Deciding between different options

"Those who trust to chance must abide by the results of chance." Calvin Coolidge

"This is increasingly difficult in a world that becomes more and more regulated by a tick box mentality, where decision-makers are terrified to make decisions because of fear of failure, and a new prurience and hypocrisy strangle honest debate." Tony Heaton, 2010, A Cultural Leadership Reader. London: Cultural Leadership Programme

The big idea

Not all problems have a clear solution. Some decisions you will need to make about your business are likely to have uncertain outcomes or may be risky. Decision trees are a technique that can help you map out the nature of these uncertainties and plan for different possible results. They break down a problem into a number of points, or nodes, from which you can evaluate the outcome of different courses of action.

Purpose

Decision trees are excellent tools for helping you to choose between several courses of action. They provide an effective structure for you to lay out options and investigate the possible outcomes of choosing those options. They also help you to form a balanced picture of the risks and rewards associated with each possible course of action.

Decision trees offer advantages over other methods of analysing alternatives because they are:

- Graphic: you can represent decision alternatives, possible outcomes and chance events schematically. The visual approach is particularly helpful in comprehending sequential decisions and outcome dependencies
- Efficient: you can quickly express complex alternatives clearly. You can easily modify a decision tree as new information becomes available. Set up a decision

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tree to compare how changing input values affect various decision alternatives. Standard decision tree notation is easy to adopt

- Revealing: you can compare competing alternatives – even without complete information – in terms of risk and probable value. The expected value (EV) term combines relative investment costs, anticipated payoffs and uncertainties into a single numerical value. The EV reveals the overall merits of competing alternatives
- Complementary: you can use decision trees in conjunction with other project management tools. For example, the decision tree method can help evaluate project schedules

The tool

A decision tree is a diagram of nodes and connecting branches. Nodes indicate decision points, chance events or branch terminals. Branches correspond to each decision alternative or event outcome emerging from a node.

A decision tree consists of three types of nodes:

1. Decision nodes: shown as squares
2. Chance nodes: shown as circles
3. Outcome nodes: shown as triangles

To build a decision tree:

1. Start with the decision you are considering. Draw a small square to represent this towards the left of a large piece of paper.
2. From this box draw out lines towards the right for each possible solution, and write that solution along the line. Keep the lines apart as far as possible so that you can develop your options
3. At the end of each line, consider the results. If the result of taking that decision is uncertain, draw a small circle. If the result is another decision that you need to make, draw another square. Squares represent decisions, and circles represent uncertain outcomes. Write the decision or factor above the square or circle. If you have completed the solution at the end of the line, draw a triangle.
4. Starting from the new decision squares on your diagram, draw out lines representing the options that you could select. From the circles draw lines representing possible outcomes. Keep on doing this until you have drawn out as

many of the possible outcomes and decisions as you can see leading on from the original decisions.

An example of the sort of thing you will end up with is shown in Figure 1:

Figure 1 Sample decision tree: Should we introduce a new programme/product?

