Deciding in messy situations

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[This guide to decision making using systems thinking was originally intended as a chapter in *Growing Wings on the Way*, but was excluded to avoid the book becoming unduly long. Many of the terms used and a number of references are explained in the book itself. See http://growingwingsontheway.blogspot.com for details.]

And he spoke of trees.

I Kings 4[33]

Systems diagrams cannot tell you what to do but they can help you map the options, clarifying your thinking so *you* can decide. Here I present two diagrams for exploring options in messy situations. Both enable diagrammers to explore their own preferences and values and are especially useful when straightforward options emerge from considering a variety of perspectives through diagrams and other means.

Sometimes, I find myself facing a decision that seems to offer no clear options. I do not describe myself as indecisive but sometimes I seem to be trapped and unable to discern what I should do. I get stuck between what I think I ought to do (see *Hardening of the oughteries* in Chapter 5 of the book); my infeasible fantasies; quick fixes; and pragmatics. I then lose sight of any criterion for making a decision. I am trapped. A decision tree[1] is a device for straightening out my thinking and allowing me to discern a clear set of options and my weightings for each. The second part of the chapter concerns objectives trees. Objectives trees support planning for action when a large number of objectives come together to achieve overall goals. It helps identify tasks and possible synergies and conflicts between them. Objectives trees support high level planning and scheduling.

Decision trees

The underlying grammar of a decision tree is simple. It consists of words describing a decision and arrows leading to other words that describe mutually exclusive options. In Figure 1, a decision *aaa* has three mutually exclusive options; *bbb*, *ccc*, and *ddd*. A box encloses options that lead to further options (e.g. *ccc*). If the outcome of any option is uncertain (e.g. *ddd*), the option is enclosed in an ellipse or blob.

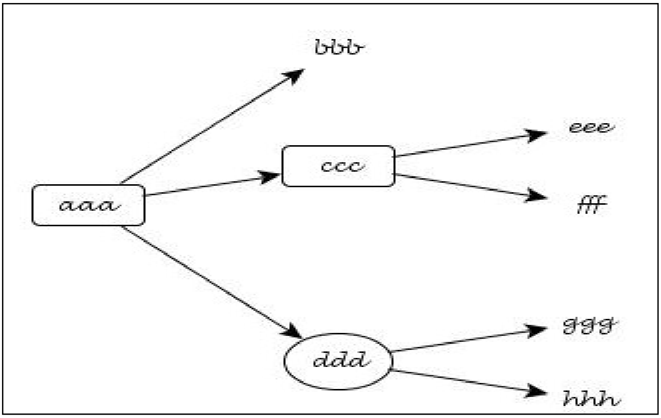


Figure 1: *Grammar for Decision Trees*

Decisions can be evaluated by attaching indicative values to each option so that the 'values' of options can be compared.

Exploring decisions with a decision tree

Several years ago I injured my ankle in a skating accident and found myself in pain and unable to walk without crutches. I faced some decisions. My best hope of recovery was surgery. As a Brit, I have access to the National Health Service, the comprehensive, free at the point of need, health-care system provided by the UK for its citizens. Unfortunately, while NHS standards of patient care are exceptionally high, standards of customer care are less so and there would be a delay of several months before I could be treated. I would have to keep off my feet to avoid further, and possibly irreparable, harm to my ankle. There was a possibility that my ankle would improve with physiotherapy, although there was a wait for that too if I opted for NHS treatment. Another possibility, both for surgery and for physiotherapy, was an excellent local clinic in the private sector, for which I would have to pay. Paying would mean raiding a savings account and delaying some house-improvements but the big advantage of 'going private' would be a date for surgery within two weeks. The choice was between free but delayed treatment, risking permanent damage; and expensive immediate treatment. The choice was complicated by my feeling, shared by many Brits, that there is something vaguely immoral about private health care[2]. The decision was beginning to be messy.

I started my diagram (Figure 2) on the left of the page. I called my decision 'do something about my ankle'. The two main options were surgery and physiotherapy and then, in each case whether to go private or use the NHS, after the inevitable delay. I drew these in. After that, outcomes became more uncertain. All the possible outcomes were about the timeframe within which to achieve a resolution of the ankle problem although the last was the possibility of no good outcome at all. The only plausible outcomes for the physiotherapy options were unattractive. Even with commitment, hard work and spending money, I was not going to get my ankle better before the winter and possibly not even then. Surgery seemed the best option. But I still faced the decision about whether to spend money at the private clinic or whether to wait for the NHS. I needed to *evaluate* the options.

