

GETTING THE BEST FROM A MULTI-CRITERIA APPRAISAL FRAMEWORK: SOME PRACTICAL TIPS

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1 SUMMARY

A Multi-Criteria Appraisal Framework (MCAF) is a powerful tool for sifting and selecting options at any stage of a transport project. But it is harder than it looks to get 'right first time' and to satisfy stakeholders and clients. This paper provides practical tips, based on experience, for what works, what doesn't, and key decisions that will help to save time and effort along the way. It briefly recaps on how MCAF fits into a typical transport project, and what WebTAG and other technical guidance require. The focus is on the tips and "dos and don'ts" for an effective appraisal.

2 INTRODUCTION AND SCOPE

Transport projects – whether they are 'hard' infrastructure or 'soft' policy measures – usually start with a range of options that need to be sifted, the best options identified for further analysis, and a preferred option finally selected. A Multi-Criteria Appraisal Framework (MCAF) is often used for this. Appraisal guidance recognises the importance of MCAF-based option selection as an input to scheme business cases and funding decisions.

This paper:

- Introduces MCAF as a tool for multi-criteria analysis (Section 3)
- Summarises the typical steps in the process (Section 4)
- Summarises how it fits into WebTAG and other selected appraisal guidance (Section 5)
- Considers how to get the best out of the UK Department for Transport's (DfT's) Early Assessment and Sifting Tool (EAST) (Section 6)
- Offers practical tips for key stages in the MCAF process (Sections 7 to 10)
- Provides conclusions (Section 11)

It focuses on typical option selection processes where practitioners need to create the MCAF and manage a scoring exercise to determine the *comparative* performance of options on the basis of available evidence. The term 'scoring' is used here to cover any scoring or rating process, whether numeric or not.

It does not focus on the final 'go or no-go' decision when the *absolute* performance of a preferred option is being assessed. Nor does it focus on situations where detailed guidance already exists or a predetermined MCAF is given. This paper is no substitute for reading the relevant guidance. However, some of the material will be relevant to those situations.

The pitfalls, tips and examples presented here are based on experience in real MCAF exercises. But they are not hard-and-fast rules: every case is different. The examples

have been simplified and anonymised for clarity and to maintain client confidentiality. They also generally retain their original terminology and scoring systems, illustrating the variations that exist.

3 MCAF AS A TOOL FOR MULTI-CRITERIA ANALYSIS

Multi-Criteria Analysis (MCA) establishes preferences between options, by evaluating them against pre-defined objectives or criteria. Importantly, it allows consideration of impacts which cannot be monetised or quantified, or where that information will only be available later in the appraisal process. The evaluation can involve scores against some or all criteria. But it is rare for the same option to be the best under every criterion, so either judgment or a totalling system will be required for identifying preferred options.

MCA offers a relatively quick, cost-effective and structured method with an auditable and documented process. It can be used to:

- Identify the best-performing option(s) to take forward for further development or delivery
- Identify a shortlist of options to take forward for further development
- Sift feasible or acceptable options from infeasible or unacceptable ones
- Rank options in order of preference

A Multi-Criteria Appraisal Framework (MCAF) is simply the list of criteria, and the scoring procedure, used to carry out the MCA. It is generally a table or spreadsheet which can be filled-in with the options and their scores. Figure 1 shows a straightforward example.

Figure 1: Example MCAF table

Collingwood Station: Option Selection Matrix												
Option no.	Description			Criteria							Total Scores	
	Location	Car park	Access	Achievability		Meeting the objectives			Policy commitments			
				Technical deliverability	Acceptability to stakeholders	Scale of cost	Local connectivity benefits	Transport user benefits	Rail revenue impact	Environmental impact	Equality impact	
1	Nelson St	None	Subway	+3	+1	-1	+2	+2	+2	+3	+1	+13
2	Nelson St	None	Footbridge + lifts	+2	+1	-2	+2	+2	+2	+2	+1	+10
3	Benbow Rd	North side	Subway	+2	+2	-2	+3	+2	+2	+2	+2	+13
4	Benbow Rd	North side	Footbridge + lifts	+1	+2	-3	+3	+2	+2	+1	+2	+10
5	Benbow Rd	South side	Subway	+1	+1	-2	+3	+2	+2	+1	+2	+10
6	Benbow Rd	South side	Footbridge + lifts	0	+1	-3	+3	+2	+2	0	+2	+7

Not all are this simple. The Appraisal Summary Table (AST) required by the DfT's WebTAG appraisal guidance is a sophisticated MCAF table, with qualitative, quantitative and monetised inputs (and only limited scoring).

MCA is (or should be) objective-led and evidence-based. Technical assessments underlying the scoring are generally documented separately, and in some MCAF formats (such as the AST) they are also summarised in the MCAF table itself.

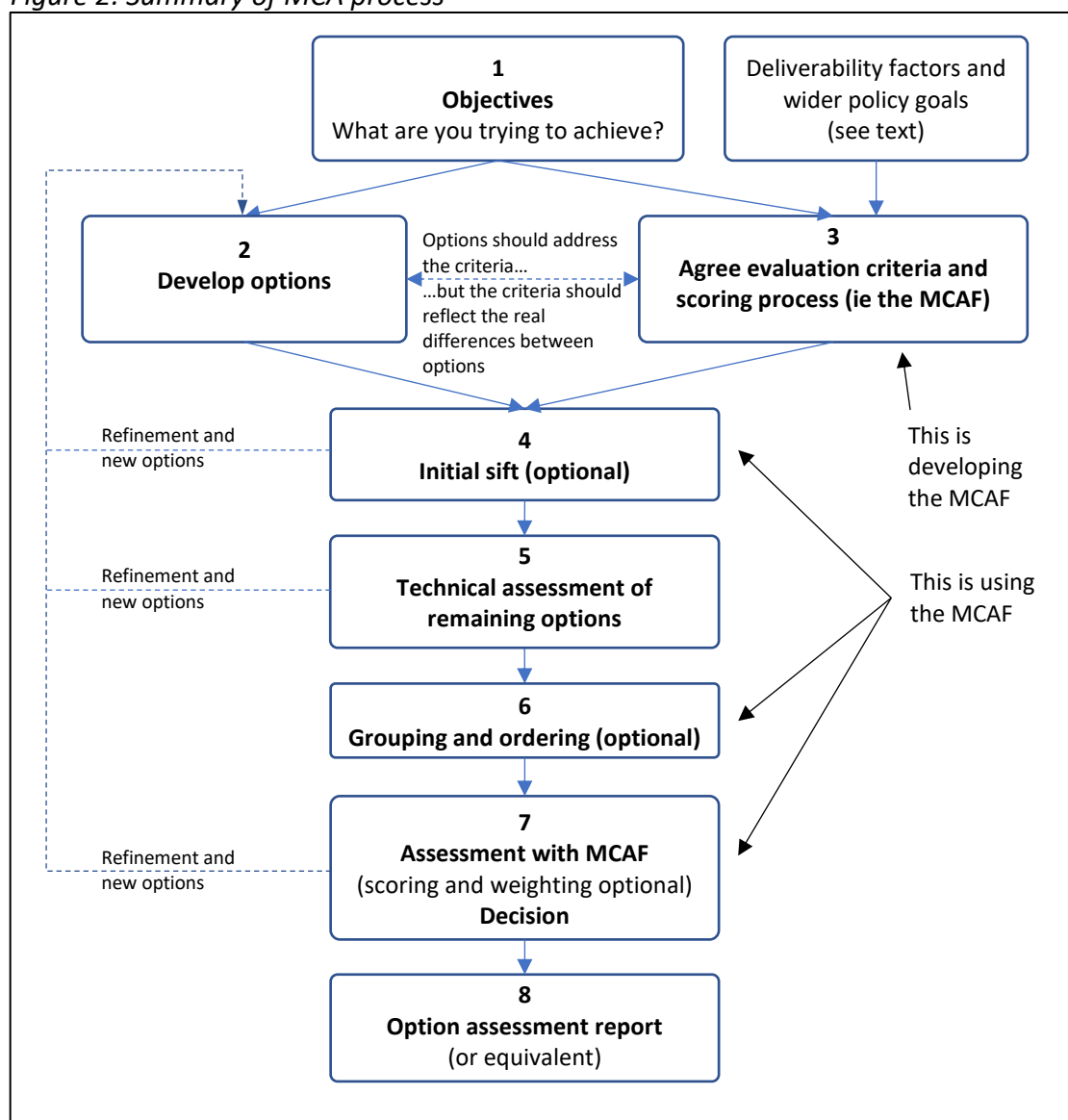
The MCAF can be an inclusive engagement tool: drawing-in stakeholders, teasing-out preferences, airing priorities or concerns and risks, and securing buy-in to a consensus-driven outcome.

