Research
Based
Curricula

Decision Making in Business

Key Stage 5
Business Studies

2019

BROUGHT TO YOU BY RBC ACCESS ED

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For Pupils
Welcome

To get into the best universities, you must demonstrate that you are intellectually curious, and will make the most of the wonderful academic opportunities available to you.

One of the best ways of demonstrating this, is by going above and beyond what is taught in school and studying something that is not on the curriculum.

This resource will give you exactly such an opportunity. You will have something interesting to write about in your application to university, something interesting to talk about in a university interview, and open whole new areas of study you might be interested in!

You will develop valuable academic skills as you go, that we have marked out with gold badges (see the next page on university skills). As you work through the resource you can look out for these badges so that you can explain which skills you have developed and what you did to demonstrate them. Developing these skills will help you get university ready!

If you have any questions while you are using the resources in this pack, you can contact your teacher or email us directly at schools@access-ed.ngo.

Good luck with your journey to higher education!

For Pupils
University Skills

To complete this resource, you will have to demonstrate impressive academic skills. When universities are looking for new students, they will want young people who can study independently and go above and beyond the curriculum. All of these skills that you will see here will demonstrate your abilities as a university student – while you're still at school!

Every time you have to look something up, or write up a reference you are showing that you can work independently. Every time that you complete a challenging problem or write an answer to a difficult question, you might demonstrate your ability to think logically or build an argument. Every time that you evaluate the sources or data that you are presented with, you are showing that you can "dive deep" into an unfamiliar topic and learn from it.

Here are the skills that you will develop in this course:

independent research	your ability to work on your own and find answers online or in other books
creativity	your ability to create something original and express your ideas
problem solving	your ability to apply what you know to new problems
building an argument	your ability to logically express yourself
providing evidence	your ability to refer to sources that back up your opinions/ ideas
academic referencing	your ability to refer to what others have said in your answer, and credit them for their ideas
deep dive	your ability to go above and beyond the school curriculum to new areas of knowledge
source analysis	your ability to evaluate sources (e.g. for bias, origin, purpose)
data interpretation	your ability to discuss the implications of what the numbers show
active reading	your ability to engage with what you are reading by highlighting and annotating

For Teachers
RBC Guide

Programme Aims

The Research-Based Curriculum aims to support student attainment and university progression by providing classroom resources about cutting-edge research at local universities. The resources are designed to:

- ✓ promote intellectual curiosity through exposure to academic research
- ✓ stretch and challenge students to think deeply about content that may be beyond the confines of the curriculum
- ✓ develop core academic skills, including critical thinking, metacognition, and written and verbal communication
- ✓ inform students about how subjects are studied at university, and provide information, advice and guidance on pursuing subjects at undergraduate level

Content

The programme represents a unique collaboration between universities and schools. Trained by AccessEd, PhD Researchers use their subject expertise to create rich resources that help bring new discoveries and debates to students.

The Research-Based Curriculum offers ten modules suitable for either KS4 or KS5 study. The modules span a range of disciplines, including EBacc and A-level subjects, as well as degree subjects like biochemistry. Each module includes six hours of teaching content, supported by student packs, teacher notes and slides. All modules are available online and free of charge for teachers at select schools.

Delivery

Resources are designed to be used flexibly by teachers. The resources can be completed by students individually or in groups, in or out of the classroom.

For Teachers
RBC Guide

Here are five examples of delivery options:

Extra-Curricular Subject Enrichment Clubs

The resources can be completed in small groups (4-8 pupils) across a series of weekly lunch clubs or after-school clubs. Groups can reflect on their learning by presenting a talk or poster on the subject matter at the end of the course.

University Access Workshops

The resources can be used by students to explore subjects that they are interested in studying at university. This can inform their decision making with regards to university degree courses, and allow students to write more effective personal statements by including reflections on the Research-Based Curriculum.

Research Challenge

The resources can be used to ignite curiosity in new topics and encourage independent research. Schools could hold a research challenge across a class or year group to submit a piece of work based on the resources. Pupils could submit individually or in small groups, with a final celebration event.

Summer Project

Resource packs can function as 'transition' projects over the summer, serving as an introduction to the next level of study between KS3 and KS4, or KS4 and KS5. Students could present their reflections on the experience in a journal.

Evidence

The Research-Based Curricula programme builds on the University Learning in Schools programme (ULiS), which was successfully delivered and evaluated through the London Schools Excellence Fund in 2015. The project was designed in a collaboration between Achievement for All and The Brilliant Club, the latter of which is the sister organisation of AccessEd. ULiS resulted in the design and dissemination of 15 schemes of work based on PhD research for teachers and pupils at Key Stage 3. The project was evaluated by LKMCo. Overall, pupils made higher than expected progress and felt more engaged with the subject content. The full evaluation can be found here: ULiS Evaluation.

Questions?

For more information contact hello@access-ed.ngo

Introduction to Topic Decision Making in Business

Human decisions are crucial for many business applications. Everything that is connected with money (e.g. shops, farms, factories, big corporations, even Youtube and Instagram) depending on your knowledge and ability to make good use of it. Researchers who work in this field seek to discover ways to manage companies effectively as small or large, region-specific or global businesses.

Interestingly, we can take many key findings from psychology on how people behave and react in a particular setting. For example, a human mind is fascinating, as it can build connections and get an answer in milliseconds, but at the same time, we know that our decisions tend to be far from optimum and sometimes are heavily subjective. Hence, decision making analysis aims to find a way to use it efficiently in business settings in order to solve many questions.

The topics within this pack will include:

Human Decisions: What can go wrong?

Individual Decisions in Organisations

Group Decision Making

Using Computer Support Systems in Decision Making

Judgemental Adjustments: A Case Study

Judgemental Forecasting Principles

Highlight key words or new vocabulary

Introduction to Subject Business Studies at University

Business subjects include various topics and tools starting from the most numeric (e.g. Accounting and Finance, Economics) to more qualitative studies (e.g. Psychology and Management; Management and Sociology). All directions are trying to balance between theoretical and practical aspects, so students can get skills that are valuable for business careers. Many courses are build using case-studies which is interesting for students but also help to connect theory to practice.

Skills include understanding how an organisation operates, financial aspects, decision-making process, marketing analytics, economics and psychology. Often students have an opportunity for summer internships at companies across the country which is amazing experience and an excellent start for future careers. Business graduates have a wide variety of career choices and have the aptitude required to work in any industry.

There are various research directions as well. Postgraduate students explore topics even deeper focusing on details and possibly finding areas where they can contribute not only in academic world but also bring impact for companies.

Good luck!
Anna Sroginis

Meet the PhD Researcher Anna Sroginis

Starting at A-level Business (Economics) class, I liked the idea of learning how economy works and what role companies play in it. So, my first degree in Economics gave me strong theoretical foundation, but after that, I decided to get a master degree in Optimisation and Management Science. It was good extension of my knowledge but in a more applicative/practical way. I went straight from my masters to my PhD without any hesitations.

My research now follows a narrow path of business forecasting which includes demand planning, supply chain management and inventory control. My colleagues and I are trying to enhance the forecasting process in companies optimising and simplifying some valuable steps.