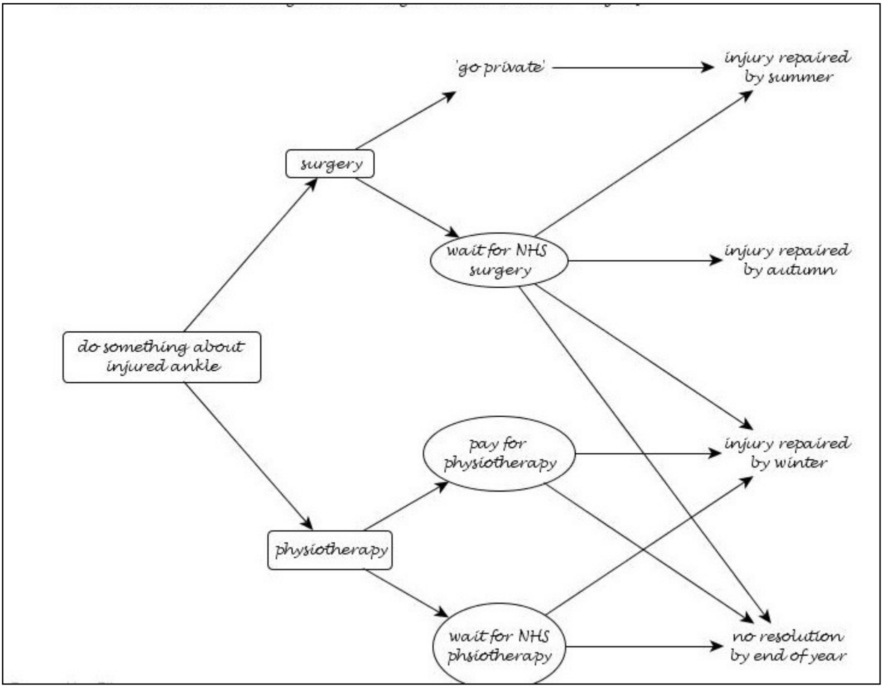


Figure 2: *Deciding about ankle surgery*

Evaluating options with a decision tree

A decision tree is a useful tool for mapping options and possible outcomes of a decision. It can also help with the decision itself by providing a method of evaluating options. Evaluating each option shows which option has the highest value but, perhaps more importantly, it creates opportunities for thinking about how you value different options and their outcomes. Three sets of values are assigned. These values are usually expressed in financial terms, especially if there are any actual costs, capital gains or incomes involved. If no financial data is involved, arbitrary scores can be used.

The first values assigned are any actual costs incurred by any option. In the example I described, the cost of surgery in the private clinic would be £3500 and the cost of physiotherapy would be £1200. I marked both on the diagram. The next set of values are those you assign to each outcome. You decide how much each of the possible outcomes is worth *to you*. I decided it would be worth £5000 to me to have my ankle repaired by the summer.

I decided that the worse outcome, no resolution by the end of the year, was literally worthless so I assigned it a value of £0. I assigned values to the other two possible outcomes after some internal juggling of ideas about what I wanted, what the risks were and how urgently I wanted it done. In recognising that I felt the need to resolve the problem urgently, I found I valued an autumn resolution eight times more highly than a winter one. In assigning these values, I was challenged to work out what I really valued, and how much.

Finally, probabilities are assigned for any uncertain outcomes. Percentages, decimals or fractions can be used, as long as they add up to 100% or one for each decision with an uncertain outcome. For example, I guessed that physiotherapy might have a 25% chance of succeeding, based on talking to the surgeon and the physiotherapist. That meant there was a three in four chance it would not work. I wrote these values on the arrows for each uncertain outcome. The surgeon had said it was very unlikely the NHS surgical appointment would come up before the autumn, suggesting a repair delayed until the winter. I took 'very unlikely' to be 80% and added in the gloomy possibility that even then there might be some delay. I split the 80% and attributed a likelihood of 45% to 'injury repaired by autumn' and 35% to 'injury repaired by winter'. The remaining 20% I distributed as 5% to the possibility of fairly immediate surgery leading to 'injury repaired by summer' and 15% to 'injury repaired by autumn'.

This was far from scientific. It was no more than my best guess, based on a mixture of hard information and hunch, about the likelihood of each outcome. It challenged me to use all the information I had to hand and to use my judgement. I wrote the numbers down (as percentages this time) on the appropriate arrows. My diagram now began to look like Figure 3.

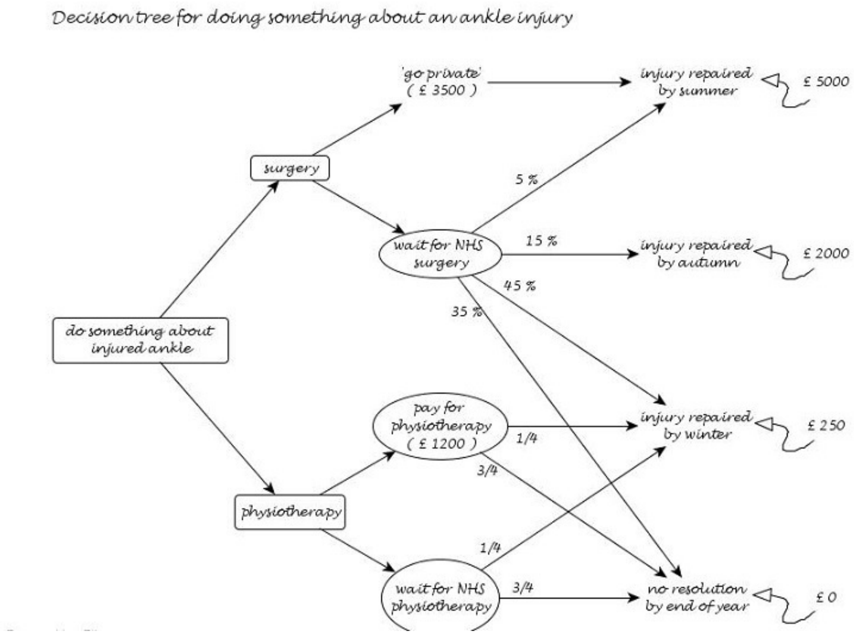


Figure 3: *Cost implications of the decision*

The next stage of developing a decision tree is evaluating the net value of each set of decisions.

For each route, determine the value of the outcome.

Where the outcome is certain, simply enter its value.

Where there are several possible outcomes, multiply each outcome's value by its probability; then add the resulting values together to determine the value of that blob's outcomes.

For example, calculate the value of the outcomes from 'pay for physiotherapy' as follows:

value of outcomes from 'pay for physiotherapy'	=	¼ x value of 'injury repaired by winter' + ¾ x value of 'no resolution by end of year'
	=	¼ x £ 250 + ¾ x £ 0
	=	£ 62.50

The value of each blob's outcomes can be written underneath it on the diagram. The *net value* of each decision route is then the value of the outcomes minus the costs along the route. Money already spent does not appear in the diagram. These are sunk costs[3] and should not factor in the decision. The decision tree is about discerning the value of particular options *now*.

