average project CapEX	$978 m average project CapEX
71.2% average EOT claimed	48.9% average EOT claimed
31.0% average cost claimed	27.7% average cost claimed

*Projects categorised by scheduled completion date

Turning a Corner?

Dispute causation overall and over time

around 50 in the Middle East, which had been an outlier in terms of overruns. This halving of the EOT average (from 97.6% to 46.7%) had the effect of bringing the region into line with Asia (where the improvement was more than 20 points). The Americas saw a similar improvement (down from 60.2% to 44.2%), so its projects typically faced the shortest overshoots. Only distressed projects in Oceania due to complete in the later period faced longer overruns than their predecessors (as the average lengthened from 36.3% to 60.0% of planned schedules).

The margin of improvement for costs was smaller overall than for time, equating to 3.3% of the average budget for the disputed works. But again, the regional pattern was mixed.

In Europe, the financial impact of claims and disputes increased by more than 8% (from a 35.5% average to 43.9% of budgets), with marginal increases in the Americas and Asia (both to around 26%).

The other three regions saw apparent savings – equivalent to more than 15% of budgeted costs in the Middle East (down to 20.8%) and nearly 11% in Oceania (to 13.3%). In Africa, where the sample sizes pre-and post-2020 were far smaller, the turnaround in cost outcomes was greatest (down from a world high of 55.3% to 20.7%).

However, it is important to note that all these cost and time benchmarks for outcomes in the later period are subject to change on major projects that may be years away from completion.

The regional picture – How project outcomes changed over time

	Pre-2020*		2020 & later*	
	⏱	💰	⏱	💰
Africa	63.0%	55.3%	55.4%	20.7%
Americas	60.2%	25.7%	44.2%	26.8%
Asia	69.4%	25.1%	46.7%	26.4%
Europe	62.9%	35.5%	57.7%	43.9%
Middle East	97.6%	36.5%	46.7%	20.8%
Oceania	36.3%	24.1%	60.0%	13.3%

* Projects categorised by scheduled completion date

⏱ = Average claim for extension of time

💰 = Average claim for cost

> ***"Such a reduction in average EOTs since 2020 would mean either a significant gain in delivery performance or propensity to agree time extensions."***

Reasons to be cautious

Apart from the fact that more recent trends are necessarily based on smaller sample sizes of projects, there are other caveats to consider:

- By definition, CRUX research is focussed exclusively on projects experiencing some degree of distress and requiring our expertise in claims management and dispute resolution.
- In contrast, HKA's advisory services experts help clients set up their organisations and projects for success. That experience informs this report's commentary and recommendations but is not reflected in the underlying causation data. Our evidence does not infer therefore that, in general, construction and engineering projects worldwide are experiencing fewer claims and disputes.
- CRUX's ranking of claim and dispute causation is based on an assessment of primary and secondary causes. Depending on how each case is analysed, a factor may still be present but given less weighting than another cause.
- The spike in COVID-19 as a driver of claims and disputes affects the ranking of other causes (in addition to how it may have influenced negotiations over claimed EOTs).
- Some regions and countries buck what may seem to be global trends, whether for claims and disputes in general, particular causes, or outcomes measured in terms of claimed time extensions and costs.
- HKA's claims and dispute management business has experienced sustained growth, and its evolving nature is another consideration. Since incorporation as an independent consultancy in 2017, HKA has supported a widening spectrum of increasingly large and complex disputes on diverse projects.
- Patterns of causation are also affected by projects' scale. Our analysis shows a higher incidence of conflicts on megaprojects compared with those below the $1 billion CapEx threshold. While the data indicates that their outcomes too have improved, the full impact of claims and disputes on ongoing works will be not be reflected in the data.

Case study: A gold standard for long-term collaboration

How does an employer harness the benefits of collaboration on a long-term infrastructure programme while assuring value for money?

This was the challenge for the City of Gold Coast and its 10-year infrastructure delivery programme (IDP) to upgrade multiple sewage treatment plants under a collaborative framework agreement.

HKA was appointed in 2024 to provide commercial support to Australia's second-largest municipality as it sought a single partner to deliver the $1 billion programme.

Bespoke tools

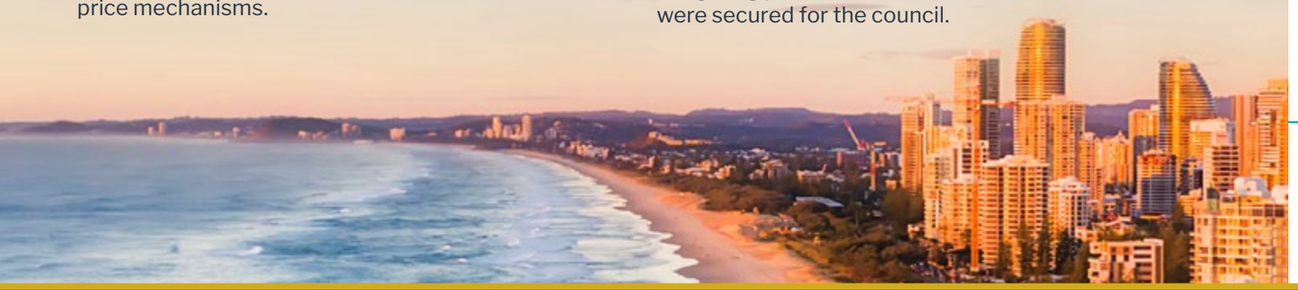
Our strategic commercial advisory services included a comprehensive review of tender documentation, clarifications, and responses to requests for information (RFI). Based on this analysis and our understanding of market conditions, we developed a bespoke commercial model as a tool for simulating risk-based scenarios and pressure-testing target price mechanisms.

An additional cost model normalised price submissions to identify outliers. We also performed a gap analysis and evaluated risk and opportunity registers. The framework agreement established a collaborative relationship, which we reviewed to ensure appropriate risk allocation and value for money.

Following contract award, HKA was appointed as IDP commercial manager, responsible for maintaining commercial governance, ensuring compliance, conducting earned value analysis, and reporting on contractor performance and commercial risk.

Optimising value and collaboration

A preferred tenderer was selected, giving an optimal blend of value for money and collaborative alignment. Risks were carefully managed and amendments made to the framework's complex target price change mechanisms to de-risk the programme. By maintaining competitive tension throughout the transaction process, minimising contractual risk and mitigating potential escalation, favourable terms were secured for the council.



Contract related conflicts: On better terms

Contracting construction and engineering projects

Almost every formal claim or dispute begins and ends with the contract. Of the 39 individual causes in the CRUX methodology,[9] eight factors directly relate to how that legal agreement is interpreted and implemented.

In last year's CRUX Insight Report, we analysed the combined effect of these factors and other clusters of interrelated causes on capital and infrastructure projects. Contract-related factors impacted just over 43% of the distressed projects worldwide that we had analysed up to summer 2024. The other four 'mega-disrupters' were associated with 'speed to build', skills, behavioural, and environmental factors.

Our claims and dispute specialists confirm that contract-specific issues remain at the heart of conflict on a large proportion of HKA assignments undertaken over the last year. Nevertheless, the cumulative CRUX dataset – now covering more than 2,200 projects – indicates that the prevalence of these contractual drivers of disputes, such as contract interpretation issues, has been reducing.

The proportion of projects affected by contractual issues over the full CRUX research programme is down by 1-1.5% compared with our last report. Further time-based analysis of projects for this Eighth Annual CRUX Insight Report suggests a potentially more significant improvement over the last decade.

As shown in the table, we have compared projects scheduled for completion by the end of 2019 with those planned to be ongoing beyond that date. The sample size for the earlier period is almost three times that for more recent projects. Accordingly, these comparative findings are necessarily tentative for this and other reasons (see previous page). There are also some notable variations between regions, not least a deep divide for most contractual factors between North America and Europe on one hand, and other regions (see next page).

However, our consultants in the field report positive signs amid ongoing concerns that the way in which contracts are managed still gives rise to many avoidable claims and disputes. We explore both these themes below.

Contract-related causation

The most widespread contract-related causes of claims and disputes throughout the CRUX research programme have been: failures of contract management and administration, contract interpretation issues, and spurious claims. However, each of these factors has been identified as a primary or secondary cause of conflict on a far smaller proportion of projects in the later period.[10]

Contract-related causes of claims or disputes – over time

* Projects categorised by scheduled completion date (% of projects that had these causes)
** Full CRUX dataset includes additional projects with unknown end dates

9 CRUX methodology – see page 41

10 The proportion of distressed projects affected by a particular factor is the percentage of the total on which it was diagnosed as a cause of a claim or dispute, whether primary or secondary

There have also been modest reductions in the frequency of disputes related to tender errors and to unrealistic targets.

The opposite is true for the three other contract-related factors – breach of contract, fraud and termination. Although the incidence of these dispute triggers remained relatively low, there has been something of a spike in contract breaches in the latest period, while fraud and termination were also more prevalent.

Positive signs

We cannot say that contractual matters are being handled better across the full spectrum of construction and engineering. But, particularly on larger-scale projects, our consultants have observed some general improvements in contract administration. Among both our clients' project teams and their counterparts, staff appear to be more highly trained, qualified and experienced in their roles.

There also seems to be greater contractual awareness. Compared with say, 15 years ago, employers and contractors generally turn to their in-house legal and commercial teams earlier to resolve issues before they escalate. Since the pandemic, there has also been a reset in awareness of commercial risk. Many contractors are more cautious when pricing projects, which is partly borne out in the decline in tender errors and inaccurate estimates. Some major projects procured in the yearsbefore COVID-19 suffered from unrealistic expectations. These have been tempered by the subsequent rise in geopolitical risk, supply chain disruption, and cost inflation.

