

Analysis of Future Fit **'Appraisal of Options'**

OVERALL ECONOMIC APPRAISAL

Prior to the final Overall Economic Appraisal which was circulated on September 30 ahead of the Future Fit Project Board, two separate pieces of analysis have been completed by the Future Fit team to appraise the shortlisted options:

- the financial analysis, and
- the non-financial analysis

The financial analysis ranked option B first with C1 second. The non-financial analysis ranked option C1 first with B second. So which option should be chosen?

The non-financial analysis is not expressed in monetary terms, and therefore cannot be simply combined with the financial analysis, and vice-versa. At this point of Option Selection, the Treasury Green Book advises appraisers that '*judgement is then required to compare the results of weighting and scoring with the cost benefit or cost effectiveness analysis*'ⁱ. As non-financial values are in consideration, it also instructs appraisers that the quantification of the non-financial benefits must be both '*possible and meaningful*'ⁱⁱ.

The appraisal team have chosen to combine the outputs of non-financial and financial appraisals using two separate methods:

- 50:50 Weighting
- Cost per Benefit Point

In this paper both of these methods are explained and analysed for suitability and integrity. In particular, it considers whether there has been appropriate judgement and meaning used to compare the results of the financial and non-financial appraisals.

1. 50:50 WEIGHTING METHOD

The appraisal team have chosen to combine the outputs of non-financial and financial appraisals by giving each a 50:50 weighting. They assign each option a score from 0 to 50 for each of the financial & non-financial appraisals respectively. These are then summed to achieve an overall score out of 100 for each option.

Rough Cut Financials	£ million			Table 1
	A	B	C1	
Investment		237	311	
		-31%		<i>B has 31% less investment than C1</i>
Revenue Cost p.a. (yr 4)	343	297	297	
		-13%	-13%	<i>B & C1 have equivalent revenue savings</i>
EAC (p.a.) of providing whole hospital service	351.4	320.4	323.8	
			+1.1%	<i>C1 has 1.1% more EAC than B</i>

After discounting the financials to their Present Value, the Total Equivalent Annual Costs (EAC) of B & C1 differ by 1.1%. The appraisal team have decided to 'value' this benefit of 1.1% into 0.5 points out of 50. This is tiny and clearly is not representing the strength of the financial advantage of option B. Even option A, the reference 'do nothing' option, with no investment, only has a difference of 4.4 points out of 50, when it should have an extreme score. Why?

It has been decided to measure the overall economic analysis in points. The non-financial analysis is already available in points. However, the financial analysis has to be converted in to points on a scale of 0 to 50. Remember, the mathematical method selected to do this conversion **must** provide for the 50:50 weighting required by the overall economic analysis. As it is now to be valued as a score, it must also be 'meaningful'.ⁱⁱ

The chosen method does not do this – it is achieving a 98 : 2 weighting (non-financial : financial).

This occurs because the possible variation in the financial scoring is significantly less than the variation of differences possible in the non-financial scoring. This is because the financial variance is valued at a Total Cost level, whereas the non-financial score variations are marginal valuations. To explain this further, consider 1.2 & 1.3 below.

1.2 Non-Financial Score Variation:

All options were scored by the Non-Financial Assessment Panel using scores 0 up to 7¹. Thus the possible range of average score per option is clearly between 0 and 7. The economic assessment team have chosen to score the winning option 50 points; the remainder are given a lower score at the rate of 0.5 points per 1% difference.

		Non-Financial Analysis					Table 2	
		% difference possible						
average winning difference	average winning score							
	7	6	5	4	3	2	1	
1	14%	17%	20%	25%	33%	50%	100%	
2	29%	33%	40%	50%	67%	100%		
4	57%	67%	80%	100%				
6	86%	100%						

Table 1 shows the % differences that are possible for combinations of winning scores and winning differences. It shows that the range of differences possible is large, with up to 100% being possible at the extreme. Therefore, at the chosen rate of 0.5 points per 1%, the economic model non-financial scores can range from 50 down to zero, the full-scale (See Appendix 1).