A-Level Subjects	Economics and Mathematics
Undergraduate	BSc Economics , Higher School of Economics (St Petersburg)
Postgraduate	MSc Operational Research and Management Science, now Business Analytics, Lancaster University

Glossary

Term	Definition
A heuristic	An approach to problem-solving or self-discovery that employs a practical method, not guaranteed to be optimal, perfect, logical, or rational, but instead sufficient for reaching an immediate goal.
Bias	Disproportionate weight in favour of or against one thing, person, or group compared with another, usually in a way considered to be unfair.
Accuracy	The quality or state of being correct or precise. In statistics, it is connected with errors from the real value.
Probability	The quality or state of being probable; the extent to which something is likely to happen or be the case.
A Stakeholder	A person, group or organisation that has interest or concern in an organisation. Stakeholders can affect or be affected by the organisation's actions, objectives and policies. Some examples of key stakeholders are creditors, directors, employees, government (and its agencies), owners (shareholders), suppliers, unions, and the community from which the business draws its resources.
An executive	A person or group appointed and given the responsibility to manage the affairs of an organisation and the authority to make decisions within specified boundaries.
Decision Support Systems (DSS)	An information system that supports business or organisational decision-making activities. DSSs serve the management, operations and planning levels of an organisation (usually mid and higher management) and help people make decisions about problems that may be rapidly changing and not easily specified in advance—i.e. unstructured and semi-structured decision problems.
Forecasting Support Systems (FSS)	A set of (typically computer-based) procedures that facilitate interactive forecasting of key variables in a given organisational context. An FSS enables users to combine relevant information, analytical models, and judgements, as well as visualisations, to produce (or create) the forecasts and monitor their accuracy.

Glossary

Term	Definition
Fast-Moving Consumer Goods (FMCG)	Products that are sold quickly and at a relatively low cost. Examples include non-durable goods such as packaged foods, beverages, toiletries, over-the-counter drugs, and other consumables.
Stock replenishment	A restoration of stock or supply to a former level or condition.
Forecast evaluation	A process of estimating how correct forecasts are.
Uncertainty	A situation which involves imperfect or unknown information. It applies to predictions of future events, to physical measurements that are already made, or to the unknown.
Archetype	Something that is considered to be a perfect or typical example of a particular kind of person or thing because it has all their most important characteristics.
A statistical model	A mathematical model that embodies a set of statistical assumptions concerning the generation of some sample data and similar data from a larger population. A statistical model represents, often in considerably idealised form, the data-generating process.

Resource One Overview

Topic	Human Decisions: What Can Go Wrong?
A-Level Modules	Understanding management decision making
Objectives	By the end of this resource, you will be able to: ✓ Understand and explain human decisions in business ✓ Provide extended answers on the weaknesses and strengths of these decision
Instructions	1. Read the data source 2. Complete the activities 3. Explore the further reading
Context	**A heuristic technique** (Ancient Greek: εὑρίσκω, "find" or "discover"), often called just a heuristic, is an approach to problem-solving or self-discovery that employs a practical method, not guaranteed to be optimal, perfect, logical, or rational, but instead sufficient for reaching an immediate goal. **Bias** is disproportionate weight in favour of or against one thing, person, or group compared with another, usually in a way considered to be unfair. **Accuracy** is the quality or state of being correct or precise. In statistics, it is connected with errors from the real value. **Probability** is the quality or state of being probable; the extent to which something is likely to happen or be the case.

Resource One
Data Source

Section A

Based on the first part of the PhD thesis

Anna Sgroginis

Human decisions are crucial in all business-related areas. For example, in order to decide how many loaves of bread you need to produce next week, you need to analyse the past data (if any is available) and/or conduct market research of bread consumption in your area and only then you will be able to say anything about the future quantity. All these steps require your attention and knowledge and involve decisions from humans.

In order to understand how a human being makes decisions, we have to explore psychological factors which might profoundly influence them. A considerable amount of literature has been published on the topic. These studies show many biases and heuristics of human mind (Kahneman and Tversky, 2000).

In the decision-making literature, if your forecast is based solely on intuition, then it is likely to be biased and to have a negative impact on accuracy (Kahneman, 2012). The first fundamental studies on this topic described three heuristics that are used to assess probabilities by people. Those heuristics are (from Tversky and Kahneman, 1974):

- ❑ Representativeness;

  This means that people rely on similarity to the specific situation without taking into account its frequency of occurrence.

  Example: People with a PhD are more likely to subscribe to the Economist than people who ended their education after high school.

- ❑ Availability;

  The situations when a person relies too heavily on the information that quickly comes to mind. In particular, Tversky and Kahneman (1973) wrote, "long-life experience has taught us that instances of large classes are recalled better and faster than instances of less frequent classes" (p. 208).

  Example: List six instances in which you behaved confidently. Now, evaluate how assertive you are in these situations.

Resource One
Data Source

❑ Adjustment and anchoring.
The effect of anchoring can be observed when people tend to perceive an initial number as an anchor and make their adjustments moving upward or downward from this number.
Examples: When was the initial release of Minecraft 1.0 on Windows/Mac/Linux? (adjustment heuristic: most probably, you can guess that it happened after 2009 when Window 7 was released). Is the annual mean temperature in England higher or lower than 20C? (anchoring heuristic: your estimate will be affected by the number provided).

Those heuristics and biases have been discussed and extended over last decades, but still, the three original ones have a significant impact on research of judgment and human behaviour.

Another psychological trait has been discussed extensively in the psychological studies is overconfidence of individuals about their abilities or experience (or unrealistic optimism to something). Sometimes this bias referred to as “wishful thinking”. If people are sensitive to perceive extremeness of evidence while not questioning its validity, then their judgments will likely be overconfident. Philip Tetlock in his book "Expert Political Judgment: How good is it? How can we know?" showed that the experts performed worse in forecasting of their particular topic than throwing dice. The reason is that the person who acquires more knowledge develops an enhanced illusion of her skill and becomes unrealistically confident.

Other biases have been described in the literature:

- a phenomenon of regression to the mean which means initial susceptibility to exceptional events (people tend to give more attention than needed) which usually leads to the wrong perception of significance.
- the illusion of understanding when individuals have confidence in their interpretation of past events (Taleb, 2008).
- the illusion of control is associated with the belief that one can control or influence the outcomes of chance events.

Overall, we can list several possible reasons for human faults in decision making (usually having emotional and cognitive roots):

- a group opinion (especially if a focus group is involved);
- a role (within an organisation/department group);
- commercial target motivation (especially in marketing departments where special targets are set to achieve);
- personal biases (e.g. personal overconfidence based on experience

Resource One Activities

Activities

1

1) Can you list all heuristics and biases which have been mentioned in the text?
2) When the main three were proposed?
3) How would you contrast 'Representativeness' and 'Availability' heuristics?
4) What examples can you find to 'Adjustment' bias?
5) How would you evaluate 'Anchoring' bias? Is good or bad? Why?

2

What cause of death is more frequent?

- Transport crashes or Diabetes;
- Skin diseases or Alcohol Consumption;
- Drugs (i.e. heroin) or Falls on and from stairs/steps.

What heuristics did you use here?

3

Claire S is a student at a leading university in England. Please rank the following nine fields of undergraduate specialisation in the first column (Score 1) in order of the likelihood that Claire S is now a student in each of these fields. Use 1 for the most likely, 9 for the least likely.

Specialization	Score 1	Score 2
Business and administrative subjects		
Creative arts and design		
Computer Science		
Mathematical Sciences		
Biological sciences		
Social studies		
Medicine		
Agriculture and related subjects		
Architecture, building and planning		

Resource One Activities

Activities

The following is a personality sketch of Claire S written during Claire's senior year in high school by a psychologist, on the basis of psychological tests of uncertain validity:

Claire S is of high intelligence, although lacking in true creativity. She needs order and clarity, and for neat and tidy systems in which every detail finds its appropriate place. Her writing is rather dull and mechanical, occasionally enlivened by somewhat corny puns and flashes of the imagination of the sci-fi type. She has a strong drive for competence. She seems to have a little feel and little sympathy for other people and does not enjoy interacting with others. Self-centred, she nonetheless has a deep moral sense.

Now please rank the same courses by how similar the description of Claire S is to the typical student in each of the following fields (Score 2 column). Use 1 for the most likely, 9 for the least likely.

What heuristics did you use in this task? How useful are they?

Resource One
Further Reading

Explore

Kahneman, D., 2012. Thinking, fast and slow. Penguin, London.

Taleb, N.N., 2007. The black swan: the impact of the highly improbable. November 2008, London: Penguin.