In some markets, including South Africa, the challenging economic environment of the last decade saw some of the less efficient contractors go out of business. The more agile and commercially aware companies that remain will have helped raise general standards of competency.

Other industry trends are contributing to better contract administration. For example, digitalisation has improved document control, and contractors using modern document management platforms can keep clearer and more accurate records, enhancing their position should a dispute arise.

Standard contracts and industry practices become better aligned as contract suites mature. FIDIC, NEC, JCT and others have been updated and tailored to the demands of modern projects.

The growth of collaboration in contracting is another positive trend, although adoption is patchy – even in countries such as the UK and Australia where collaborative models are being promoted at national level, and contract forms such as NEC4 encourage a shift to partnering. Industry resistance is greater in other territories, yet some contracts in Asia and the Middle East now include an express obligation for the parties to work together, and several employers are showing a willingness to embrace some form of collaboration, including earlier contractor involvement.

Regional differences

The apparent trend toward fewer contract-related claims and disputes is far from universal. In any given territory, our consultants still cite frequent cases of poor contract management and administration, for example. This remains a persistent issue in international projects, especially where inexperienced teams are involved, and capacity and capability can be a challenge. The global average for projects affected by contract management issues is 8.5% over the last five or so years.

Conflicts over contract interpretation are still also common. While the CRUX data indicates a sustained decline in these issues over time, on projects from the later period, more than one in 10 distressed projects worldwide (10.4%) were still impacted by contract interpretation issues.

These two factors – contract management and contract interpretation – remain the most prevalent contract-related causes of claims and disputes in most regions.

Americas: In the most recent period, the two top contract-centric factors – interpretation and administration – featured on 7.4% of projects, below the global averages.

Nevertheless, claims and disputes almost invariably result in legal arguments over contractual terms, even if they have been attributed to other underlying causes, such as unforeseen site conditions or design issues. Our consultants also report, for example, frequent disputes over project schedules, which can involve interpretations as to what scheduling was required under the contract.

Middle East: For a decade or more, contract interpretation and contract management/ administration were greater sources of contention in the Middle East than other regions. That gap has narrowed. Yet, 12.5% of projects post-2020 experienced

Contract related conflicts: On better terms

Contracting construction and engineering projects

Contract-related causes on projects since 2020* – Global & Regional

Cause of claim or dispute	Global	Africa	Americas	Asia	Europe	Middle East	Oceania
Contract interpretation issues	10.4%	14.3%	7.4%	12.2%	7.9%	12.5%	23.1%
Contract management and/or administration failure	8.5%	19.0%	7.4%	8.2%	7.9%	9.5%	3.8%
Targets and/or expectations were unrealistic	5.4%	9.5%	4.5%	4.1%	5.0%	6.5%	3.8%
Tender errors and/or inaccurate estimates	5.2%	9.5%	2.3%	2.0%	5.0%	7.1%	15.4%
Claims were spurious	5.0%	19.0%	4.0%	4.1%	3.6%	4.2%	15.4%
Breach of contract	2.9%	19.0%	2.8%	4.1%	2.9%	1.2%	0.0%
Fraud	1.0%	14.3%	0.6%	0.0%	1.4%	0.0%	0.0%
Termination	1.0%	0.0%	0.6%	4.1%	1.4%	0.6%	0.0%

*Projects with scheduled completion dates in or after 2020. (% of projects that had these causes)

contract interpretation issues, while 9.5% saw failures in contract management.

Clashes over contract interpretation are even more of a problem in Saudi Arabia, affecting 17% of projects in the same period. As in other regions, inexperience in contract drafting and the use of bespoke contracts can introduce complexities. Ad hoc amendments made by project teams to standard forms are another source of conflict. Language differences are complicating factors in contract interpretation. Translations for Chinese and European contractors of contracts written in Arabic are often inaccurate. In one case, for example, a poor translation led to a party's mistaken belief that an event qualified as force majeure. Confusion is compounded when joint venture partners do not share a common version in English or another relevant language.

Africa: Based on a relatively small sample size, the CRUX data for the last decade does not indicate that the continent's construction industry is benefiting from the positive global trend in contract-related claims and disputes. Almost one in five projects (19%) were impacted by contract management failures, spurious claims, or breaches of contract. Contract interpretation issues and fraud each affected one in seven projects (14.3%).

The growing influence of international contractors and the consolidation of the most experienced and commercially adept firms may foster a more mature contract and claims management culture in the future, as authorities strive to bear down on fraudulent practices.

Europe: In the five years to 2025, contract interpretation issues and contract administration failures remained the main contract-related causes of conflict, each impacting 7.9% of projects. Spurious claims were a problem on just 3.6% of projects, following a spike (to 13.8%) in the previous five-year period. There was also evidence of above-average levels of contract termination, at around 1.4%, reflecting economic shocks following the Ukraine invasion. Soaring energy and material costs led to budget overruns, client defaults and cancellation of contracts. Complexity and rising costs were compounded on some projects by stringent EU environmental regulations (including green building standards under the Green Deal). Meanwhile, tight margins distorted risk management by smaller builders and consultants.

Asia: The pattern of contract-related disputes was similar to Europe's, though the levels were higher. Contract interpretation issues affected 12.2% of projects, and failure in contract management another 8.2%. Here, there were two spikes in contract terminations in 2010-14 (involving 7.7% of distressed projects) and 10 years later in 2020-25 (4.1%). Again, these shifts are most likely associated with economic conditions and contract breaches, whether due to contractors' poor performance or non-compliance with regulations, or employers delaying or failing to make payments.

Oceania: Some stark variations in Australia, New Zealand and Pacific countries compared with other regions may be skewed by the smaller number of projects analysed in some periods. Post-2020, most involved transportation infrastructure and renewal and were on a smaller scale than the landmark megaprojects that dominated earlier periods. Almost a quarter of projects (23.1%) had disputes over contract interpretation, while spurious claims and errors in tenders and estimates were also running at a high level (15.4%). Apart from sample size, these findings may be partly explained by owners relying on 'boilerplate' tender documentation yet shifting away from standard contracts. Both factors may contribute to misunderstanding and misinterpretation. Supply-side constraints, increasing insurance requirements and challenging contractual KPIs[11] are other factors.

Questions of form: from standard to bespoke

What influence, if any, does contract type have on the causes of claims and disputes?

Our analysis reinforces the view that the form of contract, crucial though it is, does not predispose a project to particular kinds of dispute. Rather, the behaviour of the parties, regional practices and circumstances, and extensive amendments to standard forms can sow the seeds of disagreement.

Other factors, such as the nature, size and complexity of projects, also have a bearing on the issues that arise under different types of contracts.

11 Key performance indicators

What caused disputes?

There is a discernible divide in causes of disputes between contracts predominantly used for civil engineering projects and those used for building works.

Change in scope was the top cause of claims and disputes under FIDIC and NEC contracts. For AIA, JCT and ACA contracts – mostly governing the construction of buildings – workmanship deficiencies were a bigger factor than scope change. Meanwhile, contracts for linear projects, such as road and rail structures, and those in the oil and gas industry within the CRUX data set, are more prone to claims over restricted site access – the cause of conflict that ranked second on Australian Standard and Government contracts.

Top causes of conflict by contract type

Change in scope and design-related failures were prominent across most contract types. Change can be frequent on major projects, whether due to design errors, development, or incompleteness (especially when work starts prematurely as is often the case on major construction projects), budget reductions by employers, or their decisions to alter output requirements. On heavy engineering projects, such as the expansion of power plants, scope change can emanate from the interfaces between new and existing plant. Whatever the project, even where a genuine change is accepted by both parties, they may disagree on the time and cost consequences.

> *"Particularly on larger-scale projects, our consultants have observed some general improvements in contract administration."*

Both standard forms, such as FIDIC, and bespoke contracts provide mechanisms for managing change. However, we still see how ambiguity around the definition of the original scope of work invites different interpretations of contract terms and of what constitutes a change or additional work, and how that change or additional work is formally instructed. Alternatively, procedures under amended contracts may be unclear, resulting in a contractor executing works without prior agreement following a verbal demand on site.

Contract mechanisms are often not used effectively to manage disputes. This could be for various reasons. Project teams may lack experience or there are gaps in managers' training, and they may not appreciate the nuances of change management. Contractors and subcontractors, particularly in the earlier stages of projects, may prefer not to be seen to be 'overly contractual' or fail to capture sufficient evidence of a change when it happens. Employers and contractors should be proactive (especially under an administration-heavy contract such as the NEC) in their handling of claims to prevent disputes escalating.

Contract related conflicts: On better terms

Contracting construction and engineering projects

Top causes of conflict by contract type

Top cause of claim or dispute	ACA	AIA	Australian Standard	FIDIC	Government Contract	Joint Contracts Tribunal	NEC	Predominantly Bespoke
Access to site/workface was restricted and/or late								
Change in scope			✕	✕	✕		✕	✕
Design was incorrect	✕							
Workmanship deficiencies		✕				✕		

ACA = Association of Consultant Architects, AIA = American Institute of Architects, NEC = New Engineering Contract

Bespoke contracts

Projects with predominantly bespoke contracts formed the largest category in our analysis, with over 600 projects included – 60% more than FIDIC, and twice as many as JCT.

After scope change, late design information was the second most disruptive factor on these and FIDIC contracts. This is not surprising, as construction projects often proceed before designs are sufficiently developed, especially under design-build arrangements where early packages go to site. Also, heavy engineering, offshore energy and the oil and gas industries rely on design input from subcontractors and vendors – supply chains that have been disrupted by geopolitical events and global inflation.