My calculations showed that paying for surgery in a private clinic was the 'winner' and the most rational choice. Paid-for physiotherapy would be an expensive option whose costs would outweigh any benefit.

Understanding a decision tree

A decision tree is a rational way of laying out options and working out the expected value of each possible outcome. It is not, however a completely rational way of making decisions. The assignment of probabilities to uncertain outcomes masks many kinds of irrationality. If I am one of five candidates for a job, I may collect evidence that leads me to believe I have a fifty-fifty chance of getting the job but I don't have any direct evidence that allows me to allocate that value to my chance. There are no previous examples relating to that job, that set of candidates or that interview on that date that provide me with statistical evidence. Fifty-fifty is simply a number I assign to express my perception that it could go either way. Assigning probabilities in this way cannot be strictly logical. It depends on my judgement. My judgement is itself based on evidence and clues (such as my discussion with the surgeon about possible outcomes of my ankle injury) but it also reflects my own biases and preferences. Some of these biases are systematic. For example, there is considerable evidence that people will be over-optimistic about uncertain outcomes, ranging all the way from an unsubstantiated 'hoping for the best' to a wilful over-estimation of one's own skills, capacities, attractiveness and luck. People will typically underestimate how long a task will take to complete and how much money something will cost, both aspects of the well-known phenomenon of the *planning fallacy*[4]. It is also clear that new evidence does little to change someone's estimation of probable outcomes. The period of openness to evidence allows us to make reasonable initial judgements but once a judgement is made, new evidence does little to shake the perception of probability[5].

One of the most powerful uses for a decision tree is to surface these biases and attribute a value to them. As I tried to decide what to do about my ankle, I began to suspect myself of a bias in favour of paying for surgery at the private clinic. I would have attributed a high value to an early resolution to the problem, in any case, but I was attributing a low probability to any speedy outcome from the NHS or from physiotherapy. Was I defeating the object of drawing the diagram? Not at all. I was escaping from my confusions about the moral implications of going private. I espoused a distain for private medicine that made it difficult to acknowledge what I really wanted to do; to get my ankle repaired as soon as possible, to minimise the time I would need off work and the risk of permanent damage. I decided to go private but also had to clarify my position on private medicine.

Decision trees are very systematic, orderly and rational. Reflecting on why I find them so useful, I realised that although they are indeed more systematic than systemic, they can be used systemically[6]. As with other diagrams, they become a way of having a conversation with myself (or someone else) in which I discover new understandings. The usefulness of the decision tree arises in the drawing of it rather than from the finished diagram. In messy situations, where rationality has its limitations, a decision tree directs my thinking towards discovering the *best* option by first identifying the *rational* option *from my particular perspective*. In Part 3 of the book, I discuss responses to situations where no clear options seem to be available or where potentially conflicting values will play a large part in deciding what to so.

Rules and guidelines for decision trees

In many other systems diagrams, I test my understanding against the rules of the diagram. Decision trees test my understanding in two ways: the first in identifying as many options and outcomes as I can, and the second in assigning probabilities and values to outcomes. Here are the guidelines.

1. Start at the left hand side of the page with a box containing a phrase identifying the decision you need to make.

2. Draw lines or arrows from this box to other phrases identifying the options. Think of as many mutually-exclusive options as possible. Few decisions are truly either-or ones: many decisions have options that include postponing choices. If the option leads to a further decision, enclose the phrase in a box. If the outcome from any option is uncertain, enclose the words describing the option in a blob.

3. For each uncertain outcome, insert lines representing possible outcomes, these may include final outcomes, partially satisfactory outcomes and failure. Include all the possible outcomes you can think of.

4. Work your way through the tree, being sure to check at each node whether there are options you have not yet thought of.

5. Review and redraft your tree if there are bits that are too crowded or untidy.

Guidelines 1 to 5 help you to structure and explore the decisions that you face and to map options as they open up. Evaluating each decision route allows you to explore and challenge your perceptions of the value of each option and the probability of uncertain outcomes.

6. Start by assigning actual costs to any option that incurs them. This may be in terms of money, time or another indicator.

7. Assign a cash value or score to each of the possible decision outcomes. Estimate how much it would be worth to you if that outcome came about. Ideally, use the same units of measurement as you used to assign costs.

8. Next, look at each blob with an uncertain outcome and estimate the probability of each of its outcomes. Assign a value in percentage terms or in terms of decimal or fractions. Percentages for each circle should total to 100 per cent. Fractions or decimals should total to one. Write down your best guess based on the information that is available to you.

9. Where outcomes are uncertain, multiply each outcome's value by its probability and, for each blob, add these results. This is the value of an option with uncertain outcomes.

10. Now evaluate each decision. Start on the right hand side of the diagram and work back towards the left, tabulating your results as you go. Where the outcomes are certain, simply sum the costs and subtract the total cost from the value of the outcome.

11. Amounts already spent do not appear in the diagram. These are sunk costs and should not factor in the decision.

12. When you have finished, chose the highest value option. This is the result of the rational part of your analysis.

Don't worry if the result disappoints you. Disappointment, or delight, is where the decision tree achieves its most important value. Being disappointed, or delighted, means that somewhere in the tree, the values you assigned did not match the values you truly attribute; or the probabilities you assigned do not match your best guess. Check for wishful thinking, unrealistic optimism (or pessimism), a clash between your personal and your 'official' views, and missing options. Ask yourself about what these reveal and whether it has any bearing on your decision. It is also worth checking your sums. It can also be helpful to decide what you would really like and then 'fiddle' the values and probabilities until you get the right result. What does the diagram reveal about how conditions need to change for you to get what you want? A spreadsheet can be a useful adjunct in these explorations.