The first chapter of Kahneman (2012)
https://www.scientificamerican.com/article/kahneman-excerpt-thinking-fast-and-slow/

TED Talks by Daniel Kahneman (2010)

Talks at Google, Daniel Kahneman (2011)

Cognitive bias cheat sheet:
https://betterhumans.coach.me/cognitive-bias-cheat-sheet-55a472476b18

Resource Two Overview

Topic	Individual Decisions in Organisations
A-Level Modules	Understanding management, leadership and decision making
Objectives	By the end of this resource, you will be able to: ✓ Demonstrate an understanding of how decisions are made in organisations; ✓ Critically assess the quality of decisions taken; ✓ Show awareness of the ethical dilemmas and responsibilities faced by organisations and individuals.
Instructions	1. Read the data source 2. Complete the activities 3. Explore the further reading

Resource Two
Data Source

The simplest way to produce decisions is to ask someone about their opinion on the subject. For example, you make decisions every day such as: what you are going to wear to go outside in the morning or what you are going to have for breakfast and so on. The same procedure is required in many business questions: what and when to hire a new employee, what product to put on sale next month or what credit to take. Of course, all these tasks could be done either by an individual or by a group of people, but an individual decision is more time effective and cheaper than the decisions made by groups of experts. In this part, we will focus on single expert decisions in the organisational context.

Individual decisions are particularly vulnerable to various biases and heuristics that are hard to control. For instance, if a person who makes decisions happens to be a manager, then these decisions might reflect their wishful thinking and aim that they want to achieve. But this is only a tip of the iceberg.

Let's think what other problems that we might have with individual decisions. Imagine that we are in a company that produces and sells vacuum cleaners. First, a human bias will depend on the role of a decision-maker in the organisation. For example, as a salesman, you would underestimate your demand, so you get a bonus with lower targets. The marketing department would most probably go for overestimation of the demand to make sure of supplies. But the production is interested in producing less since they will hold a cost of unsold products. So every step in the process of producing and selling a product we may uncover many potential risks and personal interests in decision making. In other words, corporate politics which is frequently found in all aspects of a business process influences the decisions made in the organisations.

Resource Two
Data Source

The other well-known issue with human judgment is "pattern matching". It means that people often look for patterns trying to find similarities in the randomness. In general, you have to be careful with past information since many things usually happen due to a chance (randomly) and there is no particular reason explaining for this. That's the reason why statistical methods often perform better than humans – the algorithms do not overcomplicate things and do not have subjectivity.

According to Tetlock (2005), the analysis of around 300 experts and 80 thousand political forecasts showed that individual political forecasts were performing worse than group (consensus) forecasts. Moreover, the experts' predictions were not as accurate as mathematical algorithms with economic and social inputs. However, there were two distinct groups of experts, one ("foxes") performing better than the other ("hedgehogs"). The first group was more flexible and reactive to the upcoming information and was willing to accept mistakes in the past, while the other did the opposite. The best description of these "foxes" was given in the book "Superforecasting: The Art and Science of Prediction" as "cautious, humble, openminded and analytical". These people overcome some of the biases and heuristics that have been covered in Resource 1, which is extremely useful and important.

Resource Two Activities

Activities

1

1. How would you explain individual decision making? Can you give at least two examples from your life?
2. How would you control personal biases as a manager? What kind of information would you use for making your decisions?
3. Who is "a fox" according to Tetlock (2005)?
4. Can you explain why "foxes" performed better than "hedgehogs"?
5. What conclusions can you draw from this part for your own decisions?

2

Can you list at least three pros and cons in a table below for single expert decisions?

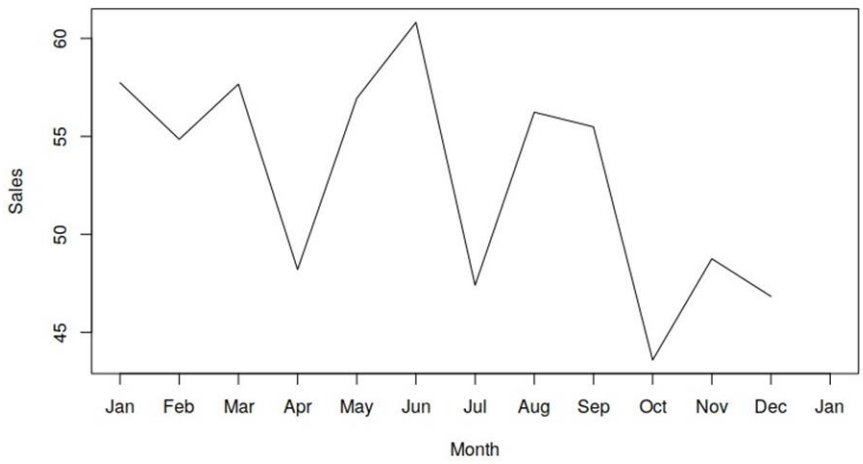
Advantages	Disadvantages

Building an argument

Resource Two Activities

Activities 3

Imagine that you are a forecaster for Sainsbury's supermarket in your town. You need to decide how many boxes of Pringles BBQ your customers will buy in the next month. You are provided with the historical sales of crisps on the graph below, where the months are shown on x-axis and sales are shown on the y-axis. So, for example, you can say that you have sold more than 60 units in June this year. Now try to analyse the graph below and put down your estimation for January (the last missing point on a graph).



What is your estimation for the next January (approximately)? _____

Why? What information might help you to produce better forecast?

Resource Two
Further Reading

Explore

Tetlock, P.E. (2005). Expert Political Judgment: How Good Is It? How Can We Know? Princeton, NJ: Princeton University Press.

Tetlock, P., and Gardner, D. (2016). Superforecasting: The Art and Science of Prediction. Random House.

Predicting the Future: A lecture by Phillip Tetlock (2015)

Talks at Google, Phillip Tetlock (2008)

Resource Three Overview

Topic	Group Decision Making
A-Level Modules	Understanding management decision making; understanding the role and importance of stakeholders
Objectives	By the end of this resource, you will be able to: ✓ demonstrate an understanding of how decisions are made in organisations on a group level; ✓ critically assess the quality of decisions taken; ✓ show awareness of the ethical dilemmas and responsibilities faced by organisations and individuals.
Instructions	1. Read the data source 2. Complete the activities 3. Explore the further reading
Context	**A stakeholder** is a person, group or organisation that has interest or concern in an organisation. Stakeholders can affect or be affected by the organisation's actions, objectives and policies. Some examples of key stakeholders are creditors, directors, employees, government (and its agencies), owners (shareholders), suppliers, unions, and the community from which the business draws its resources (from http://www.businessdictionary.com/definition/stakeholder.html). **An executive** is a person or group appointed and given the responsibility to manage the affairs of an organisation and the authority to make decisions within specified boundaries (from http://www.businessdictionary.com/definition/executive.html). .

Resource Three
Data Source

Many organisations prefer to use group decisions rather than an individual one for solving strategic and tactical questions. There are several research directions in this topic: the wisdom of crowd (where a diverse group of people come to a conclusion); jury of experts (a formal form of “the wisdom of crowd” in the organizational context); the Delphi method (a structured way of getting a consensus decision); scenarios and role-playing. We will briefly describe all of them.

Wisdom of Crowd

Since individuals have different biases and faults in decision making, a better approach is to ask many people. Using a diverse sample of people for prediction of political events (e.g. elections, referendums) on state or national level proved effective by many studies. For example, Miller et al. (2012) showed that citizen forecasts are more accurate than professional prediction markets. Similar results were established for the national level (e.g. US presidential elections) where citizens’ predictions were again better than any quantitative statistical methods, prediction markets or election experts. Hence, we can say that for big, national levels “the wisdom of crowd” works well. However, there is limited research on "the wisdom of crowds" in an organisational setting given that the company is big enough for such a knowledge elicitation method.