The greater a project's complexity, the more likely its contract will be heavily bespoke. Given this relationship, the longer extension of time (EOT) claims under bespoke contracts may be a matter of correlation rather than causation. These tailored contracts faced greater delays than the global norm for distressed projects, with EOTs averaging 71.3% of planned schedules (with wide variation by sector). Costs were just a couple of percentage points over the global average (33.4%) for all projects and contract types, at 35.4% of the values of the contracts in dispute.

FIDIC

Performance against programme on FIDIC contracts was closer to the CRUX long-term global norm (65.8% of planned schedules), with EOT claims averaging 67.2%. The form favoured for international projects faced the lowest level of cost claims of the four main contractual categories at 28.5% of budgeted values. However, the outcomes varied considerably by region and industry (see below).

In practice, FIDIC tends to be amended, probably more than other contracts, and the choice of FIDIC form sometimes does not align with the employer's intent. For example, we have seen design and build projects in Asia and Europe run under FIDIC's Red Book (which is for employer design), or where the employer seeks to retain all design control under a Silver Book contract (for turnkey projects). Such a mismatch sets up projects for later conflict.

Fit for purpose?

Many disputes stem from bespoke clauses. Amending standard contracts without compromising the risk balance, contract management, and working relationships is extremely difficult. Bespoke clauses are not tried and tested, in contrast with increasingly mature standard forms. Poor drafting can give rise to unintended obligations or critical omissions, such as not addressing what should happen in the event of a change, not properly providing for dispute resolution, or linkages with other conditions. Amendments' effectiveness may also vary with the jurisdiction.

These customised changes mostly skew risk allocations in favour of employers. As well as stressing the dangers of ambiguities and conflicts with standard terms, FIDIC's Golden Rules and NEC guidance on Z clauses warn against shifting the balance of risk.

In design-build contracts, for example, contractors must often bear full responsibility for rectifying design deficiencies. This is a huge undertaking on a large project with thousands of drawings and specifications.

Legal teams on both sides usually propose terms with a view to minimising their liabilities. The focus, understandably, is on risk and dispute management, more than on making the project run more smoothly. It is crucial that amendments are also seen through the lens of realistic and manageable project delivery.

Unbalanced risk profiles inevitably foment adversarial relationships and a lack of trust from the outset, resulting in parties working against rather than with each other, driving claims and disputes at project level and beyond.

Project EOT & Cost claims according to type of contract

Contract type	Projects	Average CapEx	Average EOT claimed	Average cost claimed
Predominantly bespoke	607	$2.4 bn	71.3%	35.4%
FIDIC	381	$1.1 bn	67.2%	28.5%
JCT	290	$425.7 m	52.9%	36.0%
AIA	146	$254.6 m	49.7%	22.6%
NEC	68	$596.6 m	57.1%	31.3%

*Expressed as percentages of the disputed contract's planned schedules and values

Case study: Design delays at Schiphol Airport

Unlawful contract termination, contractual mismatch and design development issues were at the centre of a dispute over construction of a new airside pier at Schiphol Airport.

Royal Schiphol Group (RSG) awarded the contract for the first-phase construction to a joint venture of Ballast Nedam and TAV Tepe Akfen in March 2018. The employer had changed the basis of the tender, which was reissued on a build-only basis in January 2018 after several design-and-build iterations. This caused a mismatch between the FIDIC Yellow Book contract and the design-and-build level design information. RSG now undertook to deliver a completed technical design to meet the overall programme.

Work began later in 2018, with completion due in 2020, but fell behind schedule and into dispute amid design changes and work plan revisions. In autumn 2021, the joint venture appointed HKA to provide an independent expert opinion on:

- Errors and discrepancies in the employer's requirements and design
- Inefficient management of the design process
- Delays in releasing fully coordinated design packages
- Mismanagement of change and engineer's instructions
- Failure to mitigate key programme risks
- Late access, permits and approvals

Incomplete, late & defective design

Our multi-disciplinary team – architects and structural, fire and MEP engineers – reviewed the building design and design and contract documentation, as well as minutes and correspondence. We assessed whether the technical design was sufficiently coordinated and complete for the contractor to progress to shop drawings.

In addition to providing a comprehensive expert report and reply report, an HKA expert architect attended the court hearing that followed RSG's termination of the contract in November 2021.

The District Court of Amsterdam ruled in July 2025 that the employer "was not allowed to terminate the contract prematurely for the reasons stated" and "took into account the problems that arose due to Schiphol's defective design".

Contract related conflicts: On better terms

Contracting construction and engineering projects

FIDIC by region and industry

Location matters when it comes to project performance, but FIDIC tended to return better outcomes across the regions (see table below). Claimed extensions of time on projects governed by FIDIC were consistently shorter than regional averages for contracts overall. There was also a clear margin of advantage for costs in dispute.

In the Middle East, EOTs claimed were still the longest, gravitating towards the regional 80.0% average, but still a few points under. Elsewhere, the gap between FIDIC and contracts as a whole in the region ranged from around 10% in Europe to over 26% in Africa.

Claimed costs were lowest in Asia, and more than 11 percentage points below its regional norm (26.2%). Again, in Africa, the FIDIC advantage was most apparent, with an average financial saving worth up to 33% of budgeted contract values. This gap narrowed significantly to just under 5% in Europe, and less than 3% in the Middle East, with little difference in disputed costs in the Americas. Oceania – where there was a far smaller cohort of FIDIC contracts – was the only region where the all-contracts average was lower.

In terms of industry, FIDIC projects fared far better in energy and natural resources (see table below). This form outperformed the sector's overall averages on all contract types worldwide, both for claimed extensions of time (42% as against 58.8%) and for claimed costs (18.1% of budgets as against 38.2%). In other sectors, FIDIC mirrored the global norm for EOTs more closely, with the exception of industrial and manufacturing (where there was only a small number of projects, some with severe overruns).

Outcomes for FIDIC contracts by region vs. All contract types*

Region	FIDIC Projects	Countries	Average CapEx	Average EoT claimed	Average cost claimed	EoT	Cost
Africa	21	14	$2.6bn	49.8%	25.7%	68.9%	58.8%
Americas	25	16	$664.0m	41.5%	30.8%	57.5%	31.1%
Asia	45	17	$945.8m	47.4%	15.0%	58.9%	26.2%
Europe	44	14	$583.5m	52.3%	34.4%	60.8%	39.3%
Middle East	241	11	$1.1bn	77.4%	30.7%	80.0%	33.6%
Oceania	5	3	$54.2m	19.3%	27.2%	49.1%	25.1%

Outcomes for FIDIC contracts by sector vs. All contract types*

Region	FIDIC Projects	Countries	Average CapEx	Average EoT claimed	Average cost claimed	EoT	Cost
Buildings	140	26	$678.9m	70.1%	30.0%	69.1%	31.2%
Transportation Infrastructure	105	34	$1.5bn	73.0%	36.4%	69.9%	28.4%
Power & Utilities	83	38	$952.9m	57.4%	21.2%	59.4%	35.6%
Energy & Resources	45	20	$1.5bn	42.0%	18.1%	58.8%	38.2%
Industrial & Manufacturing	6	6	$1.9bn	206.0%	59.1%	68.3%	50.3%

*All-contract averages include FIDIC projects

Lessons learned and recommended actions

- Standard suites of contracts today are mature and more flexible. There is a standard contract form that can address the requirements of just about every project. Well-used standard contract 'families', such as FIDIC, NEC and JCT include a variety of contracting models for a wide range of project types. These allow for adjustments for industry and jurisdiction. Modifications should be made with care, bearing in mind that amendments to standard forms which seem legally prudent may end up exposing the parties to unaccounted risk.
- Contracts can be better geared to successful project delivery if legal teams bring in the operational and engineering specialists early in the drafting process. Their input should inform the definition of scope, works information, and employers' requirements as well as specific conditions and mechanisms to smooth construction operations.
- Do not make assumptions. Project directors, commercial directors and their teams need to read, understand, and use the contract. It is important to treat the contract as a project management tool rather than a hindrance to getting the project finished. Carrying out 'challenge sessions' up front – wargaming various scenarios well in advance of commencing works – can help identify risks and gaps in the understanding of the project team so they can better manage and administer the contract.
- Contract-specific training is required at all levels in contracting organisations, not just commercial teams. Site engineers should understand the fundamentals of the contract, such as time obligations and completion milestones, so they can prioritise tasks to align with overall project delivery strategy. A detailed grasp of the scope of works, what constitutes a variation, how to respond to site instructions, and critical path scheduling is also essential.
- Forms of contract are not interchangeable. Parties familiar with FIDIC, for example, can underestimate the challenges of running projects under NEC rules. A contract management team needs to co-opt someone with that experience where it lacks the know-how.
- More collaborative approaches to contracting are gaining ground amid growing evidence they are helping to reduce the incidence and severity of claims and disputes. But many jurisdictions are not yet ready for a fully collaborative contract. Better ways of working and more constructive behaviours to improve project delivery can be incentivised under existing contracts through a more balanced risk profile. Hybrid contracts that combine collaborative principles with risk-based pricing offer another way forward.
- Engaging and involving contractors early in the planning process can only be to the betterment of projects. Our people, both as specialist advisors and expert construction professionals, have seen how getting all the parties together, identifying and discussing the most critical issues, helps manage risks. But early contractor involvement is not a silver bullet. The benefits fall away if designs are not stable and employers change their requirements significantly part-way through the project, or contractors do not fully understand their requirements under the contract.
- New ways of working are required. For example, both parties, recognising the risks from cost inflation, can negotiate and agree at the outset how material price increases will be managed during the project. Contract and procurement methods that better allocate risks and incentivise behaviour for the benefit of projects will allow employers and contractors to work together more effectively. Even in the absence of price escalation provisions, for example, employers may recognise that – in a highly volatile economic and geopolitical environment – negotiating solutions with contractors, rather than running the risk of their insolvency, is in their mutual interest.

