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“REJUVENATING CONTRACTS: AVOIDING MEGA-PROBLEMS ON MEGA-PROJECTS”

— MANUSCRIPT IN THE PROCEEDINGS OF POWER-GEN
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“LEARNING” PAGE



‘REJUVENATING CONTRACTS: Avoiding mega-problems on mega-projects’

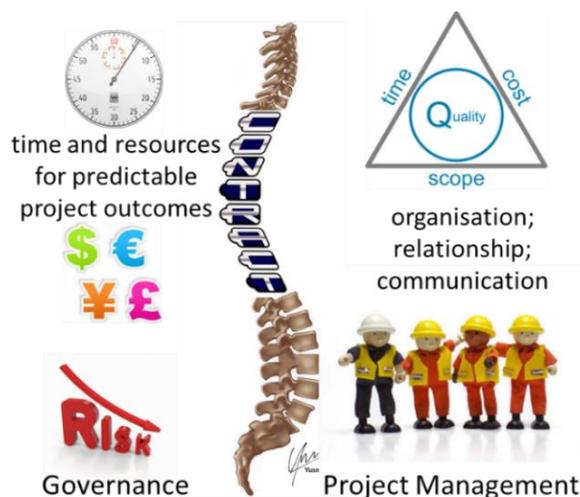
Ben Crossley, Energy Contract Solutions, Singapore 2018



Abstract. Billions of dollars are wasted annually on power mega-projects through execution inefficiency, lost production and disputes. The potential of contracts to help solve the causes of project overruns is by and large not being harnessed. Most construction contracts nowadays are too complex to be understood by users, focus *too much* on who to blame, and *too little* on how to get the job done. With modest investment and supportive behaviours, contracts can be rejuvenated¹ as powerful business instruments central to avoiding mega-problems on mega-projects.

What is a contract? It is a smart tool that significantly increases the chance of project success. In legal terms: a contract is a “*set of promises that the law will enforce.*”² The client promises to pay the contractor an agreed compensation for delivering a plant of agreed capacity and quality, under specified execution criteria and working requirements.

FIG 1. A contract is the project “spine”. It provides business governance and project management discipline.



¹ “Rejuvenate” means to restore former strength. To make fresh and new again

² Definition of “contract” by Pollock – ‘Dictionary of Law’, L B Curzon

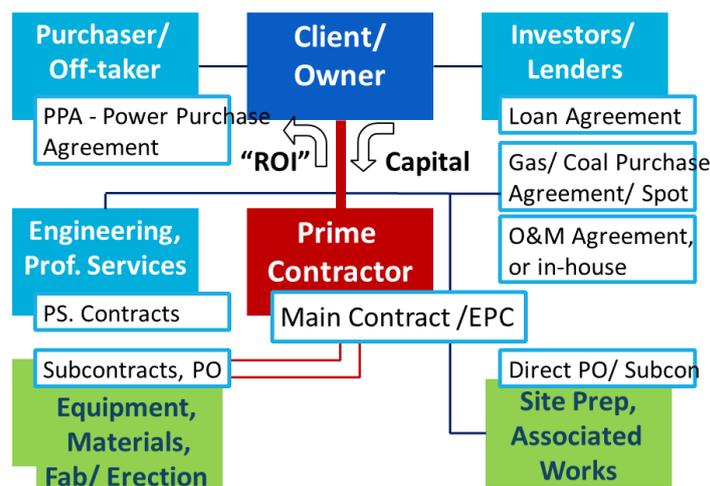
As illustrated in FIG 1, a contract should provide:

1. *Governance* of the business agreement: high-level assurance that a project has sufficient resources and control measures to meet the business objectives. Allocates risks and legal liabilities, and;
2. *Project Management* discipline to execute the agreement: scope definition, project relationships, organisation, communication, performance monitoring, control measures, and much more.

The governance function has been dramatically illustrated by the collapse of companies that entered into under-bid lump sum contracts.³ The project management function is clear to see by comparing the contents of a major construction contract against the headings of a Project Manager's Body of Knowledge "BOK".⁴ BOK headings cover exactly the same subjects as a substantial portion of the contract clauses.