The process may be repeated at different stages within the option selection process. There may be an initial high-level sift, then a more detailed assessment of the shortlist, and potentially a final assessment of the preferred option.

4 HOW DOES THE PROCESS WORK?

Figure 2 summarises a typical MCA process, with numbered steps corresponding to the remainder of this section of the paper. Appraisal guidance documents often have their own version of the process. Some steps can be omitted in simple cases.

Figure 2: Summary of MCA process



This is a generic MCAF process. Specific processes, whether set out in published guidance or devised for particular projects, can vary as required.

Step 1: Objectives. Establishing the scheme-specific objectives, or the problems to be solved, is not only important for developing options, but also critical for getting the evaluation criteria right. A common pitfall is to have criteria that reflect routine deliverability goals well but do not give enough weight to understanding how well each option addresses the specific problems or objectives. Section 7 of this paper says more about this.

Step 2: Develop options. Appraisal guidance generally highlights that the options must cover all the reasonable alternatives, and that there is no need to include unrealistic ones. However, where unrealistic options have already been raised, it is wise not to ignore them. Stakeholders and decision-makers may want to see that these have been given a fair hearing and discarded for good reasons.

Step 3: Agree evaluation criteria and scoring process. This is developing the MCAF itself. Sections 8 and 9 cover this step. Steps 2 and 3 can operate in parallel, and in practice feed into each other.

Step 4: Initial sift (optional). Often a very wide range of options are generated, either by the project team or by stakeholders, and this may be too many to take through the full MCA process. An initial sift can be done to eliminate the worst-performing options.

Section 6 describes the DfT's EAST tool which was designed for this. Alternatively, a simplified version of the MCAF can be used, often focusing on the criteria relating to scheme-specific objectives (see step 1), and sometimes also deliverability criteria to identify those that are simply too difficult. In any case, a structured and documented sift process will minimise the potential for later arguments over discarded options, particularly in controversial situations.

Step 5: Technical assessment of remaining options. This is a familiar task for practitioners, and is outside the scope of this paper.

Step 6: Grouping and ordering (optional). If the range of options is complex, particularly where they are permutations of each other, it can be helpful to simplify them into a logical set of alternatives and sequence of presentation. Section 9 has tips on this.

Step 7: Assessment with MCAF, and decision. This is the actual assessment, using the MCAF tool from step 3 and the options from step 6. It often involves a 'live' scoring exercise with the project team's technical specialists, clients and/or technical stakeholders. Section 10 covers this.

Steps 4 to 7 may lead to new options or variations being identified, or further information or assessment being required to confirm certain scores. Depending on the situation, these might become final inputs to a reconvened scoring exercise, or tasks for the next stage of the project.

Step 8: Option assessment report (or equivalent). This is the write-up. Published guidance often gives requirements for this. For brevity, this paper does not cover this step specifically, but Section 10.6 is relevant.

5 HOW IT FITS INTO WEBTAG AND OTHER APPRAISAL GUIDANCE

MCAF processes appear in the major UK and Irish appraisal guidance. Table 1 summarises some key ones. In addition to occasions when the relevant guidance needs to be followed, these MCAFs are also useful examples to draw upon in other situations, as indeed this paper does.

Table 1: Key MCAF tools and approaches within selected appraisal guidance

Guidance area	Key documents covering MCAF	Key tools and approaches
WebTAG	<i>The Transport Appraisal Process</i> (DfT, 2018)	<p>Early Assessment and Sifting Tool (EAST) – for initial sifting. See section 6 of this paper.</p> <p>Option Assessment Framework (OAF) – fuller assessment of the remaining options against the DfT’s Transport Business Case criteria (DfT, 2013). Aims to identify the better-performing options for further appraisal.</p> <p>Appraisal Summary Table (AST) – summary of full appraisal.</p>
Scottish Transport Appraisal Guidance (STAG)	<p><i>Scottish Transport Appraisal Guidance</i> (Transport Scotland, 2008)</p> <p><i>STAG Technical Database</i> (Transport Scotland, 2018), particularly sections 4, 5 and 14</p>	<p>Part 1 Appraisal Summary Table (AST) – Part 1 is an initial, mainly qualitative assessment of all the options. The Part 1 AST is an MCAF in which only certain criteria are scored.</p> <p>Policy Assessment Framework (PAF) – a specific MCAF spreadsheet for assessing the Part 1 AST sub-criterion on integration with other government policy. See Figure 16 below.</p> <p>Part 2 Option Summary Table (OST) – Part 2 is a more detailed assessment of the leading options. The OST is a concise summary of an option, with scoring of certain criteria. The Part 2 AST does not have scoring.</p>
Welsh Transport Appraisal Guidance (WeTAG)	<i>WeTAG 2017</i> (Welsh Government, 2017)	Does not include the technical detail provided in the previous, 2008 version (Welsh Assembly Government, 2008). The 2008 guidance included an MCAF-type approach for what was then the planning stage (now Stage 1 in the 2017 guidance).
Republic of Ireland	<i>Common Appraisal Framework for Transport Projects and Programmes</i> (Department of Transport, Tourism and Sport, 2016)	Sets out the role and use of MCA in scheme appraisal, including a helpful and concise description of the process.
	<i>Project Appraisal Guidelines for National Roads</i> , Particularly unit 7.0 (Transport Infrastructure Ireland, 2016)	<p>Says more about the MCA processes at various stages.</p> <p>Stage 1: Preliminary option assessment. MCA of all feasible options, using a specified set of assessment criteria. A ‘Performance Matrix’ is provided as the MCAF table.</p> <p>Stage 2: Project appraisal matrix. Full cost-benefit analysis (above a given cost threshold) and MCA of the better-performing options. A ‘Project Appraisal Matrix’, similar to the Performance Matrix but with additional criteria, is the MCAF table for this stage.</p> <p>Stage 3: Preferred option. Takes the preferred option emerging from Stage 2 and prepares a Project Appraisal Balance Sheet (PABS) – similar in principle to an AST.</p>
Transport for London	<i>Business Case Development Manual</i> (BCDM) (TfL, 2017), particularly section 2.4	Sets out how an MCAF with scoring can be useful in eliminating and shortlisting options. It includes practical advice that broadly parallels some of the tips in this paper.
	Strategic Assessment Framework (SAF)	TfL’s MCA tool for assessing a project’s or option’s contribution to a range of TfL objectives and strategies. BCDM section 11 gives a full description.

