Executive Summary Process Workflow:
Fibonacci Morphological Analysis (FMA) aka Options Analysis

This document describes the basic process for carrying out decision support and the analysis of viable options under conditions of high uncertainty, complexity and interconnectivity.

"Many problems are too 'messy' to be addressed effectively by the standard management scientist's toolkit of mathematically-based techniques. Such problems are typically characterised by complexity, a high degree of uncertainty and ignorance, and multiple subjectivity. Structuring them into a form in which they can be addressed is at least as challenging as formally solving them."[1]

Strategy Foresight is a technology company focused on developing solutions to help organisations improve their decision making under conditions of uncertainty and complexity. The methods and processes deployed, a form of strategic options analysis, help structure problems and support decision making, notably when they are complex, 'wicked'[2] and contain high levels of uncertainty.

Basic Process Workflow

It is important to emphasise that FMA is a methodological process – being not solely dependent on software in bringing about reduced configuration solutions. Operational and behavioural realities demand that the methodology address such concerns if it is to have value for practitioners.

A summary of the programme (broken down into a 10 step process) is illustrated in three definite phases as below and detailed further in this document.

Phase 1 ***Generate the entire Problem Space*** *(Steps 1-6)*	• Identification of the main problem being addressed • Selecting an expert team representing the key stakeholders • Determining a focus question which encapsulates the problem • Facilitating the expert team to generate a problem space made up of the key parameters of the problem and then the states/ dimensions within each of the parameters • *The first steps here may require external facilitation and stakeholder management to finely structure the problem – before programming the software to generate the Problem Space which reflects the total number of possible configurations to be addressed.*
Phase 2 ***Perform Cross Consistency Assessment*** *(Steps 7-8)*	• This phase involves a form of cross impact analysis where the Problem Space is transposed[3] and each state within a parameter is assessed for consistency against every other state within the other parameters (i.e. can these two states logically co-exist). If they cannot, then every configuration where such an inconsistent pair exists is discarded.
Phase 3 ***Generate the Solution Space for decision support*** *(Steps 9-10)*	• Supporting software compiles those configurations only where all pairs within a configuration are consistent with each other. This process can eliminate over 95% of the original Problem Space to produce a set of viable internally consistent solutions. These solutions are presented as 'what-if' scenarios where any dimension in a parameter can be an input or an output.

[1] Professor Sally Brailsford, Southampton University

[2] A 'wicked problem' is one that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognise. The challenge is how to deal with such problems where the relationship between the multitude of variables is poorly defined leading to sub-optimal decision making and spurious correlations.

[3] Transposition software converts the Problem Space into the Cross Consistency Matrix (cross impact and assessment). Once this latter matrix has been completed (or assessed) then the software goes into compile mode, discarding those configurations which contain any one or more pairs of inconsistent arguments as determined by the expert team. The remaining, fully consistent configurations are then presented as a Solution Space.

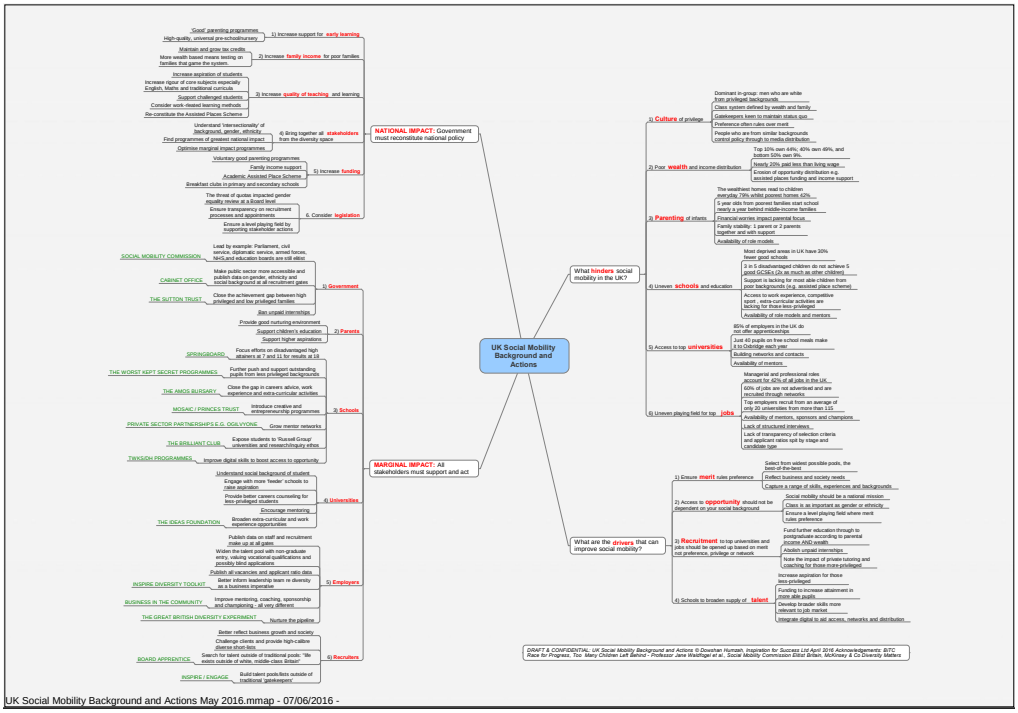
Breakdown of the 3 Process Phases (in 10 Steps)