1.3 Financial Score Variation:

¹ Clause 3.5, b), viii) of Report on Appraisal of Options states that the values 0 & 7 were used by panel members, however, no definitions were given to Panel members of what each scoring point should represent. Provision of scoring definitions would have sought to address any potential scoring bias amongst Panel members.

The financial score of 0 to 50 is generated from the Equivalent Annual Cost (EAC) % differences. Future Fit has chosen the same calibration as the non-financial assessment to complete this task – i.e. the financial scores will change by 0.5 points for each 1% of EAC difference, the winner scoring 50. But is this difference meaningful, and will it provide the 50:50 weighting required?

1.3.1 Total Costs

The financial analysis team have chosen to assess each option on a ‘total cost basis’. Therefore, the Net Present Cost (NPC) and the resulting Equivalent Annual Cost (EAC) are the costs for providing the whole hospital service. When converting the EAC using the chosen calibration, the full 50 points scoring range is equal to the running cost of a whole hospital.

An improvement of 2% in the total annual costs of a hospital is only valued at 1 point out of a possible 50 on the chosen scale. An improvement of 10% (a significant amount) is only valued at 5 points out of 50. Clearly, to use the full scoring range, the financial difference between competing options would have to be in the order of the full cost of a hospital.

It is clear that considerable care and judgement is required when transferring financial values into scores on a new non-financial scale, especially when it will be used to assess the financial differences between project options of circa £300million of public investment.

1.3.2 Absorbed Differences in Project Options

The unsuitable choice of scoring scale, highlighted in 1.3.1, is further compounded when the process of Project Option generation is considered:

All the competing options are large investment projects with the same design goal – a hospital for the future. Each option will contain the latest ‘healthcare’ know-how of what equipment to provide and what buildings are required to achieve the best revenue savings. However, if one option has identified an advantage then, during the generation and refinement of each of the options, ideas used by one option will be absorbed in to the business case of the other options. In this way, all considered options are iterated and refined over time before the final shortlisted project options are reached.

For example, if option C1 was spending its extra £75 million of capital on achieving a further £10 million of revenue savings, it is likely that the same new know-how would be absorbed into options B & C2. If it’s not possible, then it is due to other constraints, as equivalent financial capital would be made available to all options at the consideration stage. In this way all the final solutions will achieve their optimum possible cost saving, a good thing. However, it also has the effect of bounding the total cost differences between the final competing options. This is why it important that projects that do display % differences at the total cost level (EAC) are to be highly prized.

The ‘do nothing’ option is a reference, it is not a competing option. It has not been put through this thorough option refinement and optimisation process.

1.3.3 What Actual Variation in EAC is Possible?

The range of EAC differences between the final first ranked options (B & C1) are 0% to 1.1%. This gives rise to scores of 50 and 49.5 respectively. To achieve scores close to 0, the differences in EAC

would have to be close to 100%. This is clearly impossible as it is equal to the annual cost of a hospital.

To establish what variation in EAC is possible in project options, two extreme examples have been considered:

1. Capital differences of 100%
2. Revenue savings differing by 25%

Beyond these extremes, any favourable variations in capital and revenue differences would be adopted by and absorbed in to the other competing options during their evolution as explained in 1.3.2.

Applying these extremes to the final options B and C1

1. Project B is delivered for 1/2 of C1's capital spend whilst retaining the same revenue benefit of £46million p.a. :

The EAC of B_{new} will fall to £317.1 million p.a. , 2.1% better than C1

OR

2. Project C1 is delivered with a further 25% marginal revenue saving of £10 million p.a. but with the same capital spend:

The EAC of C1_{new} will fall to £315.3 million p.a., 1.6% better than B

The largest winning variation is 2.1%. This suggests that the boundary of EAC differences is 0 to 2.1% in the extreme. Values outside this range have zero probability of occurring (see Appendix 1).