Megaprojects

How scale affects causes and conflicts

Construction and engineering programmes are becoming larger, more complex and more costly – and megaprojects[12] are growing in number. More than 250 megaprojects worldwide are now part of the CRUX dataset.

With increasing scale, scope and timelines – and geopolitical uncertainties – the risks of overruns also rise. Every region has seen a landmark project run into significant schedule and/or budget overruns.

Do disputes differ with project scale?

Our CRUX analysis shows, as might be expected, that megaprojects were more likely than smaller-scale projects to be impacted by most types of claim or dispute. Either side of the $1 billion megaproject CapEx threshold, there were many differences, some more notable than others.

Change in scope and design failures due to lateness, inaccuracy or incompleteness – the top four causes in the global CRUX ranking for all projects – were unchanged for megaprojects with some reshuffling of the ranking for smaller projects.

The factors that increased most in significance with projects' scale were: contract interpretation, cash flow and payment, late approvals, and – further down the ranking – spurious claims. By contrast, workmanship deficiencies – ranked fourth for other projects – were less of an issue for megaprojects (15th).

Change in scope: It will be no surprise that change in scope was the most disruptive factor on megaprojects in nearly all regions. In Europe more than half (53.8%) were impacted and just under half in the Middle East (47.8%). The global average was 43% compared with 33% for non-megaprojects.

Design: Each of the triple whammy of late, incomplete and incorrect designs was cited separately for conflicts on more than a quarter of megaprojects. By comparison, none of these factors affected more than a fifth of smaller projects.

Contractual factors: Causes directly related to the contract were also more prominent, particularly contract interpretation (23.4% of megaprojects). Failures in contract management/ administration affected a fifth (19.9%), followed by spurious claims (14.9%) and tender errors (12.0%). There were also sharp differences between megaprojects and others with respect to fraud (2.2% v 0.8%) and contract termination (1.3% v 0.5%). Yet contract breaches were lower for megaprojects (1.3% v 2.1%).

Top causes – Megaprojects compared with smaller-scale projects

Cause of claim or dispute	Rank	Megaprojects	Rank	Non-mega
Change in scope	1	43.0%	1	33.3%
Design information was issued late	2	30.7%	3 ↓1	18.6%
Design was incomplete	3	28.2%	5 ↓2	16.7%
Design was incorrect	4	25.3%	2 ↑2	19.8%
Contract interpretation issues	5	23.4%	9 ↓4	15.0%
Cash flow and payment issues	6	22.2%	11 ↓5	13.4%
Approvals were late	7	19.9%	12 ↓5	13.3%
Contract management and/or administration failure	8	19.9%	6 ↑2	16.1%
Physical conditions were unforeseen	9	19.9%	10 ↑1	14.8%
Poor management of subcontractor or supplier and/or interfaces	10	19.3%	7 ↑3	16.0%
Access to site/workface was restricted and/or late	11	19.0%	8 ↑3	15.8%
Claims were spurious	12	14.9%	15 ↓3	10.4%
Level of skill and/or experience	13	14.2%	14 ↓1	10.8%
Shortage of skilled and non-skilled workers	14	14.2%	20 ↓6	6.5%
Workmanship deficiencies	15	13.9%	4 ↑11	18.1%

% of projects that had these causes

12 A megaproject is a complex, large-scale project that typically costs $1 billion or more, and takes many years to complete.

Site access: Restricted or delayed access to sites or the workface was a factor in around a fifth of megaprojects worldwide (19.0%), rising to 43.8% in Africa.

Late approvals: Another fifth of megaprojects (19.9%) had claims and disputes over late approvals, peaking in the Middle East (30.1%).

Two other factors – often cited in panel discussions with HKA consultants in all regions – each caused claims and disputes on a fifth of megaprojects:

Interface management: Poor management of subcontractors, suppliers and their interfaces is a major disrupter, also triggering conflicts in various other areas from design to operational performance. For example, problems when integrating the multiple works packages on a megaproject – such as metro stations with system-wide interfaces for rail, rolling stock, electrification, signalling and communications – can drive up costs and delays.

These shortcomings loomed largest in Europe, at 26.9%, above the global average of 19.3%. Poor interface management with a third party affected another 8.9% worldwide. (For lower-value projects, the equivalent global averages were 16.0% and 5.3%).

Unforeseen physical conditions: Given their scale, conflicts over unforeseen physical conditions are also more likely to arise on mega- (19.9%) than non-mega projects (14.8%). In Europe and the Middle East, the incidence of this cause of disputes was double the regional averages (of around 12%) for smaller-scale projects.

Only a few factors were in megaprojects' favour, including the levels of defective materials or equipment, and installation failures. Workmanship deficiencies also affected a smaller proportion (13.9%) than other projects (18.1%).

Yet, **workforce shortages** of both skilled and non-skilled personnel occurred on considerably more megaprojects (14.2% v 6.5%), and the gulf was wider in Africa and Europe. Gaps in **skills and experience** within teams were also more prevalent on megaprojects (14.2% v 10.8%).

How do outcomes vary?

We also explored the influence of sector, region and contract types on megaproject outcomes.

... by sector

The extensions of time sought by megaproject contractors tended to be considerably shorter in the power & utilities and energy & natural resources industries. They averaged, respectively, 49.3% and 58.1% of planned schedules. Sums in dispute were highest in energy and natural resources (averaging 12.0% of contract value), and buildings (11.6%) compared to other sectors.

Building and transportation infrastructure projects faced time claims that would add around three quarters to works programmes (77.2% and 71.4%). These delays may reflect the particular challenges faced by first-of-a-kind building structures and linear transport projects.

By contrast, in energy and natural resources projects, the wider use of modular elements, the lack of aesthetics, and the application of repeatable designs help limit scope change. Private employers in the energy sector often have their own highly experienced and capable teams and, free from public procurement constraints, form ongoing relationships with the supply chain.

... by contract type

Most megaprojects were governed by either bespoke contracts or FIDIC agreements. These two categories also returned the longest average EOTs (respectively, 68.2% and 61.4% of planned schedules).

Other forms performed significantly better, with typically lesser claims for delay – as low as 9.8% in the case of NEC (although this was a much smaller dataset). JCT was used on a number of notably large megaprojects (CapEX averaging just under $8.5 billion). Claims for extensions of time on those projects remained low (18.4%), but claims for additional costs were highest. Sums in dispute on JCT contracts averaged 15.8% of budgeted costs, compared with around 8.5% for predominantly bespoke and AIA contracts, and 12.6% for FIDIC.

It is not possible to conclude that wider use of other forms, such as NEC, would be beneficial. Very large and complex international projects may be best served by a bespoke contract, or by FIDIC, given its familiarity in the market. However, all would benefit from contracts with a balanced risk profile and strong incentives for collaborative working.

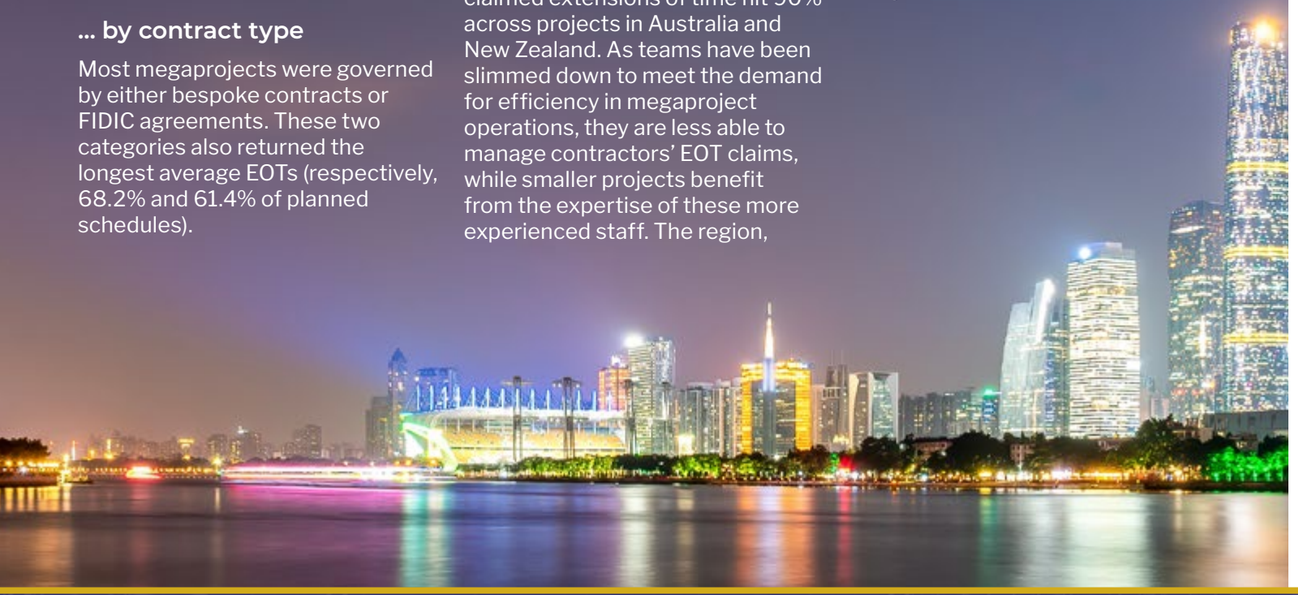
... by region

Projects in the Middle East have previously shown the longest average delays by region. This proved consistent across all projects, irrespective of scale, with megaprojects' EOTs averaging 80.6% of schedules. But that was overtaken in Oceania, where claimed extensions of time hit 90% across projects in Australia and New Zealand. As teams have been slimmed down to meet the demand for efficiency in megaproject operations, they are less able to manage contractors' EOT claims, while smaller projects benefit from the expertise of these more experienced staff. The region, which typically has amongst the lowest sums in dispute overall, also pushed the megaproject average cost overrun to a high of 11.6% of budgeted contract value.