1. **Define the problem to be addressed**. Present in the form of a focus question (this is not set in stone and may change through the process). For example: 'What factors do we have to consider in order to improve social mobility in the UK?'

2. **Identify the major stakeholders with an interest and expertise relating to the problem.** Stakeholders should represent a wide a constituency as possible (i.e. not all from the same discipline – stretched positions to avoid groupthink). Stakeholders should also have similar levels of responsibility and accountability within their respective organisations. Stakeholders can be a mix of internal and external personnel.

3. **Use the focus question as an anchor statement to build a structure such as a mindmap.** This creates a holistic/system overview of main issues and parameters and can be used as a first stage in the problem structuring exercise. It is possible that the mindmap exercise will be highly complex with a large number of problem defining parameters. In the example of social mobility this part of the process may help to actual define what we mean by social mobility; what are the drivers and what are possible solutions. A workshop will be required to draw insights from the major stakeholders, generate and validate the structure. The output may take a number of forms – but can be simply and elegantly captured as mind-map. See figure 1 below with 4 main areas regarding social mobility built from the copious research available, stakeholder inputs and expert references.

Figure 1: Example mindmap to define the problem and possible solutions for social mobility in the UK.



4. **Extract from the output (mindmap) a sub-set and transcribe into a matrix format.** This allows the user to create a 'Problem Space' (PS). Figure 2 shows a PS with 6 parameters (aka main variables) where each parameter is described in terms of a series of discrete states or dimensions (aka sub variables or 2nd level variables).

Figure 2: Populating the Problem Space via the 6 solution parameters and states for social mobility

NATIONAL IMPACT: Government must reconstitute national policy					
Increase support **Early Learning**	Increase **Family Income** for poor families	Increase **quality** of **teaching** & learning	Bring together all stakeholders from **diversity** space	Increase **funding**	Consider **legislation**
Good parenting programmes	Maintain & grow tax credits	Increase aspirations of students	Understand "intersectionality" of background, gender, ethnicity	Voluntary good parenting programme	Threat of quotas impacted gender equality review at a
High-quality, universal pre-school/nursery	More wealth based means testing on families that game system	Increase rigour of core subjects esp, English, Maths & Trad curricula	Find programmes of greatest national impact	Family income support	Ensure transparancy on recruitment processes & appointment
		Support challenged students	Optimise marginal impact programmes	Academic Assited Places Scheme	Ensure a level playing filed by supporting stakeholder actions
		Consider work-related learning methods		Breakfast clubs in primary & secondary schools	
		Re-constitute the Assisted Places Scheme			

This matrix can be described as representing the PS and is made up of 720 different configurations (i.e. the product of all states: 2x2x5x3x4x3).

5. **Decide if additional parameters such as constraints or outcomes need to be added** (e.g. Timing, Money, and Resource)? If yes, then add to the initial PS matrix as below figure 3. A smaller workshop may be required to check and validate the detailed PS as the software starts to do its work and we prepare to move to the phase.

