

# ENGINEERING PRACTICE

VOLUME 8 NUMBER 35

NOVEMBER 2022



**IACPE**  
INTERNATIONAL ASSOCIATION OF  
CERTIFIED PRACTICING ENGINEERS

[WWW.IACPE.COM](http://WWW.IACPE.COM)

**BECOME A CERTIFIED ENGINEER**



IACPE supports engineers developing across emerging economies focusing on graduates connecting with industrial experts who can help further careers, attaining abilities recognized across the industry, and aligning knowledge to industry competency standards.

IACPE offers certification in the following engineering fields:  
Mechanical, Metallurgy, Chemical, Electrical, Civil, Industrial, Environmental, Mining, Architectural, Bio, Information, Machine and Transportation.

**WWW.IACPE.COM**

# Avoiding the “Sunk Cost Swamp” is Key to New Energy Project Success

Anne B. Keller

During these uncertain times, the survival of a business will depend on its ability to plan and execute projects within tighter financial constraints than many current project managers have likely ever experienced. But when the new projects are based on technology that hasn't been scaled, or at least not successfully, will lessons from projects in the recent past enough to launch a successful moonshot?

Trust Monty Python to say it best. In a scene from “Monty Python and the Holy Grail” that brings rueful smiles to the faces of many who have been involved in major projects over the years, the new CEO of the castle recounts the experience of the last person who was in the job:

“Listen, I built this (business unit) from nothing. When I started here, it was all swamp. Other (CEOs) said I was daft to build a castle on a swamp, but I built it all the same, just to show 'em. It sank into the swamp. So, I built a second one. That sank into the swamp. So, I built a third one. That burned down, fell over, then sank into the swamp, but the fourth one... stayed up! And that's what you're gonna get: the strongest castle in these islands.”

The reason the new CEO has the job of course, is that the former CEO “left” after the third try. We are in a world where a massive amount of infrastructure development will be needed to shift the way energy and materials are created and delivered. The stakes for businesses that want to remain profitable and those who want to become the new businesses of the future are very high. There are some lessons to be learned from other industries that can help infrastructure experts build a castle that stands up the first time.

## **COST OVERRUNS | THE HIGH PRICE OF TECHNICAL SUCCESS.**

Overspend on capital projects at the very minimum increases the financial risk involved in

bringing a large amount of production capacity into the market, and can end up resulting in a rate of return that doesn't match stakeholder requirements. The issue of cost overruns is not new, and countless articles, conferences, and consulting projects have been devoted to addressing it. Recently the results of an internal study of capital project spending by Exxon, one of the largest “hard asset” companies in the world, were reportedly “leaked” to the press. The study covered project spend for a 20- year period from 1998 to 2017, when the energy and chemicals industry was spending billions on finding and developing new oil reserves in shale formations and increasing ethylene production capacity by over 61% in the US alone. Exxon wasn't alone in experiencing significant cost overruns –projects like Chevron's Gorgon LNG project in Australia, and Shell's Oryx Gas to Liquids project in Qatar are considered great technical successes, but their final costs are not publicly available.

## **WHAT DID EXXON LEARN?**

According to Bloomberg, “the 2020 analysis found that “multiple runaway projects” were the result of insufficient design and planning work. “Some projects locked into specific concepts too early, without fully considering other, better, options,” the analysis said. “In the case of “runaway” projects that exceeded their early cost estimates by more than 70%, it was suggested that the planners may have been overly optimistic, possibly to move the project through the approval process in the early stages.

In other words, the project teams got lost in the Sunk Cost Swamp, since the work proceeded in spite of growing cost overruns. The article notes that “Exxon has “reduced complexity and internal interfaces, allowing faster decision-making and significant efficiencies,” (CEO) Darren Woods told investors in March. The improvements, he said, preserve “the functional excellence we've built over decades.”

## **DRAINING THE SUNK COST SWAMP | IDENTIFY THE KEY ISSUES AT THE BEGINNING**

There are a couple of lessons in the Monty Python sketch that we could learn from when we stop laughing that Exxon's report doesn't mention. The first is to figure out the biggest challenge to be resolved to make the project a success. A surprising amount of time this doesn't have much to do with the actual technology. For example, in the castle building exercise, the real challenge was figuring out how to create a stable platform to set the foundation on. A real life example of this was Cheniere's Sabine Pass LNG terminal. It was obvious the location was in a swamp. The project team spent the extra time and money during the early stages of the project to determine exactly how deep the swamp really was, and put in test pilings to make sure they could hold the superstructure. The net result was an additional \$50 to \$60 million in project costs, and a facility that is still standing 14 years later.

One of the consistent issues we hear from engineering and IT disciplines is the frustration with the reluctance of developers and project managers to budget enough money at the beginning of the project to gain real insight into the true success metrics and the critical path requirements needed to complete the project effectively and efficiently. The "pre-feasibility" and/or initial investigation phases are usually paid from money that's part of an overhead budget, and there is sometimes a sense that any findings that diverge from the high level assumptions being made by the project sponsors already working on the project will derail the effort. The net result is the project often proceeds with way more money committed to FEL 1 work, but since this part of the project is under a different budget, and sometimes funded by outside sponsors or economic development subsidies, the spend will be viewed as somehow acceptable.