Customer Response
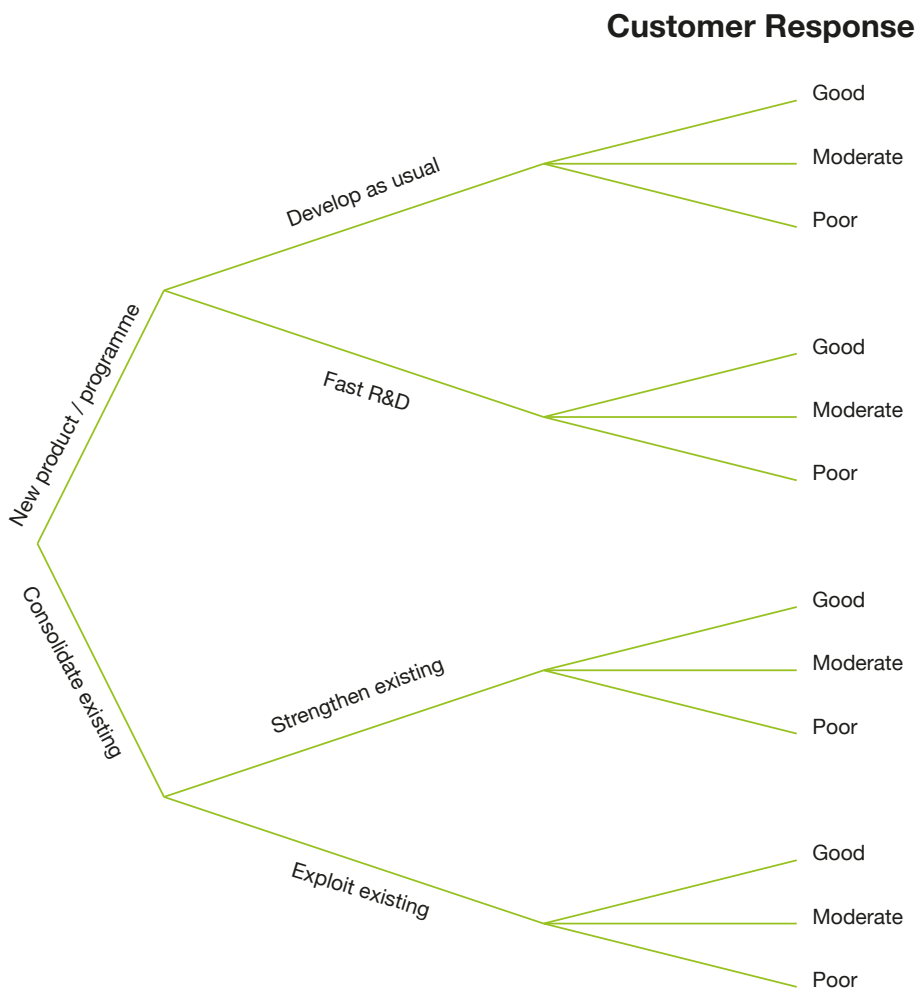
Once you have done this, review your tree diagram. Test each branch of the tree to see if there are any solutions or outcomes you have not considered. If there are, draw them in. You should now have a good overview of the possible outcomes of your decisions.
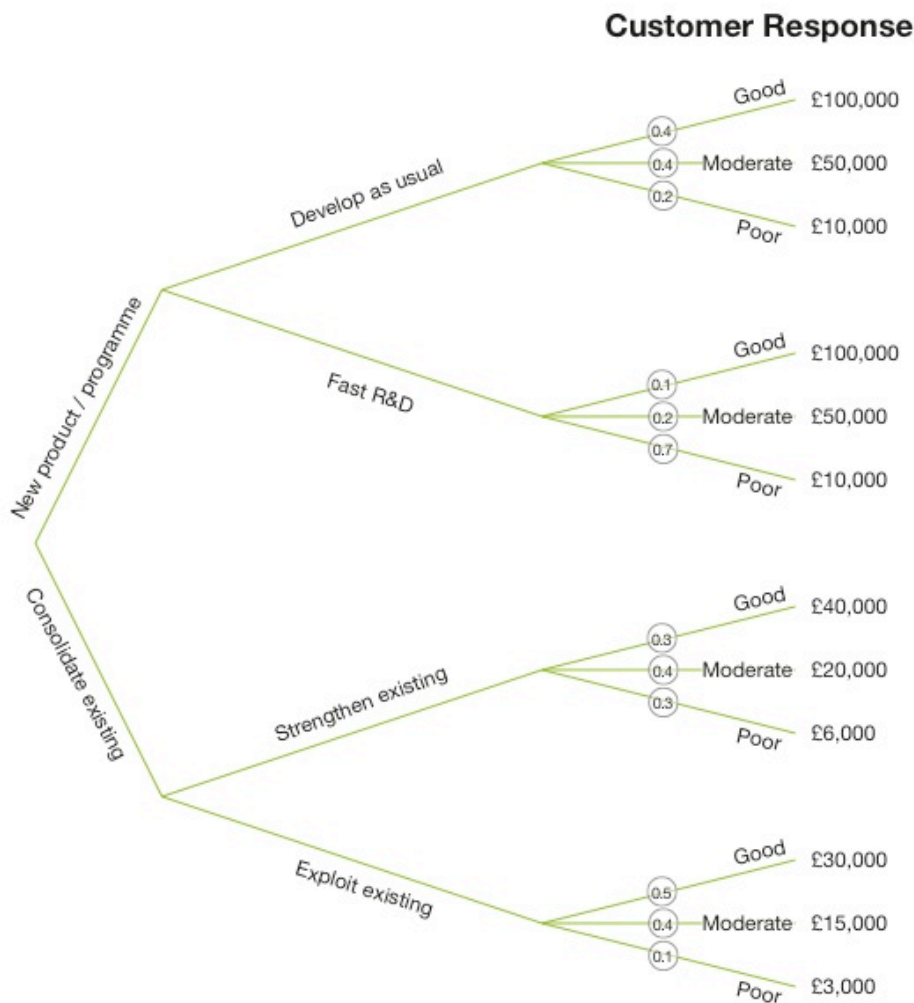
Evaluating your decision tree

At this point you can start to put a value on the possible decisions. Make your best assessment of how much the various options might be worth to you.