1.4. Calculating the Actual Weighting That the Future Fit Economic Appraisal is Delivering

Having now established the 'boundary of probability' of the financial and non-financial variations, we can now calculate the actual weighting delivered by the Future Fit Economic Appraisal:

- The full scale variation in the % difference between the EAC's of competing options can be 0% to 2.1% in the extreme
- The Overall Economic Analysis assigns 0.5 points per 1% of EAC difference
- So the maximum points difference possible for the financial analysis = **1.1 in the extreme**
- The matching maximum points difference possible for the non-financial analysis = **50 points in the extreme** (Section 1.2)
- Therefore, the weighting provided by the Overall Economic Analysis is 98 : 2 in round numbers

1.5. Sensitivity Analysis of Future Fit's Weighted Economic Model

To better understand the effects of the weighted Economic Model, consider the following sensitivity test. It will value the point at which the non-financial case is matched by the financial case, the 'switchover point':

Option C1 is ranked first in the non-financial analysis with 275.8 points (5.5 average points). Option B is second with 217.6 points (4.4 average points), a difference of 21%.

Option C1 is ranked second in the financial analysis with an EAC of £323.8 million p.a.. Option B is ranked first with an EAC of £320.4. What value must the financial case of B have to reach to overturn the above result of the non-financial analysis?

The point at which it is overturned is when the EAC of B is 21% less than C1 when measured in proportion to B. This value is £267.3 million p.a.. This is an improvement of £56.4 million p.a. compared with C1.

Over 67 years, this **switchover point is a project which has a Net Present Value (NPV) of £1507 million over C1.**

A project capable of delivering this NPV would have Option B's capital expenditure with a total annual revenue saving of 108 million (234% higher than Option B) – this is impossible.

To put this sensitivity test into words :

Future Fit will choose Option C1 and reject all other options which have a Net Present Benefit over C1 of up to £1.5 billion in order to retain the additional benefit (1.1 points average) as given by the scoring Panel.

i.e. each 1.1 point average of non-financial score has an implicit value to Future Fit of £1.5 billion (or £ 56 million each year every year for 67 years)

These are unimaginable amounts, and it is not unreasonable to conclude that there are issues with the design of the chosen weighted Economic Model.

1.6. Transfer Of Non-Financial Result To The Weighted Economic Model

The Panel completed a multi-criteria assessment (MCA) of weighting and scoring to value the identified non-financial criteria.

Future Fit describes the method they will use to bring these scores in to the Weighted Economic Model in the 2016 Evidence Pack.

"A non-financial score for each option is derived from the weighted total of the score for each non-financial criterion, giving a maximum 100 'benefit points'".ⁱⁱⁱ

1.6.1 Actual Method Used To Transfer the Non-Financial Values

The chosen process has not been followed.

Instead a process involving transferring the proportional differences between the weighted scores of each options and the first ranked option is adopted.

This proportional difference transfer method ought not be used for several reasons:

1. It is not the method the Appraisal Panel agreed to use.

2. It transfers score differences and not scores. The Panel gave meaning to scores not differences. Therefore the values transferred into the economic model lose their meaning.
3. It transfers proportional score differences. This has the additional effect of amplifying the values taken into the economic model. Even worse, the lower the scores, the higher the amplification.
4. Its use is not recommended anywhere in the Treasury or NHS Guidelines.

2. COST PER BENEFIT POINT METHOD

The appraisal team have chosen to combine the outputs of non-financial and financial appraisals by dividing the Equivalent Annual Cost (EAC) by the non-financial benefit score. In doing so, they attempt to value the financial cost to provide each point of benefit for each option.

$$\text{Cost per benefit point}_{\text{option}} = \text{EAC}_{\text{option}} \div \text{total benefit score}_{\text{option}}$$

The option with the lowest cost per benefit point is the most favourable.

