

White Paper

The Ministry of Defence's Combined Operational Effectiveness Investment Appraisal and the Defence & Security Public Contract Regulations

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Executive summary

The Ministry of Defence (MOD) uses Combined Operational Effectiveness Investment Appraisal (COEIA) in its selection of new systems in order to establish whether the system will increase the Operational Effectiveness (OE) of the MOD in a cost effective way.

When procuring items the MOD is subject to the Defence and Security Public Contract Regulations (DSPCR).

This paper introduces COEIA and the DSPCR, and discusses some of the implications raised in considering the requirements of both processes. It then goes on to suggest a number of strategies for combining information from COEIA and DSPCR award criteria to enable the production of a coherent business case.

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COEIA Introduction

A Combined Operational Effectiveness Investment Appraisal (COEIA) must be considered for projects that may affect the Operational Effectiveness (OE) of the MOD. The OE of the MOD is affected by the introduction of new systems or ways of working. OE is a formal measure of the ability of the MOD to conduct its business.

Investment Appraisal (IA) is a formal measure of the costs involved. COEIA is often used to describe the process of determining the OE and IA, and also the output of the process at various stages in the procurement lifecycle.

It may not be necessary for a project team to produce a COEIA where they are replacing an existing capability with a like for like alternative.

The MOD Architecture Framework (MODAF) describes the COEIA as¹:

Combined Operational Effectiveness Investment Appraisal (COEIA) is a formal comparison of acquisition options on a cost versus effectiveness basis to satisfy a User Requirement. The COEIA is an integral part of the Investment Approvals Committee (IAC) procedure as detailed in the SMART Approvals guidance (registration required). The Concept of Analysis (COA) for the COEIA is approved at Initial Gate with the full COEIA report submitted for approval at Main Gate.

The COEIA may be considered an Investment Appraisal, used to assess the effectiveness of differing acquisition options in an objective and where possible, quantitative way. Its purpose is to select one of the acquisition options, before proceeding further.

The COEIA ensures that significant factors which may be difficult or impossible to quantify but with a potential bearing on whole life cost or effectiveness are brought to the attention of decision makers – commonly referred to as Other Contributory Factors (OCFs).

Operational Effectiveness (OE) is determined by Operational Analysis (OA) which is defined in MODAF as²:

Operational Analysis (OA) uses modelling across a range of scenarios to determine the effectiveness that might be provided by a given performance. When combined with an Investment Appraisal in a COEIA, OA allows an assessment of which solution provides the required effectiveness and provides value or money.

Models and scenarios may contain details which are commercially sensitive or have security connotations – for example details of other friendly or threat systems.

A project team will submit a Business Case (including a COEIA) to the Investment Approvals Committee (IAC) or delegated authority, such as DE&S Investment Board (DESIB). The COEIA is scrutinised and analysed to determine whether the evidence presented from Balance of Investment (BoI) and COEIA assessments supports the recommendation made, over other options. If the recommendation is agreed, money is released to allow the project to proceed.

Simplistically, the COEIA must offer evidence that the recommended option will provide the best Value For Money (VfM). This would entail a thorough description of the options with Strengths and Weaknesses highlighted. Ultimately the IAC will need to see a summary output of the OE and the IA.

The OE and IA are often described as orthogonal issues, as such they can be depicted on a two dimensional chart below. The chart shows two options. The centre of each cross depicts the likely outcome (50%). The extremes represent the uncertainty in the calculations.

The challenge for a project team is to quantify OE and Investment so that it may be plotted and compared with other options. The techniques used to calculate the Whole Life Cost are beyond the scope of this paper.

There are a number of techniques available to calculate OE. Systems Thinking is a discipline that uses formal models to understand problems. For the MOD the modellers need to consider the possible outcomes of tasks that the military may be asked to perform. Using the principles of Systems Thinking, modellers may construct descriptions of the interactive components of conflict as a series of networks. They populate these networks of interaction using a combination of judgement and rational inference, backed up by war-games and wisdom from real operations.