Now consider each circle and estimate the probability of the outcome you have suggested. If you use percentages, the total must come to 100% at each circle. If you use fractions, these must add up to 1. If you have information on past events use this to strengthen your estimates. Otherwise, the evaluation will be based on your best guesses.

This will give you a tree like the one shown in Figure 2:

Figure 2 Calculating tree values

Customer Response

Once you have something similar to figure 2 you can start calculating the values that will help guide your decision.

Start on the right-hand side of the decision tree, and work back towards the left. Record your calculations for a given node as you go.
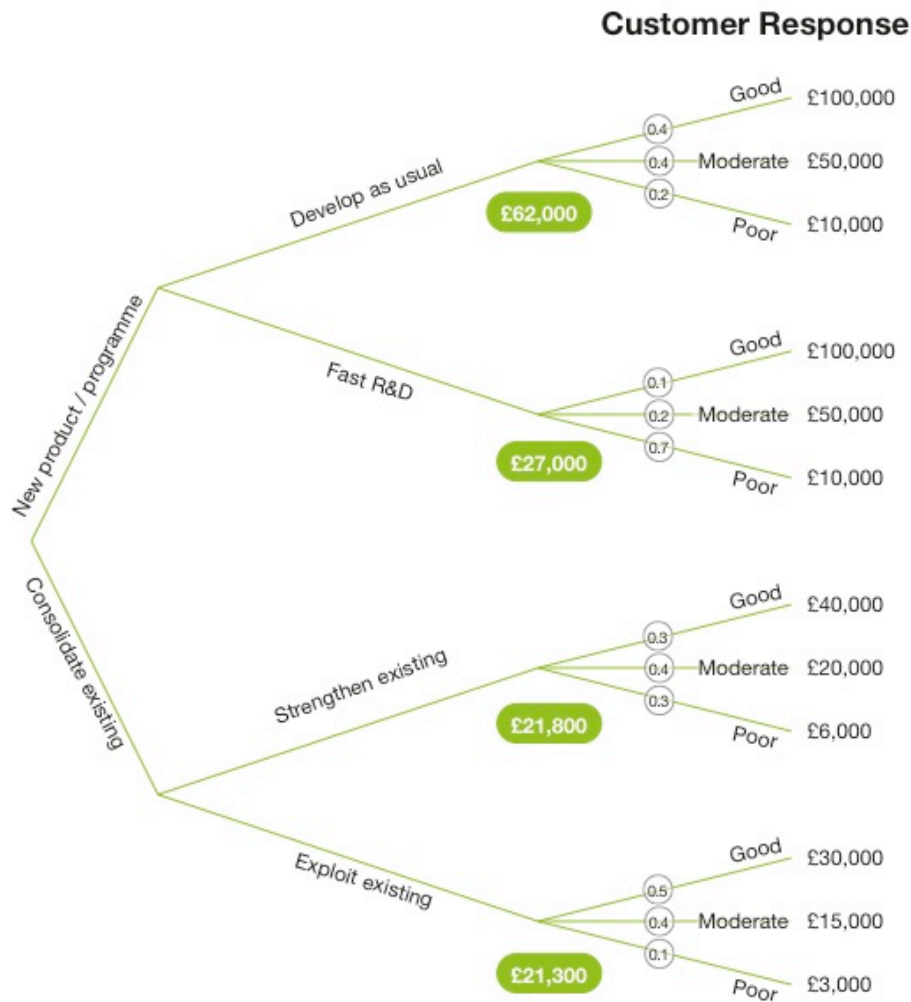
Calculating the value of uncertain outcome nodes

Where you are calculating the value of uncertain outcomes (circles on the diagram), do this by multiplying the value of the outcomes by their probability. The total for that node of the tree is the total of these values.