However, this method should play no part in the project appraisal as it :

1. Uses a mathematical quotient that has no meaning
2. Is nowhere recognised in the Green Book Guidelines or NHS Capital Guidance

The reason for each of these is explained in section 2.1 & 2.2 below:

2.1. The 'Cost per Benefit Point' Quotient Is Meaningless

Consider the meaning of each part of the quotient:

Numerator = the Total Equivalent Annual Cost of Providing Hospital Services in Shropshire & Telford & Wrekin for the next 67 years

Denominator = the sum of the weighted scores of a Panel of 50, declaring their valuation of the four criteria of Accessibility, Quality, Workforce and Deliverability, for each option.

Consider what meaning is achieved by dividing one by the other. Change in the denominator is independent of any change in the Numerator, and vice-versa. Any variation that each has is due to other factors and constraints, not to each other. So dividing the two numbers creates a third number that has no meaning.

Next, consider the extent to which values used in the quotient can vary:

- The numerator is a Total Cost and varies very little in proportion to itself (2.1% in the extreme).
- The denominator is a 'marginal' value, capable of varying in full (100%) proportion to itself.
- Therefore variation in the quotient of the two will be solely due to the variation of the denominator i.e. it varies solely with the non-financial weighted score.

Therefore, the 'cost per benefit point' is just an alternative measure of the non-financial score. (In this case it's the reciprocal of the non-financial score). It is not affected by the financial case. Therefore the **financial case is ignored**.

2.2. A 'Cost per Benefit Point' Quotient Is Not A Recognised Technique For Appraising Options

When at the point of selecting the best project option both the Treasury and the NHS offer guidelines to use:

2.2.1 The Treasury Green Book Guidelines

The final stage of overall project appraisal is covered in Section 6 of The Treasury Green Book under the heading '**Selecting The Best Option**'^{iv}:

*6.3 If a full cost benefit analysis has been undertaken, the best option is likely to be the one with the highest risk adjusted net present value. To the extent that all costs, benefits and risks have been robustly valued, this guideline can be applied with more certainty. In cost effectiveness analysis, **the option with the lowest net present cost should be the best**, again assuming that the cost estimates are as accurate as possible.*

*6.6 in practice, other factors will also affect the selection of the best option, in particular the consideration of unvalued costs and benefits. Weighting and scoring techniques are useful in comparing different options in terms of the same criteria. **However, as scores are not expressed in monetary terms, judgment is then required to compare the results of weighting and scoring with the cost benefit or cost effectiveness analysis. The two analyses should complement each other, and may indicate that further analysis is required before a decision can be reached. Annex2 provides further information on how weighting and scoring can be brought into the decision making process. Fully involving stakeholders is very important in making judgments between monetised and non-monetised effects.***

The full text is shown to demonstrate that at no point does this guidance explicitly state making a mathematical quotient of the NPC and the weighted scores to determine the preferred option.

2.2.2 The NHS Capital Investment Guidelines (1994)

In the Business Case Guide Section of this guidance, the NHS offer advice on selecting the preferred option under the heading '**Selecting the Preferred Option**'^v:

2.64.1 The steps involved in making a choice are to rank the options in order of the benefits (Step 4), and then to set the net present costs of each option (from Step 5) alongside the benefits. It may be possible immediately to identify an option which is clearly the best solution (maximum benefits at lower cost with an acceptable degree of risk), or to rule out options which are clearly inferior (fewer benefits at higher costs).

*2.64.2 However, a clearly superior choice may not be immediately evident; **often the choice will be between an option offering lower costs but fewer benefits and one at a higher cost but with better benefits. Determining the preferred option will be a matter of judging the value of the additional benefits of an option against the additional costs that would be incurred if the option were selected.** The preferred option will be the one that affords the greatest ratio of benefits to*

costs. In these situations, a fine assessment of the risks and uncertainties (Step 6) and an appreciation of purchasers' views can help with decision-making.

Again, the full text is shown to demonstrate that at no point does this guidance explicitly state making a mathematical quotient of the NPC and the weighted scores to determine the preferred option.