Modellers may also use partial models and structured facilitation of decision-making when it proves impossible to construct valid and reliable models.³

The COEIA provides a useful partial assessment of VfM as it considers only the value of military effectiveness rather than all aspects of value. In fact, the MOD insists that no attempt is made to include other criteria into COEIA.⁴

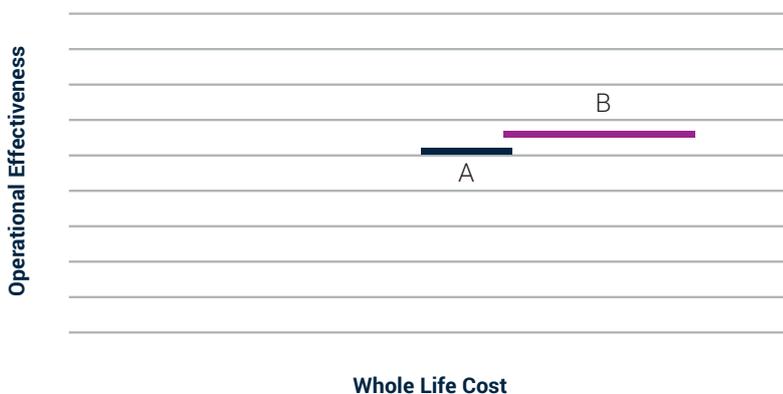
Defence and Security Public Contract Regulations

The DSPCR affect any public-sector project procuring a solution from a third party with a value over a certain limit (with the limit depending on the type of services / product being procured) that is not subject to the more general Public Contract Regulations (PCR).

The DSPCR state that the contracting authority's invitation shall include the relative weighting of criteria for the award of the contract (award criteria) or, where appropriate, the descending order of importance for such criteria.

The Regulations also state that a contracting authority may give the weightings a range and specify a minimum and maximum weighting where it considers this to be appropriate.

Figure 1. COEIA output



Public Contract Regulations

Prior to the release of the DSPCR the MOD was subject to the PCR. The PCR has undergone a number of rulings. It is reasonable to assume that the DSPCR may be subject to similar outcomes where the legislation is worded similarly. At this time however, the DSPCR remains unchallenged.

The European Court of Justice (ECJ) ruled in January 2008 that

“A contracting authority cannot apply weightings and sub-criteria to award criteria set out in tender documentation unless those weightings or sub-criteria have been previously brought to the tenderers’ attention”.

It should be noted that Article 346 does allow for the withholding of the details of criteria that can be shown to have a national security implication.

Subsequent rulings and amendments to the regulations and policies such as the 2009 Remedies Directive and the Transparency – Publication of Tender Documentation Guidance Note December 2010 have created a need to ensure that tenderers are clearly informed of the mechanisms employed to select a tender over another.

To all intents and purposes the criteria by which a contract is awarded must be clear, unambiguous and understandable. A contracting authority may choose the cheapest compliant bid, which is suitable for commodity purchases, or the Most Economically Advantageous Tender (MEAT), which is suitable for more complex decisions. MEAT can be read as the best VfM. It would be possible to plot Value against cost. See diagram below (Figure 2).

However the DSPCR states that the criteria are to be weighted. Weighted elements need to be on the same scale to make sense of their meaning. Some of us may remember the difficulty of adding apples and oranges when we started learning maths. You cannot do it because you need a common scale before the answer makes sense.

Therefore, we need a common scale to combine value and cost before it is possible to determine which tender is the best value for money.

Many projects create a formula that shows exactly how the cost is translated into a value. Cost and value are combined onto a single axis and the highest scorer wins the competition. Obviously, a particular cost conversion formula will have a profound effect on the decision. However, the MOD processes do not advocate this approach.

Again, the challenge for a project team is to realistically quantify Value and Whole Life Cost (WLC) so that it may be plotted and compared with other options. See graph below (Figure 3) – note that uncertainty is not displayed.

The techniques used to calculate WLC are beyond the scope of this paper.

There are a number of techniques that may be used to determine Value. Decision Analysis or Operational Research (OR) offer various techniques which are similar to those used in the OA. OR is the civil derivative of OA. Decision analysis advocates choosing the option whose consequences have the maximum expected value (or Utility).

Multiple Attribute Choice Elucidation (MACE) which is a derivative of Multi- Criteria Decision Analysis (MCDA) is the technique commonly used to facilitate contract decisions. At the highest level of criteria, a weight is given to Cost and a weight is given to the other attributes, so that the decision is made by clear calculation. The different attributes are facilitated by engagement of stakeholders, analysis of requirements and consideration of other contributory factors to success; such as management disciplines, timescales, and availability of resources.