Drawing a decision tree

If you want to practise drawing a decision tree, now would be a good point in the chapter to do it. Select a decision where you are 'in two minds'. It helps to draw the diagram methodically from left to right and I suggest that you simply map the decisions and their possible outcomes first. When you have mapped these, evaluate the decision routes, noticing the criteria you use for attributing value and probability. Do not neglect 'opt-out' options; the options that are concerned with not taking a decision at all, taking a different decision, or getting someone else to decide. Revisit and reconsider the name of your decision, the box on the left, from time to time. Sometimes, the decision itself evolves as you consider the options.

There only a few ways a decision tree can go wrong. One of these is to neglect Guideline 2, which specifies that options should be mutually exclusive. For example, deciding which of several options to try first (a mutually-exclusive options approach) will work much better than deciding the best order for trying the options (where options are not mutually exclusive). In messy situations, the first option will generate new information and understanding and this changes the circumstances of the decision about what to do next.

Sums can also go wrong. Check that the probabilities of the outputs from each decision add up to one or 100 %. Check your calculations of expected value for each decision with an uncertain outcome.

Decision trees deliver 'answers' but their best use is when they are drawn with the specific intention of exploring your thinking rather than representing 'reality' or finding out what to choose. Using the diagram to explore allows you to interrogate the diagram to illuminate ideas and assumptions.

Choosing a decision tree

Drawing decision trees is illuminating, not least when a decision seems puzzling and when procrastination sets in. Often, the first step is to acknowledge that the decision is puzzling. Being 'in two minds' is symptomatic of uncertainties as well as choices. By separating options and outcomes of varying uncertainty, decision trees help you understand what decisions lie ahead and what options arise under various scenarios.

Evaluation delivers an 'answer' but its real value arises when you are carrying conflicting valuations and probabilities. A decision tree helps locate where these ambiguities are located so they may be resolved. Finally, an evaluated decision tree shows what probabilities, valuations and options need to change to achieve the outcome you want.

Using decision trees with others

Decision trees, like many other systems diagrams, can mediate discussion of complex issues. The structure is simple enough for group working and invites contributions of additional options, and information influencing the assignment of probabilities. I have successfully used photocopies of sketched decision trees with groups, without assigning output values or probabilities and invited individuals and groups to assign values and probabilities. Values attributed to outcomes create lively and sometimes heated discussion. Outcome values reflect deeply-held personal values and perspectives. When conflicts of values arise, preparedness to search for accommodations, rather than compromises, often reveals previously unsuspected capabilities for cooperation and creative thinking.

Decision trees presented as flip charts, or sketches, create better discussion and invite new contributions. Beautifully drawn and intricate diagrams will stifle discussion and teams will lose any but polite interest. New contributions and changed values and probabilities inevitably need new calculations. Appoint someone chief arithmetician, and ask them to lay out the calculations so that recalculation can be done quickly.

Another decision tree

In June 2010, the new coalition government invited UK schools to express interest in becoming academies. Academies are state schools that take total responsibility for their own financial management. In the traditional UK model, local government keeps a proportion of the budget to fund school-support services. A few schools had already become academies, incentivised by additional funding, but it was unclear in 2010 whether the new academies would also get new money. It was also clear that the government was keen to persuade large numbers of schools to apply for academy status. It was possible that schools that did not apply would get reduced funding, especially in the austerity climate of the time. Under pressure to apply, a school principal and the governors considered the decisions they would have to take. They identified four options. They followed these options through and arrived at a diagram rather like Figure 4. They assigned values to each outcome, on a scale of 0-100, with 0 representing a neutral outcome. They were not fully convinced that the academy route was right for the school or the community but recognised that a resolution had value in itself. There were two possible outcomes if they decided to apply. They assigned a value of 55 to getting academy status, the first possible outcome. If they applied for academy status and were refused, the reputation of the school would suffer. They assigned the second outcome a value of *minus* 10. They assigned a probability of 85% to getting academy status, based on the current success rate and their perception that the school was at least as good as many that had been successful. That left a 15% probability of refusal. The first option, to apply, had a value of 45.25.

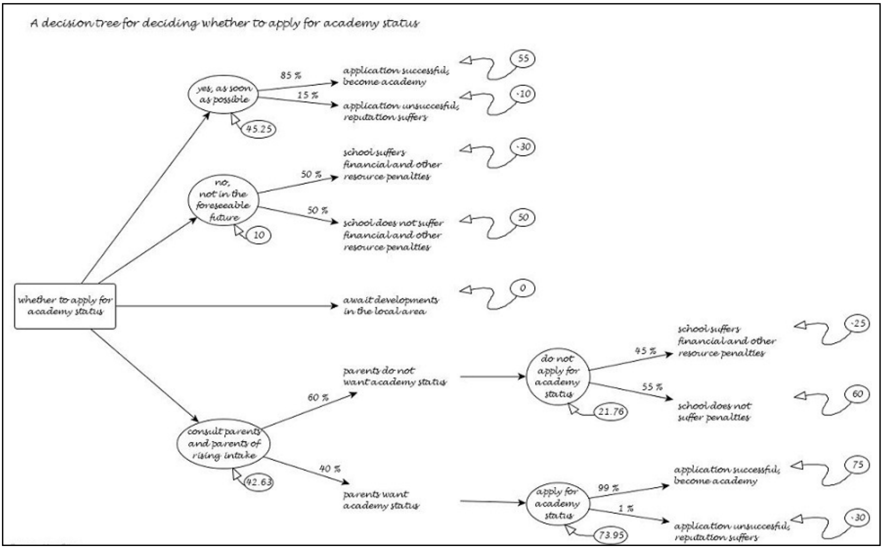


Figure 4: *Deciding about applying for Academy Status*

Their second option was to decide, there and then, not to apply for academy status. They had long discussions about whether or not this risked financial penalties and, since they could not agree, they assigned a fifty-fifty split to the probabilities of the potential outcomes. They gave a positive valuation to the possibility there would be no financial penalties on the basis that a decision made was better than no decision. They settled on a value of 50 because there would be no one-off incentives. No-one could guess what the financial penalties might be so they settled on a value of -30 on the basis that 'it seemed right', although no-one felt able to justify that value. They simply did not know what might happen. This gave the ‘no’ option a value of 10.