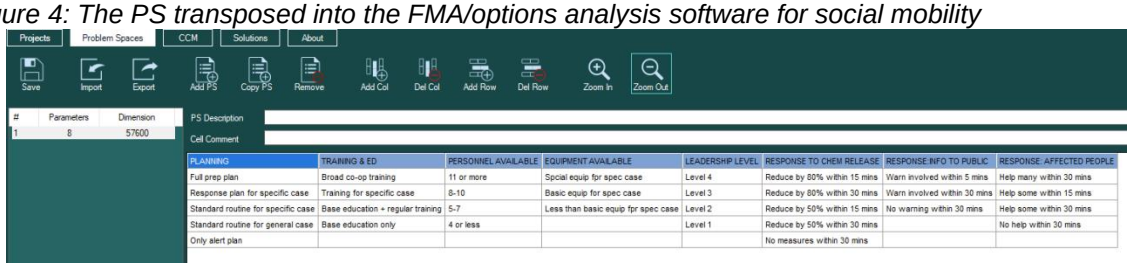
Figure 3: Adding constraints to Problem Space given the realities of implementation for social mobility

NATIONAL IMPACT: Government must reconstitute national policy						OPN Constraints		
Increase support **Early Learning**	Increase **Family Income** for poor families	Increase **quality** of **teaching** & learning	Bring together all stakeholders from **diversity**	Increase **funding**	Consider **legislation**	**Money**	**Time**	**Curr politcal**
Good parenting programmes	Maintain & grow tax credits	Increase aspirations of students	Understand "intersectionality" of background, gender, ethnicity	Voluntary good parenting programme	Threat of quotas impacted gender equality review at a Board	<1bn	<2yrs	Cat A
High-quality, universal pre-school/nursery	More wealth based means testing on families	Increase rigour of core subjects esp, English,	Find programmes of greatest national impact	Family income support	Ensure transparancy on recruitment processes	1-3bn	2-5yrs	Cat B
		Support challenge d students	Optimise marginal impact programmes	Academic Assited Places Scheme	Ensure a level playing filed by supporting	3-5bn	5-10yrs	Cat C
		Consider work-related learning methods		Breakfast clubs in primary & secondary schools		5+	10+	Desirable but back burner
		Re-constitute the Assisted						

The software allows each parameter and parameter state to be described as a form of audit trail, for example, what is meant by 'current political priority'.

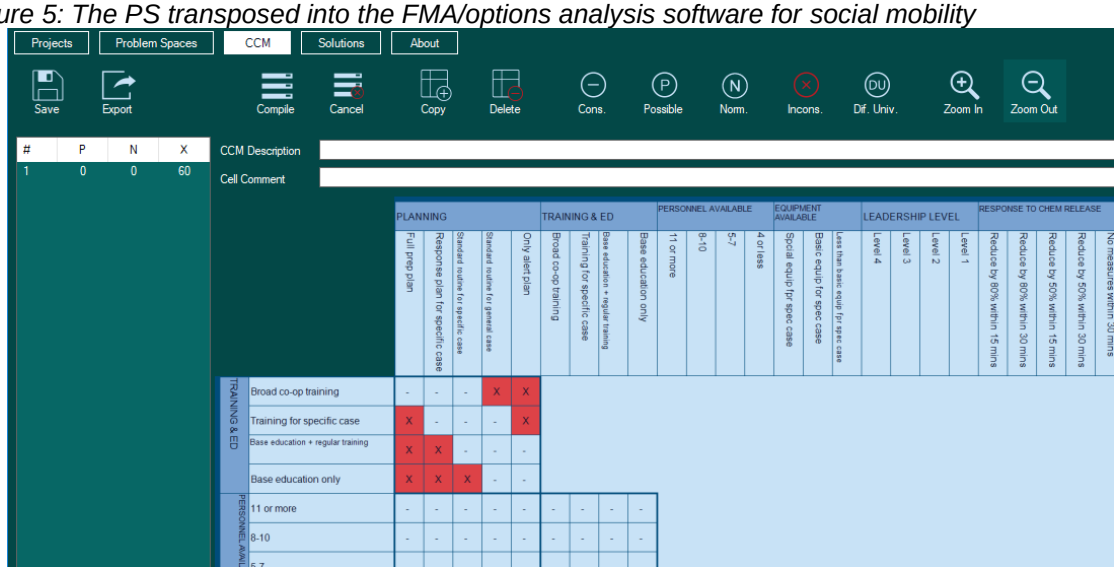
6. **Confirm final review – in that does the PS reflect the views of ALL stakeholders?** Is there a high level of consensus that the PS encapsulates the problem being addressed? If not, then revisit and adjust accordingly. Sign-off is by the stakeholder team and depending on how the outputs will be used by their seniors/board.

Figure 4: The PS transposed into the FMA/options analysis software for social mobility



7. **Use the FMA/options analysis software to convert the PS matrix to the 'Cross Consistency Matrix'**. The software transposes the PS matrix to a 'tableau' where each parameter and their respective states (descriptors) can be analysed in relation to every other state in every other parameter – this is called 'pair wise analysis'. A major workshop (possibly 2-3 half days with 2 facilitators) will be required to run the analysis across steps 7 and 8.