Figure 2. MEAT output

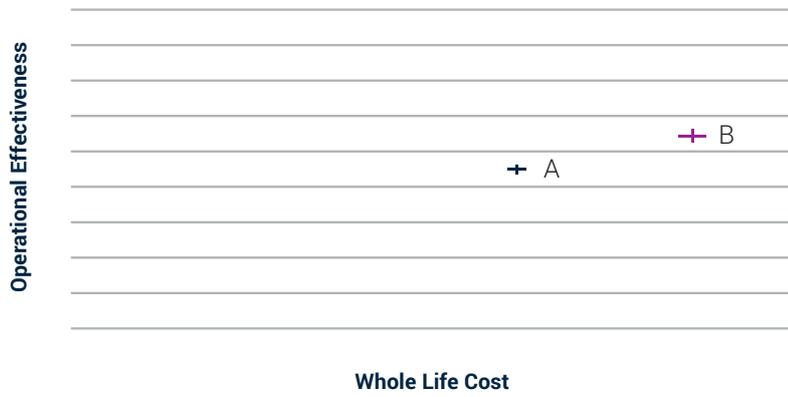
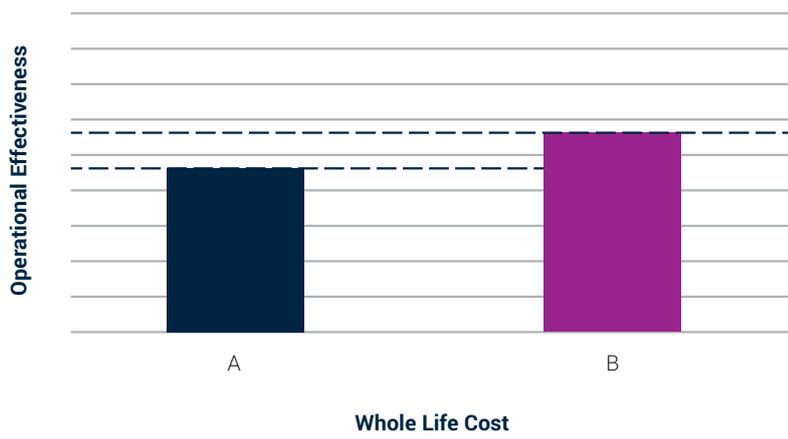


Figure 3. MEAT combined



OE and Award Criteria Separation

Assuming that OE is a pure measure of the solution's effectiveness when it is available at the right time and place, it follows that any requirements of the solution that relate to effectiveness should not be measured in the other award criteria; otherwise there is a risk of double counting. Therefore, the award criteria should consider only the factors that affect the ability of the solution to be delivered.

Award criteria do tend to focus on aspects of delivery. Project teams responsible for delivery of equipment will want to be assured that the equipment will be available at an appropriate time. It is all very well selecting the very best effective equipment, but what if the Authority is unable to communicate effectively with the Contractor, or accept the equipment because the paper work (Safety Case, Licences, Test Results, etc) will not be available.

Not all requirements contribute to the effectiveness model, and so the award criteria must also consider those otherwise unconsidered requirements. Normally, mandatory requirements such as conformance to legislation are not modelled, but the list will depend on the sophistication of the model and the circumstances of the system's use.

There is a tendency for project teams to want to merge OE criteria and other contributory factors. This often happens for smaller value projects where a formal COEIA is not required (such as a project extension) or a small team is responsible for delivery of the capability. The result is a combined model that merges the information related to effectiveness and delivery. Whilst not ideal, this mechanism at least ensures that all appropriate factors are considered.

OA Fidelity, Contracting to Requirements and Exaggerating Decisions

In this section three questions are posed that need to be considered when deciding on a decision-making model.

Will the model enable me to differentiate between the options?

OA was originally conceived to handle major force structure decisions (such as whether to purchase tanks or planes). Over time, simulation models have become more sophisticated so that higher fidelity measures of OE can be made (such as 8 soldier transporters or 4 soldier transporters?).

The decision maker must be aware of the ability of the model to differentiate between the options. Imagine that the options are between contractors delivering to the same requirement; the model will need to be very sophisticated to deal with minor differences in implementation if it is to be used as a supplier selection tool.

How different are the solutions likely to be?

Modern requirements documents are sophisticated; they do not often allow large degrees of freedom in the purchase that is being made. In fact, MOD practice is to state very clearly the requirements for a purchase so that reasonable cost estimations can be made prior to receiving authorisation to start a competition with industry. It is therefore unlikely that different solutions will have very different levels of OE as they will have been developed from the same requirements.

Is the difference between the solutions really as different as implied by the scores?

When a model converges to a single axis score (such as OE or Value) we must ensure that the implications implied by the different scores are meaningful. For example, consider the following problem: is a score of 50 half as likely to produce the desired outcome as a score of 100.

