ASRT, Feb 2018

Introduction to Making Good Decisions

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Outline

- Motivation and Context
- Key Concepts in Decision Making
  - Decision Elements & Model
  - Good/Bad Decisions
  - Assessing Decision Quality
- Applying the Model and Structured Process to Research Project Decisions
  - Project Choice (for all)
  - Making a Recommendation (for some)

(I will provide a follow-up colour PDF afterwards if desired)

Why is Decision Making important?

A large part of how your life unfolds is a result of your decisions – this is all you can control.

The rest depends upon things you cannot control: decisions of others, "nature", chance, ….

Decision outcomes not living up to expectations or possibilities – why?

- Poor decisions: many "best" predictions, beliefs or decisions are non-intuitive, especially when uncertainty and complexity are present
  - in such situations, most of us fall prey to systematic biases (prediction or belief errors) that result from mental short-cuts (heuristics)
- Uncertainty: essentially, events whose outcomes you cannot control
  - people tend to grossly under-estimate uncertainty
  - number of uncertain factors
  - the magnitude of uncertainty

leads to poor decisions when it is not incorporated properly in the decision-making process

System (Type) 1 and System (Type) 2 Thinking Keith Stanovich[1]

System 1	System 2
– Fast, automatic, effortless, implicit, and emotional	– Slow, conscious, effortful, explicit and unbiased – but lazy
– Low on computational power – based on associative memory	– More computational power – based on conscious reasoning
– Prone to "inaccuracy", especially in situations with a bit of complexity and uncertainty	– Accurate - when in control! But it usually accepts System 1's suggestions without query. Occasionally corrects System 1 or answers "questions" it can't
– Always on - runs the show! we make most decisions & form beliefs from it's suggestions.	– Needs to be "switched on"
– The intuitive brain	– The deliberate brain

Kahneman & Tversky: "Thinking: Fast and Slow"

Examples

System 1

System 2

$$\frac{23 \times 17}{12} = ?$$

Both types of thinking are useful: but only in the appropriate context!

- In many simple or instinctive decision situations, System 1 (intuitive) is sufficient and any inaccuracies in our judgements are unimportant
  - grocery shopping, what to eat, …
  - it might save our lives …..

- For important decisions that have a bit of complexity or uncertainty, and for which we have a bit of time to contemplate, we need to engage System 2 (deliberative)
  - System 1 often leads to compelling, but "wrong" beliefs & decisions

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Humans are cognitive misers and default to System 1

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List what you think are the main elements of any decision situation (that requires some thought)

- Discuss in small groups for a couple of minutes, then list

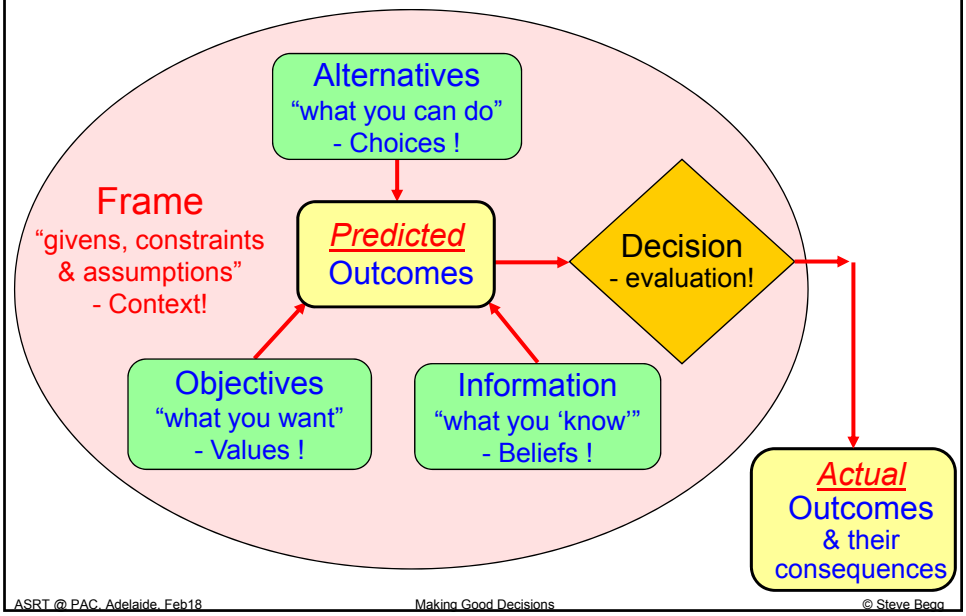
*Elements of Decision Problems

- Frame
  - Assumptions and context that informs:
- Values & Objectives
  - What you want
- Alternatives or Choices
  - What you can do
- Information
  - What you "know" and how well you "know" it