In England, Local Enterprise Partnerships (LEPs) and Combined Authorities have their own assurance frameworks, covering the business case process and hence option sifting and selection. These generally echo or refer to WebTAG but often with a lighter touch. Some have scheme selection and prioritisation criteria which clearly need to feed into any MCAF. Others require a closer match to the DfT Transport Business Case structure and evaluation criteria (DfT, 2013). For a 'retained scheme' which will be subject to direct DfT scrutiny, that closer match is certainly advisable. Mapping the MCAF criteria back to the EAST criteria (Section 6 below) is one approach.

Finally, the Design Manual for Roads and Bridges (DMRB) sets out how route and design options for trunk road schemes should be chosen through an MCAF (TA 30/82, Highways Agency et al, 1982). Unusually, it suggests pairwise comparison: comparing options two at a time, eliminating the less-favoured option each time, until only one remains and becomes the preferred option. For brevity, this paper does not cover pairwise comparison, but TA 30/82 offers a useful perspective on that method.

6 GETTING THE BEST OUT OF EAST

The DfT's Early Assessment and Sifting Tool (EAST) (DfT, 2011a) is a spreadsheet-based tool, with accompanying guidance (DfT, 2011b), for developing, summarising and presenting evidence on options in a clear and consistent format. It was designed to allow options to be compared across all modes and geographies. It has approximately 20 scoring criteria, plus some unscored 'commentary only' elements, covering each of the five parts of the Transport Business Case (DfT, 2013). However, it is primarily a sifting tool – to allow early sifting-out of unpromising options – and is explicitly not for making recommendations or final funding decisions (DfT, 2018, para 2.9.5). Practitioners need to identify their own criteria or thresholds for determining which options 'pass' or 'fail' the sift (DfT, 2018, para 2.9.6).

Within EAST, details of the assessment can be entered on a sheet for each option (Figure 3). These feed into a summary table (Figure 4).

Figure 3: EAST option sheet (extract)

The screenshot shows a spreadsheet titled "Early Assessment and Sifting Tool - Enter option details". It is organized into sections: Strategic, Economic, Managerial, and Financial. Each section contains several criteria with input fields and dropdown menus. For example, the Strategic section includes "Identified problems and objectives", "Scale of Impact", "Fit with wider transport and government objectives", "Fit with other objectives", and "Key uncertainties". The Economic section includes "Economic growth", "Carbon emissions", "Socio-distributional Impacts and the regions", "Local environment", "Well being", and "Expected VM Category". The Managerial section includes "Implementation timetable", "Public acceptability", "Practical feasibility", "What is the quality of the supporting evidence?", and "Key risks". The Financial section is partially visible at the bottom. On the right side, there are buttons for "Save Option", "Return to Summary Sheet", and "Clear Form", along with two informational text boxes.

Figure 4: EAST summary table (extract)

The screenshot shows the EAST software interface. At the top, there are controls for text size, adding new options, and showing/hiding comments. Below this is a table with three main sections: Overall, Strategic, and Economic. The Overall section includes Name/No., Date, and Description. The Strategic section includes Identified problems and objectives, Scale of impact, Fit with wider transport objectives, and Key uncertainties. The Economic section includes Degree of consensus over economic, Economic growth, Carbon emissions, Socio-distributional impacts, Local environment, Well being, and Expected VPM Category. The table contains three rows of example data.

Overall			Strategic				Economic										
Unique Ref. No.	Name/No.	Date	Description	Identified problems and objectives of the option	Scale of impact	Fit with wider transport objectives	Fit with other objectives	Key uncertainty	Degree of consensus over economic	Economic growth	Carbon emissions	Socio-distributional impacts and the regions	Local environment	Well being	Expected VPM Category	Implementation timetable	Public acceptability
1	Delete Example option 1	#####	Example option for illus	Congestion. Poor air q	5 High	3	Affordability of ongoing	5 Majority	5 Green	5 Green	5 No Imp	5 Amber	6 No Imp	2 High	2-4		
2	Delete Example option 2	19/06/2018	Another example option	Congestion. Poor air q	5 High	3	Land availability	4	5 Green	4 Amber	5 No Imp	3 Amber	6 No Imp	2 High	2-		
3	Delete Example option 3	19/06/2018	Further example option	Congestion. Poor air q	5 High	4	Stakeholder acceptabil	3	4 Amber	5 Green	6 No Imp	5 Green	6 No Imp	2 High	2-		

As it stands, EAST is essentially a desktop tool for setting-out options and assessments, not a tool for a 'live' scoring and selection exercise with stakeholders. Its major advantages are that it is a ready-made format covering all the key areas of assessment, and that it can cope with widely-differing options on an equal footing. However, the standard format is also a limitation and requires adaptation if there is a need to focus on a richer understanding of particular areas.

In particular, there is just a single criterion for the impact on identified problems and objectives, and any trade-offs between different problems/objectives can only come through in the textual commentary. Local stakeholders may require this element (and also deliverability criteria) to be expanded to support their own decision-making.

Tips for using EAST are:

- Don't jump straight into filling-in options without reading the guidance. It includes helpful prompts and, in some cases, a guide to what each point on the 1-5 scoring scale should represent.
- Where there is no guidance on what each point on the scale represents, consider setting project-specific meanings or thresholds for these (see section 8.4 of this paper).
- Where there are large numbers of options with strong commonalities in nature or in assessment results, it can be more efficient to type directly into the summary table (accepting the loss of the 'print-friendly' option sheets).
- By working only in the summary table, EAST can be adapted to suit project circumstances and requirements. This approach has been used successfully to select a sub-set of criteria and create weighted total scores for each option. In effect the summary sheet becomes a starting-point for a bespoke MCAF table.

7 TIPS, SOLUTIONS AND PITFALLS FOR THE EVALUATION CRITERIA

7.1 Tip 1: Don't let your project-specific problems and objectives get lost among general criteria

Selecting appropriate evaluation criteria is a critical first step. An effective approach is to look explicitly at three categories of criteria:

- **Project objectives** – how the option achieves the scheme-specific goals or solves the scheme-specific problems
- **Policy commitments** – how the option achieves wider transport or non-transport objectives or commitments, such as social inclusion, the environment or adopted local plans
- **Achievability** – technical feasibility, funding and other deliverability factors such as stakeholder acceptability

Figure 5 shows an example of these categories in use, taken from a sifting exercise to select transport schemes to take forward for unlocking growth areas. The 'overall requirements' reflect the categories listed above. The sub-criteria are the individual scoring criteria.