The third option was to await local developments. The principal and governors discussed this option at great length. It appealed as ‘the cautious option’ until they began to realise that they would learn nothing of significance by delaying their decision. They kept the option in their diagram but assigned it a zero value.

The final option was to consult parents. This was not a formal requirement but the principal argued it was a moral obligation, not least because the school would be a new school in many ways, with a new name, new uniform and new building. It was already clear from a national poll that many parents were sceptical of the benefits of academy status. Moreover, the governors were already beginning to get cold feet about academy status and realised they would be in a stronger position to resist political pressure if parents had expressed their views in a properly conducted consultation. They gave higher scores to the outcomes, which would have parental assent, than to the equivalent options based on their own decision. Their initial guess was that 60% of the parents did not want academy status for the school. This gave the consultation option a value of 42.63, only slightly less than the value of the ‘decide to apply’ option.

The governors now began to question their initial valuation of academy status. The first option appeared to be the best only because the consultation option would lead to their less-preferred decision. When they started exploring the numbers, they realised that the more parents did *not* want academy status, the less valuable the consultation option seemed. At first, the principal and governors thought there was something wrong with the diagram, until they reminded themselves that it simply reflected their thinking. One way of interpreting it was 'if you want academy status, then don't consult parents'. Their preferred option was unlikely to be the parents' preferred option. The parent governor (elected to the board by the parents) confessed that, although he preferred the academy option, he thought their guestimate of parental support was optimistic. Perhaps only 20% of parents would be in favour. The principal expressed her view that going against parents' wishes would be unethical. The group suddenly found themselves wanting to revalue all their preferences in response to recognising how much they valued the good will and backing of the parents. They decided to value parents' input by giving the consultation process itself a value of 20 in the diagram, although I think they had already decided that they would consult parents.

This is an interesting story, I think, because it illustrates a diagram revealing the new ways of thinking about an issue. The principal and the governors were able, by using the diagram, to confront the contradiction between their own first choice and the parents' possible wishes to remain under local-government control. It helped them re-evaluate parents' support and consent and change their minds about the best option.

Objectives trees

Objective trees are a way of breaking down the objectives necessary to achieving a higher goal. A reductionist approach would simply list all the necessary component objectives but a systemic approach goes on to relate the objectives to each other, searching for synergies and conflicts. As with decision trees, there are two phases, a formal setting out of the objectives and an informal, but nonetheless rigorous, critical consideration of activities in relation to the aims they are intended to fulfil and to each other.

The grammar of an objectives tree is simple. The diagram consists of words describing goals and the subsidiary objectives needed to meet the goals; and arrows that read '… is necessary to achieve …'. Thus, in Figure 5, to achieve *aaa, bbb* and *ccc* must both be achieved. In a developed form of the objectives tree, a small circle above the objective indicates that it is the same as, or synergistic with, another objective in the tree. A pair of lines indicates that the objective might be difficult to achieve or conflicts with another objective in the tree.

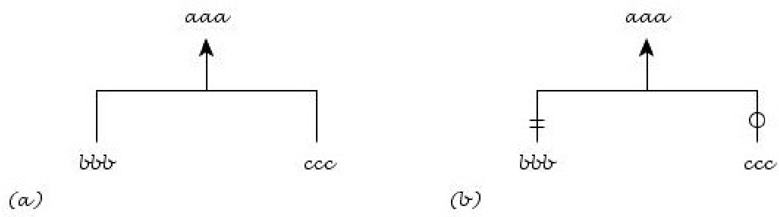


Figure 5: *Grammar for Objectives Trees*

By convention, the arrows of an objectives tree flow upwards. This is probably because there is a tendency to think in terms of 'higher goals', 'overarching aims' and 'top-level mission', all of which suggest that the single main goal should be at the top. Objectives trees usually place the highest level objective (variously called goal, aim, mission etc.) at the top. There is no compelling reason for this orientation, which often generates a very wide diagram. It is, however, important for all the arrows to 'flow' in the same direction.

Choosing an objectives tree

An objectives tree is ideal for exploring possible actions that themselves seem complex, messy or tricky to accomplish. When you are reasonably confident of what must be achieved and what unintended consequences might follow, an objectives tree helps to see how interrelated objectives can be structured towards achieving the goal.

Draw an objectives tree when you are uncertain how to complete a task or to achieve a goal. Alternatively, use one to structure a things-to-do list of objectives or tasks. Structuring the list as an objectives tree allows you to identify synergies, conflicts and constraints or 'chunks' of objectives that can be delegated, together with areas where coordination of conflicting or synergistic objectives demand collaboration. An objectives tree can also help with identifying options for delegating and scheduling tasks.

Thinking about decisions with an objectives tree

Jason had leased several hectares of land at the corner of a country estate and, with some capital, had decided to set up a 'Sustainable Countryside Centre'. The land included some suitable buildings, a meadow, hedgerows, some woodland, a small river and some overgrown gardens, already teeming with wildlife. Visitors came to enjoy the quiet and the birdsong; to watch the birds, insects, small mammals and fish; and to see the trees and wildflowers. As Jason began to understand what visitors enjoyed, and what they expected from a day out at the centre, he began to think about how to invest the rest of his capital. He was committed to the goal of becoming sustainable and wanted to develop the centre to reflect his interest, which resonated with many of the visitors. Figure 6 shows some of his objectives tree. (Parts are omitted for clarity.)