Decision Basis

- Pay-offs and their consequences
  - What you will get and what that means for you
- Decision Criteria
  - How you will choose

Structure of a decision (applies to all decisions that require some "thinking")



Why are decisions hard?

- Multiple goals, objectives or criteria
  - different measures for each objective
  - objectives that don't have natural measures (satisfaction, quality, …)
  - competing or conflicting objectives – requiring trade-offs
  - ambiguous goals/objectives
  - conflicting objectives when multiple decision-makers
- Complexity
  - number of factors (incl. people) involved
  - timing/sequencing or relationships between factors
- Uncertainty
  - in current states-of-nature or future events, due to lack of information
- Too many, or too few, alternatives (no good ones)
- Anxiety about consequences
- Time pressure

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"Decision-making is what you do when you don't know what to do"

Ron Howard

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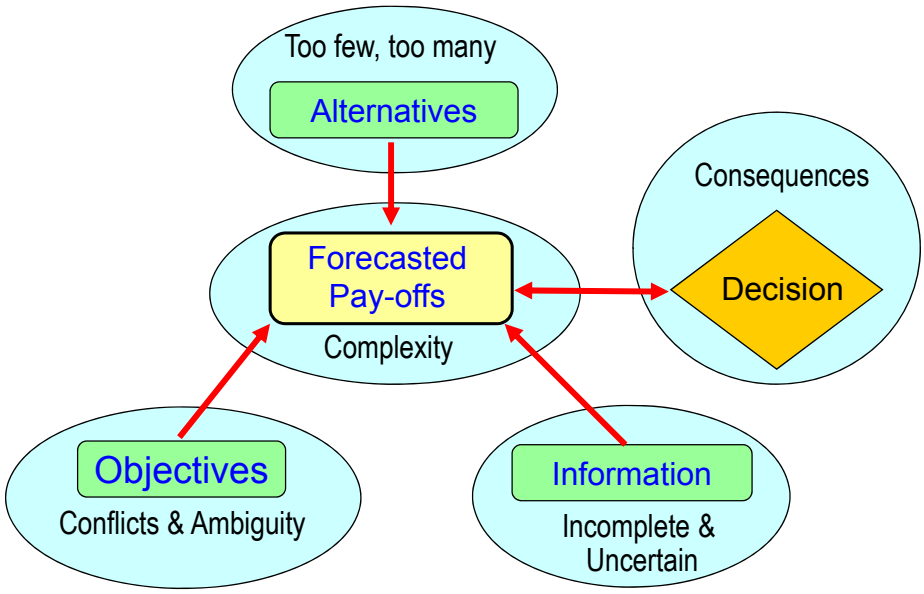
* Factors Surrounding High Level Decision Elements



Decision Analysis (DA)

- Decision Analysis is a structured, pragmatic, auditable and scalable approach (under-pinned by evidence and sound reasoning) to help people
  - create and evaluate choices in difficult decision situations
  - get enough information to make best choice, as opposed to making the best prediction of outcome
  - gain insight into the risk and value drivers of decision situations
  - have high quality discussions leading to a compelling best course of action
- DA does not make the decisions for you, it is a structured way of providing insight to all factors that affect the decision
- It uses System 2

Decision Analysis (DA)

- Decision Analysis is a structured, pragmatic, auditable and scalable approach (under-pinned by evidence and sound reasoning) to help people

Preferred style is not necessarily best style

Applies to decision making as much as it applies to learning

- way of providing insight to all factors that affect the decision
- It uses System 2

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Better decisions in minutes: using the Decision Basis in a structured conversation

- Get into the habit of structuring decision-making conversations around the three elements of the Decision Basis, in this order:
- Objectives:
  - "so what do you/we want to get out of this decision?"
  - "is there anything else, anything you/we missed?"
  - "what is most important?"
- Alternatives:
  - "what are your/our options?"
  - "can't you/we think of anything better?"
- Information:
  - "what do you/we know about how each option will satisfy our goals?"
  - "are you/we sure of these predictions?",
  - "what is the evidence?"
  - "are you/we subject to subconscious biases or false beliefs?"