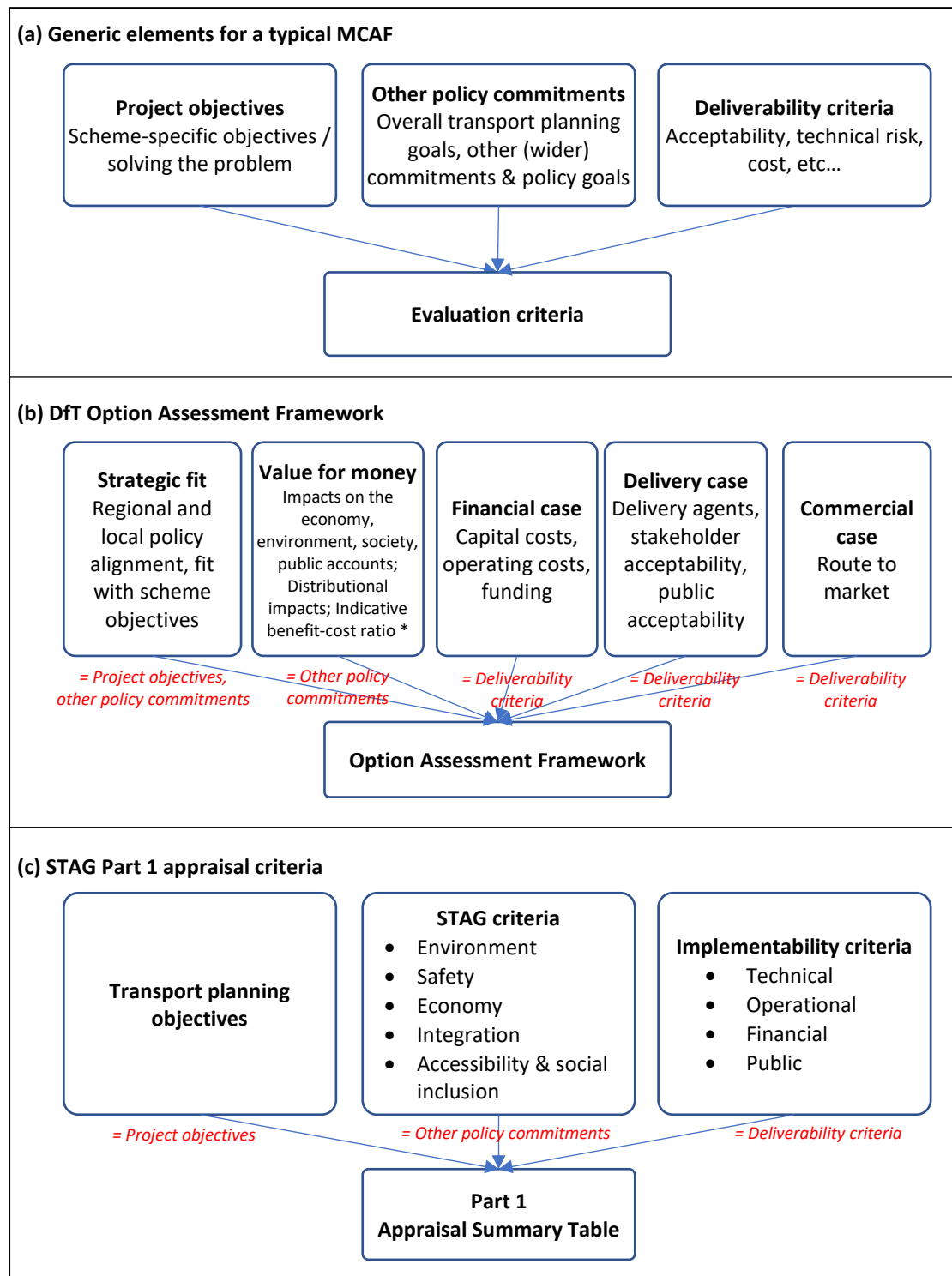
Figure 5: Example of using the three categories of criteria

Overall requirements [= categories]	Sub-Criteria [= Criteria]
Contribution to unlocking strategic allocation sites and other strategic development opportunities [= Project objectives]	<ul style="list-style-type: none"> • Likely relevance to unlocking of each strategic site • Wider strategic role in unlocking infill development sites • Likely contribution to addressing forecast congestion hotspots
Alignment with core strategy and local transport plan [= Policy commitments]	<ul style="list-style-type: none"> • Vitality of town centres • Supporting the rural economy • Sustainable impacts on the natural and built environment • Contribution to climate change adaptation/mitigation • Sustainable travel behaviours • Healthier communities
Deliverability [= Achievability]	<ul style="list-style-type: none"> • Funding certainty • Technical feasibility • Organisational ability to deliver • Public acceptability

Figure 6 illustrates how these categories cover essentially the same ground as the criteria in WebTAG and STAG, albeit with different groupings and terminology.

A common pitfall with bespoke MCAFs is to focus too much on the second and third categories, giving too little weight to the scheme-specific objectives. Use of WebTAG AST criteria as a starting-point can also lead to this issue. There needs to be a robust line-of-sight from strategic policy/goals to problems identified, leading to scheme-specific objectives (first category above), then the assessment criteria (all three categories), and hence the selected option.

Figure 6: Elements contributing to the evaluation criteria

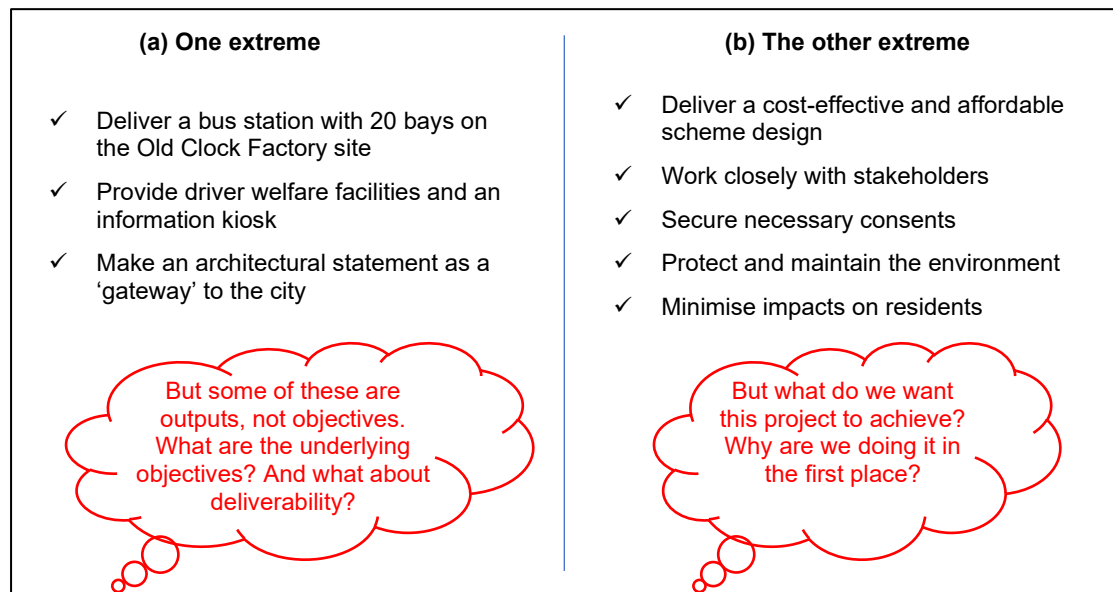


Source: (a) Author; (b) summarised from The Transport Appraisal Process (DfT, 2018), (c) summarised from STAG Technical Database (Transport Scotland, 2018)

* Each of these headings has sub-criteria which are omitted here for clarity.

As Figure 7 illustrates, the stated scheme objectives, design criteria, or similar lists can be a useful starting-point but may not be suitable to directly become evaluation criteria. If the real, underlying objectives are not clear, they must be teased out.

Figure 7: How the objectives might start



7.2 Tip 2: Don't have too many criteria to be manageable

Around 8 to 15 criteria is the most effective range for a scoring exercise and matrix. This can mean amalgamating potential criteria. Below this number, the exercise is too coarse and key issues may be obscured. Above this number, the process risks becoming unwieldy.

Where larger numbers of technical assessment criteria are required or desirable (eg the 36 in the DfT's Option Assessment Framework), these can and should be used for technical assessment. Ideally they should be explicitly mapped to any amalgamated MCAF criteria, so that the flow-through is clear and omission or double-counting is avoided.

7.3 Tip 3: Minimise overlaps, and specify what gets counted where

The evaluation criteria should minimise potential overlaps – partly to avoid double-counting, and partly to avoid queries during the scoring exercise. It is helpful to set out what each criterion covers, allocating potential overlaps to one or another. Figure 8 gives an example.