Most principles in this paper apply to all the project network of owner contracts illustrated in FIG 2. The project needs an overall contracting strategy, including aligned risk and contingency allocation, coordinated scope and schedule. For example: the degree of engineering definition and schedule of deliverables shall match the construction contract bid schedule and the contract form.⁵

FIG 2. The network of Owner Agreements underpinned by contracts.



³ Carillion Group in UK building sector collapsed 2018, and Shaw Group in international process plant contracting collapsed 2012

⁴ Project Management Institute (PMI) USA; Association for Project Management (APM) UK

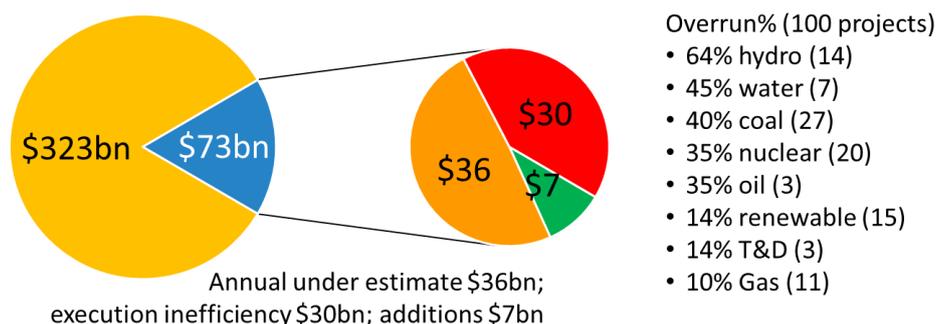
⁵ Some contract forms need more definition (% variance to actual) at bid stage than others

Overruns: mega-problems on mega-projects. Three recent reports highlight global overruns across power, oil and gas, mining, civil infrastructure and building projects.⁶ Ernst & Young report specifically on 100 major power and utility projects:⁷

- Cost overrun average 35% from initial estimate on 57% of projects
- Delays average 25 months on 64% of projects

Though publicly available data is limited,⁸ the Ernst & Young figures are realistic by the author's own experience and the many "sick projects" reported by personnel in the SE Asia power industry.

FIG 3. Annual US\$73 billion overrun on initial estimate in the global power sector, split into three cost overrun categories; and average project cost overrun % by type.⁹



Cost overruns are huge: US\$73 billion overrun every year globally as illustrated in FIG 3. It is easier to grasp the scale of overruns on an individual project of the type typically encountered. Taking a reasonably common \$1 billion project, the average overrun applying reported percentage % would be \$350 million. Almost half is pure waste through execution inefficiency. Even the better performing renewables, many of which are nowadays mega-projects, often in challenging off-shore environments, overrun at double the 5-7% contingency typically budgeted by clients/ investors.

⁶ Cited Literature Ref. #5, 6, 7

⁷ Cited Literature Ref. #5

⁸ Any company wanting to validate reported figures can benchmark their outturn data against these figures

⁹ Cited Literature Ref. #5 overruns % as shown in FIG 3, multiplied by International Energy Agency 2016 forecast investment in each sector, multiplied by estimated mega-projects in IEA sector total. US\$73bn total overrun is split 50%, 40%, 10% based on the author's analysis of claims and changes databases.

Delay to start-up causes Return on Investment “ROI” losses. Considering a \$1 billion project again:

- \$340 million would be the ROI loss for the reported average 25month delay in the \$1 billion project scenario, and a mid-range ROI of 0.045%.¹⁰
- \$100 million would be the maximum Delay Liquidated Damages “DLD” when contractually capped at the normal 10% of contract price.¹¹

Disputes occur on all projects with major overruns, including EPC lump sum turnkey. Some clients are advised and believe that EPC lump sum turnkey terms *guarantee* a fixed price. A recent actual client quotation to that effect:

“If the project fails contractor is responsible ... we won’t pay more than the contract.”

This common belief is a delusion. The previous \$1 billion project outcome scenario shows the fact that even a client who recovers the maximum DLD will suffer significant ROI loss. Added to which, the \$350 million capital cost overrun is always shared between parties. Responsibility is never black and white and is often contested in disputes that support a thriving ancillary claims business burning \$100s of millions annually. In the real world, clients have more to lose from project overruns.