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Clarifying meanings of "related" words/concepts: Beliefs vs Values

- Values: things that are desirable/undesirable, good/bad (to the decision-maker in the context of the decision to be made)
  - "studying hard is good"; "students should aim for an A in the research project"; "I don't like the Research Project"
  - may be inherent to the person or learned/adopted from others
  - not a statement of truth or falsity; not based on information or logic; not a description of how the world is, or was, or will be (i.e not facts)
- Beliefs: our view on the truth/falsity of statements or claims about "states of the world" (facts) - past/present/future
  - "studying hard will lead to a higher grade"; "doing a research project on something the student enjoys will increase their grade";
  - they are ultimately correct/incorrect, though we may not now have enough information to know for sure, so …..
  - if not certain, they can be held to some degree ("I'm pretty sure …")
  - note: a feeling of "knowing" is not the same as actually knowing!
  - no "value judgement" (of goodness or badness) is being made

Distinction in meanings of "related" decision making words/concepts

- Bias: systematic error in (degree of) belief or thought. Can be
  - cognitive: due to unrepresentative or wrong information and/or incorrect "reasoning" (thinking, evaluation) about it
    - eg using intuition to form a degree of belief in uncertain & complex situations
  - motivational: due to our values - we would like something to be true
    - eg just because you like/dislike what a source of information (including people) says, does not mean there is a greater chance it is true/false
- Preferences: order of desirability of "states of the world", based on our values (and on our beliefs, if the state is uncertain)
  - "an A grade is better than a B"; "I prefer students who respect me" ;
  - we can mistakenly order our preferences if we have biased (false) beliefs, and thus make bad decisions
- Preferring one thing to another is not being biased. Having a (degree of) belief in some claim (or in the effect of some action) that is inconsistent with data or evidence is bias.

What is a good decision?

- Discuss in small groups for a couple of minutes, then list the elements of what you think constitutes a good decision

"how would you know a good decision if you saw one?" !

What makes a Good or Bad Decision?

- The weather report on the evening news predicts a warm, dry sunny day tomorrow
- When you get up and look out the window in the morning there's not a cloud in sight
- You decide to leave your umbrella at home and get soaked in an unexpected afternoon thundershower

Did you make a good or bad decision?

What makes a Good or Bad Decision?

- Russian Roulette
- $10 million offered
- One loaded chamber, 5 empty
- Six possible outcomes of equal probabilities
- Is the player who survives a good decision-maker, …
- or a Lucky-Fool?

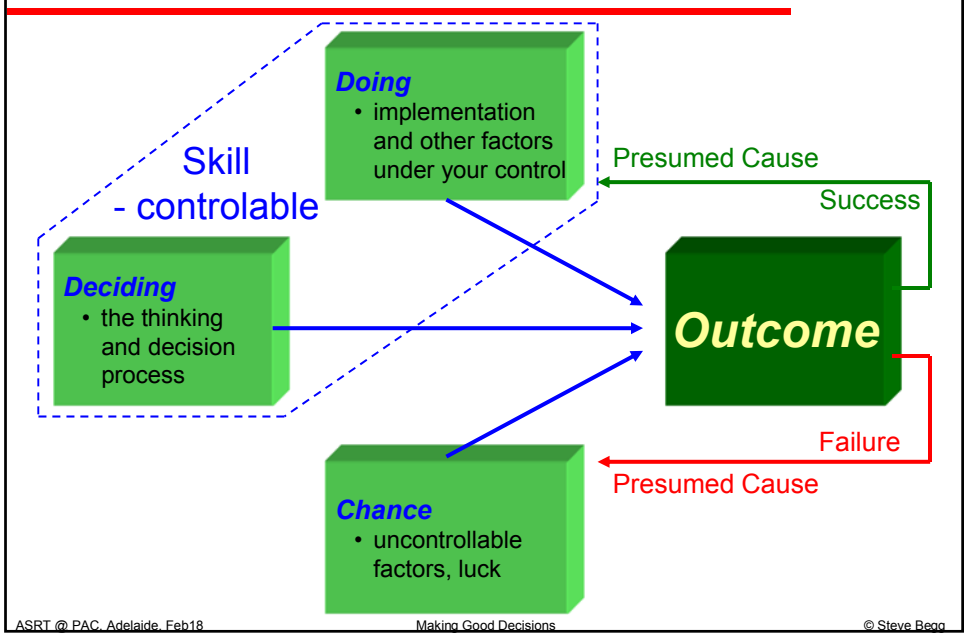
If only the outcome is used to judge the quality of a decision, this person should be used as a role model for decision-makers!