Figure 8: Setting out the elements contributing to each evaluation criterion

Evaluation criteria		
Category	Criterion	Considerations
Project objectives	Local access to station	<ul style="list-style-type: none"> • Pedestrian • Cycle • Bus • Car
	Sustainable growth	<ul style="list-style-type: none"> • Connecting businesses to the labour market • Improved public transport connectivity to jobs • Supporting proposed housing areas
	Transport user benefits	<ul style="list-style-type: none"> • Journey time • Interchange • Local access • Crowding
Achievability	Technical feasibility / deliverability	<ul style="list-style-type: none"> • Engineering • Timetabling • Fit with developers' plans
	Capital cost	<ul style="list-style-type: none"> • Land • Construction
Policy commitments	Environmental impacts	<ul style="list-style-type: none"> • Construction • Permanent • Extent of potential mode shift from car

7.4 Tip 4: Consider whether any criteria can be scoped-out (at least for now)

Criteria can be scoped-out if:

- All options are likely to score the same (eg all have the same cost, or have negligible environmental impact)
- A potential impact is not understood at this stage but is not expected to be critical to the decision

However, these criteria cannot be forgotten altogether: things may change, and in any case they will need to be considered later when assessing the preferred option's *absolute* performance. A 'greyed-out' treatment may be a helpful reminder.

8 TIPS, SOLUTIONS AND PITFALLS FOR THE SCORING METHOD

8.1 Tip 5: A seven-point scoring scale (-3 to +3) usually works well

Numerous scoring scales have been tried, including 'marks out of ten', 'marks out of five' (as used in EAST) or positive/negative scales with 3, 5 or 7 points. The choice offers scope for debate and is a key item to agree before the scoring exercise (see section 9.1). Table 2 shows what it should achieve.

Table 2: Desiderata for scoring scales

<ul style="list-style-type: none"> • Be intuitive • Allow explicit consideration of "things get better/worse" than do-minimum, not just comparing options against each other. This means negatives are needed (see also section 8.2) • Allow a neutral score • Have enough positive and negative 'steps on the ladder' to distinguish between options... • ...but not so many that the scoring becomes an unrealistically precise and time-consuming exercise • The sense of direction should be consistent – ie high scores should always be 'good'. In some cases this may need the natural scale of measurement to be reversed (eg distance from a key demand generator)

The best option is often a seven-point scale from -3 to +3 (or equivalent such as "----" to "+++" if preferred). This meets the criteria in Table 2, is familiar from environmental

assessment practice, and in some cases the scores can be directly read across from an environmental assessment.

STAG directly supports this scale for some elements of qualitative appraisal. The 2007 WelTAG also supported this scale. WebTAG is less clear-cut but still offers support (DfT, 2018, para 2.10.9).

8.2 Tip 6: Compare options to the do-minimum as well as each other

A common question is “are we scoring options against each other or against do-minimum?” The answer should generally be “both”. As well as comparing options to each other, it is important to know whether an option makes matters better or worse than today. This is a key reason behind the scale suggested above. It also needs to flow into the scoring itself.

Costs are best scored as negatives because they are bad compared to do-minimum. It would be unintuitive and misleading to say “cheapest option scores +3”. Where an option saves money compared to do-nothing, positive scores are of course appropriate.

Applying this principle to other deliverability criteria can be more awkward. Often any do-something is inherently less deliverable than do-minimum, but entirely negative deliverability scores would look and feel wrong. In practice this can be treated pragmatically, either:

- 0 = a “typical” level of difficulty, with positive scores for easier projects and negative scores for less deliverable ones, or
- 0 = completely infeasible, through to 3 = easy (this only gives a narrow range of possible scores).

Whatever approach is adopted, it should be set out at the start of the scoring exercise to avoid confusion (see also section 8.4).

8.3 Tip 7: Use scores to reflect the overall spread of performance

The scores for any criterion should reflect the overall spread of options’ performance. This may involve giving the same score to two options even if one of them is slightly better, because in overall terms they are similar. Table 3 gives an example. Similarly, if none of the options meets the criterion as much as had been hoped, there might be no +3 or even +2 scores awarded.

Table 3: Scoring should reflect the overall spread of options’ performance

Option	Assessment of performance on this criterion	Score – best approach	Score – misleading approach
A	Some benefits	+1	+1
B	Some benefits, slightly more than A	+1	+2
C	Lots of benefits, much more than A or B	+2 or +3	+3

In practice, and particularly with a large number of options, you will occasionally wish for extra points on the scale to distinguish between them: “this one is a 2.5” or similar. This should be resisted unless it is critical to the assessment (in which case a more

detailed assessment is probably required anyway – see section 10.7). It is potentially misleading precision, and could trigger a time-consuming re-assessment of previous scores on what has in effect become a new scoring scale. “Don’t try to be over-precise” is a good motto.

8.4 Tip 8: Consider defining scores in relation to levels of outcome

Another common question is “what do we really mean by” a particular score. Ideally scores should relate to recognisable outcomes or thresholds. These can be agreed and set out ahead of the scoring exercise. This can be very project-specific, so the examples here are simply illustrations.

Table 4 gives a set of generic meanings (based on environmental assessment practice), and some potential criterion-specific meanings.

Table 4: Examples of defining scores

Score	Generic meaning	Examples of potential criterion-specific thresholds		
		Impact on a scheme-specific problem	Cost	Land-take
+3	Strongly positive	Completely solves the problem	Saving >£100m	Within existing highway kerblines
+2	Moderately positive	Mostly solves the problem	Saving £50m to £100m	Within existing highway land
+1	Slightly positive	Partly solves the problem	Saving £5m to £50m	Within council land (not entirely highway)
0	Neutral or negligible impact	Neutral or negligible	Cost or saving <£5m	Requires land from willing stakeholder
-1	Slightly negative	Makes problem a little worse	Cost £5m to £50m	Requires land from potentially willing stakeholders
-2	Moderately negative	Makes problem much worse	Cost £50m to £100m	Requires limited compulsory purchase
-3	Strongly negative	Makes problem very much worse	Cost >£100m	Requires multiple compulsory purchases

Table 5 shows the generic definitions in STAG. These are expressed in terms of eligibility for funding, but the principle can be applied more generally.

Table 5: STAG scoring definitions

Score	Summary of STAG definition	
+3	Major benefit	Depending on the scale of benefit or severity of impact, should be a principal consideration when assessing an option’s eligibility for funding
+2	Moderate benefit	Taken in isolation, may not determine an option’s eligibility for funding, but may do so when taken together with others
+1	Minor benefit	Worth noting, but unlikely to contribute materially to determining whether an option is funded
0	No benefit or impact	No or negligible benefit or impact
-1	Small minor cost or negative impact	Taken in isolation, may not determine an option’s eligibility for funding, but may do so when taken together with others
-2	Moderate cost or negative impact	Taken in isolation, may not determine an option’s eligibility for funding, but may do so when taken together with others
-3	Major cost or negative impacts	Depending on the scale of benefit or severity of impact, should take into consideration when assessing an option’s eligibility for funding

Source: Paraphrased from STAG Technical Database (Transport Scotland 2018), section 5.4. Colour-coding not in original, but added for ease of comparison in this paper. Note that the definitions are not completely mirrored around the zero point.

Table 6 is from a sifting exercise to identify potential transport schemes to support local plan growth, using a five-point scale.