Overruns have become almost an accepted part of project business. Huge overruns are often consigned to a footnote in a financial review. For example: *“The cost overrun of US\$1.5 billion on the original project provided valuable lessons on dealing with future work.”*¹² Just another \$1.5 billion!

Investors, business executives and project managers of both clients and contractors should be searching for the causes of overruns and the corresponding solutions. Yet, in a recent survey,¹³ only 30% of more than 200 power sector executives said they had

¹⁰ ROI figures vary greatly depending on the Power Purchase Agreement PPA and electricity price, operating hours and cost. ROI industry benchmarks vary in the range 0.02% to 0.07% of capital investment per day

¹¹ DLD rates range from 0.01 to 0.03% per day

¹² ‘Project Finance International’ report on SE Asia energy project, June 2018

¹³ Cited Literature Ref. #5

identified measures to tackle overruns. Measures to help improve outcomes are examined below.

Overrun root causes. Three recent reports¹⁴ highlighting global overruns also list root causes.¹⁵ These are similar across all three reports and match the author's own experience. The principal causes are summarised as follows:

1. Unrealistic contract commitments of cost and time
2. Inadequate definition of work scope and execution conditions
3. Business intentions misaligned with signed contracts
4. Inappropriate risk allocation
5. Poor supply-chain integration
6. Execution teams unprepared and lacking necessary skillsets. Projects not set up for delivery

FIG 4. Example of a power plant mega-project major overrun due largely to unachievable time commitments



Case examples from author's experience demonstrate root causes numbers 1 - 2:

1. Unachievable time commitments: FIG 4 nuclear power plant contracted with 5-year schedule v. historical best of 7 years. Not only was the project destined to overrun, the teams trying to "catch up" with an unrealistic schedule lacked a sound basis to manage their work. The eventual cost/ time overruns from execution inefficiency vastly exceeded the original (under)estimate.

¹⁴ Cited Literature Ref. #4, 5, 6

¹⁵ Causes of what went wrong on the project. Irrespective of client/ contractor contractual responsibility

2. Inadequate definition occurs in two forms:

- Front End Engineering Design (FEED) which should be developed to within +/- 10% variance of actual¹⁶ is poorly defined as industry norm. Variance exceeding +/- 25% occur even on EPC lump sum contracts.
- Technical Requirements being stated in such a complex or poorly defined manner, that the intended outcome is impossible to define. For example: one turbine OEM recently reported a contract with 39,000 specifications. This presented a veritable “kaleidoscope” of requirements - changing with every viewing. We will return to the complexity problem later.

A different overrun cause often cited is the increasing scale, complexity and one-off nature of mega-projects. They may seem unmanageable at first sight: scores of companies in a global supply chain, hundreds of engineers, thousands of workers, tens of thousands of documents. However, if complexity was the root cause, then breaking a mega-project into independently managed projects would cure the problem, but it does not. Mega-projects are not destined to fail. They require appropriate contracting strategies, more disciplined project development, engineering, and execution.¹⁷

It is significant that all causes 1-6 could be resolved during project definition and setup.¹⁸ It is frustrating that many projects fail for the same unnecessary reasons. Project professionals know why projects fail, and they know how to prevent all the reported root causes 1-6. This leaves a big question which has been open for at least 20 years. It is sometimes known as “Cobb’s Paradox”:

“We know why projects fail; we know how to prevent their failure—so why do they still fail?” - Martin Cobb, advised the Canadian Treasury investigating information technology project failures, 1995.

So why don’t organisations just fix the problems? That’s a great question. An answer is proposed towards the end of this paper in the section on social behaviours. First, let us look at solutions.