A high quality decision doesn't guarantee a high quality of outcome (nothing can)!

		Quality of Outcome	
		Good	*Bad*
Quality of Decision	*Good*	Drove sober, arrived safe	Drove sober, had accident
	Bad	Drove drunk, arrived safe	Drove drunk, had accident

Good decisions can have bad outcomes, and vice versa!

Illusion of Control



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Illusion of Control

- Illusion of control frequently causes people to repeat actions that in the past were followed by success (or avoid actions that resulted in failure).
- This is true even if there's no reason to believe the actions did anything to cause the success.
- Only by realistically assessing the role of chance in successes can you *learn* which of your actions you should repeat and which could be improved.

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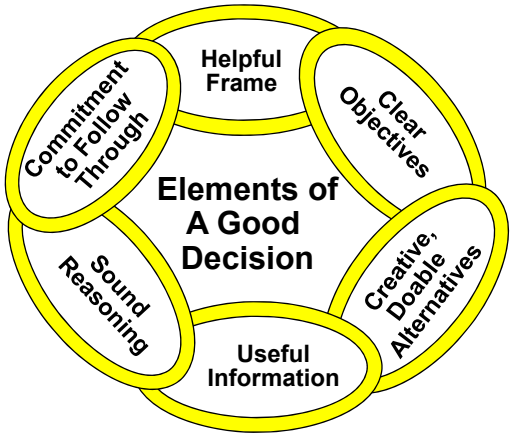
So what is a good decision?
The six dimensions of Decision Quality



- The 6 dimensions can be used as a decision-making guide
- Make each link as strong as possible
  - The decision is only as strong as the weakest link.

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So what is a good decision?
The six dimensions of Decision Quality

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Implications for everyday situations: was it a bad decision?

- Before you make a judgement that someone has made a "bad decision" (or you hear someone else saying so) stop to think what that means
  - Maybe it was just a bad outcome to a good decision?
- Maybe you are confusing a bad choice with a difference between your values (objectives) and the other person's
  - Work Decisions: there should be alignment on objectives – those of the decision-maker (as a proxy for the owners) – and the decision should be consistent with those objectives. There is no place for "other", or personal, objectives.
  - Personal Decisions: a good decision for one person might not be for another – this is a common error, we think that other people have, or should have, the same values and preferences us

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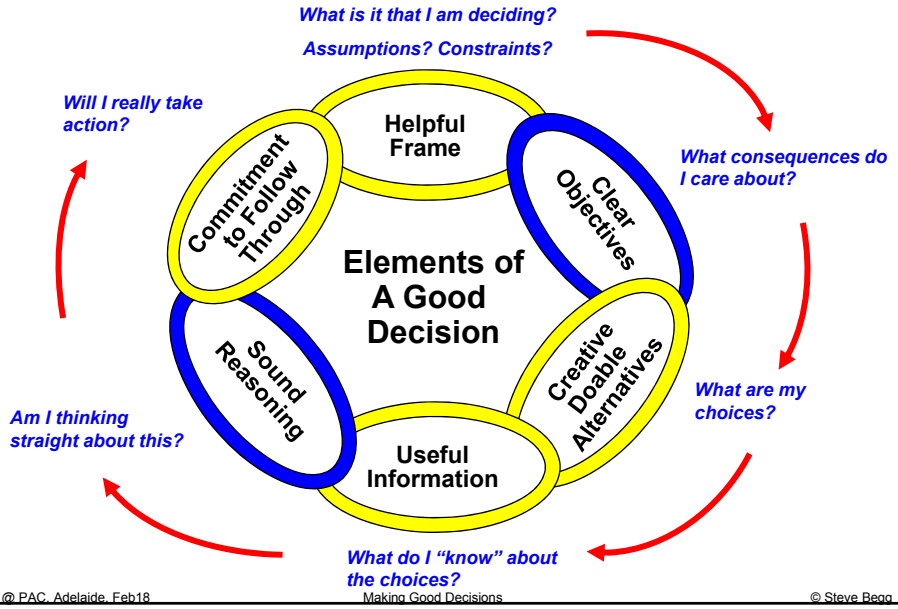
Six dimensions of Decision Quality: use as a checklist/discussion guide