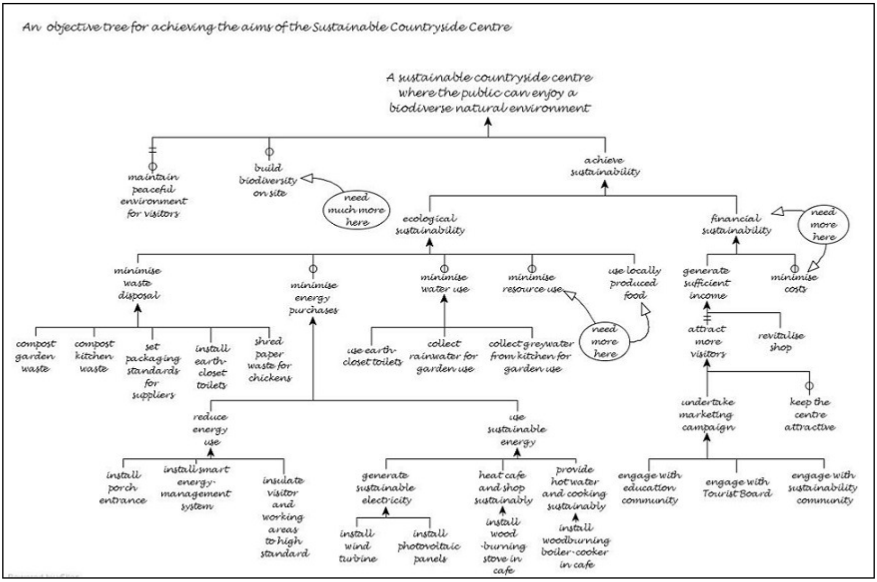


Figure 6: *An Objectives Tree for sustainability*

Jason's first reaction to the objectives tree was that it made sense of his things-to-do list. This list had hundreds of items. Although Jason had done some preliminary sorting, the objectives tree took him from loosely-defined criteria for 'importance' towards a more structured way of looking at what might be done.

Understanding an objectives tree

Even with the limited objectives tree depicted, Jason realised minimising costs, to achieve financial sustainability, coincided with the objectives of saving energy and water. These objectives could support each other.

Measures to reduce energy use became the priority investments for the buildings. Installing wood-burning facilities for heating, hot water and cooking would follow: solar and wind-energy would come later.

Although these measures had less eco-glamour than electricity generation, they nonetheless looked more likely to secure the financial viability of the Centre. Composting activities and earth-closet toilets, all relatively cheap to install, would provide the immediate eco-glamour. The decision to install earth-closet toilets made sense financially as well as ecologically but reminded Jason that he would need a new set of objectives, at the second level down, to continue meeting legislative and other regulatory requirements as visitor numbers increased. Jason had tended to keep the business side of the centre separate from the 'outdoors' aspects. It took him some time to realise that attracting more visitors would need a continuously evolving, bio-diverse and attractive outdoor experience as well as an advertising campaign.

The two sides were reconciled in his thinking by the synergy between attracting more visitors (towards the middle right of the tree) and the second-level objectives *maintain a peaceful environment for visitors* and *build biodiversity on site*. In exploring his thinking about these issues, Jason also noticed a potential conflict between *attract more visitors* and *maintain a peaceful environment for visitors*. How could he attract more visitors while maintaining the peacefulness? Several years into improving the centre and attracting more visitors, this remains a continuing concern for Jason.

Rules and guidelines for objectives trees

Objectives trees help in shaping a coherent set of goals and objectives[7]. They are valuable for explaining goals and objectives and analysing the relationship between them. Here are the rules.

1. Start at the top of the page by stating your highest-level goal. This may be a high-level mission or more restricted objective such as seizing an opportunity, tackling a task or solving a discrete problem.

2. Identify all the objectives needed to realise the top-level goal and link them to the top-level goal by a branching line.

3. Check that each subordinate objective reads upwards as 'is necessary to achieve … ' and downwards as 'depends upon'.

4. Make a note of alternative ways of achieving the higher-level and note any constraints that will make completion of the objective difficult.

5. Repeat 2, 3 and 4 for each of these objectives until further disaggregation ceases to be informative.

6. Where one objective contributes to more than one higher-level objective, draw the relevant branch lines to link the objective to all the relevant higher objectives, or where this is tricky, include the objective in each of the relevant branch lines and mark it with a small circle (as in Figure 12.5 b).

7. Where objectives appear to be contradictory, identify them with a two-line bar (as in Figure 12.5 b and make a note to give them further thought. Mark difficult-to-achieve objectives similarly.

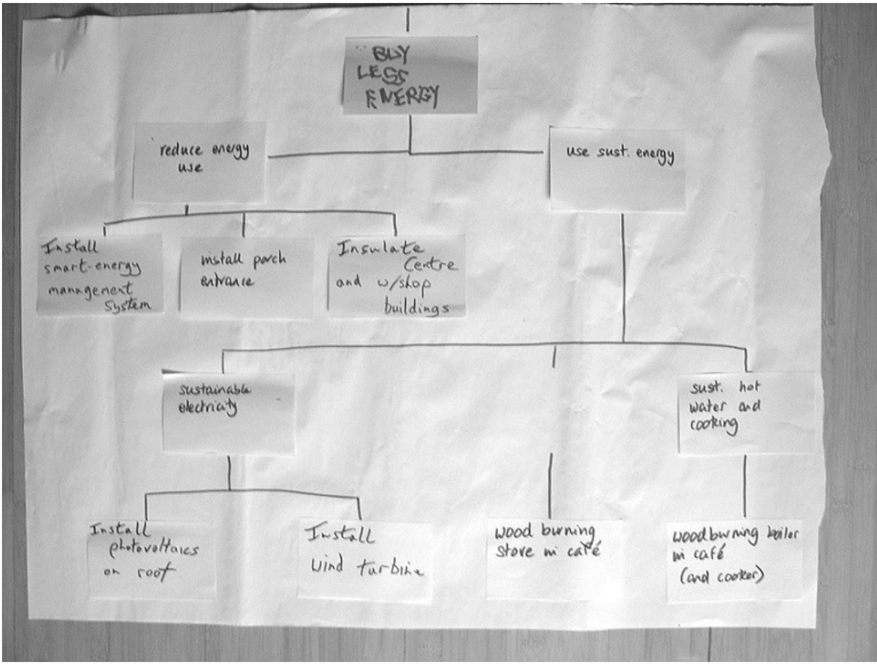
Drawing an objectives tree

Any task, opportunity or problem that generates a long things-to-do list is suitable for practising an objectives tree[8]. Things-to-do lists with more than 15 related items, suggest the need for an objectives tree. Many people start from a list and develop an overall aim. Others start with an overall aim and tease out the contributing objectives. At each stage, ask *What else needs doing to achieve this higher-level objective?*