Resource Three
Data Source

Jury of Experts

When leading experts (or executives) with different responsibilities are brought together, the final decision will incorporate different managerial viewpoints and experiences. However, there might be political drawbacks in such debates. This approach could be effective for strategic questions, although quite expensive and slow. Also, if all experts are internal for the company, group biases may prevail domination by various people, different level of contribution and agreement. The use of a focus group could be a good alternative. The main difference is that focus groups aim to explore a problem and possible answers rather than to reach a solution. These groups require a facilitator who controls and guides the process. Unfortunately, focus groups are still subject to all personal and group biases that we have discussed above.

The Delphi Method

When the final decision is based on several rounds of questionnaires of multiple experts while every round the experts are provided with feedback on the anonymous views of the other experts. First, since there is no direct interaction (it can be done online), this process allows minimising negative aspects of personal interactions (e.g. boss/employee, different levels of domination and contribution due to many factors). Second, it naturally comes to a better consensus where the range of opinions decreases over the rounds, but at the same time, everyone feels responsible for his/her results. This method shows really good, consistent results, but also quite tricky and expensive to organise.

Resource Three
Data Source

Scenarios

The use of scenarios is useful when a problem can be presented as a story that represents possible future events. All elements and its interaction should be carefully included. This method could be used for

- Understanding possible outcomes and its consequences;
- Developing organisational strategies;
- Testing theoretical business concepts in practice.

If carefully planned and implemented, scenarios can be powerful tools to simulate business processes. This method is time-consuming and quite expensive: it includes the major stakeholders and actors. It should also be thoroughly checked for consistency and plausibility. If scenarios are used in "what if" manner, then it can be approximated with a simple simulation.

Role-playing

Role-playing is basing on the scenario method described above but adds some dynamics of interaction among the interested parties. For example, it could help to analyse how different sides can behave in a particular setting. This method allows either reaching the final decision or evaluating different approaches prior to making the decisions and recognising the complexity of problems. An example of role-playing is when experts gather together to discuss some work-related conflicts.

Resource Three Activities

Activities

1

1) Can you explain what is happening when the Delphi method is used?
2) Who can participate in Jury of Experts?
3) How would you explain the differences between Jury of Experts and The Delphi Method?
4) What is the difference between Role playing and Scenarios methods?
5) What would you select as the best method for group decision making? Why?

2

Imagine that you work for Jaguar/Landrover company, and there is a question, what type of car is to launch next year. The key features of the vehicles are provided in the table below. The company is planning to produce only one type. Which car should be selected? Is this possible to do without any additional information? How can one find out whether the correct solution is proposed?

	Car 1	Car 2	Car 3
Fuel consumption (miles per gallon)	14.3	24.4	19.2
Number of cylinders	8	4	6
Transmission	Automatic	Manual	Manual
Weight (1000 lbs)	4	2	3

Please list at least five factors which can influence your decision.

3 (optional group work)
When was a ballpoint pen invented?

Ask people in the group and calculate the average. If needed, you can collect the second round of individual estimators.
Note: people in a group should not discuss their guesses.

Resource Three
Further Reading

Explore Scenario Thinking: Practical Approaches to the Future. George Wright and George Cairns, Palgrave, 2011.

Resource Four Overview

Topic	Using Computer Support Systems in Decision Making
A-Level Modules	Understanding management decision making

Objectives

By the end of this resource, you will be able to:

- ✓ identify the impact of technology on decision making;
- ✓ appreciate the difficulties in learning and interacting with the software;
- ✓ understand the importance of development of new modules and features.

Instructions

1. Read the data source
2. Complete the activities
3. Explore the further reading

Context

Decision Support Systems (DSS) is an information system that supports business or organisational decision-making activities. DSSs serve the management, operations and planning levels of an organisation (usually mid and higher management) and help people make decisions about problems that may be rapidly changing and not easily specified in advance—i.e. unstructured and semi-structured decision problems. Decision support systems can be either fully computerised or human-powered or a combination of both.
(https://en.wikipedia.org/wiki/Decision_support_system)

Forecasting Support Systems (FSS) is a set of (typically computer-based) procedures that facilitate interactive forecasting of key variables in a given organisational context. An FSS enables users to combine relevant information, analytical models, and judgements, as well as visualisations, to produce (or create) the forecasts and monitor their accuracy. (Ord, K., Fildes, R., Kourentzes, N., 7 2017. Principles of Business Forecasting, 2nd Edition. Wessex Press Publishing Co.)

Resource Four
Data Source

In order to facilitate various operational processes in more structured, problem-oriented, analytic-driven way, many companies use different Decision Support Systems (DSS). Looking at the figures below, try to identify areas where these systems can be helpful. Where can we use similar systems?

Figure 1

Customer Decision Support System (CDSS) example

– immediate alerts

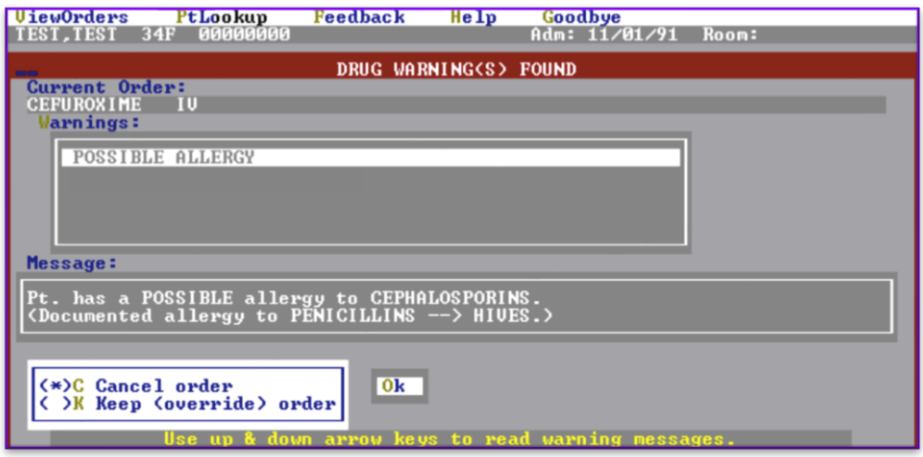
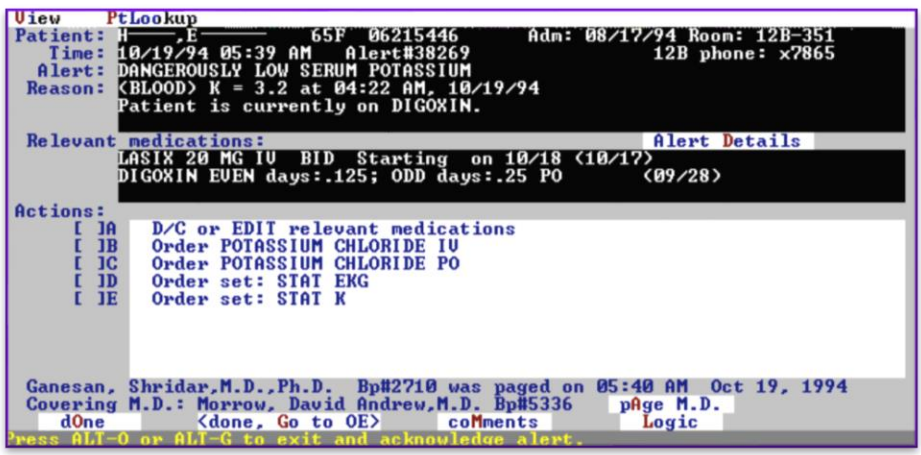


