Managerial Economics

Lecture Notes

© Prof. Dr. Stephan Huber

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Preface

About the notes

A PDF version of these notes is available here.

Please note that while the PDF contains the same content, it has not been optimized for PDF format. Therefore, some parts may not appear as intended.

- These notes aims to support my lecture at the HS Fresenius but are incomplete and no substitute for taking actively part in class.
- I appreciate you reading it, and I appreciate any comments.
- This is work in progress so please check for updates regularly.
- For making an appointment, you can use the online tool that you find on my private homepage: https://hubchev.github.io/

About the author

Figure 1: Prof. Dr. Stephan Huber

I am a Professor of *International Economics and Data Science* at HS Fresenius, holding a Diploma in Economics from the University of Regensburg and a Doctoral Degree (summa cum laude) from the University of Trier. I completed postgraduate studies at the Interdisciplinary Graduate Center of Excellence at the Institute for Labor Law and Industrial Relations in the European Union (IAAEU) in Trier. Prior to my current position, I worked as a research assistant to Prof. Dr. Dr. h.c. Joachim Möller at the University of Regensburg, a post-doc at the Leibniz Institute for East and Southeast European Studies (IOS) in Regensburg, and a freelancer at Charles University in Prague.

Throughout my career, I have also worked as a lecturer at various institutions, including the TU Munich, the University of Regensburg, Saarland University, and the Universities of Applied Sciences in Frankfurt and Augsburg. Additionally, I have had the opportunity to teach abroad for the University of Cordoba in Spain, the University of Perugia in Italy, and the Petra Christian University in Surabaya, Indonesia. My published work can be found in international journals such as the Canadian Journal of Economics and the Stata Journal. For more information on my work, please visit my private homepage at hubchev.github.io.

Contact:

Prof. Dr. Stephan Huber
Hochschule Fresenius für Wirtschaft & Medien GmbH
Im MediaPark 4c
50670 Cologne
Office: 4e OG-3
Telefon: +49 221 973199-523
Mail: stephan.huber@hs-fresenius.de
Private homepage: www.hubchev.github.io
Github: https://github.com/hubchev

About this course

Workload: 125 h = 42 h (in-class) + 21 h (guided private study hours) - 62 h (private self-study).

Assessment Students complete this module with a written exam of 90 minutes. A passing grade in this module is achieved when the overall grade is greater than or equal to 4.0.

Learning outcomes: After successful completion of the module, students are able to:

- describe how tools of standard price theory, location theory, production theory, and the theory of investment decision can be employed to formulate a decision problem,
- evaluate alternative courses of action and choose among alternatives,
- apply economic concepts and techniques in evaluating strategic business decisions taken by firms,
- apply the knowledge of the mechanics of supply and demand to explain the functioning of markets.

How to prepare for the exam: I am convinced that reading the lecture notes, preparing for class, taking actively part in class, and trying to solve the exercises without going straight to the solutions is the best method for students to

- maximize leisure time and minimize the time needed to prepare for the exam, respectively,
- getting long-term benefits out of the course,
- improve grades, and
- have more fun during lecture hours.

Literature: Bazerman and Moore [2012], Hoover and Giarratani [2020], Parkin et al. [2017], Wilkinson [2022], Bonanno [2017]

Content:

0.0.0.0.1 * Price theory

- the market price of an efficient competitive market and sources of inefficiency
- the impact of supply and demand on the market price
- the output and price decision of a profit maximizing monopolist
- regional market power and price setting

0.0.0.0.2 * Production and cost theory

- output and costs of firms in the short and long run
- optimization under constraints (Lagrangian multiplier)
- cost-volume-profit analysis

0.0.0.0.3 * Location theory

- Hotelling's location model
- Thünen's model of agricultural land use
- location fundamentals and agglomeration forces (sharing, matching, learning)

0.0.0.0.4 * Strategic behaviour of firms

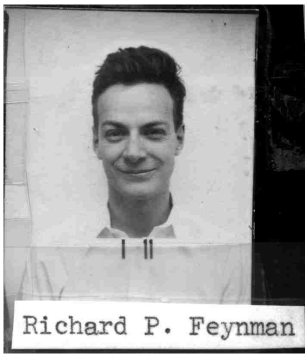
- nature, scope, and elements of game theory
- static games
- limitations

0.0.0.0.5 * Investment decisions

- net present value
- internal rate of return
- decision-making under risk
- decision-making under uncertainty
- common pitfalls in investment decisions

How to prepare for the exam

Figure 2: Richard P. Feynman's Los Alamos ID badge



Source: *https://en.wikipedia.org/wiki/File:Richard_Feynman_Los_Alamos_ID_badge.jpg*

Richard P. Feynman (1918-1988) was a team leader at the Manhatten Project (see Figure 2) and won the Nobel Prize in 1965 in physics. He once said:

> "I don't know what's the matter with people: they don't learn by understanding; they learn by some other way – by rote, or something. Their knowledge is so fragile!" [Feynman, 1985]

Of course, the key to learning is understanding. However, I believe that there is no understanding without practice, that is, solving problems and exercises by yourself with a pencil and a blank sheet of paper without knowing the solution in advance. Thus, I recommend the following:

- Attend lectures and and take the opportunity to ask questions and actively participate in class.
- Study the lecture notes and work on the exercises.
- Review the material regularly each week. Learning in small increments is more effective than last-minute cramming.
- Test yourself with past exams that you find in the appendix.
- If you have the opportunity to form a study group, make use of it. It is great to help each other, and it is very motivating to see that everyone has problems sometimes.
- If you have difficulties with some exercises and the solutions shown do not solve your problem, ask a classmate or contact me.