Sticky notes can be helpful, especially used in conjunction with flip-chart or butchers' paper. They have the advantage that you can move them around and use different colours for each hierarchical level. The early stages of developing an objectives tree can quickly become unfeasibly wide. You can try drawing it from the left to the right of the page (like a decision tree) before developing your 'final' draft. Software for spray diagrams[9] can also be a useful way of drafting an objectives tree. It has the effect of arrows converging towards a 'central goal' rather than a higher goal but it is quick and easy and you can move objectives around easily. (See Chapter 12 of the book for a discussion of diagramming software.)

Using objectives trees with others

Objectives trees provide an opportunity for teams to pool their expertise in working out how to achieve an aim. The grammar is simple enough for everyone to understand and checking for synergies, conflicts and difficulties can emerge in discussion, although it is important to check thoroughly after structuring all the objectives. In a collectively-created objectives tree, sticky notes provide a convenient way of recording, and then moving objectives (see Figure 7).



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igure 7: *Moving objectives easily*

Decisions that involve other people are potentially problematic. Objectives trees provide one way to address that difficulty. Diagrams always represent particular perspectives (see Chapter 2). Objectives trees surface these perspectives and make them discussable. Differences will emerge from all levels of participants' objectives. It is in discussing these that new understandings emerge, creating better conditions for coordinated action. Where divergent perspectives co-exist, it can be instructive to ask each team-member to draw their own objectives tree and then show-and-tell to get to working accommodations[10].

Another objectives tree

In Figure 8, an organisation of professional project evaluators has set out a generic model of evaluation, expressed as an objectives tree. Objectives trees always come from a perspective and this one is intended to guide the organisation's staff in making sure evaluations met the needs of the client or sponsor (usually the same body). Very little detail of the evaluation process itself is evident since it was intended that staff select the best approach for each context. The tree also suggests evaluation under a number of different criteria that represent the distinctive approach of the organisation. The tree does not indicate any potential conflicts, difficulties or synergies since it has a very generic application.

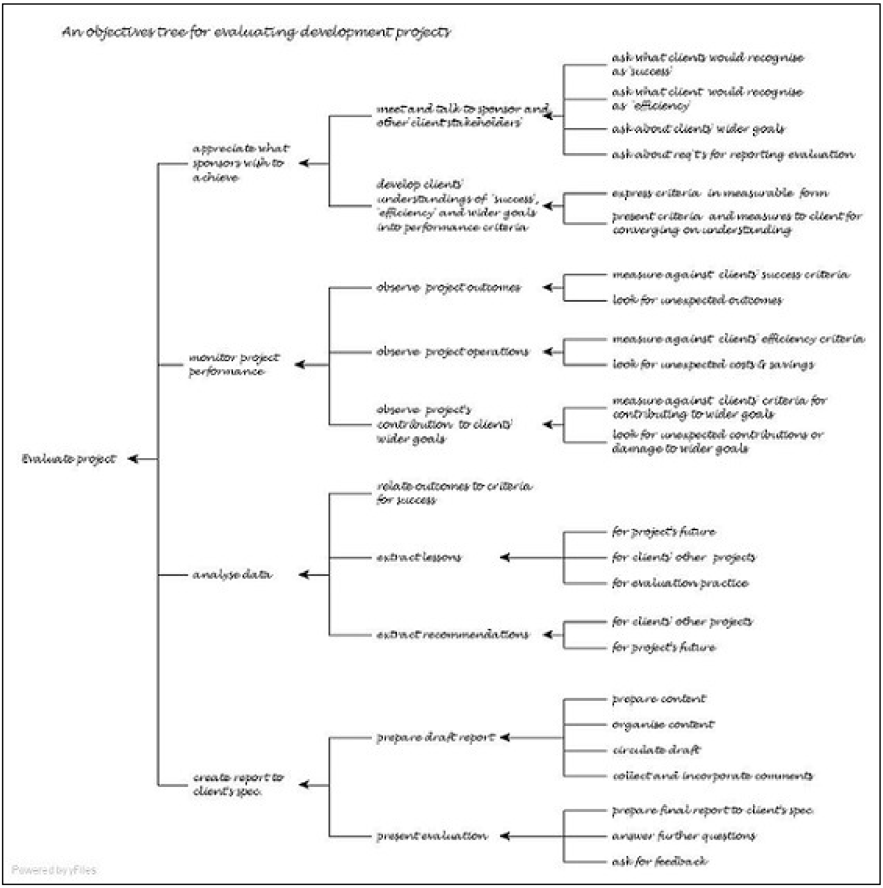

Figure 8: *Objectives Tree evaluation*

Notes, resources and explorations

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[1] Decision-making under uncertainty

Decision trees originate in the work of Blaise Pascal (1623 – 1662), the French mathematician and philosopher. Pascal took a particularly gloomy view of the human condition and much of his writing is concerned with Christian theology. *Pensées* is a posthumous assembly of his key – mainly theological - ideas, including his thoughts on decision-making under conditions of uncertainty. He argues that since there is no proof of the existence of God, the only rational decision is to believe: the rewards for doing so (eternal life), if God exists, outweigh any costs. If God does not exist, nothing significant is lost except the opportunity for 'those poisonous pleasures, luxury and glory'. (Pascal was an extremely ascetic Christian.) *Pascal's Wager*, as this argument is known, has been widely criticised (it does not consider the possibility that one might chose the wrong God to believe in, for example) but *Pensées* nonetheless laid the foundations for decision theory. Included among the notes assembled in *Pensées* is his work on expected value, the core idea of decision trees. In exploring the contradictions and paradoxes of rationality, Pascal also laid the foundations for the existentialist school of philosophy that emerged in the 19th Century and for probability theory. The *Système Internationale* unit for pressure is the Pascal, named in honour of Blaise Pascal and his achievements.