Figure 2

Customer Decision Support System (CDSS) example

– event-driven alerts



Resource Four
Data Source

Figure 3

LADSS (Land Allocation Decision Support System) example

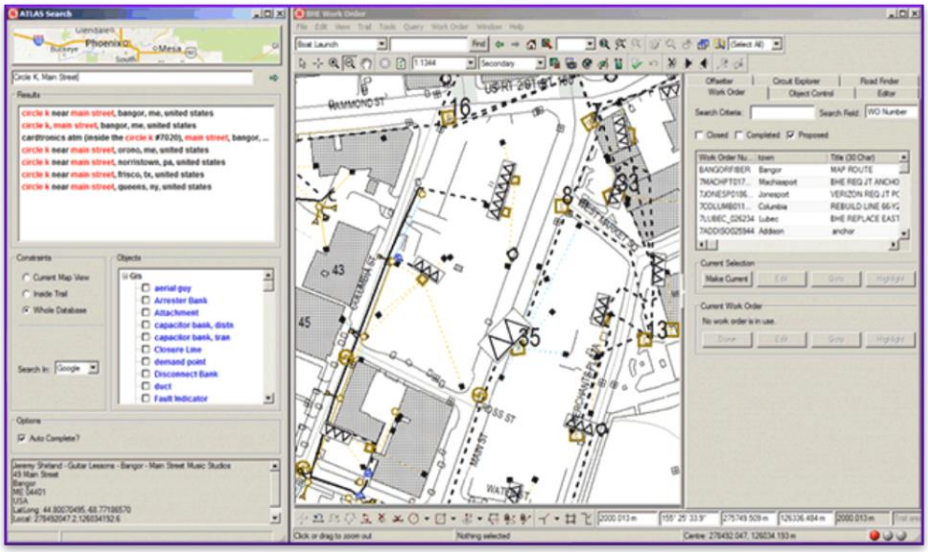


Figure 4

FSS (Forecasting Support System) example

Resource Four Activities

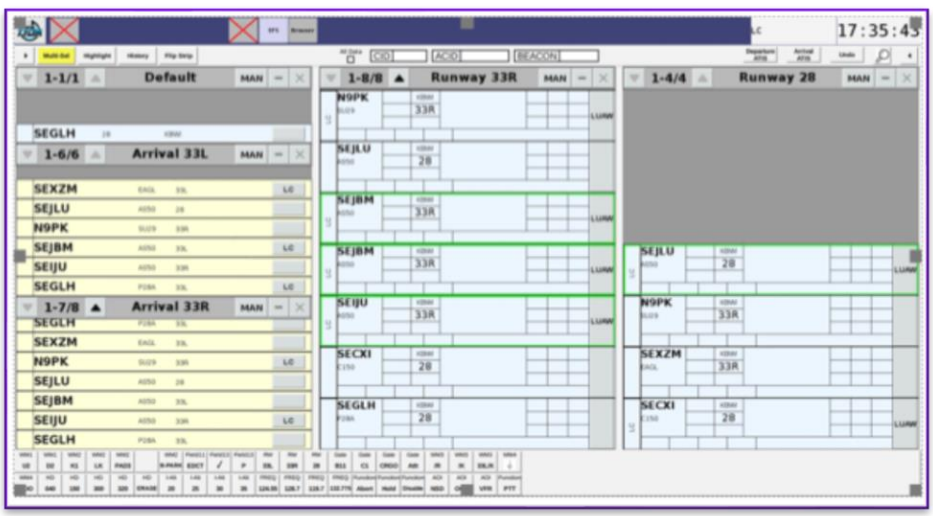
Activities

1

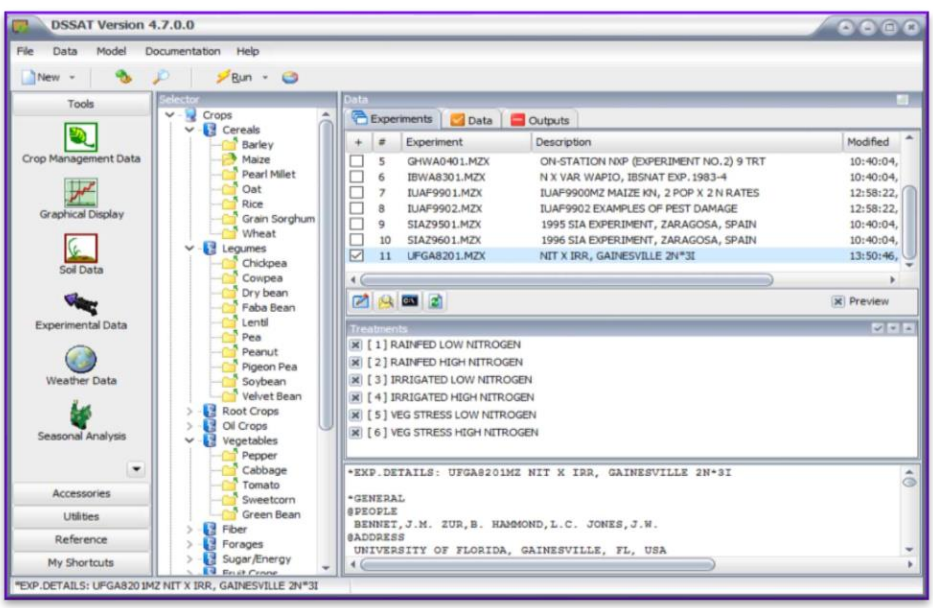
1. What is the main idea of Decision Support Systems?
2. Can you recall any software that helped you to make a decision?
3. How would you improve the software in Figure 1 and 2?
4. Can you recall any software that you used to make decisions?

2

Can you guess what industries might use these DSS?
Industry 1: _____



Industry 2: _____

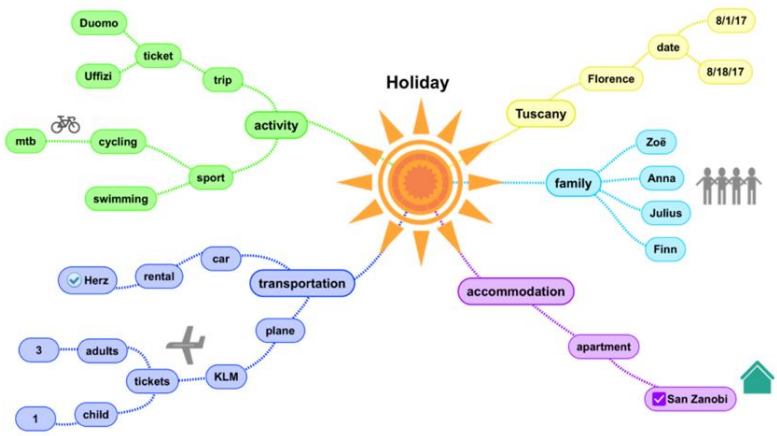


Resource Four Activities

Activities 3

There is a nice tool for your planning and decision making: **mind mapping**.

A mind map is a diagram used to organise information visually. A mind map is hierarchical and shows relationships among pieces of the whole. It is often created around a single concept, drawn as an image in the centre of a blank page, to which associated representations of ideas such as images, words and parts of words are added. Major ideas are connected directly to the central concept, and other ideas branch out from those major ideas. (https://en.wikipedia.org/wiki/Mind_map)
Many programs allow creating such maps (see an example below).



Creativity

Using one of any free software and any topic, please try to create one, so you can see the full spectre of opportunities and applications of this useful tool.

Resource Four
Further Reading

Explore

Look up online or check this journal: https://www.journals.elsevier.com/decision-support-systems.

A short overview of DSS: http://www.umsl.edu/~sauterv/analysis/488_f02_papers/dss.html

Resource Five Overview

Topic	Judgemental Adjustments (A Case Study)
A-Level Modules	Making operational decisions to improve performance; managing inventory and supply chains
Objectives	By the end of this resource, you will be able to: ✓ See how developments in technology are affecting decision making and activities in operations; ✓ Understand how operational decisions influence business strategies; ✓ Identify the connections between decision-making theory and practice.
Instructions	1. Read the data source 2. Complete the activities 3. Explore the further reading

Context

A **statistical model** is a mathematical model that embodies a set of statistical assumptions concerning the generation of some sample data and similar data from a larger population. A statistical model represents, often in considerably idealised form, the data-generating process.