These three questions should be used as the drivers for designing decision mechanisms.

Uncertainty

The COEIA consider uncertainty as a primary outcome. The OE process is essentially about reducing uncertainty. The COEIA recognises that uncertainty will remain until long after the project is completed.

The DSPCR only considers uncertainty in terms of weighting. An Authority may publish weighting ranges where it is unable to determine definite weights. The DSPCR does not mention uncertainty in the decisions made. At the time of writing, the author is unaware of any legislation or cases that consider uncertainty.

Using Uncertainty Wisely

The diagram below (Figure 4) shows uncertainty as lines extending in each axis. The uncertainty comes from the OE modelling, assessment and WLC estimates. Essentially A is more certain than B (because the lines are shorter on each axis). A is likely to cost less than B. A is likely to offer less value than B.

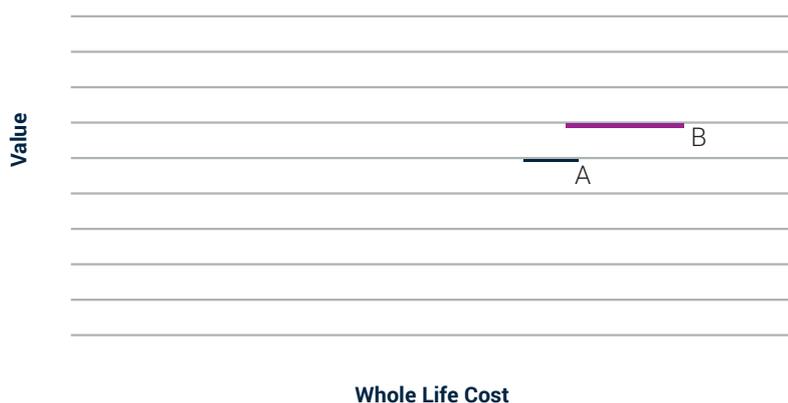
In circumstances like these, decision makers have a job on their hands to decide which to choose, and more importantly, they need to make the decision before they see the graph.

The things to consider are what the decision will be when⁵:

- the preference is consistent and certain in both dimensions (i.e. no overlap, in WLC or value)
- the preference is certain in WLC only
- the preference is certain in value only
- the preference is not clear when you consider uncertainty

The order in which the bullets will be considered should also be taken in to account.

Figure 4. MEAT



Using DSPCR and COEIA in Decision Making

JSP 507⁶ implies that non-OE (or benefit related) criteria are not considered as part of the quantitative elements of the COEIA, but are considered as Other Contributory Factors (OCF).

The DSPCR insists that contract award criteria are clearly defined, weighted and unambiguous where possible. The challenge that MOD procurement teams are faced with is how to ensure that the combination of these sources of decision information do not contradict each other, lead to ambiguous decisions, generate confusion with industry, or delay projects.

The relevant parts of a Business Case are often structured as follows, i.e. not combined:



It is possible that the three major elements of the Business Case will produce conflicting results. The COEIA may consider individual supplier's solutions and form a recommendation. The Award criteria may make another recommendation and the Other Contributory Factors (OCF) make a third. The reader/authoriser of the Business Case must balance potentially conflicting information before reaching a judgement.

Where the COEIA and OCF contradict the Award Criteria in the recommendation of a preferred supplier, the authoriser needs to choose with the Award Criteria. Otherwise, they risk a challenge by a losing bidder or by the European Commission. This would be a generally unsatisfactory result.

Option 1: Combine COEIA and Award Criteria

Weiss² suggests that including the Other Information into the Award criteria would reduce the complexity and improve decision making.

By re-arranging the hierarchy of information, it is possible to create a structured business case that meets the needs of the MOD and DSPCR.



Subsuming the COEIA and other information into the award criteria ensures that OE contributes directly to the value axis. Other contributory factors can be weighted against OE. The relative importance of delivery, OE, and cost can be described in a coherent way (considering the three questions posed above).

Where OE measurement requires sophisticated modelling, it will need to be explained within Invitations to Tender (ITT). Where OE information falls within the confines of Article 346, the criteria may be withheld legitimately whilst the other requirements of the DSPCR are fulfilled.

The cost, value, and uncertainty information from the COEIA can be considered in a declared way to create a decision mechanism that conforms to the DSPCR. The recommendation made by a Business Case will then be supported by the OE and other value criteria.

This approach will ensure that potentially conflicting information is dealt with as a natural process in generating the Business Case and ensure that robust and defensible decisions are made and recorded. It will also ensure that the needs of the end-user are considered proportionately with the needs of the procurement teams.