Modern decision theory has two main strands: *normative decision theory* is about how to take the 'best' – usually the most rational - decision and is related to *games theory*. *Descriptive decision theory* is about how people actually take decisions and why. Rarely, of course, do people make purely rational decisions. Most decisions rest on a mixture of rationality, optimism, hunches and arbitrary selections of information. One can argue that some decisions should *not* be entirely rational, including deciding whom to marry, for example.

Decision trees directly represent Pascal's approach to decisions in the face of uncertainty. They set out the criteria for the most rational decision. Their main value lies, however, not in their rationality but in the dialogue between their strict rationality and the hunches and perceptions of the diagrammer.

Decision trees do not deal directly with time issues or discounting. Discounting is the branch of decision theory that deals with how I value costs now against possible future benefits.

Pascal, B., & Krailsheimer, A. (2003). *Pensées*. Harmondsworth: Penguin.

Pensées is also available for free download at Project Gutenberg. (Pascal describes his Wager in *Pensée 233*). http://www.gutenberg.org/etext/18269

[2] *Choices and the NHS*

The UK's NHS is one of the biggest employers in the world and offers UK citizens free, high-quality health care. It is also a headache for politicians. The NHS consumes a significant proportion of UK tax revenue and is widely suspected of inefficiency. But politicians tamper with it at their peril. Brits are passionate about the NHS and view any attempts to reform it with suspicion. Private care is also available. It offers more choice about timing (people can negotiate their dates for treatment) and privacy. (NHS patients are typically treated in open wards and individual rooms are allocated by medical need only). The food is also better in private hospitals. Some types of surgery, such as cosmetic surgery for vanity reasons, are not available on the NHS.

As I write, another US President is attempting to extend the availability of quality health-care. Europeans, especially Brits, are completely baffled by the opposition to this egalitarian project.

Our histories, individual and collective, form our sense of what is 'normal', 'right' and 'natural' and so I imagine that some readers will have difficulty understanding why I experienced deciding about my ankle as messy. Some messes come into being in the interaction between self and circumstances.

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[3] *Sunk Costs*

The *sunk-costs dilemma* arises from economic decision theory. It captures the idea that a rational decision about what to do now should not be affected by what has already been done. If, for example, millions of pounds have been spent developing infrastructure for an industrial development that has not quite been completed, it is tempting to think that investing a few million pounds more to complete it will represent good value for money. Deciding whether to invest more money *now* should depend only on current circumstances. If the infrastructure is necessary, then a few more millions invested now will realise far more than their value, because the few millions will realise the whole infrastructure project. If however, circumstances have changed, perhaps because a major industrial development has been cancelled, then investing more money now will only yield unwanted infrastructure. The millions of pounds already spent are irrelevant to the decision if the infrastructure is unnecessary. What is gone is gone. 'Pouring good money after bad' in an effort to recover some value from sunk costs is a major temptation, especially when the sunk costs are substantial. It is as if spending more money is a better alternative to admitting to an investment mistake. It is called 'waste aversion' but wasting yet more money in an effort to recoup yesterday's investment is an irrational response to today's circumstances.

[4] *The planning fallacy*

The human propensity to underestimate how long something will take and how much it will cost, is so common it has acquired a name: the *planning fallacy*. This human vanity can lead to serious mistakes but the belief in our ability to deliver is often validated, rather than challenged, by everyday experience. For example, contracts will typically be awarded to the company that tenders for the lowest cost or the shortest time, despite everyone's experience that cost and time over-runs are more usual than delivery-as-promised.

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[5] *Irrationality*

The extent to which irrationality intrudes into decisions is alarming, especially for those of us who believe we can be rational and dispassionate in our judgments. I suggest the following books for a tour through this important but neglected area. They are each accessibly written by acknowledged experts and researchers.

Fine, C. (2007). *A Mind of Its Own: How your brain distorts and deceives*. Cambridge: Icon Books.

Frith, C. D. (2007). *Making up the Mind: How the Brain Creates our Mental World*. Oxford: Blackwell Publishing.

Sutherland, S. (2007). *Irrationality*. London: Pinter & Martin Ltd.

[6] *'Systemic' and 'systematic'*

Chapter 8 in the book explores this important distinction.

[7] *Goals, missions, objectives and aims*

Management literature has made repeated attempts over the years to establish a stable hierarchy of usage for *aims*, *goals*, *missions* and *objectives*. The only consistent usage seems to be that missions tend to come at the top of the tree. In the context of objectives trees, I have used *objectives* for lower levels of the objectives tree and *goals* for higher levels.

[8] *Suggestions for practising objectives trees*

Any complex task can benefit from an objectives tree but here are some suggestions for practising.

- Social occasions of all kinds
- Christmas and other holidays or any other big family occasions
- Building a new shed, warehouse, office block, etc.
- Acquiring a new set of skills
- Improving your capability for …

[9] *Spray diagrams*

For an example of a spray diagram, see Chapter 9 of the book.

[10] *Accommodations*

See Chapter 2 of the book.