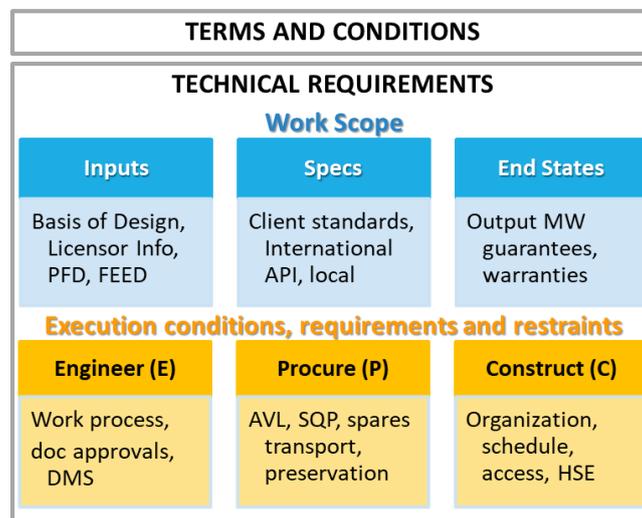
¹⁶ Cited Literature Ref. #8

¹⁷ Cited Literature Ref. #8 (new or challenging technology requires extra special discipline)

¹⁸ External events such as change in law or Force Majeure make a negligible contribution to total overruns

Contracts are key to a solution. All complex undertakings¹⁹ with successful outcomes start with careful preparation. In energy projects this preparation is commonly known as Front End Loading (FEL). Which means loading the early project stages with project development resources. In particular developing well-defined FEED²⁰ and execution conditions, thinking through the project execution plan, and making realistic cost and time estimates based on a reliable project definition. This could solve most of the reported overrun root causes.

FIG 5. A good contract encapsulates all Front-End Loading. A logical contract structure gives clarity and makes it easier for users to navigate



Contracts are key for several reasons: A contract is the ‘spine’ of business governance and project management discipline – see FIG 1 and the related explanation. It defines four key attributes of the business deal: performance obligations, payment principles, first-order risk allocation, and working relationship. It is the only way to encapsulate the vital results of Front-End Loading illustrated in FIF 5. as enforceable commitments between contracting parties. Constructive pre-contract clarification and negotiation is the first step to building an important outcome focused project team.

¹⁹ Whether it be constructing a plant, a sports match, or even a military campaign. All are one-off “projects”

²⁰ FEED costs are in the range 1% and 3% of total capital investment. That is \$10 million to \$30 million in the \$1 billion project scenario.

Contracts which *do not* provide solutions. Many contracts nowadays are not “smart tools” that help projects succeed. Problems occur in two principal areas: poorly-constructed *contract content* which has become increasingly complex over the last 20 years, and second; using the wrong *contract form*.²¹

The General Legal Counsel at GE Aviation recently wrote in the Harvard Business Review:²²

"For the most part, the contracts used in business are long, poorly structured, and full of unnecessary and incomprehensible language..... Business leaders should not have to call an attorney to interpret an agreement that they are expected to administer."

Many contracts fit this description of poorly-constructed contract content. That is alarming. If contracts cannot be understood by normal project people, they will not be used. If not used, what chance is there of a contract being a key part of the solution? This situation is highlighted in a recently reported statistic²³ that many people in commercial business situations do not read the contract anyway, and 88% of those that do cannot understand most of it.

And here is another alarming point. The inefficiency of people reading a contract without any useful benefit. That's only a small part of major inefficiencies caused by poorly-constructed contracts: Negotiations take longer delaying project commencement, execution takes longer²⁴, and ambiguities means that each side can find a different interpretation which causes friction in project teams often escalating to disputes. Far from being part of the solution, poor contracts contribute to overrun problems.

²¹ Contract “form” or “strategy” or “type” means the choice of EPC lump sum, reimbursable, or one of several other contract form options. Wrong contract form relates to reported root causes numbers 3 and 4

²² Cited Literature Ref. #2

²³ Cited Literature Ref. #1

²⁴ One of many examples: Execution delayed by poor document specifications that comprised 8 unlinked sections, totalling over 200 pages. Just months before project completion, project teams needed to agree practical specific requirements for turn-over documentation to be submitted before start-up.

In practice, most claims and disputes originate in the Technical Requirements, particularly the execution conditions. TR are mostly prepared by engineers who are experts in their field, but not necessarily expert in the art of drafting contracts. They are inclined to *focus on what* equipment to specify and tend to *overlook how* to execute.

