

Navigating Pitfalls in Estimating Complex

Defence & Aerospace Projects

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Introduction

In the realms of complex defence and aerospace project management, robust and transparent cost estimation is paramount for project success. However, relying solely on traditional methods, such as expert judgment or historical data, can lead to unreliable estimates. This paper explores the pitfalls associated with not leveraging commercially proven off-the-shelf parametric estimating tools for complex projects and emphasises the benefits of incorporating these tools into project planning and management.

The presentation will address and propose solutions for the following challenges:

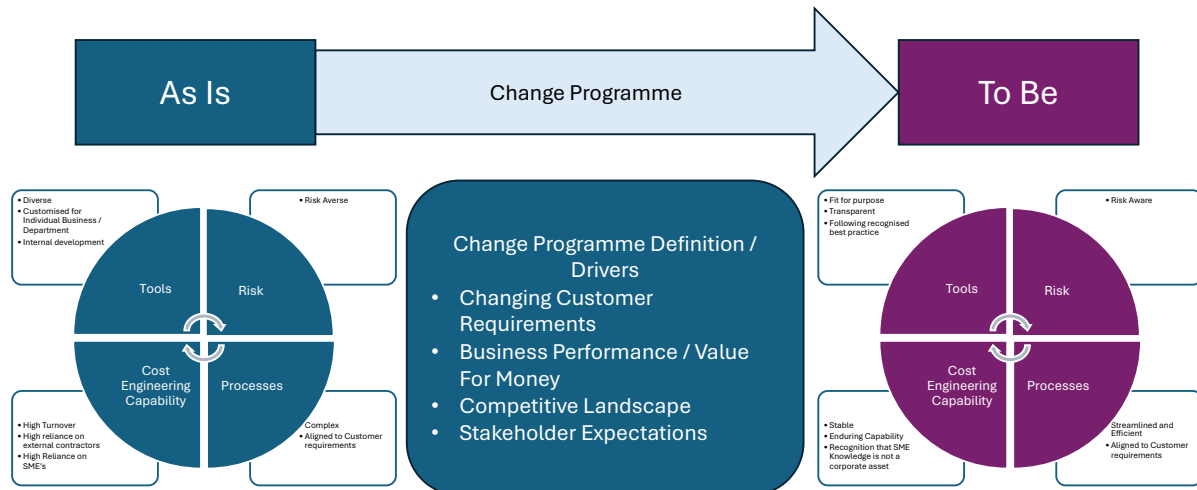
- Lack of Consistency and Standardisation which leads to a lack of applicable benchmarks
- Inefficiency due to Failure to Learn from Experience and a lack of systemic, measurable improvement in estimation outcomes.
- The need to increase reliability using uncertainty to reduce risk
- Lack of; Repeatability, Transparency and Accountability
- Imperfect data encouraging the implementation of strategies which reconcile seemingly conflicting data, driving strategic decision making
- An inability to unlock the rewards of Knowledge Sharing and Reuse (KSR) and how this can be entrenched in an organisations DNA.

The Pitfalls in Context

To provide some context around these challenges, it is interesting to consider how businesses function today and how the change programmes most organisations are engaged in impact the cost estimating capability that should underpin business operations.

Using a hypothetical example of a generic Government Department buyer or Tier 1 supplier of defence and aerospace capabilities we can review a sub-set of the wide variety of factors that impact business performance:

Figure 1: Generic Change Programme Section



A Typical corporate change programme might consider more than thirty factors but for the purposes of this paper I have considered just four as depicted in Figure 1 above. Complex change programmes are often hampered by an inability of an organisation to clearly articulate the “As Is” situation. However, an honest appraisal of the current situation is important as the most effective change programmes boil down to a set of stop, start or continue decisions relating to the “As Is” situation. Is what we are doing now consistent with where we want to be? If the answer is yes, we should continue but, importantly, if the answer is no, we should stop that activity in its current form and move forward with an alternative strategy that is more likely to positively contribute to the “To Be”.