Table 6: Relating scores to meaningful outcomes: Example from a sifting exercise

Criterion	Score 0	1	2	3	4
Impact on growth: does the scheme directly support development of strategic sites?	No or negligible direct impact	Indirectly supports a strategic site (creates improved network conditions that will encourage development)	Directly supports a strategic site (transport is the major constraint)	Indirectly supports multiple strategic sites (creates improved network conditions that will encourage development)	Directly supports multiple strategic sites (transport is the major constraint)
Alignment with Local Transport Plan objectives	No Strategic Alignment	Little strategic alignment	Moderate strategic alignment	Good strategic alignment	Complete strategic alignment
Timescale: when is the scheme likely to be delivered?	Undeliverable before 2031	Deliverable by 2031	Deliverable by 2024	Deliverable by 2022	Deliverable by 2019
Congestion relief: is the scheme likely relieve known congestion problem areas?	No impact on congestion hotspots	Small / moderate impact at a specific location	Moderate / large impact at a specific location	Small to moderate impact on multiple locations	Moderate to large impact on multiple locations
Funding: how likely is funding for the scheme?	Highly unlikely in plan period	Some uncertainties around funding	Funding probably available	Funding will be obtained	Funding already available

Table 7 is from an exercise where a ten-point scale was requested to give finer graduations in scoring.

Table 7: Example of defining scoring on a ten-point scale

Score	User Benefits	Future Resilience	Deliverability
10	Excellent (high)– significant benefits against all types of benefit	Excellent (high) – option is 'best in class' at being flexible to adapt to technology	Excellent (high) –easy to deliver / low risk / can be delivered at pace
9	Excellent (low) - significant benefits against all types of benefit	Excellent (low) - option is near 'best in class' at being flexible to adapt to technology	Excellent (low) –easy to deliver / low risk / can be delivered at pace
8	Good (high) - key benefits at a notable scale, and/or a wide range of benefits	Good (high) - option will be good at adapting to technology	Good (high)
7	Good (low) – key benefits at a notable scale, and/or a wide range of benefits	Good (low) – option will be good at adapting to technology	Good (low)
6	Acceptable (high) across all areas but some benefits will deliver at a greater level	Acceptable (high) satisfies the requirement to be flexible in all areas	Acceptable(high) –can be delivered / average risk / at a reasonable pace
5	Acceptable (low) across all areas – key benefits delivered	Acceptable (low) – satisfies the requirement to be flexible in some areas	Acceptable (low) –can be delivered / average risk / at a reasonable pace
4	Minor reservations (low) about the scale of potential benefit	Minor reservations (low) that the option will be flexible to adapt to technology	Minor reservations (low)
3	Minor reservations (high) about the scale of potential benefit	Minor reservations (high) that the option will be flexible to adapt to technology	Minor reservations (high)
2	Major reservations (low) about the scale of potential benefit	Major reservations (low) that the option will be flexible to adapt to technology	Major reservations (low) - unacceptable organisational change / risky / cannot be delivered at pace
1	Major reservations (high) about the scale of potential benefit	Major reservations (high) that the option will be flexible to adapt to technology – it would need to be replaced	Major reservations (high) - unacceptable organisational change / risky / cannot be delivered at pace

Ideally the levels should be consistent across criteria. For example, if a -3 score for an environmental impact criterion indicates an impact so severe that it is likely to be unacceptable or a show-stopper, a -3 score for a cost criterion should indicate something that is likely to be unaffordable, not simply something that is the most expensive of all the options.

Neutral scores should cover negligible impacts as well as nil impacts (similar to environmental impact assessment practice). Again, this is project-specific and what can count as neutral will generally become evident in the scoring process. However, the DfT's OAF (see Table 1) gives guidance on this. In particular, for environmental criteria it suggests that a neutral impact can be reported where any potential impacts can be managed through standard mitigation measures at low cost.

8.5 Tip 9: You may not need to weight the criteria...

Criteria can be explicitly weighted to reflect their relative importance, provided the scoring scale is numeric or can be converted to numbers. This in turn leads to a weighted 'final score' for each option (Figure 9). Weighting – or not – is a key decision to be agreed with the client or decision-maker ahead of the scoring exercise.

Figure 9: Example of weighting the criteria

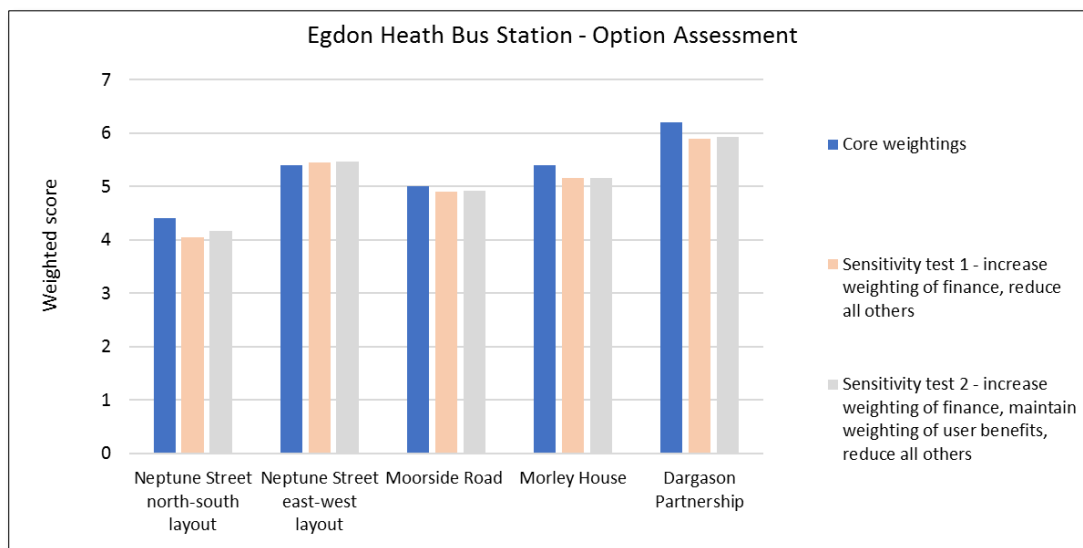
Option	Description	Criterion	User Benefits	Re-generation	Financial	Building partnerships	Resilience and reliability	Deliverability	Weighted score
		Weighting	30%	10%	20%	10%	10%	20%	100%
1	Neptune Street north-south layout		6	5	2	2	5	5	4.40
2	Neptune Street east-west layout		5	5	6	5	5	6	5.40
3	Moorside Road		6	5	4	6	5	4	5.00
4	Morley House		7	6	3	7	6	4	5.40
5	Dargason Partnership		9	8	3	8	7	3	6.20

In a situation that positively needs rankings (such as when selecting the best schemes from a list of candidates for funding), weighting and a final score may indeed be necessary. In other cases, it may not be worth the time and effort involved in agreeing the weightings, particularly with multiple stakeholders. Often the preferred option(s) come through clearly without weighting, particularly if the scoring is presented intuitively (see section 10.1).

Weightings have the potential for the numeric 'winner' to be different from the option that intuitively seems best. This is a double-edged sword. It provides an opportunity to challenge the intuitive view, or to identify weightings that aren't quite right. But it also brings temptation to change the weightings until the expected answer comes through – which defeats the point of the process.

If weightings are used, they should be soft-coded in any spreadsheets, and documented. Sensitivity tests of slightly different weightings are useful to confirm that the results are robust (Figure 10).

Figure 10: Example of sensitivity tests to confirm robustness of outcome



8.6 Tip 10: ...but consider using total scores as a sense-check

Simply adding-up the scores for each option (Figure 11) can be a useful sense-check of the intuitive conclusions. In practice, people will do this anyway (even if the scores are expressed as ticks/crosses or plus/minus signs rather than numbers), so the spreadsheet might as well do the calculations. This has worked effectively on exercises with 8-10 criteria. In effect it gives each criterion equal weighting and should be seen only as a sense-check rather than a final score. An appropriate caveat should be included (Figure 12). To reinforce this message, the sense-check totals could have less visual emphasis than the individual criterion scores.