1 What is managerial economics?

Learning outcomes

- Understand the core principles and scope of managerial economics.
- Analyze the application of managerial economics in personal and professional decision-making.
- Explain the connections between managerial economics and other social science disciplines.

As a student, you might wonder what managerial economics really is. Well, there isn't a single well-accepted definition. However, there are certain ideas that many people agree on.

In simple terms, managerial economics is about applying economic theories to make better decisions in business and management. It's about using tools from economics to solve real-world problems that companies face every day. That means, any sort of method, information, and knowledge from economic research that can help managers in making good decisions.

If you're curious about what most people mean by managerial economics, sources like Wikipedia can give you a good starting point. While I wouldn't suggest citing Wikipedia in academic papers[1] or using ChatGPT to generate text, it can provide helpful, widely accepted definitions and give you an overview of the topic.

1.1 What is managerial economics for Wikipedia?

Read https://en.wikipedia.org/wiki/Managerial_economics

1.2 What is managerial economics for ChatGPT?

1.2.1 Me: Define managerial economics.

ChatGPT (4.0):

Managerial economics is a discipline that combines economic theory with managerial practice. It helps in analyzing business situations and decision-making processes within an organization. By applying microeconomic principles and tools, managerial economics aids managers in planning, optimizing resource use, forecasting future conditions, and making strategic decisions that enhance the organization's performance. It encompasses various aspects of both economics and business, such as demand analysis, production and cost functions, pricing strategies, risk analysis, and capital budgeting.
Key areas of focus in managerial economics include:

[1] Wikipedia is generally considered a secondary source.

Demand Analysis and Forecasting: Understanding consumer behavior and predicting future market trends to make informed decisions.
Production and Cost Analysis: Evaluating the production process and cost functions to optimize efficiency and reduce expenses.
Pricing Decisions: Developing pricing strategies that maximize profits while remaining competitive in the market.
Profit Management: Analyzing profit margins and identifying ways to increase overall profitability.
Risk and Uncertainty Analysis: Assessing and managing risks associated with business decisions.
Capital Budgeting: Making decisions about long-term investments and capital expenditures.
Overall, managerial economics provides a framework for systematically thinking about business decisions and executing strategies to achieve organizational objectives.

1.2.2 Me: What distinguishes managerial economics from Microeconomics and Macroeconomics?

ChatGPT (4.0):

Managerial economics, microeconomics, and macroeconomics are all subfields of economics, but they differ in their focus, scope, and application. Here's how they are distinguished from one another:
Managerial Economics
Scope and Focus:
Organizational Level: Primarily focuses on the firm or organization, aiming to solve specific managerial and business problems.
Decision-Making: Applies economic theories and principles to managerial decision-making processes, such as pricing, production, costs, and resource allocation.
Practical Application: Designed to be directly applicable by managers for optimizing business operations and strategic planning.
Microeconomics
Scope and Focus:
Individual and Firm Level: Concentrates on the behaviors of individuals, households, and firms.
Market Mechanisms: Studies how these entities interact within markets, how prices are determined, and how resources are allocated.
Theoretical Framework: Provides the underlying theories that explain demand and supply, elasticity, consumer behavior, production, and costs.
Macroeconomics
Scope and Focus:
Economy-Wide Perspective: Looks at the entire economy rather than individual units.
Aggregate Indicators: Studies large-scale economic factors such as national income, unemployment rates, inflation, GDP, and overall economic growth.
Policy Implications: Often deals with government policies, monetary and fiscal policy, and their impact on the economy as a whole.
Key Differences
Scale:

Managerial Economics: Focuses on optimizing decisions within individual firms or organizations.
Microeconomics: Explores the behavior of individual agents such as consumers and firms.
Macroeconomics: Examines aggregate economic variables and economy-wide phenomena.
Application:
Managerial Economics: Directly used by managers to make practical business decisions.
Microeconomics: Provides foundational theories that inform both managerial economics and broader economic policies.
Macroeconomics: Used by policymakers to shape economic policy and understand economic fluctuations on a national or global scale.
Objective:
Managerial Economics: Goal-oriented towards improving organizational efficiency and profitability.
Microeconomics: Aims to understand the fundamental aspects of supply and demand and market mechanisms.
Macroeconomics: Seeks to explain economic trends and issues that affect the economy as a whole.
In essence, while managerial economics draws heavily from microeconomic theories, it is distinct in its focus on practical application within firms. Macroeconomics, on the other hand, operates at a higher level of abstraction, dealing with broad economic indicators and policies.

1.3 What is economics?

All economic questions arise because we want more than we can get. Our inability to satisfy all our wants is called scarcity and because of scarcity, we must make choices that depend on the incentives we face. An incentive is a reward that encourages or a penalty that discourages an action.

Economics is a social science, and as in all social sciences, many of the terms used in it are poorly defined. The following quotes can demonstrate that:

> John Maynard Keynes (1883-1946): "The theory of economics does not furnish a body of settled conclusions immediately applicable to policy. It is a method rather than a doctrine, an apparatus of the mind, a technique of thinking, which helps it possessors to draw correct conclusions." Keynes [1921]

> Alfred Marshall (1842-1924): "Economics is a study of mankind in the ordinary business of life; it examines that part of individual and social action which is most closely connected with the attainment and with the use of the material requisites of wellbeing." Marshall [2009, p. 1]

> Gary S. Becker (1930-2014): "Economics is all about how people make choices. Sociology is about why there isn't any choice to be made." Becker [1960, p. 233]

> Colander [2006, p. 4]: "Economics is the study of how human beings coordinate their wants and desires, given the decision-making mechanisms, social customs, and political realities of the society."