Most of the challenges or “Pitfalls” described in this paper can be attributed to these Stop, Start, Continue decisions, particularly when the impact of those decisions on other areas of development are not fully considered. Referring back to figure 1, the organisation has the sensible aim of moving from a risk averse to a risk aware culture. This might be driven by an awareness of a changing approach in competitor organisations and end user demand for greater transparency in the area of risk. The organisation may well employ a consulting firm to advise on the best way forward and the firm will make a set of recommendations which, when implemented may include:

- Investment in tools and training
- An enduring internal risk capability and/or
- An enduring need to employ the services of the consulting firm

As the new risk capability moves into steady state operation, the change programme management and the organisation leadership will be keen to understand and quantify the return on investment. In isolation, this may be difficult to do, and the uncertainty may cause doubt about the efficacy of the programme overall.

Importantly, in terms of the cost engineering capability, the result of the uncertainty on the risk line, (I could have chosen process efficiency or tools as all areas are linked), is likely to drive a decision around developing the desired, “enduring and sustainable internal capability” which might look like a quick fix. Typically, an organisation will increase reliance on subject matter experts and or readily accessible tools using historic projects as the basis for an estimate. These two strategies give rise to a key pitfall; An inability to unlock the rewards of Knowledge Sharing and Reuse (KSR) and how this can be entrenched in an organisation’s DNA.

This is particularly true in the case of complex projects in the defence and aerospace arena where requirements dictate an extension to the state of the art and an associated need for research programmes to develop solutions which can bridge the gap to the new requirement level. Using SME knowledge or methods such as reference based forecasting, while both useful data points, take a simplistic view where:

Previous project + delta to cover change in performance requirements + risk = Estimate for new capability.

The issues that this approach exposes are:

- SME Knowledge is not a corporate asset.
- The Non-recurring elements of the programme (research activity) are very difficult to estimate based on historic programmes.
- The extent to which previous project developments, especially in software elements, can be re-used is often overlooked.

A Key Component of the Solution

Commercially proven off-the-shelf (COTS) parametric estimating tools are a credible component of the solution to these challenges, providing an objective, data-driven approach to cost estimation. These tools use pre-defined mathematical models to capture the relationships between project characteristics and costs, allowing for consistent and standardised estimation across projects. This also enables organisations to learn from past projects and continuously improve their estimation capabilities.

Ironically, we are currently witnessing a trend in government procurement organisations in the UK, challenging perceived best practice and moving towards processes which create an enduring requirement to use external contractors to provide credible

estimates rather than creating an enduring internal capability with a foundation of demonstrably independent, parametric COTS tools.

By leveraging COTS tools, project teams can also incorporate uncertainty into their estimates, which is crucial for managing risks in complex projects. These tools provide probabilistic estimates, taking into account the range of possible cost outcomes and providing a level of confidence around these estimates. This allows for better decision-making and risk management by identifying areas of high uncertainty and allowing project teams to focus on mitigating these risks.

In addition to improving the accuracy and reliability of estimates, COTS tools also provide repeatability, transparency, and accountability. These tools facilitate a consistent and transparent estimation process, allowing for easy tracking of changes and assumptions made throughout the estimation process. This also enables better communication and collaboration among project stakeholders, promoting accountability for the estimated costs.

For large and complex portfolios, programs, and projects, COTS tools offer the scalability and manageability required for success. These tools can handle large amounts of data and provide a holistic view of a project portfolio. They also allow for collaboration among teams, enabling them to work together and make informed decisions based on reliable data.

Moreover, the implementation of COTS tools encourages organisations to adopt a knowledge sharing and reuse (KSR) approach to cost estimation. With these tools, organizations can capture and store estimation data, creating a knowledge base that can be leveraged for future projects. This enables organizations to continuously improve their estimation capabilities, driving better project outcomes and cost management.

In conclusion, incorporating commercially proven off-the-shelf parametric estimating tools into project planning and management is crucial for the success of complex defence and aerospace projects. These tools offer a data-driven, objective approach to cost estimation, addressing the challenges associated with traditional methods. By leveraging these tools, organizations can increase the reliability and accuracy of their estimates, promote transparency and accountability, and continuously improve their estimation capabilities.