Balanced or “fair” contracts with a mutually beneficial business deal are more likely to succeed. Contracts seeking wins only for one side cause friction and end with unpredictable outcomes. A problem nowadays is the almost “automatic” choice of EPC lump sum even in the wrong circumstances. This form has many advantages but is not appropriate when the work scope and execution conditions are poorly defined, or contractor is compelled to take risks that he can neither quantify nor control.

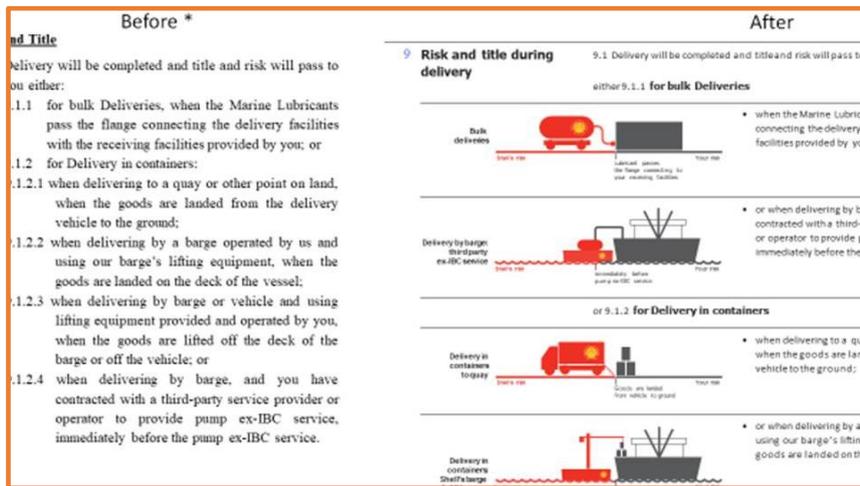
The root cause of problems with contracts is that their purpose, function and value are often misunderstood. They have an image problem. They are seen in a negative context, not a positive one. Some organisations view contracts as a “necessary evil,” which take time and effort to prepare, contribute little to getting the job done, and can be used only by “experts”.

Because contracts are misunderstood in a negative context, there is a lack of investment in time, resources and management of the contract development process.²⁵ The result is more poorly-constructed contracts. Contracts remain trapped in a vicious cycle of lack of understanding, lack of investment, and back to the next poor contract. To break out of this cycle and rejuvenate contracts, they must be correctly understood as a key part of the solution as already explained.

Contracts which *provide solutions*. These are the opposite of the last section. They have well-constructed contents and an optimised contract form. They are structured, concise, precise and complete. They prevent “value leakage” from the business deal. They are also currently in the minority.

²⁵ It's rare to find a realistic Contract Development Schedule (CDS). Managing the technical departments, and often the separate engineering companies generating TR is challenging and often inadequate

FIG 6. Contract simplification – before and after. Infographics - endorsed by legal team (defines scenarios of passing risk and title of goods)



Contract simplification is trending with the aim of rectifying problems highlighted in the previous section. Simple does not mean incomplete or lazy.²⁶ It is the opposite: comprehensive yet making complex situations simpler to understand and execute. Unstructured complex contracts are lazy²⁷ and pose a greater business risk due to ambiguous interpretation. Respected industry associations²⁸ recommend several techniques for well-constructed contracts:

- Use a logical structure – FIG. 5.
- Use a short and to the point style.
- Use tangible actionable terms: what, who, when, where.
- Use plain language.²⁹
- Use infographics, lists and tables to communicate complex situations – FIG. 6.

The choice of contract form must be based on realistic analysis of risks and facts in a logical Project Contract Strategy (PCS). Not an almost “automatic” choice based simply on client’s wish, or hope, for a guaranteed fixed price.³⁰ The PCS should maximize value from the market and motivate performance.

²⁶ “Simplification” really means increasing the degree of understanding.

²⁷ Terms and Conditions (TC) with general statements that don’t have actionable obligation can be classed as lazy because the drafter hasn’t made the effort to find out the real point. Also, Technical Requirements (TR) “thrown in the contract soup” from previous projects without much planning or editing can be classed as lazy.

²⁸ Cited Literature Ref. #1, #3.