Figure 5: The PS transposed into the FMA/options analysis software for social mobility



The result is figure 5 which shows all the paired cells; those which are red with a cross are paired cells deemed inconsistent, whilst blank cells are deemed consistent.

8. **Perform analysis via a detailed evaluation of the relationship between each of the pairs in the CCM.** Decisions are audited via an audit recorder which can be aggregated post exercise.

9. **Once the pair-wise assessment within the CCM is completed then click the 'Compile' button.** The model algorithm then discards all configurations with one of more inconsistent pairs and generates a 'Solution Space' made up of only those configurations which are totally consistent. If the PS has been properly constructed then it is expected that over 95% of the PS configurations are discarded so that the remaining 5% represent possible viable options. A smaller workshop will be required to evaluate and feedback on the Solution Space.

10. **The Solution Space represents visually and dynamically all the potential options which work.** This 'filtered' selection can then be further evaluated for preference, comfortable in the knowledge that these options are compatible. Examples are shown in figures 6 and 7.

Figure 6: This graphic shows 1 of 12 scenarios in the Solution Space – red indicates inputs and blue indicates the range of options as an output.

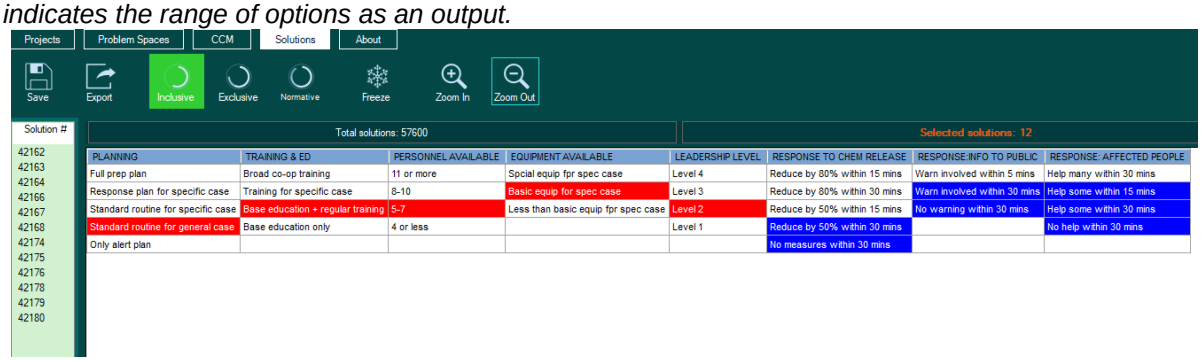
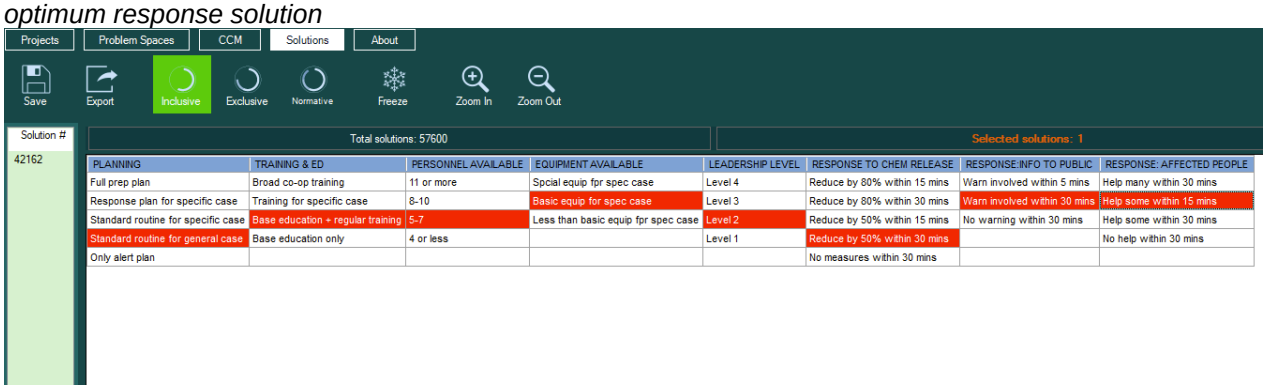


Figure 7: This graphic shows of the 12 scenarios solution number 42162 would appear to provide the optimum response solution



It is then up to the stakeholders how to present and release the results of the analysis. However, there is rich content and insight from the model that can be used for a variety of purposes.