Fast-Moving Consumer Goods (FMCG) are products that are sold quickly and at a relatively low cost. Examples include non-durable goods such as packaged foods, beverages, toiletries, over-the-counter drugs, and other consumables.

Stock replenishment is a restoration of stock or supply to a former level or condition.

Forecast evaluation is a process of estimating how correct forecasts are.

Resource Five Data Source

Taken from Anna Sroginis' thesis

Human adjustments to statistical forecasts might be beneficial since two main features of statistical and judgmental forecasting are combined: statistical baseline gives a more consistent forecast for the whole time series while individual adjustments can incorporate contextual information that is not taken into account by a statistical model for specific periods.

Since human judgment is widely used in many organisations, the analysis of available cases is essential for describing this process in detail and identifying critical open questions. We collected and analysed data from a UK-based major retail company. In this section, we discuss the forecasting process followed in the case company, highlighting when adjustments occur and the information sources used.

Figure 1

Screenshot of an example product

The case study is based on a retail company that focuses primarily on household and FMCG products. There are around 50 thousand products organised in 3 supercategories and around 20 categories. Only 20 thousand are regular items, and all others are either new or seasonal. The data has a lot of zero-demand periods (considering two years of weekly data). Moreover, items are heavily promoted, especially in the supercategory of FMCG (10 types of promotions and each type having many different durations).

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Resource Five
Data Source

The company uses the SAP F&R software for forecasting and replenishment, where the implemented algorithm switches forecasting models between non-promotional and promotional periods. The system plots sales and forecasts with indicators for promotional and seasonal events, which help demand planners visually access the quality of system forecasts. Figure 1 provides a screenshot, where the dark red line corresponds to actual sales and the light green one to the company's estimates. The horizontal lines under the graph represent different types of promotions. Various events, including seasonal events and holidays, are also colour coded and presented in the same box as promotional markers.

Figure 2

Forecasting process in the case company

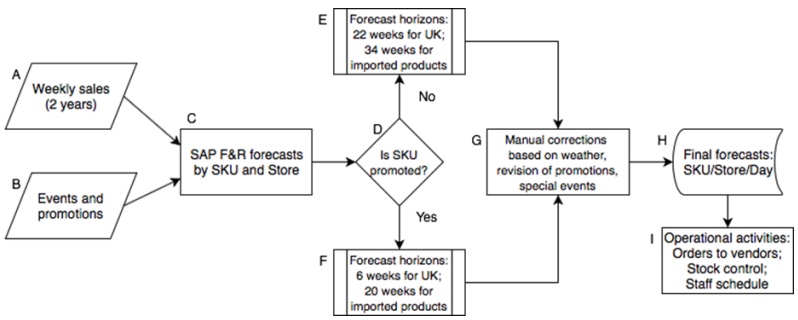

Figure 2 presents a flowchart of the forecasting process implemented in the case company. Initially, there are several inputs: a history of 120 weeks of sales as a base for its weekly forecasts; yearly promotional plans and calendar events (A and B input nodes in Figure 2).

In general, several operational forecast horizons depend on a type of a product (local/imported) and whether this product is on promotion or not. These horizons can be seen in boxes E and F in Figure 2.

Resource Five
Data Source

Statistical forecasts are produced at a store level for each SKU, weekly, using the SAP F&R system (Box C in Figure 2). Then these may be judgmentally adjusted based on weather, known special events and revisions of promotions (Box G). Finally, the resulting values are disaggregated into days and stored for the following operational activities: orders for distribution centres, stock control and staff scheduling (Boxes H and I respectively).

A critical problem of the F&R system is an absence of forecast evaluation. This is a common limitation of systems in practice, discussed by Ord, Fildes and Kourentzes (2017) (Chapter 13). According to Petropoulos et al. (2018), experts revise predictions better when provided with forecast bias feedback, which is also absent in the current process.

Resource Five Activities

Activities 1

1. What FMCG companies do you know?
2. Why do they do forecasting?
3. What is a replenishment system? Why companies need this?
4. What is the problem with the F&R system in this case?
5. How would you evaluate this forecasting process?

2

There is information about a hospital A&E unit. Look at Figure 3 below and answer the following questions.

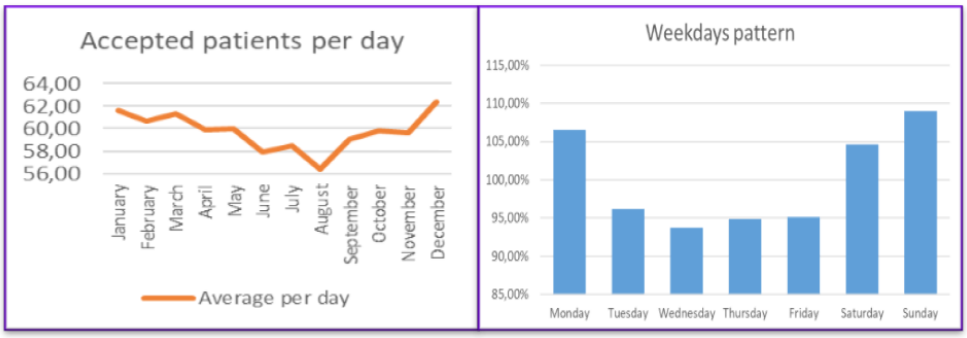

Figure 3: Accepted patients at a hospital and weekday patterns

Source Analysis

- What is the maximum number of patients on average?
- What is the minimum number of patients on average?
- Can you list at least two reasons why August has fewer injuries than any other month?
- How would you explain similar patterns on Saturdays, Sundays and Mondays?

Resource Five
Further Reading

Explore

Ord, K., Fildes, R., Kourentzes, N., 2017. Principles of Business Forecasting, 2nd Edition. Wessex Press Publishing Co.

Petropoulos, F., Kourentzes, N., Nikolopoulos, K., Siemsen, E., 2018. Judgmental Selection of Forecasting Models. Journal of Operations Management (May).

Resource Six Overview

Topic	Judgemental Forecasting Principles
A-Level Modules	Making operational decisions to improve performance; managing inventory and supply chains
Objectives	By the end of this resource, you will be able to: ✓ Demonstrate knowledge of terms, concepts, theories, methods to show an understanding of how individuals and organisations are affected by and respond to business issues; ✓ Analyse issues within a business, showing an understanding of the impact on individuals and organisations of external and internal influences ✓ Identify the connections between decision-making theory and practice
Instructions	1. Read the data source 2. Complete the activities 3. Explore the further reading
Context	**Uncertainty** is a situation which involves imperfect or unknown information. It applies to predictions of future events, to physical measurements that are already made, or to the unknown. **Archetype** is something that is considered to be a perfect or typical example of a particular kind of person or thing because it has all their most important characteristics.

Resource Six
Data Source

Adapted from 'Principle of Business Forecasting' (ord, Fildes and Kourentzes, 2017)

To summarise everything that we covered in the previous resources, a part of Judgmental Forecasting Principles from "Principles of Business Forecasting" book is provided below. Some ideas are specifically written for the forecasting context, but they can be easily adapted to the general decision making context. Following these principles can help to avoid some biases and problems that come with human decision-making process.

- **Identify the decision to be made and the inputs required to make that decision.**

We start with the decision to be made and then work backwards to determine what information is needed in order to make that decision. As we follow this reverse process, we should identify the key variables and how to measure them. Oftentimes, we may have to modify our objectives somewhat, because either the desired variable is not measurable or the information will not be available in time. At the end of this step, we should have a clear idea of the variables whose values we need to forecast.

- **In asking forecasting related questions, of individual experts or groups, develop clear wording for the questions, consider alternative versions, and always pretest.**

Consider the following two questions:

1. In extreme circumstances in a labour dispute, should employees have the right to withdraw their labour?
2. Should employers have legal means to terminate lengthy strikes that are damaging to the economy?