²⁹ Write from the viewpoint of the readers who are nowadays usually multi-national project teams whose first language will not be the contract language.

³⁰ EPC lump sum terms will not guarantee a fixed price – as explained in outcomes section above.

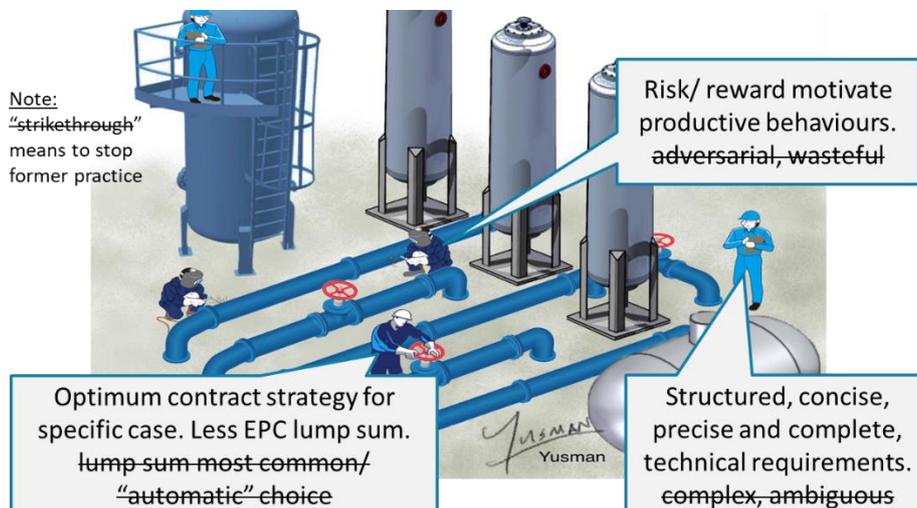
It is difficult to achieve complex mega-project definition to +/- 10% when contract development duration is shortened to achieve early commencement and early “time to market.” EPC lump sum is not appropriate if there is inadequate definition. Opinions vary, and can be hotly debated, on the optimum contract form in these circumstances.

One option is Early Contractor Involvement (ECI). Contractor and vendors cooperate with the client’s engineering services provider to progressively develop an integrated design solution and build-up up a target price before project execution is sanctioned. Another potential option is to select a contract such as the “NEC4 Alliance Contract”; launched in June-2018 and aimed specifically for use on major complex projects as recommended by a contract issuing body with 25-years record of effective contracting.

Preparing well-constructed contents and rational analysis of an optimised contract form are key parts of a solution for project overruns. Naturally, there is a modest cost involved and considered in the next section.

The business case for investing in contracts. Decision-makers may ask the question: why invest time and manpower in contracts? Mr. Warren Buffett, the most successful investor in history, famously thinks long-term. “Buffet logic” would justify relatively modest investment early if there were rational prospects of improved outcomes years later.

FIG 7. Investing in contract rejuvenation.



The potential opportunities to significantly reduce the overruns illustrated in the \$1 billion project scenario. Benefit summary:

- *Reduce cost overrun*: Currently \$350 million average on initial estimate with 57% probability; \$140 million of which is wasted in execution inefficiency, and;
- *Reduce ROI loss*: Currently \$340 million average from start-up delay with 64% probability; \$100 million of which is maximum liquidated damages; plus, dispute costs.

verses investing in a key part of the solution. Cost summary:

- *Additional Front End Development (FED)*: \$10 million range of additional 1% FEED execution and management, and;
- *Well-constructed contract*: \$1 million range for a contract development team for six months.

Looking at it this way, the business case for investing in front end development and contracts is hard to argue against. Investors, clients and contractors all³¹ stand to benefit. We return to “Cobb’s Paradox”. We know the overrun causes and we know solutions. Returning to the previous question: So why don’t organisations just fix the problems?

Emotions and politics often override logic and laws of physics. Like every good paradox, Cobb’s apparent contradiction contains a deeper truth: projects, including contract development, remain social undertakings. Social behaviours are reported³² and observed by the author frequently to be the determining factor in early project-shaping decisions.