> Parkin [2012, p. 2]: "Economics is the social science that studies the choices that individuals, businesses, governments, and entire societies make as they cope with scarcity and the incentives that influence and reconcile those choices."
>
> Gwartney et al. [2006, p. 5.]: "[E]conomics is the study of human behavior, with a particular focus on human decision making."
>
> Backhouse and Medema [2009, p. 222]: "[E]conomics is apparently the study of the economy, the study of the coordination process, the study of the effects of scarcity, the science of choice, and the study of human behavior."
>
> Greenlaw and Shapiro [2022, ch. 1]: Economics seeks to solve the problem of scarcity, which is when human wants for goods and services exceed the available supply. A modern economy displays a division of labor, in which people earn income by specializing in what they produce and then use that income to purchase the products they need or want. The division of labor allows individuals and firms to specialize and to produce more for several reasons: a) It allows the agents to focus on areas of advantage due to natural factors and skill levels; b) It encourages the agents to learn and invent; c) It allows agents to take advantage of economies of scale. Division and specialization of labor only work when individuals can purchase what they do not produce in markets. Learning about economics helps you understand the major problems facing the world today, prepares you to be a good citizen, and helps you become a well-rounded thinker.
>
> Backhouse and Medema [2009, p. 222]: "Perhaps the definition of economics is best viewed as a tool for the first day of principles classes but otherwise of little concern to practicing economists."
>
> Jacob Viner (1892-1970): "Economics is what economists do." Backhouse and Medema [2009, p. 222]
>
> Parkin [2012, p. 2]: "Microeconomics is the study of the choices that individuals and businesses make, the way these choices interact in markets, and the influence of governments. [...] Macroeconomics is the study of the performance of the national economy and the global economy."

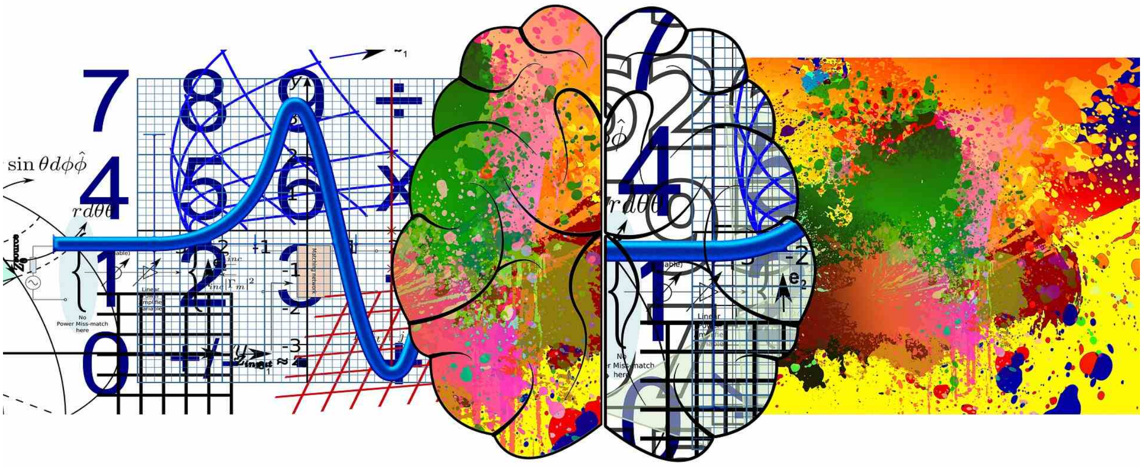
Although many textbook definitions are quite similar in many ways, the lack of agreement on a clear-cut definition of economics does not really matter and does not necessarily pose a problem as

> "[E]conomists are generally guided by pragmatic considerations of what works or by methodological views emanating from various sources, not by formal definitions." Backhouse and Medema [2009, p. 231]

The important questions of economics: How do choices end up determining what, where, how, and for whom goods and services get produced? And: When do choices made in the pursuit of self-interest also promote the social interest?

Exercise 1.1. Brain

Figure 1.1: From data to decision



Source: https://pixabay.com/images/id-6671455

I am the author of the Managerial Economics course and I am currently looking for a cover image for my book. I have reached out to several art and marketing companies for suggestions. Now imagine you are a sales representative from one of these companies and you have designed the cover shown in the image Figure 1.1. You have three minutes to make a compelling sales pitch that convinces me to choose your design. What would you say in those three minutes?

2 Decision making basics

Learning outcomes

- Make informed decisions with a clear understanding of their nature and purpose.
- Identify and explain the trade-offs involved in decision-making processes.
- Describe the different characteristics of various types of decisions.
- Utilize a range of decision-making strategies effectively.
- Explain the rational decision-making model and the concept of homo economicus.
- Discuss the concept of bounded rationality and its impact on human decision-making.
- Apply heuristics to enhance decision-making in practical situations.

Required readings

Section 11.2 of Saylor Academy [2002].

