

# Decision Trees

Visual and numerical method of setting out the risks and rewards associated with alternative options open by projecting likely outcomes.

Not appropriate for day-to-day decisions (like ordering materials) but more longer term strategic decisions that require significant resource commitment, e.g?



# Worked Example – Hugh and Tom

Table 1 Decision table

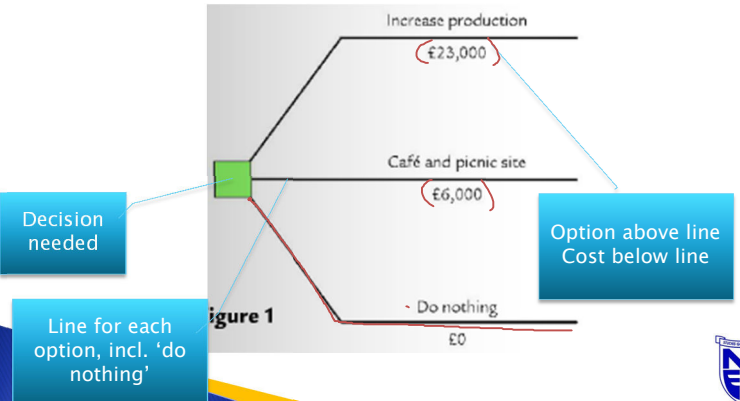
Option	Initial cost	Success		Failure	
		Probability	Expected outcome	Probability	Expected outcome
Increase production	£23,000	0.7	£84,000	0.3	(£14,000)
Café and picnic site	£6,000	0.5	£45,000	0.5	£4,000

- ▶ The choices available
- ▶ The possible outcomes
- ▶ The probability of **each outcome** occurring
- ▶ Estimated financial result of **each outcome**



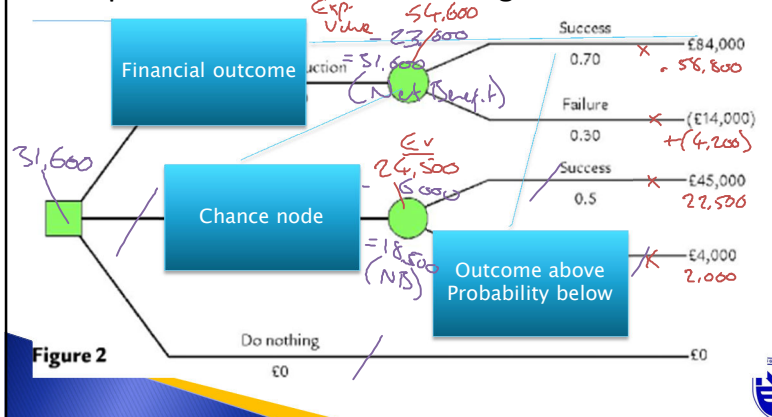
# Worked Example – Hugh and Tom

Step 1 – draw the decision tree



# Worked Example – Hugh and Tom

Step 2 – show outcomes through chance nodes



### Worked Example – Hugh and Tom

Step 3 – calculate the ‘expected value’ of each option (taking into account probabilities)

Increasing production			
Success	$£84,000 \times 0.70$	=	£58,800
Failure	$(£14,000) \times 0.30$	=	(£4,200)
Expected value	$£58,800 + (£4,200)$	=	£54,600
Less cost			£23,000
Net benefit			<b>£31,600</b>
Café and picnic site			
Success	$£45,000 \times 0.50$	=	£22,500
Failure	$£4,000 \times 0.50$	=	£2,000
Expected value	$£22,500 + £2,000$	=	£24,500
Less cost			£6,000
Net benefit			<b>£18,500</b>



### Worked Example – Hugh and Tom

Step 4 – make the decision and show it on the tree

Net benefit of increasing production is higher than the café/picnic area – this makes most sense.