Figure 11: Example of total scores

J	K	L	M	N	O	P
a					Note	
of the objectives		Policy commitments			Total Scores	
Transport	Rail revenue	Environmental	Equality			
er benefits	impact	impact	impact			
+2	+2	+3	+1			
+2	+2	+2	+1			
+2	+2	+2	+2	+13		
+2	+2	+1	+2	+10		

Figure 12: Caveat when using total scores

5	Benbow Rd	South side	Subway	+1	+1	-2	+3	+2	+2	+1	+2	+10
6	Benbow Rd	South side	Footbridge + lifts	0	+1	-3	+3	+2	+2	0	+2	+7

* The 'Total scores' column is provided for convenience as a broad indication of the overall balance of the scoring. It is a simple sum of the criteria scores. This does not imply that all criteria necessarily carry equal weight in option selection, and consequently the total score does not imply a formal ranking of the options.

With or without total scores, the trade-offs between criteria involved in the selected option(s) still need to be understood and accepted.

Sometimes a high total score for an option could be misleading if this masked a very poor – perhaps unacceptable – performance under one particular criterion. Some guidance suggests highlighting criteria where a poor score would virtually rule out an option irrespective of its total. In practice the author has never found this precaution necessary: with such options, if they make it to the final scoring at all, the showstopper tends to make itself obvious.

9 TIPS, SOLUTIONS AND PITFALLS AHEAD OF THE SCORING EXERCISE

9.1 Tip 11: Agree the criteria and scoring rules beforehand

It's worth agreeing this not just internally within the project team but with the client and potentially stakeholders. For example, if there is a series of working group meetings, the criteria and scoring process can be agreed at one meeting for a scoring exercise at the next.

9.2 Tip 12: Do a dry-run of the scoring exercise

A dry-run by the project team will draw out any issues that need correcting or further investigation. The dry-run scores can themselves be presented as starting-points in the actual scoring exercise (*"We thought it was xxx because yyy – do you agree?"*). This can save time and focus debate.

9.3 Tip 13: Consider the best sequencing of options

Options should be presented in a logical and intuitive sequence. This may not be the order in which they were originally developed or numbered (see section 9.5). Depending on the project, the best sequence might be geographical, or in order of increasing complexity, or in groups that share key features.

9.4 Tip 14: If there are lots of permutations, consider a staged approach

Where there is a large number of options, each with sub-options or variants, it may be most practical to take a staged approach, beginning with what is likely to be the biggest decision and then working down to sub-options and variations. Figure 13 illustrates this in relation to a new railway station with a choice of sites plus a choice of design features/approaches within each site. The practical approach in this case was to choose a site, then focus on design choices for the preferred site.

Figure 13: Multi-stage option selection



This Figure also illustrates careful option numbering to minimise confusion. Sites were numbered 1-3, access options were letters A-E and parking options were lettered W-Z.

9.5 Tip 15: Don't get confused over option numbering

As options are created, are sifted-out, and generate variants, their numbering can depart from a simple or logical sequence. Sometimes, after a sift, options are re-numbered into a new sequence for wider presentation, which helps that wider stage but has potential for confusion in documentation, or when tracing back options or reinstating previously-discarded options. There is no right or wrong answer, other than to recognise the pitfall, keep track of both 'old' and 'new' numbers, and provide additional cues such as option names in the matrix (see also section 10.1).

10 TIPS, SOLUTIONS AND PITFALLS FOR THE SCORING EXERCISE AND BEYOND

10.1 Tip 16: Make the matrix intuitive

During the scoring exercise, the matrix should ideally be on a large screen, to be filled-in as the scoring progresses. Showing not just option numbers but also their names and/or key points (see Figure 1, Figure 9 and Figure 13) will help the exercise to flow.

Colour-coding cells according to their scores will make the matrix easier to read, and helps the best and worst options to stand out. In a spreadsheet, conditional formatting is valuable for this, and drop-down menus help to minimise errors (Figure 14).

The colour-coding should, however, only be a supplement to the scores themselves. Some people are red-green colour-blind, and some users will later want to print the matrix in monochrome. The scores also need to be legible from the back of the room.

Figure 14: Intuitive presentation: colour cues and drop-downs

Technical livability	Acceptability to stakeholders	Scale of cost	Local connectivity benefits	Transport user benefits	Rail revenue impact	Environmental impact	
+3	+1	-1	+2	+2	+2	+3	
+2	+1	-2	+2	+2	+2	+2	
+2	+2	-2	+3	+2	+2	+2	
+1	+2	-3	+3	+2	+2	+1	
+1	+1	-2	+3	+2	+2	+1	
0	+1	-2	+2	+2	+2	0	

10.2 Tip 17: Score collectively where possible

Scoring is inevitably subjective, and is most robust when several people who jointly have all the necessary knowledge contribute to the process. This is best done as a consensus-building discussion rather than trying to add up or resolve individual ‘voting’ made in isolation. The discussion helps to provide well-rounded information, reveals nuances, and may change individual opinions from their starting-point. Being seen to reach a consensus provides robustness for the process and reassurance for the participants.



10.3 Tip 18: Set out the rules

It is helpful to introduce the exercise with a short briefing on how it will work and what needs to come out of it. This should include an overview of the criteria and what each one covers (section 7.3), the scoring rules (section 8), and how the exercise itself will be conducted. Figure 15 shows an example presentation slide for the latter.

Figure 15: Set out the rules (example slide)

Approach to scoring

- Go through criterion by criterion - compare across the options and score.
- Scores are on a 7 point scale from strongly negative (-3) to strongly positive (+3).
- Be concise and don't over-debate. Pick up the key points
- If we can't get consensus quickly, we'll note where further evidence is needed
- Once scoring is complete, identify whether there is a clear preferred option and 'low cost' or 'ambitious' alternatives.
- No weighting for now - unless the discussions highlight any particularly important criteria meaning the results would be skewed by not weighting

10.4 Tip 19: Score each criterion in turn, not each option in turn

It is best to score each criterion in turn, comparing how the options perform against it, rather than to go through each option and score it against each criterion. This naturally requires all the options to have been set out before the scoring begins – which is also beneficial as it sets the scene and means the range of impacts and issues is understood from the start.

10.5 Tip 20: Where some options have common factors, these could become bump-ups and bump-downs

Look out for factors that apply to multiple options and can be used to increase or decrease a score. For example, the station option selection exercise shown in Figure 1 has three basic options, each of which could use either an existing subway (odd-numbered options) or a new footbridge (even-numbered options) for access. In this case, the footbridge adds complexity and visual intrusion compared to the subway. This meant that on the deliverability and environmental impact criteria, for each basic option the footbridge option scored one point lower on the scale than whatever the subway option scored.

In practice these situations tend to emerge in discussion. Once recognised, they can be accepted as a logic and can speed-up the scoring process. Of course this should only be applied if it makes a significant difference between options, and you should always step back to check that the result is fair (Section 8.3).

10.6 Tip 21: Record the rationales for scores

Record the rationale for each scoring decision. Bullet points are usually sufficient. This is not only valuable evidence for reporting, but is also useful if new options need to be scored at a later date. Without these notes, it is surprisingly difficult to remember the thinking and hence to score new options on the same basis. This still applies even if there is a detailed technical assessment report.