2.1 Definition: decision

The statement of Eilon [1969] still holds true:

> "An examination of the literature reveals the somewhat perplexing fact that most books on management and decision theory do not contain a specific definition of what is meant by a decision. One can find detailed descriptions of decision trees, discussions of game theory and analyses of various statistical treatments of payoffs matrices under conditions of uncertainty, but the definition of the decision activity itself is often taken for granted and is associated with making a choice between alternative courses of action."

The word *decision* stems from the latin verb *decidere* which can have different meanings including

- make explicit,
- put an end to,
- bring to conclusion,
- settle/decide/agree (on),
- die,
- end up,
- fail,
- fall in ruin,
- fall/drop/hang/flow down/off/over,
- sink/drop,
- cut/notch/carve to delineate,
- detach,
- cut off/out/down,

- fell.

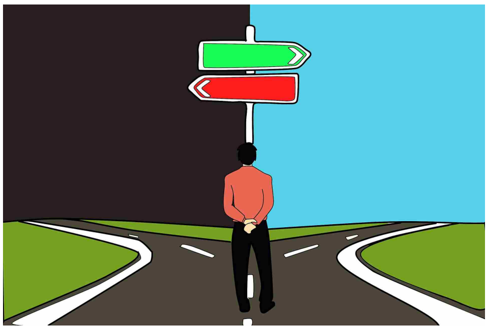
Wikipedia [2024] defines **decision making** as follows:

> "In psychology, decision-making [...] is regarded as the cognitive process resulting in the selection of a belief or a course of action among several alternative possibilities. Decision-making is the process of identifying and choosing alternatives based on the values, preferences and beliefs of the decision-maker. Every decision-making process produces a final choice, which may or may not prompt action. [...] Decision-making can be regarded as a problem-solving activity yielding a solution deemed to be optimal, or at least satisfactory. It is therefore a process which can be more or less rational or irrational..."

Let's agree on the following working definition that is symbolized in Figure 2.1:

> Fitzgerald [2002, p. 8]: "A decision is the point at which a choice is made between alternative—and usually competing—options. As such, it may be seen as a stepping-off point—the moment at which a commitment is made to one course of action to the exclusion of others."

Figure 2.1: Decision-making



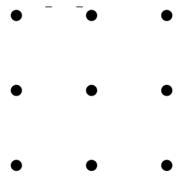
Source: Picture is taken from https://pixabay.com/de/illustrations/entscheidung-auswahl-pfad-stra%C3%9Fe-1697537

Exercise 2.1. Why are you studying here?
There are probably many personal reasons why you have chosen your study program. Take a moment to think about the decisions that led you to choose this program. Think back to the moment you signed the contract - was it a difficult decision? What factors influenced your choice? Perhaps you had several options; why did you ultimately choose this degree program? Think about your decision-making process and write a short summary of how you came to this decision.

Exercise 2.2. Solve the puzzles

a) **The nine dots problem** Connect the dots shown in figure Figure 2.2 with no more than 4 straight lines without lifting your hand from the paper.

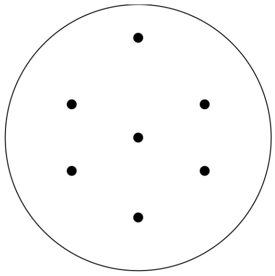
Figure 2.2: The nine dots problem



b) **The tasty cake puzzle** In figure Figure 2.3 you see a tasty cake with the nine dots representing strawberries. Cut this cake up with exactly four straight cuts so that each portion of the cake contains just one strawberry on the top.

Reflect on how you tried to solve the puzzles. Did you have a problem solving strategy? How did you come to the right decision? Think of restrictions you imposed on yourself which was not inherent to the problem.

Figure 2.3: The tasty cake puzzle

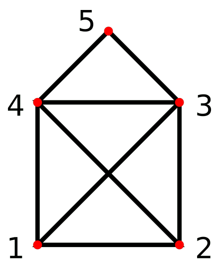


c) **The house of Santa Claus** The house of Santa Claus is an old German drawing game. It goes like this: You have to draw a house in one line where you

(1) must start at bottom left (point 1),
(2) you are not allowed to lift your pencil while drawing and
(3) it is forbidden to repeat a line.

During drawing you say: “Das ist das Haus des Nikolaus”. What do you think is the success-rate of kids who play this game for the first time?