These Treasury and NHS guidelines are giving broadly the same advice to appraisers selecting the preferred option. In particular, when making the choice between options where non-financial scores are involved, **judgement** is required when using and comparing the results of financial and non-financial analyses. Whilst the NHS guidance uses the word 'ratio' (in 2.64.2 on previous page), its meaning is clearly as emphasis of the human judgement process required to balance the two analyses. It is not an explicit instruction to mathematically divide the two analyses. This is supported by the Treasury Guidance.

2.3. Sensitivity Analysis of Future Fit's 'Cost per Benefit Point' Economic Model

To better understand the effects of the 'cost per benefit point' Economic Model, consider the following sensitivity test. It will value the point at which the non-financial case is matched by the financial case, the 'switchover point':

Option C1 is ranked first in the non-financial analysis with 275.8 points (5.5 average points). Option B is second with 217.6 points (4.4 average points), a difference of 21%.

Option C1 is ranked second in the financial analysis with an EAC of £323.8 million p.a.. Option B is ranked first with an EAC of £320.4. What value must the financial case of B have to reach to overturn the above result of the non-financial analysis?

The point at which it is overturned is when the EAC of B is 79% of the EAC of C1. This value is £255.8 million p.a.. This is an improvement of £68 million p.a. compared with C1.

Over 67 years, this **switchover point is a project which has a Net Present Value (NPV) of £1838 million over C1.**

A project capable of delivering this NPV would have Option B's capital expenditure with a total annual revenue saving of £122 million (265% higher than Option B) – this is impossible.

To put this sensitivity test into words :

Future Fit will choose Option C1 and reject all other options which have a Net Present Benefit over C1 of up to £1.8 billion in order to retain the additional benefit (1.1 points average) as given by the scoring Panel.

i.e. each 1.1 point average of non-financial score has an implicit value to Future Fit of £1.8 billion (or £68 million each year every year for 67 years)

These are unimaginable amounts, and it is not unreasonable to conclude that there are issues with the design of the chosen 'cost per benefit' Economic Model.

2.4. Conclusion: Cost Benefit Method

The 'Cost per Benefit Point' quotient is used by Future Fit in its Overall Economic Appraisal.

It has been demonstrated in this paper that the quotient is not suitable:

- It is not recommended anywhere in the NHS or Treasury Guidance for selecting the preferred option
- It produces a number which has no relevant meaning
- It varies greatly with the non-financial case and ignores the financial case

The use of this quotient does not demonstrate the required *judgement* required by the Guidelines.

3. WHAT WEIGHTING IS FAVOURED BY THE PUBLIC?

A stratified public telephone survey was completed for Future Fit in April 2016. Its results are summarised in the 2016 Evidence Pack.^{vi} In this survey the Public were asked to rate their view of the 'importance of cost compared to the four non-financial criteria' on a scale of 1 to 10, where 10 is very important. The results of this question, taken from the Evidence Pack, are summarised in Table 3 below.^{vii}