Only megaprojects in the Americas saw delays averaging less than a third of schedules (32.7%), and their claimed costs were also below the global average (9.4%).

In the rest of the world, multinational joint ventures are the norm, bringing complications – behavioural, contractual, lingual and cultural. The relative size of the partners' shareholdings, their ability or reluctance to communicate and share information, divergent standards of record-keeping (often in a different language than the contract, and to each other), propensity to claim or negotiate – these are just some of the potential flashpoints. In many developing countries, a local partner or subcontractor is a prerequisite, bringing further challenges in capability and capacity. Alternatively, the works need to be broken down into smaller packages for local contractors, compounding problems in coordination and quality control.

Many other variations between contracts, causes and countries become evident through further analysis via the CRUX Dashboard.



Megaprojects
How scale affects causes and conflicts

Are megaprojects performing better?

Given that megaprojects are more likely to be impacted by most types of claim or dispute, there is a paradox. In percentage terms, extensions of time claimed on megaprojects appear to be somewhat lower, and disputed costs significantly below those on smaller projects – a reflection of overruns that may be distorted by the massive scale of megaprojects. The data also suggests a marked improvement in megaproject outcomes over the last five years, though the picture for specific drivers of disputes is more mixed.

These counterintuitive findings should be considered in the context of a multi-faceted, long-running project. Most claims and disputes investigated by our consultants will be specific to one package of works (even if the underlying problem is their integration with others). Though of high value, the budget for such a package will typically be only a fraction of the megaproject's overall CapEx costing. Also, while HKA teams may be involved in single or multiple claims on a project, that involvement may be focused on quantum or delay, rather than both, and may be limited to specific elements of a wider dispute.

Another factor to consider is the different ways in which claims may be processed and settled on projects of contrasting scales. While many disputes are not resolved until a final reckoning with the closeout of most projects, on a multi-year megaproject, more tend to be settled over the course of the project. The CRUX data for disputed costs on projects with scheduled end dates in 2020 or later will only include claims and disputes on which our consultants completed their work before mid-July 2025.

How has the pattern of causation changed?

We analysed claims and disputes on megaprojects over the last 25 years[13] and tracked the pattern of causation. CRUX's 39 causal factors fell into three more or less equal categories according to whether their incidence had fallen, increased or stayed roughly the same.

The table overleaf shows the top 15 causes on projects scheduled to be completed in or after 2020 – and how their prevalence has changed compared with the previous two decades.

There are some welcome signs. The comparison suggests that megaproject owners and delivery teams are more effectively managing change in scope, which remains the primary trigger of conflict. Design-related failures may have declined somewhat but remain near the top of the ranking. However, these design factors were leapfrogged in the latest period by two other disrupters – COVID-19 and problems around cashflow and payment – which are analysed separately on page 35.

Clashes over contract interpretation continue to disrupt megaprojects as much, if not more than ever, whereas contract management/administration would seem to be less common as a source of conflict (although this is not universal – see On better terms, page 19.), on contract-related causes). More generally, megaprojects tend to need mega-teams to manage them. Many problems stem from teams being under-resourced and/or from poor management structures.

Skill and experience levels and worker shortages continue to challenge delivery, though deficiencies in workmanship have fallen dramatically (from 16.7% to 5.6% over the full period). With the number of megaprojects worldwide forecast to grow, these pressures will intensify, especially where several in the same region are competing for human resources. For example, when electricians were in demand for both London's Crossrail and Tottenham Hotspur Stadium ahead of its completion a few years ago, cost control was the loser.[14]

Megaproject outcomes over time – Claimed EOTs and Costs

Pre-2020	2020 & later*
74.9% average EOT claimed	42.1% average EOT claimed
10.7% average cost claimed	9.8% average cost claimed

* Includes megaprojects ongoing beyond 2024, which may be years away from completion

13 CRUX includes historical data from predecessor firms compiled prior to the formation of HKA as an independent consultancy in 2017

14 https://www.standard.co.uk/sport/football/crossrail-shocked-as-new-tottenham-stadium-sparks-shortage-of-electricians-a3858666.html

Megaprojects

How scale affects causes and conflicts

Why does time weigh heavier than cost?

The wider gap between the averages for claimed EOT and additional cost on megaprojects can be attributed to many factors.

Contractors often prioritise claims for extensions of time. Successful extension of time claims are crucial in reducing and managing exposure to what might be significant daily liquidated damages. Also, while unrealistic schedules continue to be set (not least on infrastructure projects), contractors are doing better when it comes to pricing, which has become more realistic, and more contracts include mechanisms to manage inflation.

Amended provisions on concurrency incorporated into some FIDIC and bespoke contracts allow only time, not costs. Similarly, contractors have relied on force majeure due to shocks to global markets, often entitling them to time rather than money.

It is also true that owners and contractors are more often able to come to reasonable terms on the direct costs of a variation or other change, such as challenging site conditions. Subsequently, however, there is a battle over how much time should be allowed and what portion of the delay should be compensated.

A series of delay events may be claimed but the related costs swept up in a global settlement agreement along with compensation for unrelated events – again amplifying the time element over cost. The upsurge in COVID-related claims handled by HKA – predominantly around force majeure – will also have helped widen the gap between EOTs and costs in the data analysed.

Since 2020, there is welcome evidence too of owners and contractors being more cautious and legally aware (see On better terms, page 19), tempering some of the behavioural factors that can drive claims and disputes, and were analysed in our 2024 report.[15] Growing acceptance of cost escalation clauses in contracts may also be contributing to a reduction in the value of sums in dispute.

Top 15 causes of conflict – The last 5 years compared with previous periods

Causes of claims or disputes	Up to 2010	2010-2019	2020 & later
COVID-19 related cases	0.0%	1.4%	31.8%
Change in scope	50.0%	48.6%	27.1%
Cash flow and payment issues	16.7%	18.3%	25.2%
Design information was issued late	25.0%	29.6%	22.4%
Design was incorrect	25.0%	21.8%	22.4%
Design was incomplete	41.7%	26.1%	19.6%
Contract interpretation issues	16.7%	18.3%	19.6%
Physical conditions were unforeseen	16.7%	19.7%	16.8%
Access to site/workface was restricted and/or late	16.7%	14.8%	15.9%
Approvals were late	25.0%	16.9%	15.0%
Poor management of subcontractor/supplier and/or their interfaces	16.7%	18.3%	14.0%
Contract management and/or administration failure	25.0%	19.7%	12.1%
Shortage of skilled and non-skilled workers	8.3%	13.4%	12.1%
Level of skill and/or experience	0.0%	12.7%	12.1%
Tender errors and/or inaccurate estimates	16.7%	9.2%	12.1%

* COVID-related claims arising on projects overrunning their pre-2020 scheduled completion dates (% of projects that had these causes)

> *"The factors that increased most in significance with projects' scale were: contract interpretation, cash flow and payment, late approvals, and spurious claims"*

15 7th Annual CRUX Insight Report examined how employer and contractor behaviours contributed to a cluster of underlying causes of conflict – one of five 'mega-disrupters' on distressed projects.

Case study: A benchmarking tool for organisational capability

Businesses and public sector agencies responsible for delivering infrastructure face a common capacity and capability challenge. As projects grow in complexity and economic conditions change, they must adapt their functions, processes and systems to better meet stakeholders' needs.

Having supported many clients on this journey, HKA has developed tools to benchmark organisations against best international, cross-sector practice based on our experience and research.

National goals for infrastructure

In the case of one national agency, HKA's brief was to develop a plan to improve the overall productivity and innovation of the country's infrastructure sector as part of wider public sector reforms.

Our benchmarking exercise was based on five pillars: organisation, technology, data, people, and governance. It involved:

- Analysing internal policies, frameworks, and performance data.
- Interviewing stakeholders to gain insights on current capabilities, risks, and improvement opportunities.
- Evaluating functions against best practice frameworks and a structured maturity scale.
- Comparing the agency's capabilities with peer organisations across public and private sectors.
- Developing a roadmap to address capability gaps and support transformation.

Our team developed customised models to assess maturity across project management, contract management, and capital delivery functions.

Better customer outcomes

We provided a clear baseline of organisational capability and maturity, and identified key gaps in leadership alignment, data governance, and project delivery.

Our prioritised improvement plan – along with templates to support assurance and compliance – guides the agency's transformation and will reduce dependency on external advisors over time.

HKA's experience shows that improved processes and new ways of working enable better project planning and execution, more innovative and productive teams, and significant efficiency savings (of 15-30%).