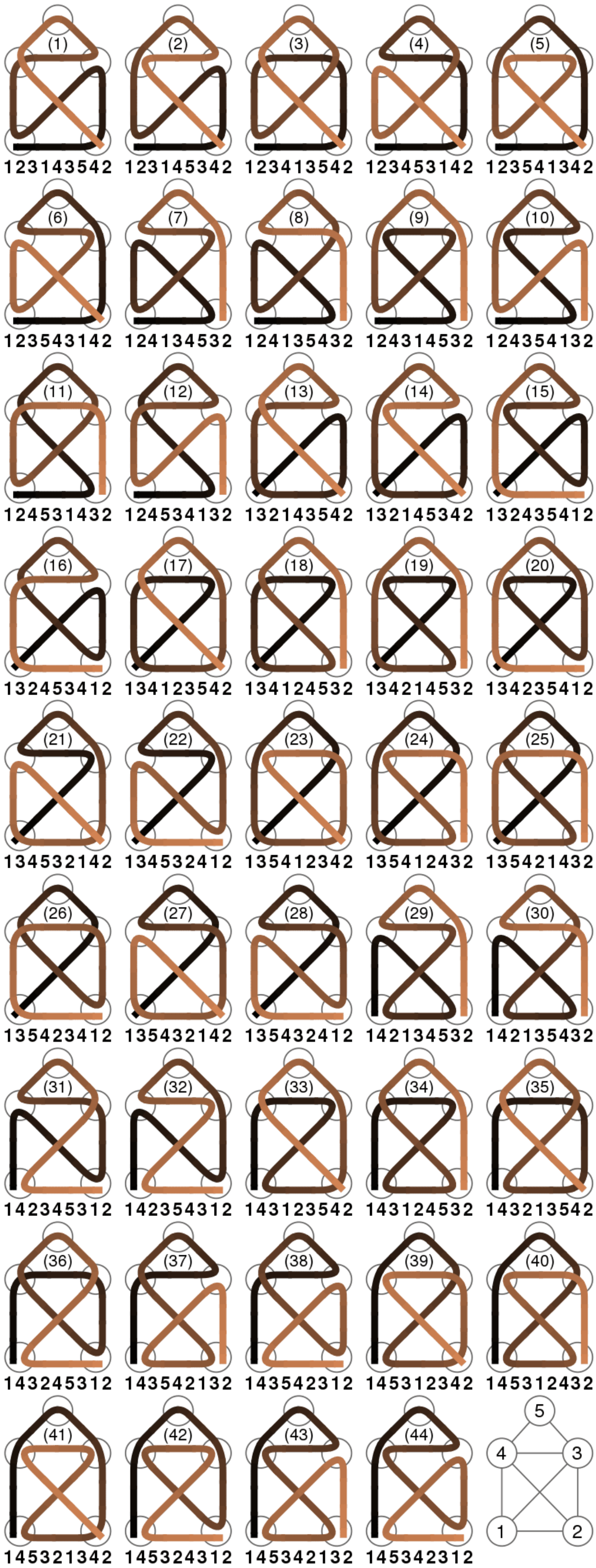
Figure 2.4: The house of Santa Claus



Solution

Solution 2.1. There are 44 solutions (see Figure 2.5) and only 10 different ways to fail (see Figure 2.6). Thus, the probability to fail is about 18.5% and hence the probability to succeed is about 81.5%.

Figure 2.5: Forty-four ways to solve the puzzle



Taken from https://de.wikipedia.org/wiki/Haus_vom_Nikolaus.

2.2 How to characterize decisions

Decision making is a process of investing time and effort to make a decision that leads to a results. Before we talk about the results, let's discuss some (stereo) types of decisions that can help to design an appropriate decision making process. Using stereotypes and categorizations can be beneficial as they simplify complexities and provide guidance. For example, we often employ stereotypes to appropriately engage with others. When encountering a person dressed formally, it is generally advisable to approach them in a professional manner, even when uncertain of their preferences. In this case, our prior experiences help guide our behavior based on stereotypes.

According to Fitzgerald [2002, p. 9f] decisions can be roughly divided into two generic types:

- **Routine decisions**: Decisions that must be made at regular intervals.
- **Non-routine**: Unique, random, non-recurring decision situations.

Another common method of dividing decisions into two categories is as follows:

- **Operative decisions**: This type of decision usually involves day-to-day business operations. There is a lot of overlap with the routine category here. Examples of this type of decision include
  - setting production levels,
  - determining employee work shifts for the upcoming week to ensure adequate coverage,
  - coordinating daily delivery routes for distributing products to customers,
  - deciding to stop production or fix a problem if quality standards are not met during routine inspections, or, when it comes to decisions in our daily lives,
  - where, what, when, and what to eat for lunch.
- **Strategic decisions**: These decisions typically concern long-term company policies and direction. Examples include
  - entering a new market or exiting an industry,
  - choosing a corporate design, or
  - acquiring a competitor.
  - In our personal lives, a strategic decision might be choosing between renting an apartment near the university or commuting from our parents' home.

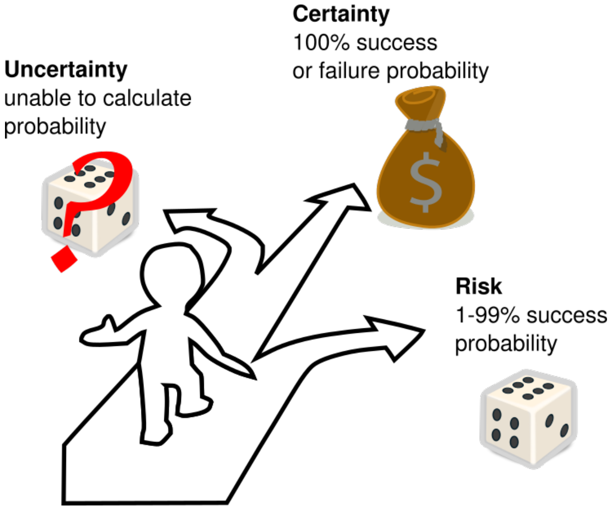
People often distinguish between **decisions at work** and **private decisions**. Private decisions affect fewer people on average, but usually the people involved are closer to you personally. However, both types of decisions involve the same things such as people (human resources), money (budgeting), buying and selling (marketing), how we do something (operations) or how we want to do it in the future (strategy and planning).

Some decisions are more important than others because the potential impact of a decision varies, that is, the **scope of a decision**. For example, decisions can affect one person or millions, one pound/dollar or millions, one product/service or an entire market, one day or ten years, etc.

However, it is not entirely clear how to validate the scope. It depends heavily on the perspective of the decision-maker. For a small company, for example, an investment of 10,000 euros may be a big decision, while for a multinational cooperation it is a drop in the ocean. So the scope for decisions is relative, not absolute. It depends entirely on the context in which the decision is made and on the characteristics of the person(s) making it.