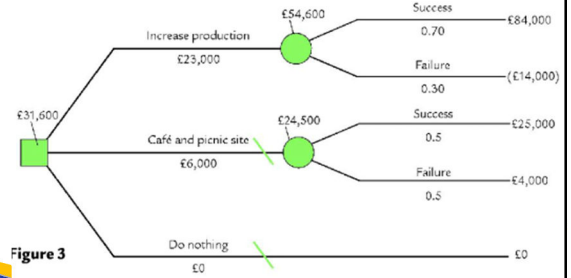


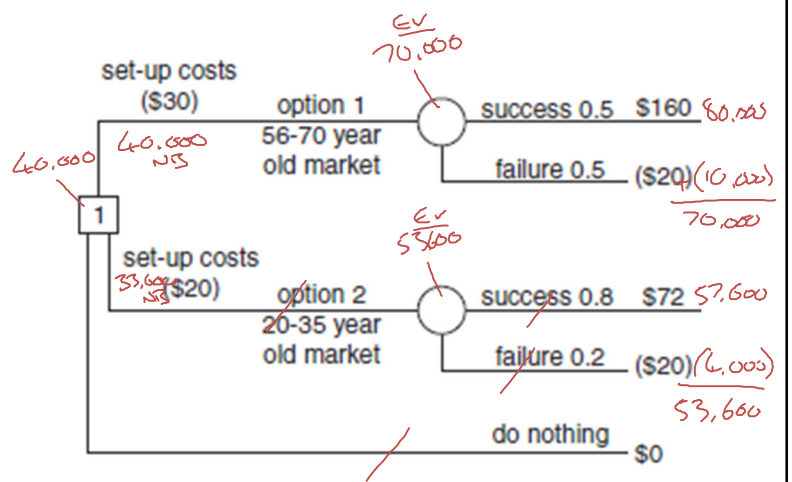
Figure 3

### Which magazine?

Malika and Ahmed are considering launching a new magazine to expand their publication business.

A magazine for an older market (56-70) would cost \$30,000 to produce. There is an equal chance of success and failure. If it succeeds, it will make a return of \$160,000. If it fails, it will make a loss of \$20,000.

A magazine for a younger market (20-25) would cost \$20,000 and has an 80% chance of yielding \$72,000. if it fails, it will yeild a net loss of \$20,000.



### Internet edition too?

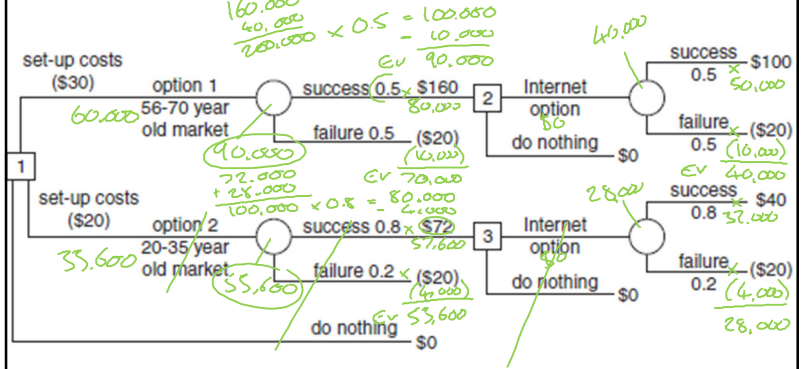
Malika and Ahmed think that if a print version of either magazine is successful, an online version would also be worth offering – this would cost nothing to set up.

An online version for the 56-70 market magazine could expect to yield \$100,000 if successful, and lose \$20,000 if not. The chances of each outcome are equal.

For the 20-25 market, there is an 80% chance of yielding \$40,000. If it fails, it would make a loss of \$20,000.



### An additional decision node



Option	If a Success		Success		Failure	
	Initial Cost	Probability	Expected Outcome	Probability	Expected Outcome	
Internet Version 56-70	0	0.5	100,000	0.5	50,000	
Internet Version 20-25	0	0.8	40,000	0.2	(20,000)	



### EVs - Internet

**Internet (56-70 market)**  
 Success  $100,000 \times 0.5 = 50,000$   
 Failure  $(20,000) \times 0.5 = (10,000)$   
 EV = 40,000  
 Less cost = 0  
 Net Benefit = 40,000

**Internet (20-35 market)**  
 Success  $40,000 \times 0.8 = 32,000$   
 Failure  $(20,000) \times 0.2 = (4,000)$   
 EV = 28,000  
 Less cost = 0  
 Net Benefit = 28,000



## EVs - Overall

### Option 1 (56-70 market)

Success	$160,000+40,000=200,00 \times 0.5$	= 100,000
Failure	$(20,000) \times 0.5$	= (10,000)
EV		= 90,000
Less cost		- 30,000
<b>Net Benefit</b>		<b>= 60,000</b>

### Option 2 (20-35 market)

Success	$72,000+28,000=100,000 \times 0.8$	= 80,000
Failure	$(20,000) \times 0.2$	= (4,000)
EV		= 76,000
Less cost		- 20,000
<b>Net Benefit</b>		<b>= 56,000</b>



## Evaluation

In conclusion, decision trees offer a quantitative and scientific approach to decision-making which may make strategic choice more objective. However...

Companies also need to assess qualitative factors, such as personal preference, source and accuracy of data and predictions, availability of capital, aims and objectives, competition...etc.



## Practice makes perfect – 2 lessons

- ▶ Activity 36.4 question 1 (638)
- ▶ Activity 36.5 questions 1 and 2 (639)
- ▶ Activity 36.6 questions 1 and 2 (641)
- ▶ Revision case study 1 question 1 (642)

Homework – **due 10<sup>th</sup> Oct**

Case study 2 (2 in bullet point format) on page 643