Megaprojects
How scale affects causes and conflicts

13 steps to managing megaprojects better

» There has been a significant change in complexity from major construction and engineering projects of the past to modern megaprojects. Gigaprojects represent a further leap. Steering numerous contractors, extensive supply chains and multiple stakeholders is akin to running a global corporation. Except, most companies in the FTSE 100, S&P 500 or Nikkei 225 have decades of organic growth behind them, whereas megaproject teams must be mobilised from a standing start. Management methods – and organisational capability, capacity and culture – must be fit for programmes with lifespans of 15 years or more from inception to completion.

» Pressures associated with 'speed to build' manifest in various underlying causes of conflict, as our Seventh CRUX Insight Report detailed last year. From immature design and inadequate site investigation to restricted access and late appointment of subcontractors, the effects of this mega-disrupter are far-reaching. Also, big-ticket, prestige projects – such as transportation infrastructure, public buildings, nationally important hospitals – are more politicised and prone to being launched prematurely with optimistic timescales than other projects, especially in the private sector. Programming needs to be more realistic. Rigorous gateway checks, impartial verification of budgets and schedules to counter optimistic forecasting, and more advanced design development are critical to reduce delivery risks.

» Our advisory services team's advice to 'go slow to go fast' applies equally to scope change and design failures – the entangled, dominant causes of megaproject distress. Employers should commit to tighter scope definition and earlier involvement of contractors, integrating their technical input and insights when developing designs that are checked and frozen before starting work. This greater expense and time up front pays off in scheduling, constructability, and the management of interfaces and costs, especially on more complex engineering projects. Recognising this, the UK Treasury recently endorsed the government's Office for Value for Money's recommendation that mega infrastructure projects should have longer feasibility stages before being announced publicly.[16]

» Contractors also can act earlier for self-protection. Appointing experienced consultants and contract managers sooner – if not before, then immediately after, signing the contract – would help identify the risks that contractors have taken on that are likely to trigger disputes. Where risk transfer is excessive and/or a contractor is inexperienced, the need to develop strategies to mitigate and manage these risks only becomes more critical.

» Interface management is key. Alliance contracting has been shown to be effective. Entities involved in delivery across large-scale projects commit to managing their many interfaces, bridging the gaps that might otherwise result in clashes and disputes. Real 'buy in' by all is necessary to make alliancing work.

» A competent senior manager able to coordinate multidisciplinary designs is crucial on complex projects. So are specific milestones for design elements. Even if not enshrined in the contract, these markers allow more realistic scheduling as well as regular formal reviews by the project team. Responsibilities of employers, contractors and others for design should be clearly set out and agreed. Many disputes arise from poor change control and lack of clarity around design responsibilities. Assessment of design issues and claim events must be impartial, which may be compromised when the designer doubles up as project engineer.

» Recent global volatility has taught some lessons. We are seeing greater use of cost escalation provisions that share inflation risk between employers and contractors. Parties should consider re-balancing the risk allocation in contracts, providing incentives as well as penalties, while making fewer amendments to standard terms.

» Contractors, in turn, must ensure they have suitably experienced and resourced teams able to work collaboratively and transparently with their employers. The outcome for all is a greater ability to deliver value engineering, innovation, and enhanced constructability.

» Notwithstanding the dangers of customising contracts and the flexibility of standard contract suites, heightened uncertainties may justify some additional amendments. For example, special terms could enable improved risk sharing or management of change events. A more pragmatic and engaging approach to early notice provisions would help ensure that delays are notified soon enough by contractors to mitigate them. Meanwhile, rapid technological change increases the need to account for cybersecurity and adopt appropriate AI-driven efficiencies (see page 39).

» In some territories, localised versions of standard contract forms do not cater properly for the social context, including risks of civil unrest and strikes over pay. Terms can also be exploited for corruption and extortion, resulting in unqualified labour, or set out strict requirements that are complex and disadvantage local contractors. In Africa, where many livelihoods are at stake, workers sometimes go unpaid for long periods and labour agreements are renegotiated every second year, leading to recurring disruption. More refined terms rather than standard force majeure clauses would take better account of these local, and often foreseeable, conditions.

» Megaprojects will continue to be delivered by joint ventures and consortia, often multinational. Their members need to instil greater collaboration. JV agreements may be well structured from a legal perspective but can often fail to provide for practical ways of working together for project delivery. Poor drafting adds to the friction, as well as misunderstandings that arise from differences in language, culture, work processes, and claims culture. Clear definitions of and demarcations for duties, responsibilities, data sharing arrangements (including project costs), record keeping, communication channels and dispute resolution processes are essential. Internal review boards with parent company representatives should be put in place to resolve disputes before escalation.

» Amid fiscal tightening and rising public debt, private finance will have to play a bigger part in megaprojects. PPP models need to be revamped to rectify flaws – such as loose definitions of scope and risk allocation – that have derailed projects from North America to Asia. A 'progressive design build' approach is under consideration in Canada after 25 years of lump-sum, fixed-price contracts under its P3 model. The world needs innovative solutions that better balance the interests of private investors, national treasuries and end users while meeting the challenges of energy transition and climate adaptation.

» Efforts to improve megaproject delivery are being made in multiple countries, through agencies such as the UK's NISTA[17] and Saudi Arabia's EXPRO[18] and by enabling legislation, such as the One Canadian Economy Act.[19] The aim is to streamline planning, remove obstacles and expedite the development and delivery of projects of national interest. Measures focus on planning, environmental, regulatory and governmental impediments. Improving visibility of government project pipelines (as in the UK) allows Tier 1 contractors and supply chains to right-size their capabilities. As with PPP reforms, these and other initiatives will not fully achieve their objectives if project strategy, set-up and governance, or government client skills, are neglected.

16 Treasury endorses recommendations for longer feasibility stage before mega projects confirmed publicly | New Civil Engineer

17 https://www.gov.uk/government/organisations/national-infrastructure-and-service-transformation-authority/about

18 https://saudipedia.com/en/article/1280/government-and-politics/expenditure-and-project-efficiency-authority-expro

19 https://www.canada.ca/en/one-canadian-economy/services/building-canada-act-projects-national-interest.html

COVID-19

The pandemic's impact made plain

Previous CRUX Insight reports reflected the impact of COVID-19, but its long shadow falls most heavily on this year's analysis.

Since 2020, nearly a quarter of all distressed projects (24.0%) have had claims or disputes over delays and disruption attributed to the pandemic. This approached a third of megaprojects (31.8%). These are likely to be peaks, as the indications are that the number of unresolved claims related to the pandemic diminishes.

From global to regional

Our second graphic below shows how the pandemic's impact unfolded by region and time (based on projects' scheduled end dates).

The Middle East and Asia – regions with the longest lockdowns – spawned most claims and disputes. At least one dispute in South-East Asia saw a two-year EOT claim. But the Americas and Oceania still saw levels of disruption that were higher than might have been expected, when compared with claims activity in Europe.

Apart from disruption to international supply chains, the more labour-intensive construction practices followed in some markets, such as Africa, was another factor, as were the responses adopted by parties in different parts of the world (see below). In terms of global sectors, energy and natural resources would appear to have been disrupted most, followed by power and utilities.

How did employers respond?

The diverse responses of employers to the pandemic also affected the pattern of disputes. In Asia, many owners are said to have been pushing back all COVID claims where contractors had agreed to a guaranteed lump sum.

In Europe and the Middle East most contracts allowed time rather than money under force majeure clauses. But FIDIC's broad definition of change in law also provided relief for many contractors. In some cases, including the UK offshore wind industry, moral arguments and industry guidance persuaded employers to allow financial compensation, particularly where they had built a long-term relationship of trust with contractors over several projects.

On many US projects, change orders were granted and direct costs paid, but the parties disagreed over lost productivity and other impacts that contractors blamed on the pandemic. In Canada, arguments over the cost impact mostly boiled down to whether a change in law or force majeure applied. Most of these cases handled by HKA were resolved through negotiation.

A pandemic-proof future?

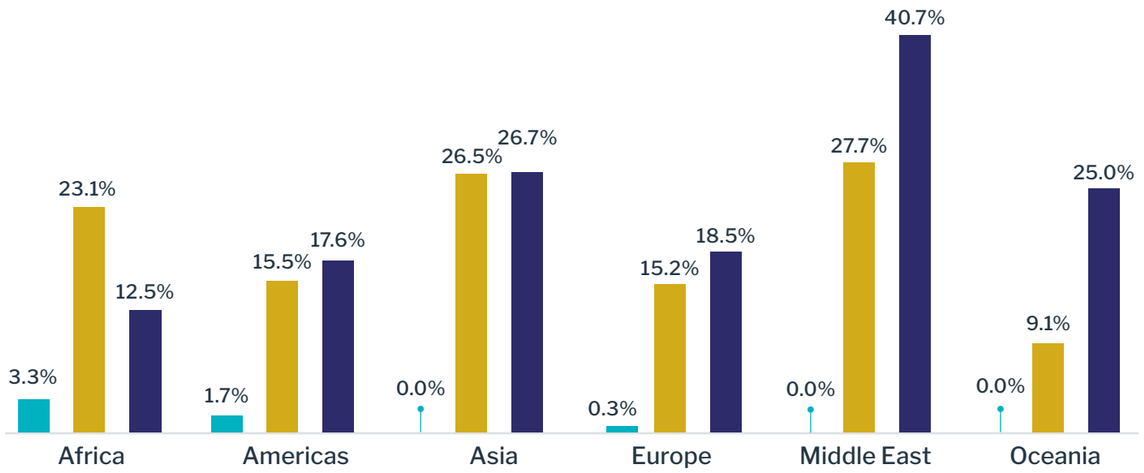
Some contractors may issue claims retrospectively, based on lessons learned. But contracts are increasingly being pandemic-proofed for the future. Some contracts provide more clarity on how to address a global pandemic: global virus outbreaks are more often expressly excluded from entitlement or are subject to defined parameters. Further, there is the potential issue of whether or not future pandemics are unforeseeable and might fail the force majeure test.