There are three general conditions (see Figure 2.7) that determine the design of the optimal decision making process:

Figure 2.7: Conditions of decision making



Source: CEOpedia [2021]

1. **Certainty:** A condition under which taking a decision involves reasonable degree of certainty about its result, what are the opportunities and what conditions accompany this decision.
2. **Risk:** A condition under which taking a decision involves reasonable degree of certainty about its result, what are the opportunities and what conditions accompany this decision.
3. **Uncertainty:** A condition in which decision maker does not know all the choices, as well as risks associated with each of them and possible consequences.

2.3 Rationality

2.3.1 The rational model

A choice can be considered as a rational one when a individual decides for the best alternative courses of action. That is, the alternative with the greatest benefit over cost for the individual making the choice. Whatever the benefits and the costs maybe, a decision maker has to consider all and make a decision. Of course, in reality it is often difficult if not impossible to sum up benefits and costs as the nature of both may be totally different. That is what makes decision often so difficult.

The nature of costs and benefits is manifold and emotions in general are hard to quantify and take as a basis for a decision. To deal with that economists use a theoretical concept that measures everything in **utility**. That is a general and abstract measure to model worth or value. Its usage has evolved significantly over time. The term was introduced initially as a measure of pleasure or happiness within the theory of utilitarianism. For example, it represents the satisfaction or pleasure that people receive for consuming a bundle of goods and services.

Definition: Rational decision

A rational decision is the result of a logical and systematic process in which the decision-maker evaluates

- all relevant and available information about

- all possible courses of action (a.k.a., alternatives) and
- all their potential outcomes,

aiming to choose the option that maximizes utility, where utility increases with benefits and decreases with costs.

The rational model assumes that actors always act in a way that maximizes their utility (as consumers) and profit (as producers) and that they are capable of arbitrarily complex considerations. This means that they consider all possible outcomes and choose the course of action that leads to the best result. In economics, this is known as the *homo economicus* assumption, which is a paraphrase of the assumption of perfect rationality. Of course, this assumption is highly idealized, and it is doubtful that any serious economist has ever believed it to be completely true in reality. It is important to understand the limitations of this assumption in order to make good decisions. Therefore, we will discuss the limitations in detail later. All in all, it is a useful assumption that is indispensable in theoretical research and simplifies many things in practical analysis. It makes it possible to make predictions and explain behavior to a certain extent.

Here is an example of a logical and systematic sequence of steps for making a decision, as outlined similarly by Fitzgerald [2002, p. 13]:

1. **Clearly identify the problem**. A *problem* is defined as the perceived gap between the current situation and the desired outcome.
2. **Generate potential solutions**. For routine decisions, various alternatives can be easily identified using established decision rules. However, non-routine decisions require a creative process to discover new alternatives.
3. **Select a solution**. Using appropriate analytical approaches, choose the alternative with the highest expected value. In decision theory, this is referred to as **maximizing the expected utility** of the outcomes.
4. **Implement the solution**. Successful implementation requires ensuring that those responsible understand and accept their roles, and have the necessary motivation and resources for success.
5. **Evaluate and improve**. Assess the effectiveness of the decision and refine the process for future improvements.

Exercise 2.3. Poor and irrational decisions
People make poor decisions all the time. They smoke, take drugs, and harm themself in various ways, make seemingly stupid things that they regret instantaneously. Do all these people act irrational? And, what is a poor decision? What is a stupid thing? The more you think about all that the more challenging it becomes to stay within a logically consistent framework where the meaning of words doesn't change.
Discuss whether taking drugs can be considered a rational choice.

Solution

Taking drugs are usually considered to be a "stupid" idea because drugs (if not taken for medical purpose) usually don't solve problems and causes addiction and bad side effects. However they may give some sort of relieve for some short period of time. Thus, taking drugs can be considered as a rational choice for people that have strong time preferences (i.e., people that can't take the (emotional) pain now and want to postpone it), don't fear side effects, and have little or no hope that things will get better later or that taking any other alternative would help them solving their problem. For those people it is, at least from their perspective, a rational choice.
Overall, I would tend to argue that taking drugs can be a rational choice if these individuals consider all (!) alternative and all (!) information available and if they analyze all (!) relevant aspects without a bias.
If all that hold, we can disagree and we can try our best to convince these individuals that there are better alternative courses of action. Of course, we can and I believe, we should support those human beings not taking drugs. For example, we can teach them to be more optimistic and hence weight the chances that problems can be solved better. However, we cannot claim that their decision is irrational given the conditions mentioned above hold.
Often the conditions to not hold as desperate people are not capable to use all the information without a bias. This gives bystanders such as relatives, friends, and other authorities the legitimate to interfere. For example, doctors and national authorities can send people that are not capable to act rational to a psychological institute until they have the ability to rationally make a decision.

2.3.2 Irrationality

While the rational model is useful, it can also be criticized in a number of ways. One key misconception is that managers always optimize their decisions through rationality, consciously selecting and implementing the best alternatives. However, this belief rests on several questionable assumptions, as outlined by Fitzgerald [2002, p. 13]:

- It is rarely possible to know in advance all possible alternative solutions and predict their specific outcomes.
- The assumption that there is always an optimal solution among the identified alternatives may not hold true.
- Accurately and numerically weighting the alternatives, their outcome probabilities, and the relative desirability of these outcomes is often impractical.
- Decision-makers are not always purely rational; emotions, biases, and organizational politics frequently influence the process.
- Business decisions are not exclusively driven by the desire to maximize profits.