In the example in Figure 2, the value for 'new product, developed as usual' is:
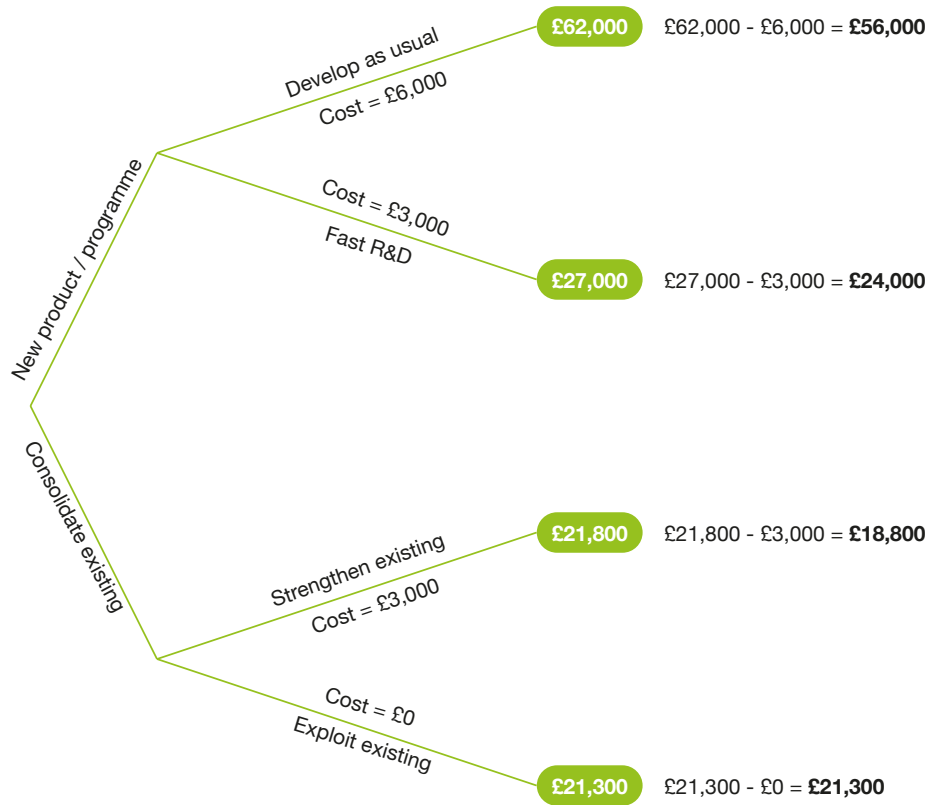
0.4 (probability good outcome) x £100,000 (value) =	£40,000
0.4 (probability moderate outcome) x £50,000 (value) =	£20,000
0.2 (probability poor outcome) x £10,000 (value) =	£2,000
Total =	**£62,000**

Figure 3 Calculating uncertain outcome nodes

Customer Response

Develop as usual — £62,000
- Good (0.4) — £100,000
- Moderate (0.4) — £50,000
- Poor (0.2) — £10,000

Fast R&D — £27,000
- Good (0.1) — £100,000
- Moderate (0.2) — £50,000
- Poor (0.7) — £10,000

Strengthen existing — £21,800
- Good (0.3) — £40,000
- Moderate (0.4) — £20,000
- Poor (0.3) — £6,000

Exploit existing — £21,300
- Good (0.5) — £30,000
- Moderate (0.4) — £15,000
- Poor (0.1) — £3,000

New product / programme

Consolidate existing

Note that the values calculated for each node are shown in the boxes.

Figure 4 Calculating the value of decision nodes

Figure 4 decision tree:

New product / programme
- Develop as usual, Cost = £6,000 → £62,000 : £62,000 - £6,000 = **£56,000**
- Fast R&D, Cost = £3,000 → £27,000 : £27,000 - £3,000 = **£24,000**

Consolidate existing
- Strengthen existing, Cost = £3,000 → £21,800 : £21,800 - £3,000 = **£18,800**
- Exploit existing, Cost = £0 → £21,300 : £21,300 - £0 = **£21,300**

To evaluate a decision node, write down the cost of each option along each decision line. Now subtract the cost from the outcome value that you have already worked out. This will give you a value that illustrates the benefit of that decision.

You should not include anything you have already spent these are 'sunk costs' and should not be part of the calculation.

The option with the largest benefit is the decision you should make.

Figure 4 shows this calculation of decision nodes in our example:

In this example, the benefit we previously calculated for 'new product, standard development' was £62,000. We estimate the future cost of this approach as £6,000. This gives a net benefit of £56,000.

The net benefit of 'new product/programme, fast R&D was £27,000. On this branch we therefore choose the most valuable option, 'new product/programme, develop as usual' and allocate this value to the decision node.

Result

The decision tree shows you that the best option is to develop a new product or programme. It is worth much more to you to take time and get the product/programme right, than to rush to market. And it's better just to improve our existing products/programming than to cobble together a new product, even though it costs us less.

Take the next step

Think of the process you went through when you developed your last product or programme. What steps did you go through in your decision-making? Did you assign any form of value or probability at the time? Did the outcomes match your expectations? How might you do it differently next time?

Top tips

- Make use of different colours to highlight costs and benefits
- As with all decision-making methods, decision tree analysis should be used in conjunction with common sense. They are just one important part of your decision-making tools
- If you need to buy in from others, the decision tree can provide a greater level of visibility than other written methods
- Make sure you ask yourself 'What next?' at each stage

References

Tony Heaton, (2010) Thoughts from a Train: On Leadership, in *A Cultural Leadership Reader*, Eds. Venner, K. & Kay, S. pp: 100-105. London: Cultural Leadership Programme