Option 2: COEIA Selects Options Award Criteria Selects Supplier

The COEIA is relevant to evaluating options. The DSPCR is relevant to supplier selection. The COEIA covers a wider scope than selecting a supplier. The options required to be investigated by COEIA cover cases such as "Do Nothing", "Do Minimum", and "Buy New System".

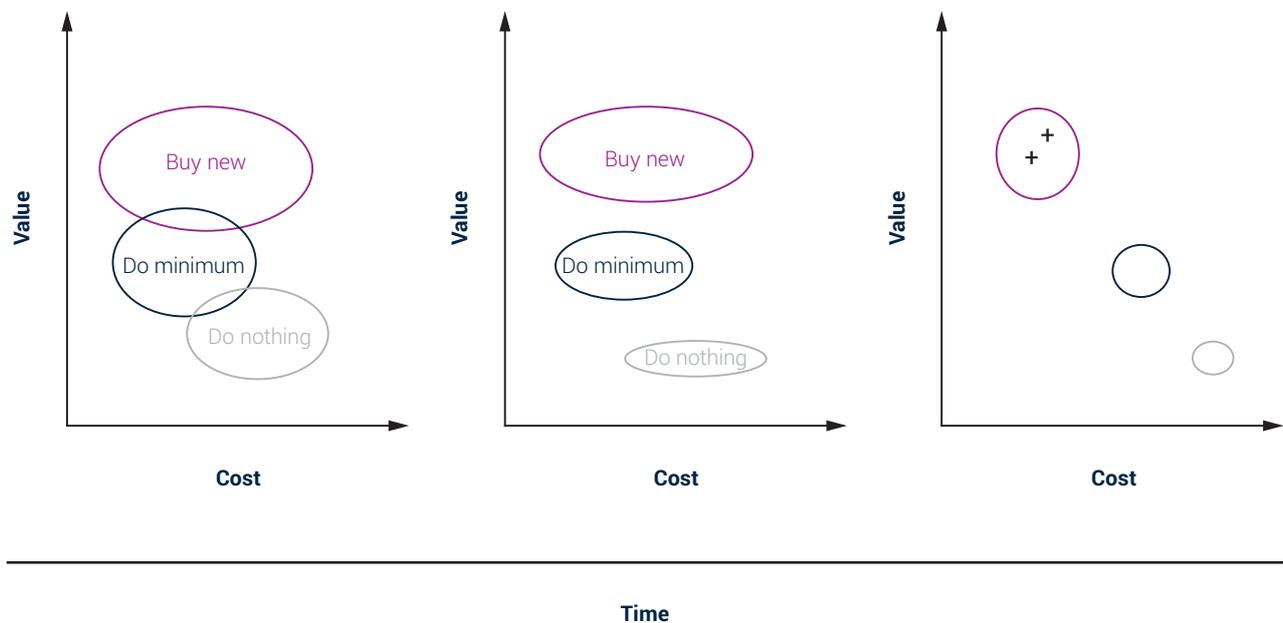
The DSPCR states that a Contract Notice should be issued after the public works contract has been authorised, and only applies to options that contain a purchase.

In the illustration below (Figure 5) the ovals represent the uncertainty in value and cost. By Initial Gate, the IAC should reasonably expect separation on the options (diagram in the centre), thus being assured that further work is warranted. By the time that industry is involved, industry should expect that the other options have been excluded, unless industry is unable to offer a solution to the requirements. Why else would a competition be authorised?

The decision making process then falls into distinct phases. Firstly, from the COEIA, it should be decided which option should be taken. Then, if the project requires a purchase, it should be decided from the award criteria which supplier should be awarded the contract.

This approach is suitable when the modelling of OE is at a fidelity that is unable to reasonably differentiate between the implementations of the requirement. This approach has the same benefits as Option 1. The Business Case authorisation process can be described within the ITT so that the bidders understand it.

Figure 5.



Option 3: Full Integration of Criteria

This approach requires taking a step back from the building blocks that we have created for ourselves. These blocks being: OE, IA, OCF and award criteria.

The fundamental reason why a project exists is because the Authority wishes to realise some benefits. These benefits are usually described in a Business Case. It is possible, practical and sensible to derive a set of criteria from the list of benefits. Some of the benefits may be the realisation of increased OE, the reduction in costs, the effect on the market, and the non-cancellation of the project.