³¹ In the real world - cost overruns and delays impact all parties

³² Cited Literature Ref. #9, 10

FIG 8. Honey bees are a metaphor in many cultures for constructive social behaviours, efficiency and exceptional commitment. Exactly what's required on projects.



Behaviours contract to FIG 8. that contribute to poorly-constructed contracts include:

1. Commitment:
 - Instead of commitment to investing for long-term outcomes, attempting short-term “savings” on Front End Loading and contracts.
2. Leadership:
 - Executives and project managers need to retain leadership of contract development. They are accountable for project outcomes. But giving up leadership of contract development to experts or lawyers may not align contracts with achieving the best project outcomes
3. Fear/ or greed impulses:³³
 - Fear of taking responsibility for contract simplification. *“We forgot the reasons for that clause. safer to leave it.”*
 - Fear of taking tough decisions to use contract strategies that fit project reality, compared to a theoretically “safe option” of EPC lump sum.
 - Greed for one sided gains. When companies try to take as much of the opportunity as they possibly can, put all contract risks to the other side, they have forgotten an essential requirement for successful projects: a stable business deal requires that all parties share in the value opportunity.

Part³⁴ of the solution to Cobb’s Paradox is clear and courageous leadership implementing disciplined decision-making based on reliable information, logical reasoning, value trade-offs, and a project outcome focus.

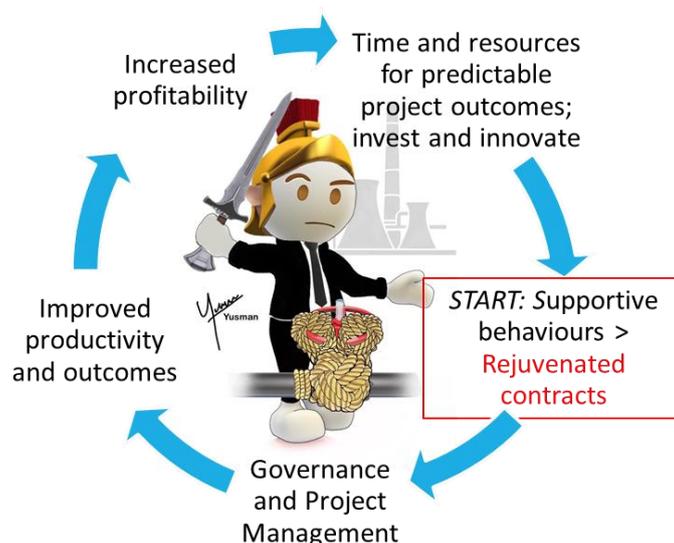
³³ In a corporate sense. Not personal

³⁴ Recognizing that some commercial and political factors outside company control when developing projects; it would be wise to at least take control of factors that can be influenced

Takeaway: Opportunities for rejuvenating contracts. The principal improvement opportunities and the main challenge to the construction sector are:

1. We could perform adequate additional Front End Loading (FEL).
2. We could prepare well-constructed contracts.
3. We could optimize contract forms.
4. We could provide training to improve skillsets and understanding.
5. We *need* a positive understanding of contracts. We need supportive business behaviours and disciplined decision making. That is the challenge.

FIG 9. Rejuvenated contracts. A “flywheel” of positive improvement³⁵



Cost-effective improvements are within reach. But it is hard to change the practices and mindsets that parties have become used to over decades. Companies should take a logical look at their project outcomes and lessons learned. If the business case is anything like the above \$1 billion-dollar project scenario, then it is obvious to invest in Front End Loading and contracts.

Ending with the opportunity illustrated in FIG 9: enlightened members of current management are ready for change. There is already a slow trend to better constructed contracts, and optimised contract forms. If the trend continues, there is the potential to build sustained momentum for improved productivity and outcomes, increased profitability, improved job satisfaction and conditions in the power construction sector.

³⁵ Untangling the “Gordian Knot” (in our case complex contract) is a metaphor for creative thinking and positive solutions. It originates in the legend of Alexander the Great who simply cut through the knot to solve the issue

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The author extends his thanks to individuals from the SE Asia power industry who have generously contributed their views and perspectives on the outline article.

Author



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³⁶ Chronologically ordered

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