Contracting parties need to be more wary of force majeure clauses and remain mindful of the high standard of proof required for any global claims. Impacts on productivity and the root causes of specific delay events or additional costs should be clearly identified and evidenced.

Across Europe and other civil law jurisdictions, legal codes offer potential relief to contractors from further events like COVID or the Ukraine invasion that cause 'economic hardship' through rapid cost inflation or supply chain disruption. Whereas, in common law jurisdictions, a high bar is set for contractors hoping to invoke the legal concept of frustration where "the law recognises that without default of either party a contractual obligation has become incapable of being performed……".[20]

20 https://www.fenwickelliott.com/sites/default/files/f_frustration.pdf

Claims and disputes caused by COVID-19



* Projects categorised by scheduled end date. Includes those completed in later periods that experienced claims arising from the pandemic.

Claims and disputes related to COVID-19 – Megaprojects vs. Projects overall

	Pre-2020*	2020 & later*
All projects	2.0% COVID-19 related causes	24.0% COVID-19 related causes
Megaprojects	1.3% COVID-19 related causes	31.8% COVID-19 related causes

* Projects categorised by scheduled completion date. Pre-2020 includes those completed in later periods that experienced claims arising from the pandemic.

> *Nearly a quarter of projects had pandemic-related claims or disputes, and a third of megaprojects.*

Cashflow and payment issues

Contention rises with financial pressures

Cashflow and payment issues have risen in this year's CRUX ranking. Over the dataset's entire time range, this problem now ranks in 11th place as a source of claims and disputes. The cumulative share of distressed projects impacted by this cause stands at 14.7%.

Our analysis reveals that this form of conflict has risen over time, and the toll has been far heavier on megaprojects in several world regions.

Overall, more projects have been affected in Africa and the Middle East than in any other region (27.9% and 25.8% respectively). Other regions lie below the global average, with Oceania the lowest at 6.7%.

This divide reflects the benefits of payment security legislation – lacking in Africa and the Middle East – for the construction pyramid of contractors and subcontractors.

Laws and regulations in various (and more) jurisdictions afford some degree of protection against late and under-payment and retentions. Singapore's Security of Payment Act (SOPA)[21] took effect from April 2025. Hong Kong's equivalent ordinance came into full force at the end of August.[22]

In Europe, the EU is proposing an update to strengthen its late payment directive, while requiring all member states to establish enforcement agencies. UK legislation, which already mandates payment processes and timelines, this year extended performance reporting requirements for larger companies on their retention policies and payment performance, and mandatory payment terms to the supply chain.[23]

In North America, prompt payment regimes are in force for federal projects in the US and Canada, while many states and provinces have their own laws on payment practices and dispute resolution.

How badly are megaprojects affected?

When we take account of projects' scale, the pattern of claims and disputes over cashflow and payment issues changes significantly. This is the sixth most powerful driver of disputes on megaprojects (compared with 11th for projects below the $1 billion CapEx threshold).

More than a fifth (22.2%) of megaprojects were affected worldwide over the full analysis period. The global average for smaller-scale projects was 13.4%. And there were intriguing regional variations:

Africa: The correlation with scale reverses. Megaprojects incurred fewer claims, with 18.8% of projects affected against 31.1% of smaller projects.

Americas: The region has the sharpest divide, as megaprojects were three times as likely to suffer arguments over payment – 30.4% compared with 10.1% of other projects. Conflict over cashflow was the third biggest source of contention on megaprojects after incomplete design and change in scope. In some cases, contractors may blame late payment for delays that arise from other causes. The Americas is the only region with this factor among its top five causes.

Middle East: Megaprojects were only slightly more prone to these disputes (28.3% versus 25.1% of other projects), as traditionally restrictive payment practices are firmly embedded across the industry.

In other regions, the gap between megaprojects and other projects was narrower, at around three percentage points in Asia (14.3% v 11.6%) and Europe (11.5% v 8.8%). In Oceania there was little difference, and larger projects – despite the distress highlighted in other CRUX data – were less vulnerable to this type of dispute (6.4% v 6.8%).

Are restrictions on payments increasing?

The trend over time in cashflow and payments disputes on megaprojects is also significant.

Prior to 2010, this was already among the larger sources of claims and disputes, affecting 16.7% of projects. There was an uptick to 18.3% over the next decade, probably due to straitened finances following the global crash and recession.

Further shocks came at the decade's end with the pandemic, invasion of Ukraine, and spikes in energy prices, inflation, interest rates, and thus capital costs. Among projects with scheduled completion dates in 2020 and later, a quarter (25.2%) were disrupted by disagreements over cashflow and payments.

How to ease cashflow?

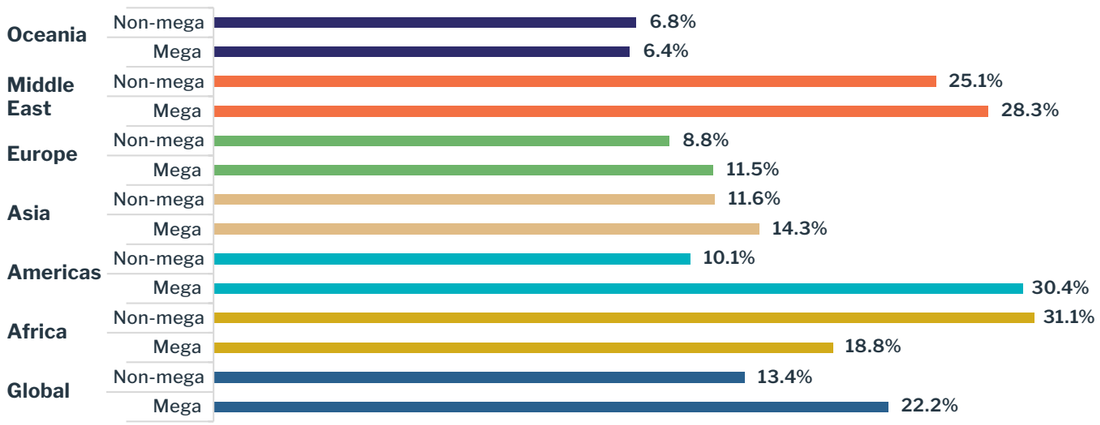
Higher volatility and uncertainty in the world economy make governments and private investors more cautious and pile more pressure on project financing.

Widening international regulation of payment security is a positive development for the global construction industry. A lack of statutory protection leaves a country's domestic contractors and supply chains at greater risk and deters foreign players. In South Africa, where contractual adjudications over payment are too protracted to ease cashflow, the need to legislate for a solution is again a hot topic at industry forums.

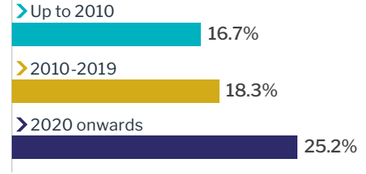
At a project level, an escrow arrangement in the contract would require the developer to deposit funds as security in the event of late payment; (and may require a performance guarantee from the contractor). Escrow accounts could be mandated by federal or state governments as an alternative to payment security legislation, or a supplementary measure.

In some regions, project bank accounts with ringfenced finances also increase protection for payments to contractors and subcontractors. While employers may resist such non-mandatory measures, statutory solutions to ease cashflow are feasible but require political will.

Cashflow & payment issues: Megaprojects vs. Smaller-scale projects



Cashflow & payment issues on megaprojects over time*



* Projects categorised according to scheduled completion date

21 https://sso.agc.gov.sg/Act/BCISPA2004

22 https://www.cic.hk/content/sopl/en/home.html

23 Duty to report: guidance to reporting on payment practices and performance - GOV.UK

Artificial Intelligence

AI's role in construction and dispute resolution

As an enabler of data-informed decisions, AI tools can already support almost every phase of construction and engineering from design through site operations to maintenance. Although significant barriers remain to be overcome, adoption is rising.

Generative AI has the potential to transform project outcomes, and if successfully integrated at scale in workflows across the project life cycle, could boost the industry's lagging productivity.

We have seen clear benefits too in the investigation and resolution of disputes, not least identifying the root causes of delays on complex projects (see case study). HKA has also demonstrated, through workshop sessions, how time and efficiency savings can be reaped in investigations ranging from an environmental dispute[24] on a construction project to a financial scandal.[25]

Many of the most important uses of AI on major projects currently involve scheduling, delay risk management, and safety and site monitoring. For example, millions of construction sequences can be simulated, testing various scenarios such as delays and resource shifts. Real-time comparisons of on-site progress to BIM[26] and the planned schedule can be used to forecast delays, prompting AI-derived targets and dynamic re-sequencing of works. Based on data captured through computer vision and sensors, AI-powered systems can autonomously detect missing PPE or unsafe behaviour, deny authorised entry, and alert supervisors.

Ongoing development

Many in the industry expect that AI will advance over the next five years to shape smarter, faster project design.[27] With AI-powered digital twins, project management could also be transformed as continuous, real-time updating of the model unifies design, procurement and construction. By identifying delays and their causes earlier, they can be managed at the time, potentially minimising disputes. In the longer term, it is hoped that AI's growing predictive capabilities and integration with the Internet of Things, robotics and other technologies will lead to autonomous site operations and end-to-end supply chain optimisation. In the meantime, there are valuable gains to be made by exploiting the capacity of AI tools to analyse data rapidly and detect patterns that may not be visible to the human eye. The sooner, and earlier in a project, data is captured and mined, the more proactive and effective decision-making will be. We need to train AI to maximise the value of these insights.