The other issue involves staging of investments and is critical for the types of projects we're looking to build as part of the energy transition. A number of the ideas that are being pursued are true "moonshots" – they involve technology that hasn't been used widely outside smaller pilot facilities, and/or complexity and a level of scale that we've never seen before. In this case, where both the stakes and uncertainty level around the commercial acceptance of the project are high, another type of pre-feasibility analysis is called for.

## **MOONSHOTS AND "MONKEY TRAINERS" IMPROVING THE DO-ABILITY SCORE FOR NEW TECH**

In our work with clients developing business strategy, we create scorecards designed to describe, quantify, and rank the options generated by the study group. Since the primary end goal for a business is usually to generate rate of return on investment that meets or beats a set target, most of the factors we use are quantitative, such as expected margin, up front capital, and costs. But we also include another qualitative factor we call "Do-ability". This factor includes an assessment of the resources at hand available to execute – including corporate culture, staffing, and level of commitment to a particular type of strategy. A strategy that involves buying 2 competitors could be feasible given enough budget, but in a company that has grown via incremental expansion of its existing asset base the need for a change in attitude and additional skills needs to be considered before moving forward. Doing this before project teams begin work on development can avoid unnecessary spending.

A version of the "do-ability" assessment that's easier to remember is the approach used by the team at Google X, Alphabet's own "moonshot lab". Although Google is much better known for selling ads than building industrial plants, the team is working on projects that involve real world assets. Their process is nicknamed #MonkeyFirst, and it's used to find out quickly whether a project is worth pursuing before spending time and money on detailed feasibility. The name comes from the idea that creating world changing technology involves a challenge that's similar to getting a monkey to stand on a pedestal reciting Shakespeare. If that's the challenge, where would they begin?

"The right answer, according to business unit lead Astro Teller, is training the monkey. The wrong answer is building the pedestal. That's because training the monkey is infinitely harder than building the pedestal -- and at X, it's imperative to do the hardest thing first. "You can always build the pedestal. All of the risk and the learning comes from the extremely hard work of first training the monkey." An example of how this works in practice was a project designed to turn sea water into carbon neutral fuel. The focus, as in many of the new energy projects we see today, was on the technology. The "monkey" in this case was being able to make it at a competitive cost. The technology was basically the pedestal – the team could report progress in getting it working, but not in getting it sold.

The technology was basically the pedestal – the team could report progress in getting it working, but not in getting it sold.

There are a number of projects and businesses today that have successfully built technological pedestals, but are finding out, some after raising and spending billions, that the monkey is harder to train than they'd thought. A couple of examples are Tesla and the Hyperloop project. Tesla is considered extremely successful in making electric vehicles. They have yet to demonstrate how to make the batteries at a competitive cost, without consuming vast quantities of energy and using slave labor, and without raising the price of the raw materials beyond where they are today. The electric vehicle industry has yet to address how drivers will pay for their part of the

The solutions that are offered seem to be a version of spending whatever it takes to make it possible to put more EV's on the road, but the limits of society's ability to pay for them are rapidly being reached. The Hyperloop project involved the idea of sending humans through a tube at rapid speeds in a vacuum system like money was transferred from a drive-up teller at a bank. The Google X team opted to pass on further spending when they determined they would have to essentially build out the whole system in order to test it properly with real humans

Applying this to many hydrogen projects indicates that the actual 'monkey' to be trained isn't the technology for creating hydrogen. It's how to put it into a form that

allows it to be transported for use in other locations. Hydrogen isn't compatible with most existing pipelines that transport oil and natural gas currently at high concentrations. How much money will be spent before this becomes an obvious issue?

For companies whose goal is to "place" capital in a world where money is abundant, it may be enough to build pedestals. But for companies whose goal is to generate a sustainable return on investment for their stakeholders, and truly change the world, it's time to look for monkey trainers who can walk in swampy water.

## REFERENCES

[http://www.montypython.50webs.com/scripts/Holy\\_Grail/Scene13.htm](http://www.montypython.50webs.com/scripts/Holy_Grail/Scene13.htm), accessed 11 November 2022

<https://www.upstreamonline.com/live-americas/cheniere-installs-pilings-at-sabine-pass/1-1-1031917>, accessed 11 November 2022

<https://www.inc.com/business-insider/alphabet-google-x-moonshot-labs-how-people-work-productivity-monkey-first.html> accessed 12 November 2022

<https://www.bloomberg.com/news/articles/2022-09-23/leaked-study-says-exxon-partners-overspent-by-138-billion-on-oil-gas-projects?leadSource=uverify%20wall&sref=KYE92QtO> Accessed 11 November 2022



**ENGINEERING DESIGN  
SOFTWARE**

**SPECIALIZED TECHNICAL  
ARTICLES AND BOOKS**

**DETAILED ENGINEERING DESIGN  
GUIDELINES**

**PROJECT ENGINEERING  
STANDARDS AND  
SPECIFICATIONS**

**TYPICAL PROCESS UNIT  
OPERATING MANUALS**

**TRAINING VIDEOS**

**KLM Technology Group** is a technical consultancy group, providing specialized services and training to improve process plant operational efficiency, profitability and safety. We provide engineering solutions by offering training, technical services, best

practices, and engineering designs to meet the specific needs of our partner clients. Since 1997, KLM Technology Group has been providing engineering, operations, and maintenance support for the hydrocarbon processing industry.

**[WWW.KLMTECHGROUP.COM](http://WWW.KLMTECHGROUP.COM)**

**Engineering Solutions, Standards, and  
Software**

**KLM**

**Technology  
Group**