Some standard MCAFs require, and provide space to record, comments or a summary of the evidence alongside the score itself. Figure 16 shows an example. This is ideal as a final record or for desktop assessments but is less helpful for 'live' scoring exercises where a simple 'at a glance' matrix is needed.

Figure 16: Recording the rationale for scores: Example of comments alongside each score (Transport Scotland's Policy Assessment Framework (PAF) tool)

Name of Scheme			Option 1	Option 2	Option 3
NTS High Level Strategic Outcomes	Question to be scored	Explanation (from STPR/NPF/NTS)	Comments / Explanation for scoring	Comments / Explanation for scoring	Comments / Explanation for scoring
Promote Economic Growth: By building, enhancing managing and maintaining transport services, infrastructure and networks to maximise their efficiency.					
Promote 'competitive' inter-urban journey times.	To what extent does the intervention reduce inter-urban journey times?	Improving Journey times and the connectivity between the cities of the Central Belt and between them and the other urban centres in Scotland will therefore help to underpin economic growth and spread the benefits of that growth. Access to or from centres more distant from the Central Belt should be considered in terms of the potential to improve service frequencies or reduce overall journey times, including from reduction in level of unplanned disruption.			
Reduce inter-urban journey time on public transport.	To what extent does the intervention reduce inter-urban Journey time on public transport?				
Reduce the proportion of driver journeys delayed due to traffic congestion and disruption.	To what extent does the intervention reduce the proportion of driver journeys delayed due to traffic?	Perception of driver Journeys delayed due to traffic congestion (including from reduction in level of unplanned disruption)			

'Comments' cells below the scoring matrix (Figure 17) have worked well for entering notes 'on the fly' during a live exercise while maintaining the at-a-glance matrix. However, this format is awkward for final write-up so the comments may need to be transferred to a more conventional reporting format.

Figure 17: Recording the rationale for scores: example of comments below the scoring matrix

Collingwood Station: Option Selection Matrix									
Option no.	Description			Achievability			Criteria		
	Location	Car park	Access	Technical deliverability	Acceptability to stakeholders	Scale of cost	Local connectivity benefits	Tran user b	Meeting th
1	Nelson St	None	Subway	+3	+1	-1	+2	+	
2	Nelson St	None	Footbridge + lifts	+2	+1	-2	+2	+	
3	Benbow Rd	North side	Subway	+2	+2	-2	+3	+	
4	Benbow Rd	North side	Footbridge + lifts	+1	+2	-3	+3	+	
5	Benbow Rd	South side	Subway	+1	+1	-2	+3	+	
6	Benbow Rd	South side	Footbridge + lifts	0	+1	-3	+3	+	
Notes on Rationale for score									
Option no.	Description			Achievability			Criteria		
	Location	Car park	Access	Technical deliverability	Acceptability to stakeholders	Scale of cost	Local connectivity benefits	Tran user b	Meeting th
1	Nelson St	None	Subway	Footbridge and car park construction each add complexity compared to underpass. Options 5&6	Having no parking may raise concerns about parking on nearby streets. South side car park would have access through	Car park costs are similar on either side. Footbridge adds cost compared to underpass.	Car park helps with connectivity. Location and access option are unlikely to affect this. Footbridge has more locational	Positive benefits assumed local ac Little dif between options Pedest	
2	Nelson St	None	Footbridge + lifts						
3	Benbow Rd	North side	Subway						

10.7 Tip 22: Embrace the uncertainty, expect loose ends

Typically a scoring exercise encounters unknowns and uncertainties. EAST requires a 'best guess' even if the evidence is limited. DfT guidance suggests a "prudent approach... that reflects the quality of information... but ensures any key risks associated with options are highlighted" (DfT, 2018, para 2.10.9). It also recommends identifying the level of uncertainty for each impact, and this can feed into the appraisal methodology for the next stage (para 2.10.17).

In practice, you will identify key questions that will need to be resolved to complete the selection process by:

- Confirming a tentative rejection
- Distinguishing between potential 'runners' that are otherwise similar to each other
- Validating a key assumption that underlies a tentative preferred option

These may be resolvable quickly, leading to a final decision – or may indicate the need for more detailed assessment at a later stage, retaining the relevant options until then. Don't force a decision if further work is needed to get there. Even if no decision can be made on the day, the session will have had value by drawing-in participants' knowledge and teasing-out issues that need to be addressed.

Good practice is to follow this up with a 'requirements confirmation workshop' or similar. In this sense, 'requirements' means choices about what the scheme will have or do: for example, the desired local access routes, or whether an architectural statement is needed rather than a basic design. This involves going back to the group, having tied up the loose ends, to confirm the requirements based on the issues and ideas previously teased-out.

10.8 Tip 23: Don't be too rigid about the number of options to take forward

The number of options to take forward to the next step is generally a matter of judgment, although some guidance specifies a minimum number. DfT asks for a low-cost solution to be among those taken forward (DfT, 2018, para 2.11.2).

Where several options perform similarly to each other, it will be hard to justify rejecting some of them but not others, given the limited nature of this initial evidence. The 2008 WelTAG usefully suggested imagining options' performance as being points on a spectrum from 'poor' to 'good', and that if there is a significant gap between a set of options and the next, this may be a sensible place to set the 'cut'. Using total scores (weighted or otherwise) will make this approach easy to visualise.

10.9 Tip 24: A facilitator can help lift a 'live' scoring session

In a scoring session, particularly one with multiple organisations and/or technical areas, a facilitator can be a valuable part of the team. They need not be additional or external – they can be an existing project team member, as long as they don't need to focus on a key technical area.

Like any facilitator, they can introduce the exercise, lead participants through the process, keep an eye on the clock, ensure a balanced discussion with all participants getting their say, and ensure decisions are clear. But with some relevant technical knowledge, and without the need to focus on a particular area, they can also be alive to overlaps and consistency, gently challenge as devil's advocate where appropriate, and step back to summarise the big picture.

Their personal style is key, and the right person can lift a potentially dry technical process into an engaging and value-adding discussion.

11 CONCLUSIONS

This paper has set out the role of MCAF in developing and selecting options for transport projects, and noted some key MCAFs given in appraisal guidance.

Many MCAF exercises, particularly where national guidance or pre-set templates are not required to be followed, give practitioners a great deal of flexibility and require careful thought to be successful, avoid pitfalls, and secure buy-in. The tips presented in this paper are summarised below.

Evaluation criteria

- 1 Don't let your project-specific problems and objectives get lost among general criteria
- 2 Don't have too many criteria to be manageable
- 3 Minimise overlaps, and specify what gets counted where
- 4 Consider whether any criteria can be scoped-out (at least for now)

Scoring method

- 5 A seven-point 'scoring scale' (-3 to +3) usually works well
- 6 Compare options to the do-minimum, as well as each other
- 7 Use scores to reflect the overall spread of performance
- 8 Consider defining scores in relation to levels of outcome
- 9 You may not need to weight the criteria...
- 10 ...but consider using total scores as a sense-check

Ahead of the scoring exercise

- 11 Agree the criteria and scoring rules beforehand
- 12 Do a dry-run of the scoring exercise
- 13 Consider the logical sequencing and potentially grouping of options
- 14 If there are lots of permutations, consider a staged approach
- 15 Don't get confused over option numbering

During the scoring exercise

- 16 Make the matrix intuitive
- 17 Score collectively where possible
- 18 Set out the rules
- 19 Score each criterion in turn, not each option in turn
- 20 Where some options have common factors, these could become bump-ups and bump-downs
- 21 Record the rationales for scores
- 22 Embrace the uncertainty, expect loose ends
- 23 Don't be too rigid about the number of options to take forward
- 24 A facilitator can help lift a 'live' scoring session

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