Limitations & guardrails

At HKA, we will continue to develop and apply AI-powered tools in dispute resolution, technical reporting, and advisory assignments. However, guardrails are essential given the technology's limitations:

- **Contextual understanding:** Although AI excels at recognising patterns and summarising data, it lacks the nuanced understanding of human experts, especially in unique, context-specific situations.
- **Data quality:** The accuracy of AI predictions hinges on the quality and completeness of input data; gaps can lead to misleading results. Data must be AI-ready, so it is fit for the specific use case.
- **Data security:** Confidentiality and security requirements must be recognised from the start, and appropriate standards implemented. A virtual private cloud (VPC) or other secure, isolated environment is essential for storing and processing data on large language models (LLMs). Licensing terms must guarantee that no information is retained or used by the model's creator.
- **Defensible process:** Our procedures ensure that the process and tools used are clearly documented and traceable; the output is trustworthy, validated, and fit for purpose; and repeatable – the same input yields consistent output under controlled conditions.
- **Human oversight:** AI's output must be validated by construction experts to ensure contextual accuracy and reliability. Domain expertise is irreplaceable.

24 https://www.linkedin.com/posts/algglee_aichallenge-environmentalinvestigations-innovation-activity-7381353054769672192-Eig8/?utm_source=share&utm_medium=member_desktop&rcm=ACoAADmnMycBp1f_ApYa88q34naIaIHvEovqpJ4

25 https://www.hka.com/article/reimagining-investigations-ai-in-action-in-london/

26 Building Information Model / Modelling

27 https://www.rics.org/news-insights/optimism-high-for-ai-in-construction-but-skills-shortages-and-integration-challenges-adoption

AI, particularly the latest LLMs, excels at managing data-heavy and repetitive tasks such as document parsing and pattern recognition, thereby allowing experts to focus on strategic analysis. However, it is imperative to integrate AI with human judgment to ensure comprehensive and contextually accurate assessments. The defensibility of such assessments and the underlying evidence will be key to ensuring trust in AI-driven expert analysis.

> *"The sooner, and earlier in a project, data is captured and mined, the more proactive and effective decision-making will be."*

What would an AI-optimised dispute investigation look like?

The following scenario blends HKA experience, existing AI models and tools now in development to outline a plausible use case involving interlinked delays on a complex transportation project.

Streamlining analysis of metro rail delays

A major metro rail project involving construction of a series of stations faces significant delays and disputes between the contractor, owner, and subcontractors. Our team is engaged to identify the root causes of these delays, which are attributed to design revisions, materials procurement, labour shortages, utility conflicts and other factors. The analysis requires processing over 15,000 documents (including emails, schedules, change orders, and inspection reports).

Challenges

The assignment poses several challenges, not least data overload and the complexity of the project's timelines. The volume of documents means that manual review would be impractical, risking critical details being overlooked. Delays are interlinked across multiple stations, complicating the assessment of liabilities.

What we do

At each stage, our team applies HKA's defensible and proven AI-powered methodology to overcome these obstacles:

- Document summarisation and analysis: We make secure use of the latest Large Language Models (LLMs) to automatically summarise contracts, meeting minutes, and technical reports, cutting document review time by an estimated 60%.
- Key date & event extraction: Using these LLMs, we are able to extract and structure accurately key milestones and delay triggers (such as permit delays), and to assign responsibility.
- Delay categorisation and analysis: We employ advanced AI capabilities to categorise delays into distinct phases (design, procurement, execution), revealing systemic issues in design approval workflows.
- Timeline reconstruction: By integrating insights from AI with Primavera schedules and using AI-powered timeline mapping, we visualise critical path disruptions effectively.

Predictive insights: Drawing on past experience and AI trained in-house to identify patterns, we analyse historical data to predict potential future risks, enabling proactive mitigation strategies for the remaining stations under construction.

Results

Our AI-driven approach produces rapid and robust results. We identify a series of critical delays with an accuracy of 95% compared to traditional methods. The shortened analytical phase releases our experts to add significant value for clients, not least through timely evidence and advice. Our AI-generated reports provided actionable insights, facilitating dispute resolution and accelerating subsequent project phases.

CRUX Methodology

The Eighth Annual CRUX Insight report presents the high-level findings from our analysis of the causes of claims and disputes on 2,204 projects across 114 countries worldwide.

New report features

Our well-established methodology is essentially unchanged from last year. Claims and disputes on capital and infrastructure projects are analysed according to their primary and secondary causes, which have been identified by HKA consultants. CRUX then ranks these causal factors by the percentage of projects they affected. The CapEx values of projects, sums in dispute, and claimed EOTs are also analysed to provide averages for affected projects, regions and sectors.

For this year's report, we also analysed the patterns of causation and outcomes over time. Given that projects can span long periods – exceeding a decade in some cases – several bases were used, including the start and end dates of projects and our assignments. Categorisation by projects' scheduled completion date in periods of five, 10 or more years provided the most consistent and robust results.

The CRUX database not only includes claims and disputes analysed over eight years but also legacy data from previous assignments completed before HKA was formed in 2017 from the merger of consulting practices in predecessor firms. Some projects date back to the early 2000s. Where scheduled end dates were not recorded, projects have been excluded from the time-based analysis, giving a dataset of 1,705 projects.

Definition of causes

Before launching the CRUX integrated research programme more than eight years ago, we compared causation taxonomy across 57 peer-reviewed academic publications, industry reports, and other available sources worldwide. This produced a list of 1,750 causes of construction and engineering claims and disputes.

Through detailed analysis and mapping of trends and variations in terminology, we were able to condense these causes into 50 coherent, individual definitions. The list was then analysed by a HKA Expert Review Panel to compare these frequent theoretical factors with their practical experience on live projects. Our panel refined the list to give us the most salient causes.

The list was then shared with another group of HKA experts drawn from all our regions to ensure that the causation factors used in our internal questionnaire would be comprehensive and representative of the disputes and projects occurring across the global industry. Similar reviews have led to further refinements, including the addition of causes to cover claims and disputes relating to the COVID-19 pandemic. The current list of factors in the questionnaire comprises 39 causes of claims and disputes.

We continue to review the CRUX causation factors and will refine the analysis where we believe it would reduce subjectivity and improve reliability.

CRUX data acquisition and reporting

The CRUX report examines construction and engineering projects on which HKA has provided services where there was a claim and/or a dispute. All data is derived solely from these assignments and the first-hand findings of our consultants. Our analysis therefore reflects the pattern of HKA's workload in our operating regions, the mix of project types, and the quantum, delay and/or forensic analytical services provided.

When an HKA team has been involved with a project for over 30 hours it becomes eligible for inclusion in the CRUX analysis. They complete a digital questionnaire attributing each claim or dispute to primary and secondary causes, based on their investigations. This dataset now extends from commissions on projects for the period from 2016 up to July 2025. We continue adding to this cumulative bank of data, updating previously captured information where appropriate, and undertaking additional analysis.

Having analysed the data to produce our initial CRUX results, we share the findings with HKA staff from around the globe who, in a series of regional panel discussions, appraise and contextualise the results, adding further value. (See CRUX Interviewees, next page.) Data and expert insights are then summarised for the annual CRUX Insight report, which is peer-reviewed before publication.

Additional data, beyond that included in the published report, can be accessed via the CRUX Interactive Dashboard.

If you would like to know more about the methodology of our reports, please contact CRUX@hka.com.

CRUX Interactive Dashboard

or visit

https://www.hka.com/crux/interactive-dashboard/

Further value can be derived by delving deeper into our dataset through the CRUX Interactive Dashboard.

Users can freely explore data on more than 2,200 projects to illuminate a wide range of issues, such as the most prevalent causes of claims and disputes in a particular industry or market, the proportion of projects affected by a specific cause in different jurisdictions, or the extensions of time typically claimed on different types of projects in a given region or globally.

These are just a few examples of the many questions the dashboard can answer.

HKA's CRUX Team

We would like to thank Renny Borhan (Partner, Chief Executive Officer), Toby Hunt (Partner, CRUX Sponsor), Haroon Niazi, Stephen Rae, Kourosh Kayvani, Maged Abdelsayed, Franco Mastrandrea, Mike Pitt, Shaun Russell and Peter Caillard and all CRUX interviewees for their guidance and review throughout the production of this Eighth annual CRUX Insight report.

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Partner, Chief Marketing & Communications Officer

Toby Hunt
Partner, CRUX Sponsor

Josh Robinson
Global Graphic Designer

Eugene Silke
Silke & Co
Editorial Consultancy

Laura Whyte
Corporate PR and Digital Communications Manager

CRUX Interviewees

Below are our CRUX experts, drawn from all HKA disciplines and global offices, and interviewed as part of the research process. They have contributed their expert insights based on direct experience working on claims and/or disputes on some of the world's largest and most complex engineering and construction projects.

Kirsteen Cacchioli
Principal

Nicola Caley
Partner

Yen Chew
Director, Country Manager, Malaysia

Nader Emile
Partner

Dan Feinblum
Partner

Sonia Guerra
Director

Bill Haggart
Partner

Timothy Harwin
Partner

Huseyin Karanci
Principal

Martin Leatham
Principal

Werner Luus
Principal

Rick Moffat
Partner, Head of Operation, Canada

Darren Mullins
Partner, Investigations Practice EMEA

Kim Reome
Partner

Francois Spies
Technical Director

Charles Wilsoncroft
Partner

HK>A

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