The two questions could both be interpreted as asking "Do you support employees' right to strike?" yet the responses may be very different. Even the two terms "withdraw their labour" and "strike" may evoke different responses. Thus, it is important to phrase questions clearly, to avoid emotive or ambiguous terms, and to pretest with individuals who are representative of those likely to respond, in order to ensure that the results will be meaningful.

Resource Six
Data Source

- Use multiple experts chosen for their different perspectives on the forecasting task.
- Ask experts to justify their decisions in writing.
- Keep records of past forecasts and use them to provide feedback.

Records can yield insights about both the events forecast and the performance of individual experts. This second feature is particularly useful when similar situations are examined on a continuing basis (e.g., new product evaluations or investment opportunities). Confidential feedback to individuals can also help them to calibrate their own forecasting performance.

- When carrying out a Delphi study, use between 5 and 20 experts who possess domain knowledge.
- Continue Delphi polling until the responses show stability; generally, three structured rounds are enough.
- Focus scenario construction on key strategic questions and uncertainties facing the organisation between now and the horizon year (rather than on general questions that fail to delineate key uncertainties).

Many scenarios are used to assess the timing of future events, such as when electric-powered automobiles will capture 25 per cent of the U.S. market. Careful wording is needed to ensure that everyone is considering the same issues.

- Use multiple scenarios to focus on uncertainties.

The progress of electric vehicles will depend upon relative fuel prices, technological issues relating to the development of batteries, the provision of recharging facilities, and government subsidies. Different scenarios should emphasise particular developments.

- Develop scenarios that characterise "extreme" archetypes aimed at capturing possible diverse futures.

Using archetypal cases allows the range of possibilities to be circumscribed so those resulting scenarios will be relevant to the context of the decision.

Resource Six Activities

Activities 1

1. How many experts are required to conduct successful Delphi study?
2. How many rounds for the Delphi method are needed?
3. Scenarios are great for _____ problems.
4. Why is it necessary to ask experts to justify their decisions in writing?
5. What type of feedback can you provide experts?
6. Why do companies need to keep records of past decisions?

Resource Six
Further Reading

Explore

Armstrong, J. S. (ed.) (2001). Principles of Forecasting: A Handbook for Researchers and Practitioners. Boston and Dordrecht: Kluwer.

Ord, K., Fildes, R., Kourentzes, N., 2017. Principles of Business Forecasting, 2nd Edition. Wessex Press Publishing Co.

Understanding Decision Making: https://courses.lumenlearning.com/principlesmanagement/chapter/11-2-understanding-decision-making/

Final Reflection

Deep Dive

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Reflection

Through the history of forecasting the role of judgment has changed from warning against the use of predictive human judgment due to less accurate estimation, biases and psychological issues, to the acceptance of the idea that judgmentally adjusted forecasts add value to organisations. In fact, even if the majority of statistical forecasts are more accurate than human predictions, people usually choose human methods showing a case of algorithm aversion.

In recent years, there has been an increasing interest in personal predictions in practice. Sanders and Manrodt (2003) found that 30.3% of 240 US corporations considered judgmentally focused methods as primary methods used in practice, while 41% of the companies use both judgmental and quantitative methods. Another surveys showed that a third of all forecasts were typically made using human judgment. These findings show how important human judgment is in business setting, in my research we aim to analyse how we can enhance this process and make it more unbiased.

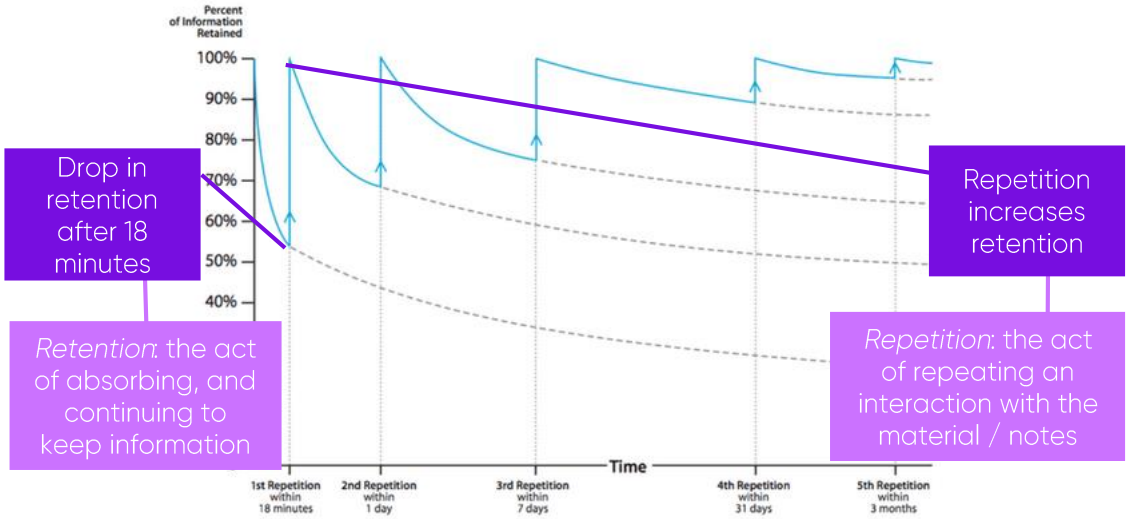
My research is interdisciplinary since it incorporates some principle of decision making, psychology and behavioural studies into the forecasting field (and that is what it makes it even more interesting and exciting). But also, the results could be integrated as a part of Forecasting Support Systems, having a direct impact on practice.

University Study Skills
Cornell Notes

Why is good note taking important?

If it feels like you forget new information almost as quickly as you hear it, even if you write it down, that's because we tend to lose almost 40% of new information within the first 24 hours of first reading or hearing it.

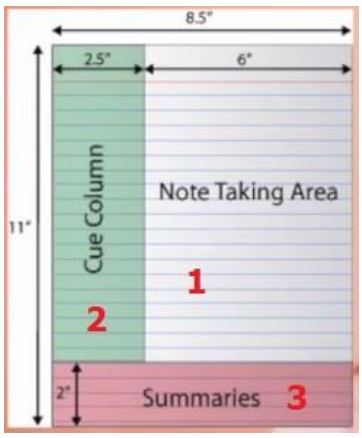
If we take notes effectively, however, we can retain and retrieve almost 100% of the information we receive. Consider this graph on the rate of forgetting with study/repetition:



Learning a new system

The Cornell Note System was developed in the 1950s at the University of Cornell in the USA. The system includes interacting with your notes and is suitable for all subjects. There are three steps to the Cornell Note System.

Step 1: Note-Taking



1. <u>Create Format</u>: Notes are set up in the Cornell Way. This means creating 3 boxes like the ones on the left. You should put your name, date, and topic at the top of the page.

2. <u>Write and Organise</u>: You then take your notes in area on the right side of the page. You should organise these notes by keeping a line or a space between 'chunks' /main ideas of information. You can also use bullet points for lists of information to help organise your notes.