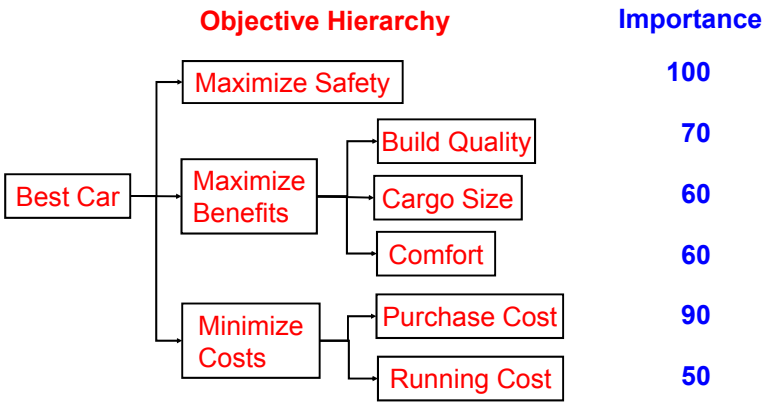


Helping students discover their objectives

- Topic choice is the student's decision, therefore its their objectives that count
  - resist temptation to inject your objectives, your School's objectives, or what you think the student's objectives should be!
- In a discussion of objectives there is often confusion between fundamental objectives (the ultimate goals of the decision) and means objectives (ways of achieving the goals).
- These need to be teased apart. The fundamental objectives are used to generate and evaluate possible choices. The means objectives might also provide insight on alternatives.
  - To move towards fundamental objectives, use WITI "Why is this important?"
  - To mover toward means objectives ask "how could this be achieved?"

Fundamental objectives often occur, and can be diagramed in, a hierarchy.

- Example. Decision is to choose a car

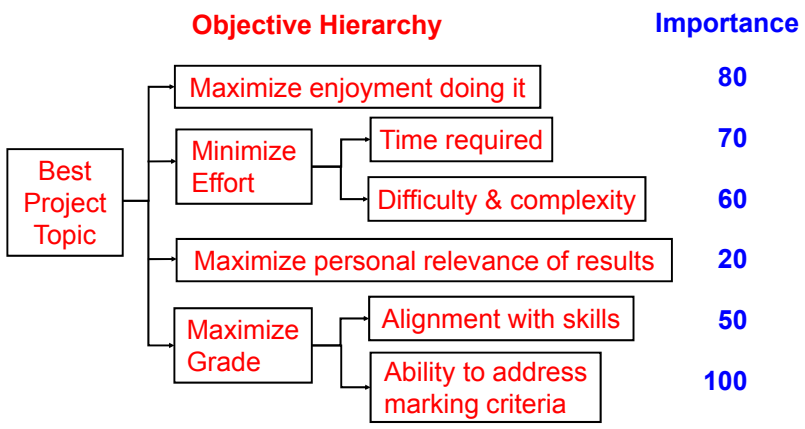


- Each "child" level is a more granular description of what the "parent" level means – not new or different objectives

Small group exercise

- List what you think might be a typical student's fundamental objectives in doing their research project
  - if relevant, organize in a hierarchy (don't force it if not natural)

Possible objectives for a specific student



Sound reasoning 1: developing valid beliefs in relationships between actions and outcomes

- It is claimed that Feverfew (a herbal medicine) is effective in treating headaches. Suppose 25 unbiased observations have been made as shown below. Does this data support the claim?

		Headache	
		Gone	Stayed
Feverfew	Took it	16	4
	Didn't	4	1

Sound reasoning 1: developing valid beliefs in relationships between actions and outcomes

- It is claimed that Feverfew (a herbal medicine) is effective in treating headaches. Suppose 25 unbiased observations have been made as shown below. Does this data support the claim?