The **rational model is considered normative** because it prescribes a strict, logical sequence of steps to follow in any decision-making process. It is based on the assumption that human behavior is logical and therefore predictable in certain conditions. However, this doesn't always reflect real-world decision-making. For example, findings from behavioral economics reveal that the concept of *homo economicus*, while useful, is flawed in several key aspects.

After all, what would happen if economics adopted the opposite extreme, assuming individuals act irrationally? If actors behaved randomly and unpredictably, we would struggle to make any predictions, and the future would resemble a random walk. Science itself would become meaningless and unnecessary.

Clearly, the extreme of irrationality isn't a viable alternative. So, what can we do? We can identify, explain, and account for the limitations of the *homo economicus* assumption in both theory and empirical analysis. Economists, and anyone applying or studying economic theories, should be aware of the pitfalls in human decision-making and recognize that our ability to act rationally is often limited.

2.3.3 Bounded rationality

Figure 2.8: Herbert A. Simon

(a) (#fig:simon)

Source: Picture is taken from Nobel Foundation archive.

Herbert A. Simon (1916-2001) shown in figure Figure 2.8 received the Nobel Memorial Prize in Economic Sciences in 1978 and the Turing Award[1] in 1975. According to NobelPrize.org [2021], he

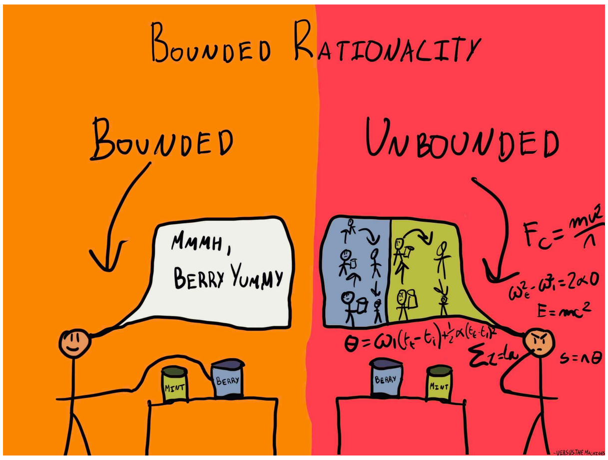
> "combined different scientific disciplines and considered new factors in economic theories. Established economic theories held that enterprises and entrepreneurs all acted in completely rational ways, with the maximization of their own profit as their only goal. In contrast, Simon held that when making choices all people deviate from the strictly rational, and described companies as adaptable systems, with physical, personal, and social components. Through these perspectives, he was able to write about decision-making processes in modern society in an entirely new way".

In particular, he proposed **bounded rationality** as an alternative basis for the mathematical and neoclassical economic modelling of decision-making, as used in economics, political science, and related disciplines.

Bounded rationality proposes that decision making is constrained by managers' ability to process information, i.e., the rationally is *bounded* (see figure Figure 2.10). Managers use shortcuts and rules of thumb which are based on their prior experience with similar problems and scenarios. Given the constraints of managers in their position, they do not actually *optimize* their choice

[1]The Turing Award is an annual prize given by the Association for Computing Machinery (ACM) for contributions of lasting and major technical importance to the computer field. It is generally recognized as the highest distinction in computer science and is known as or often referred to as 'Nobel Prize of Computing'.

Figure 2.10: Bounded rationality



Source: https://thedecisionlab.com/wp-content/uploads/2019/08/Bounded-Rationality.jpg.

given the available information. It is more like finding a *satisfactory* solution, not necessarily the *best* or the *optimal* solution.

Exercise 2.4. Optimal vs. satisfactory solution
Using the images @ref(fig:picA) to @ref(fig:picD), explain the idea of bounded rationality in the context of decision making.

Figure 2.11: The idea of bounded rationality

(a) Picture B

(a) Picture A

(a) Picture D

(a) Picture C

Solution

A) Collecting and analyzing the available information about a product is costly. It is also difficult to analyze the importance of product features for the intended purpose.
B) Individuals often use rules of thumb to make a satisfactory decision.
C) It is difficult to understand complex situations such as the market for financial products. For some people, it is simply not possible to find the best product in these complex markets.
D) Consumers are often confronted with many variants of a product. The differences are negligible and therefore it is not worthwhile for consumers to analyze the situation in detail. Thus, they make a decision that may not be optimal, but they are satisfied with it.

Exercise 2.5. Are we irrational?
Discuss the following statement:

> Since the rationality of individuals is bounded and it is obvious that individuals do not make optimal decisions, we can say that individuals act irrationally.

2.3.4 Heuristics

In real life, we frequently rely on heuristics to solve problems and make decisions. A **heuristic** is any approach to solving a problem that uses a practical method that is not guaranteed to be optimal, perfect, or rational. However, a heuristic should–at best–be sufficient to achieve an immediate, short-term goal or approximation. Overall, people use heuristics because they either cannot act completely rationally or want to act rationally but do not have the time it would take to compute the perfect solution. Moreover, the effort is probably not worth it or simply not possible given the time constraints under which the problem must be solved. A heuristic is a mental shortcut or rule of thumb to make decisions and solve problems quickly and efficiently. It helps individuals to arrive at a solution without extensive analysis or evaluation of all available information. Heuristics are usefull when time, resources, or information are limited.