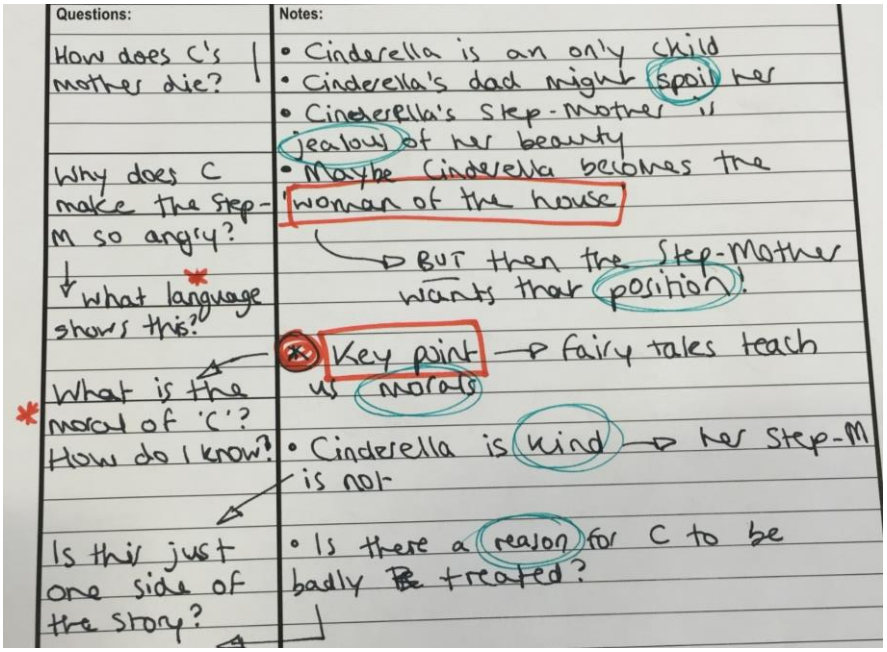
Step 2 Note-Making

1. Revise and Edit Notes: Go back to box 1, the note taking area and spend some time revising and editing. You can do this by: highlighting 'chunks' of information with a number or a colour; circling all key words in a different colour; highlighting main ideas; adding new information in another colour

2. Note Key Idea: Go to box 2 on the left hand side of the page and develop some questions about the main ideas in your notes. The questions should be 'high level'. This means they should encourage you to think deeper about the ideas. Example 'high level' questions would be:

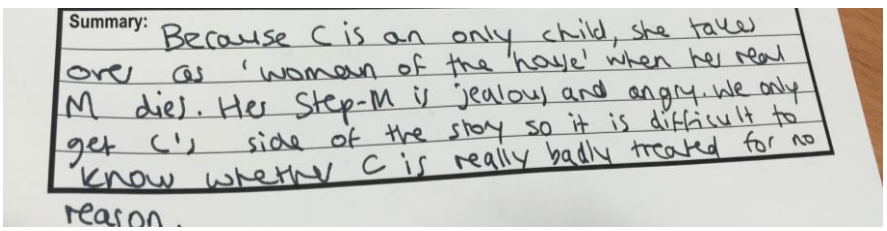
- Which is most important / significant reason for...
- To what extent...
- How does the (data / text / ideas) support the viewpoint?
- How do we know that...

Here is an example of step 1 and step 2 for notes on the story of Cinderella:



Step 3 Note-Interacting

1. Summary: Go to box 3 at the bottom of the page and summarise the main ideas in box 1 and answer the essential questions in box 2.



Give the Cornell Note Taking System a try and see if it works for you!

University Study Skills
Key Instruction Words

These words will often be used when university tutors set youu essay questions - it is a good idea to carefully read instruction words before attempting to answer the question.

Analyse – When you analyse something you consider it carefully and in detail in order to understand and explain it. To analyse, identify the main parts or ideas of a subject and examine or interpret the connections between them.

Comment on – When you comment on a subject or the ideas in a subject, you say something that gives your opinion about it or an explanation for it.

Compare – To compare things means to point out the differences or similarities between them. A comparison essay would involve examining qualities/characteristics of a subject and emphasising the similarities and differences.

Contrast – When you contrast two subjects you show how they differ when compared with each other. A contrast essay should emphasise striking differences between two elements.

Compare and contrast – To write a compare and contrast essay you would examine the similarities and differences of two subjects.

Criticise – When you criticise you make judgments about a subject after thinking about it carefully and deeply. Express your judgement with respect to the correctness or merit of the factors under consideration. Give the results of your own analysis and discuss the limitations and contributions of the factors in question. Support your judgement with evidence.

Define – When you define something you show, describe, or state clearly what it is and what it is like, you can also say what its limits are. Do not include details but do include what distinguishes it from the other related things, sometimes by giving examples.

Describe – To describe in an essay requires you to give a detailed account of characteristics, properties or qualities of a subject.

Discuss – To discuss in an essay consider your subject from different points of view. Examine, analyse and present considerations for and against the problem or statement.

University Study Skills
Key Instruction Words

Evaluate – When you evaluate in an essay, decide on your subject's significance, value, or quality after carefully studying its good and bad features. Use authoritative (e.g. from established authors or theorists in the field) and, to some extent, personal appraisal of both contributions and limitations of the subject. Similar to **assess**.

Illustrate – If asked to illustrate in an essay, explain the points that you are making clearly by using examples, diagrams, statistics etc.

Interpret – In an essay that requires you to interpret, you should translate, solve, give examples, or comment upon the subject and evaluate it in terms of your judgement or reaction. Basically, give an explanation of what your subject means. Similar to **explain**.

Justify – When asked to justify a statement in an essay you should provide the reasons and grounds for the conclusions you draw from the statement. Present your evidence in a form that will convince your reader.

Outline – Outlining requires that you explain ideas, plans, or theories in a general way, without giving all the details. Organise and systematically describe the main points or general principles. Use essential supplementary material, but omit minor details.

Prove – When proving a statement, experiment or theory in an essay, you must confirm or verify it. You are expected to evaluate the material and present experimental evidence and/or logical argument.

Relate – To relate two things, you should state or claim the connection or link between them. Show the relationship by emphasising these connections and associations.

Review – When you review, critically examine, analyse and comment on the major points of a subject in an organised manner

University Guidance

Exploring Careers and Study Options

- ✓ Find job descriptions, salaries and hours, routes into different careers, and more at https://www.startprofile.com/
- ✓ Research career and study choices, and see videos of those who have pursued various routes at http://www.careerpilot.org.uk/
- ✓ See videos about what it's like to work in different jobs and for different organisations at https://www.careersbox.co.uk/
- ✓ Find out what different degrees could lead to, how to choose the right course for you, and how to apply for courses and student finance at https://www.prospects.ac.uk/
- ✓ Explore job descriptions and career options, and contact careers advisers at https://nationalcareersservice.direct.gov.uk/
- ✓ Discover which subjects and qualifications (not just A levels) lead to different degrees, and what careers these degrees can lead to, at http://www.russellgroup.ac.uk/media/5457/informed-choices-2016.pdf

Comparing Universities

- ✓ https://www.whatuni.com/
- ✓ http://unistats.direct.gov.uk/
- ✓ https://www.thecompleteuniversityguide.co.uk/
- ✓ Which? Explorer tool – find out your degree options based on your A level and BTEC subjects: https://university.which.co.uk/

UCAS

- ✓ Key dates and deadlines: https://university.which.co.uk/advice/ucas-application/ucas-deadlines-key-application-dates
- ✓ Untangle UCAS terminology at https://www.ucas.com/corporate/about-us/who-we-are/ucas-terms-explained
- ✓ Get advice on writing a UCAS personal statement at https://www.ucas.com/ucas/undergraduate/getting-started/when-apply/how-write-ucas-undergraduate-personal-statement
- ✓ You can also find a template to help you structure a UCAS statement, at https://www.ucas.com/sites/default/files/ucas-personal-statement-worksheet.pdf
- ✓ How to survive Clearing: https://university.which.co.uk/advice/clearing-results-day/the-survivors-guide-to-clearing

Subject Guidance

Business Studies at University

- ✓ Studying business at university involves learning about various elements of business operations to examine how they all work together to allow successful businesses to thrive
- ✓ Often learning about business involves case studies and business based projects where students are given the opportunity to explore for themselves real life challenges business face and tactics to over come them.
- ✓ To compliment the employability needs of business students, the manner of learning in the classroom entails, group projects and presentations, which will help develop the skills you will need.

A Deeper Look Into Business

- ✓ **Listen: To understand the difference between managing and leading employees** https://www.youtube.com/watch?v=d_HHnEROy_w
- ✓ **Listen:** To examine how contemporary issues can create business opportunities https://www.bbc.co.uk/programmes/m00025d6.
- ✓ **Read: For greater knowledge on the role of leadership in businesses** Bryman, A. (Ed.). (2011). *The SAGE handbook of leadership*. Sage Publications.
- ✓ **Browse:** The latest changes and updates from the business world https://www.bbc.co.uk/news/business

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