Rating the Importance of Cost vs non-financial criteria

Table 3

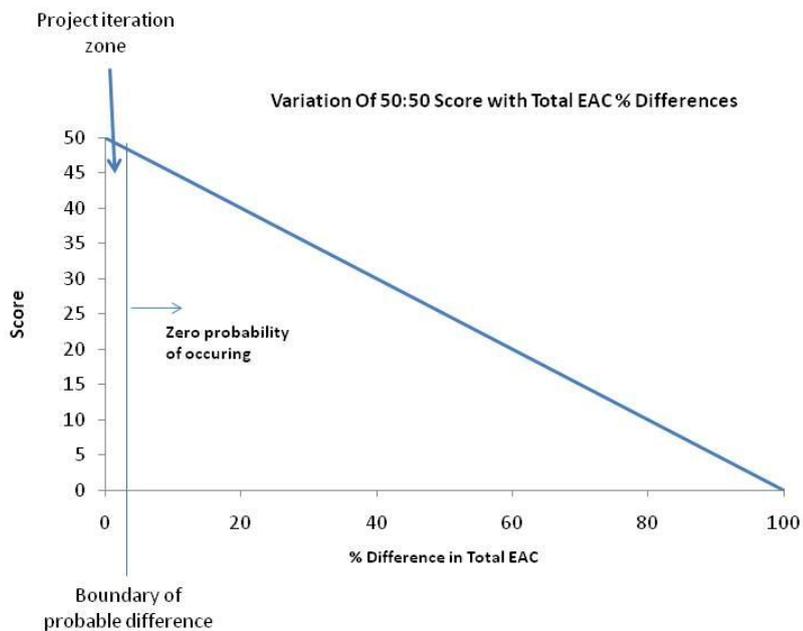
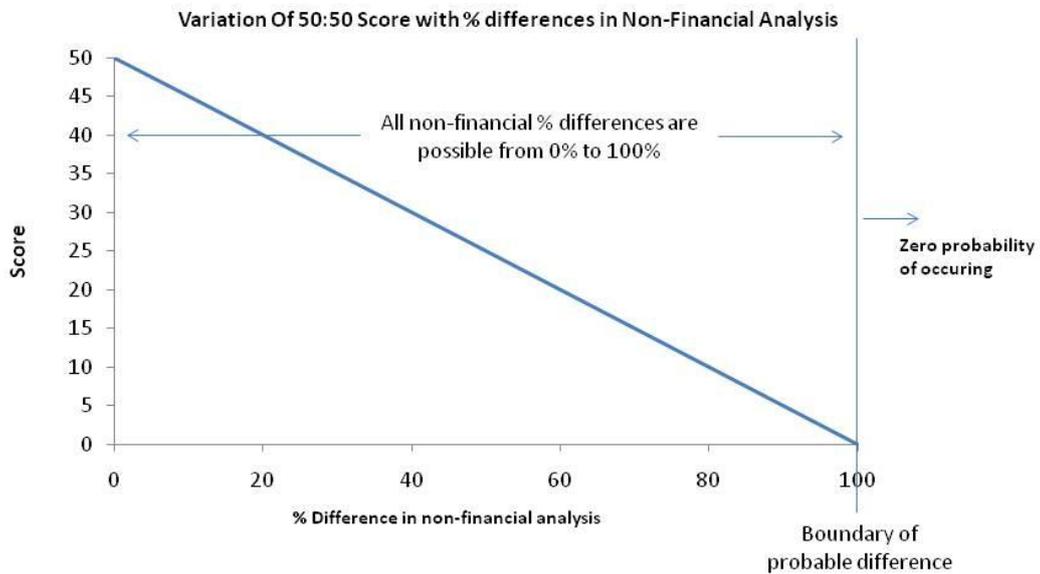
	% scoring 1- 4	% scoring 5-6	% scoring 7-10
% Public vote	21.6	26.9	51.3

Table 3 shows that 26.9% of the public felt that the costs & non-financial criteria have equal value. Of the remaining 73.1% of the public, two-thirds (51.3%) rated the costs as more important than the non-financial criteria.

Therefore, the public value the importance of the financial case more than the non-financial case. Considering all the public's votes, the public assign a **65 : 35 financial : non financial weighting**.

It should be noted that there is a mistake in the evaluation pack on page 179. Here, in a highlight bubble, it indicates that the public vote favoured the non-financial case ahead of the financial case. This is clearly not the case.

Appendix 1 – Scoring range and Calibration of Overall Economic 50:50 Method



References

ⁱ Section 6.6 of Green Book

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf

ⁱⁱ Section 5.76 of Green Book

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf

ⁱⁱⁱ Section 3a) page 7

'Future Fit Non-Financial Appraisal Panel – Evidence Pack September 2016'

^{iv} Chapter 6 of Green Book

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf

^v Step 7, page 43

The NHS Capital Investment Manual 1994 – Business Case Guide

^{vi} Appendix H

'Future Fit Non-Financial Appraisal Panel – Evidence Pack September 2016'

^{vii} Page 159

'Future Fit Non-Financial Appraisal Panel – Evidence Pack September 2016'