		Headache		
		Gone	Stayed	Total
Feverfew	Took it	16	4	20
	Didn't	4	1	5
	Total	20	5	25

- Compare frequency of headache going whether Feverfew is taken or not

  Headache goes when Feverfew is taken = 16/20 = 80%

  Headache goes when Feverfew is not taken = 4/5 = 80%

- Taking Feverfew has no effect!

Sound reasoning 1: developing valid beliefs in relationships between actions and outcomes

- It is claimed that Feverfew (a herbal medicine) is effective in treating headaches. Suppose 25 unbiased observations have been made as shown below. Does this data support the claim?

If you use observations to develop beliefs you need (unbiased) observations in all 4 boxes!

- don't come to conclusions based on just the number of positive occurrences

- Compare frequency of headache going whether Feverfew is taken or not

  Headache goes when Feverfew is taken = 16/20 = 80%

  Headache goes when Feverfew is not taken = 4/5 = 80%

- Taking Feverfew has no effect!

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Do you have valid beliefs about what affects student outcome (Grade) for Research Project

Project Grade

Enjoys the subject matter

	B+ or better	Less than B+
Does	?	?
Doesn't	?	?

Project Grade

Good at the subject matter

	B+ or better	Less than B+
Good	?	?
Poor	?	?

Remember: this also applies to students drawing conclusions from observations!

Mental accounting & intuition can lead to wrong judgements

Outcome

Intuition

	Correct	Incorrect
Had it	Remember & reinforce	Forget & Ignore
Didn't have it	Unknown	Unknown

Intuition

- Many decision-makers believe that intuition and their general intelligence will see them through
- Intuition can be useful when
  - It is educated by making the same kind of decision multiple times and observing the outcome very shortly afterwards
  - The nature of the decision is such that none of its possible outcomes are particularly important
- Intuition can lead you astray when
  - Even slight degrees of complexity are involved
  - Uncertainty is involved, particularly if there are multiple uncertainties which you have to combine to reach a conclusion
  - It is trained/educated/developed in one situation but then applied to another

Sound reasoning 2: Integration of the information to choose, or recommendation, an action

- Direct subjective (beware) assessment of the value (to the decision-maker) of each alternative, on each objective
  - 9 = alternative really helps achieve objective
  - 3 = alternative is good fit
  - 1 = alternative supports a little
  - 0 = doesn't help , neutral

Best
↓
Worst

- Directly assess decision ranks & weights
  - Based on their ability to discriminate the relative value of alternatives
  - If the outcome on just one objective could be "swung" from worst to best value, which would it be? Rank that number 1, and so on
  - Assign a weight of 100 to the attribute ranked number 1, and relative weights to the others (in terms of their desirability of going from worst to best outcome)

Example: 9,3,1,0 Scoring

Objectives	Name	Rank	Wt	Alternatives A	B	C	D	E
	Max Enjoyment	3	60	1	3	0	6	9
	Min Time Needed	1	100	9	0	3	1	3
	Min Difficulty & Complexity	4	40	~~9~~	~~3~~	~~9~~	~~3~~	~~0~~
	Max Personal Relevance	5	30	9	3	9	1	0
	Max Capability in Topic	2	90	3	9	3	0	3
	Max Ability to Address Criteria	6	20	0	3	1	9	3
	Sum of (Wt*Score)=Total Score			1860	1260	1220	790	1170
	Rank			1	2	3	5	4

- The scores only need to be accurate enough to identify the highest ranked alternative!

Main take-aways

- For most significant decisions we can only control the choice we make and its implementation
  - other factors, beyond our control, will also affect the outcome, thus
  - a good decision does not guarantee a good outcome, and *vice versa*
- The route to better outcomes is by making better decisions
  - adopt the principles of Decision Quality and implement through the structured tools and methodology of Decision Analysis
- The most basic way to help students (or anyone, including yourself) make better decisions (research project or anything else) is to structure the conversation / thinking in the order:
  - What do you want? Identify Objectives (goals/criteria)
  - What can you do? Identify Alternatives (options/choices)
  - What do you "know"? How the Alternatives will deliver your Objectives? Are your information, beliefs and reasoning reliable and unbiased?
- Better, use the 6 dimensions of Decision Quality