While heuristics can be helpful in many situations, they can also lead to errors and biases, particularly when they are overused or misapplied. We will discuss some of these biases in **?@sec-cognitive-biases** in greater detail.

2.4 Decision making strategies

Exercise 2.6. Different schemes of a decision making process

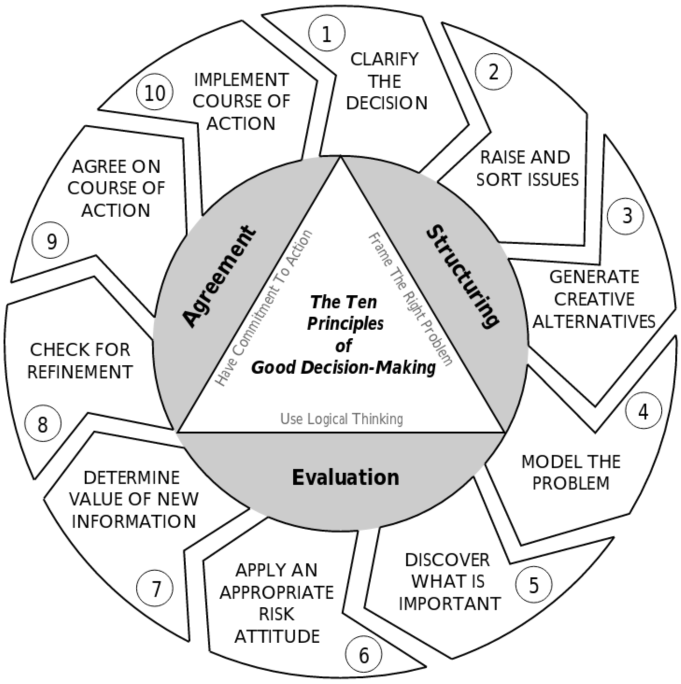
a) Google for *"decision making strategies"* and look at the images that Google suggests you.

b) Read Indeed Editorial Team [2023] and discuss the twelve decision making strategies. The article can be found here.

c) Compare these strategies to the scheme shown in Figure 2.16.

Figure 2.16: *Source: https://pixabay.com/de/illustrations/entscheidung-auswahl-pfad-stra%C3%9Fe-1697537/*

Decision-making



d) Choose a problem of your choice and try to solve the problem using the two illustrations above by making a good decision.

e) Discuss in class whether the diagram or the strategies in Indeed Editorial Team [2023] are helpful in making a wise decision or solving a problem.

f) Watch https://youtu.be/pPIhAm_WGbQ and answer the following questions: How is the nature of decisions discussed here? Does it contain a rational model of problem solving? Reflect on which ways to solve a problem and come to a decision, respectively, have been addressed.

Exercise 2.7. The businessman and the fisherman
A classic tale that exist in different version^[This one stems from thestorytellers.com. A famous version stems from Paulo Coelho^[See https://paulocoelhoblog.com and it goes like this:

> One day a fisherman was lying on a beautiful beach, with his fishing pole propped up in the sand and his solitary line cast out into the sparkling blue surf. He was enjoying the warmth of the afternoon sun and the prospect of catching a fish.
>
> About that time, a businessman came walking down the beach, trying to relieve some of the stress of his workday. He noticed the fisherman sitting on the beach and decided to find out why this fisherman was fishing instead of working harder to make a living for himself and his family. "You aren't going to catch many fish that way", said the businessman to the fisherman.
>
> "You should be working rather than lying on the beach!" The fisherman looked

> up at the businessman, smiled and replied, “And what will my reward be?” “Well, you can get bigger nets and catch more fish!” was the businessman’s answer. “And then what will my reward be?” asked the fisherman, still smiling. The businessman replied, “You will make money and you’ll be able to buy a boat, which will then result in larger catches of fish!” “And then what will my reward be?”” asked the fisherman again.
>
> The businessman was beginning to get a little irritated with the fisherman’s questions. “You can buy a bigger boat, and hire some people to work for you!” he said. “And then what will my reward be?” repeated the fisherman. The businessman was getting angry. “Don’t you understand? You can build up a fleet of fishing boats, sail all over the world, and let all your employees catch fish for you!”
>
> Once again the fisherman asked, “And then what will my reward be?” The businessman was red with rage and shouted at the fisherman, “Don’t you understand that you can become so rich that you will never have to work for your living again! You can spend all the rest of your days sitting on this beach, looking at the sunset. You won’t have a care in the world!”
>
> The fisherman, still smiling, looked up and said, “And what do you think I’m doing right now?”

Define the cost and benefits of both persons. Who do you think has a better life overall. Who is acting rationally here? In other words, who is maximizing utility here? The fishermen or the businessmen? Both? None?

2.5 Review

- Decision analysis is about using information in order to come to a decision.
- A structured and rational process can help improve the chances of receiving good decision outcomes.
- As decision problems are often (too) complex to fully capture or solve rationally. Thus, a good decision analysis should try to use the available information and the existing understanding of the problem as transparent, consistent, and logical as possible.
- A complex decision problem should be simplified and hence decomposed into its basic and most important components.
- There are hundred of different *schemes* or *strategies* how to make decisions in certain circumstances. Many heuristics exist how to think, behave, and calculate to come to a wise decision.
- Mostly decisions are based on subjective expectations. These expectations are difficult to validate.
- Articulating exact expectation and preferences is a difficult task and the information that stems from these articulation is full of biases. Decision analytic tools need to take that into consideration.

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