All these factors have a bearing on the decision. It is possible to create criteria by which you can assess any option, at any time. You may require different evidence to make the assessment but the benefits that you are trying to realise should be fundamental to any decision you make. This approach means that you need to take a holistic approach to defining the value (or OE). The "Do Nothing" option is immediately available and so has a good score on an availability or immediacy benefit, whereas it might suffer on a cost related benefit (otherwise, why run the project?).

A new-build option may not have a good score on immediacy because it is not available for some time, but score highly on another benefit, whereas an off-the-shelf solution might score more highly still because it combines the best of both.

The benefits evaluation approach can conform to DSPCR if described in the ITT. COEIA processes recognise that value of benefits (VoB) is an alternative to OE as a measure. Benefits realisation can also be used as a project success measure. Benefits transcend responsibility (Authority, Supplier, third parties) and solution (equipment, people) and so can be used to frame dialogue or negotiation.

The benefits can be established when low level requirements are unknown, which makes it suitable for Negotiated Procedure competitions or even for Competitive Dialogue. High level benefits can be used as sign posts for team members' decisions; "Will this decision lead to better realisation of the so-and-so benefit?"

Such a mechanism requires a disciplined approach to derivation of the decision-making network. Structured Criteria Development (SCD) techniques used by QinetiQ Commerce Decisions Ltd offer such structure.

However, before any such method is used, it will need to be carefully examined by MOD Technical Scrutiny to ensure that the resulting decision method conforms to the sensible goal of providing a VfM decision.

Conclusion

MOD procurement teams must meet the demands of internal processes such as those defined in JSP 507 and the external legislation of the Defence and Security Public Contract Regulations (DSPCR). The Operational Effectiveness modelling performed by MOD in order to assess usefulness of project initiatives is sophisticated and useful, but there are issues related to how they should be used in conjunction with the DSPCR.

The literal translation of the DSPCR does not align with MOD practices, but there are practical ways of adapting the processes to overcome the problems to create a DSPCR and JSP 507 compliant competition and decision.

References

- 1 Extracts from MODAF taken 7/2/2012.
<https://www.aof.mod.uk/aofcontent/tactical/approvals/content/coeia.htm> (registration required)
- 2 Extracts from MODAF taken 7/2/2012.
https://www.aof.mod.uk/aofcontent/tactical/approvals/content/coeia_proc_reg.htm (registration required)
- 3 The Theory and Practice of Complexity Science – Kurt A. Richardson, Graham Mathieson, and Paul Cilliers
- 4 Value-for-Money – Defining and Measuring 'Value' Dr Alex Weiss 2006
- 5 This approach has been taken by a live MOD CAT A project
- 6 JSP 507 MOD GUIDE TO INVESTMENT APPRAISAL AND EVALUATION Version 5 April 2011 Paragraph 3.2.18

About Richard Tottman

Richard Tottman is a principal consultant at QinetiQ Commerce Decisions. He has facilitated evaluation strategies for numerous programmes, many valued at over £100million. He is a practitioner of the QinetiQ Commerce Decisions Structured Criteria Development process. Richard also co-wrote the early versions of AWARD.

Prior to 2001 Richard was a Requirements Management Consultant, and Software Development Manager working for large List X organisations.

About Commerce Decisions

Commerce Decisions has been supporting strategic, high-risk procurements globally since 2001, and is at the forefront of best practice procurement. With a unique focus on complex evaluation, we have unrivalled experience in supplier evaluation and are a trusted provider of procurement services to the public and private sectors.

We deliver a robust and defensible procurement process to our clients, proven time and time again across many sectors including construction, transport, education, health, defence and facilities management procurements – to date, we have supported over 13,000 strategic projects, collectively worth over \$400billion. This enviable experience and in-depth knowledge has enabled us to develop proven methodologies, supporting clients to deliver the best possible outcome on strategic and complex procurement projects.

Headquartered in Oxfordshire, UK, and with offices in Canberra, Australia, and Ottawa, Canada, Commerce Decisions provides software and services to support the procurement and post contract review processes for both buyers and suppliers. For buyers we improve the efficiency and effectiveness of the evaluation process to make the best buying decision based on all the relevant criteria, underpinned by our AWARD® software. For bidders we improve the quality and timeliness of proposals to best meet the needs of the potential buyer and thereby give them the best chance of securing the contract, underpinned by our ADVANCE™ software.

About QinetiQ

QinetiQ is a leading international provider of technology-based services and solutions to the defence, security and related markets. We develop and deliver services and solutions for government organisations, predominantly in the UK and US, including defence departments, intelligence services and security agencies.

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