Adapt and Evolve

Timeless Strategies for Navigating the Knowledge Age

Stijn Dejongh

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To Eden, Julie, and Wolf. That I may be what you grow beyond.

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Stijn Dejongh

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Introduction

The only thing that is constant is change. To be effective, we must constantly adapt to new situations. In our evolving field, developers regularly switch contexts, making learning one of the most critical skills to master. Contrary to popular belief, learning is not innate; it is a skill that can be honed. Moreover, learning is not a one-size-fits-all activity—people learn in different ways and at different paces.

Education was highly valued in Ancient Greece. Tutors were hired to teach young children and prepare them for the challenges of adulthood. The education given to their brood was comprehensive, covering reading, writing, mathematics, music, and physical education, aiming to produce well-rounded individuals who could participate in civic life and contribute to society. The philosophers of Athens, such as Socrates and Plato, emphasized critical thinking and self-examination as vital aspects of education.

Similarly, the Romans viewed the pursuit of knowledge as a noble virtue, focusing on practical skills such as public speaking, accounting, and military strategy. Education was seen as the primary way to advance socially and politically. Many successful Roman politicians were well-educated orators and authors.

In ancient Japan, the samurai were well-versed in both reading and writing, and were instructed in a range of subjects to imbue their troops with a sense of discipline and duty. Similarly to the Greeks and Romans, the pursuit of knowledge and the honing of one's innate skills was seen as a moral duty, essential for sharpening the minds and character of their citizens and making them valuable assets capable of contributing to society in various ways. We have all heard how the Japanese samurai were fearless in battle, disciplined in their actions, and above all honourable. But did you know this warrior class was also well-versed in both reading and writing? Similarly to the Greek philosophers, and Roman writers, the samurai were no stranger to the softer sides of life. Some of their pondering has been passed through the ages in the form of traditional haiku.

These societies all believed that the pursuit of knowledge, and the honing of innate skills were moral duties that sharpened minds and character and contributed to society. Although renowned for their legendary military prowess, these civilizations

had advanced artistic, scientific, and social ideas. Modern education finds its roots in these ancient traditions, and concepts like the Socratic method, democracy, stoicism, the Hippocratic Oath, and citizenship continue to influence our society, attitudes, and beliefs profoundly.

The pen has proven more powerful than the sword, indeed.

> I know no safe depository of the ultimate powers of society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion by education.
>
> —Thomas Jefferson

Moving forward, we must remember the critical role that education has played–and will continue to play–in human development. In the upcoming chapter, we will explore a few powerful mental models that will transform the way you approach knowledge and enhance your reasoning and learning skills. We will also make sure you are equipped with a toolkit of learning techniques and practices that will help you advance in any chosen direction.

Let's get moving!

Wait a minute, where are we going?

Hold your horses for a moment. Before we cast off, let's take a few moments to set the stage and understand where we are headed. I promise we will get moving soon, but first, let's make sure we are all on the same page. Which coincidentally is one of the most important lessons on learning: **start with a clear goal in mind**.

It is a fool's errand to embark on a journey without a sense of direction. Ideally, you posses a rudimentary map to guide you. In absence of a map, you can make do with a compass and a general sense of where you are headed. Writing a book is no different: The intent is clear, the underlying principles are too, what is left is to get going and write it. Right now, I have a general idea of the topics I want to cover, and the order in which I want to cover them.

As any traveller knows, the map is not the territory. Any map provides not much more than a rough sketch of the terrain, indicating some landmarks, milestones, and interesting sights we hope to see along the way.

If you have ever tried to navigate an unfamiliar town, you know what I am talking about. You set off, knowing where you want to end up. Being a reasonable person, you even took the trouble to prepare and look up the most efficient route beforehand. As you embark on your journey, the first thing you notice is that the road you wanted to take is closed. It seems someone deemed it a good idea to park their truck in the middle of the road. So, you take a detour, try to find your bearings, and get back on track.

Most things in life are like that. You set off with a plan, and then things happen. You adapt, you adjust, and you keep moving forward. Or, you decide the destination is no longer worth the trouble, and you change course.

Figure 1. Mindmap of the book structure

Structure of the book

Each chapter starts with a brief introduction to the topic, followed by a collection of the most important topics, practices, and techniques. While the book is written in a linear fashion, the content is designed to be self-contained. This means that you can read a chapter, and understand the content without having read the previous chapters.

Wherever applicable, the content cross-references related topics in other chapters. If you are reading this book on a digital medium, you can click on these links to jump to the referenced content. This will help you understand the topic at hand, and provide you with additional context. If you are someone who reads multiple books at once, these links are particularly useful to get back into the subject matter after having taken a break.

Chapter Overview

STUB: This section is still under construction.

As this book is written incrementally, the structure of the chapters is still in flux. It is likely content will be slightly reordered. As such, the following is a rough outline of the structure of the book. This will likely change in the future as the book evolves, and the content is refined.

Introduction

The section you are reading now. It provides you with an overview of the book, and a brief introduction to the topics that will be covered. We start by sketching the outline of the book, and a brief overview of the different topics that will be handled. The aim is to give you a sense of direction, and to help you understand the overarching themes that you will encounter while reading. Here, a few alternate reading routes are suggested, to help you find the information that is most relevant to your learning needs.

Road to Proficiency

A deep dive into the concept of learning, and the different elements that will help you be successful in your endeavours. The chapter starts by outlining the three main pillars that will support our learning journey: "Who we are", "What we want to achieve", and "What will get in our way". These pillars are then used to build a framework for learning, and to help you understand the different stages of your lifelong learning journey. The topics covered in this chapter will be refined and expanded upon in the following chapters.

What is Knowledge?

Following the "know the terrain" concept of the chapter, we will delve deep into the concept of knowledge. Understanding what exactly is meant by the term *"knowledge"* gives us a clear mental picture of what exactly we are getting ourselves into. To do so, we will dissect the concept of knowledge, and explore the different areas of life that impact your own knowledge gathering process. This chapter is somewhat theoretical, but provides a baseline understanding of the philosophy behind our efforts.

Formatting and icons

Some sections of the book are formatted in a special way. These sections are intended to provide additional context, or to share a story or anecdote. They are not strictly necessary to grasp the main content of the book, but they will provide you with a deeper understanding of the topics at hand. You can recognize these inserts by the grey background.

At other times, you will find a section that is indented and accompanied by a small icon. These "blurbs" are intended to highlight certain ideas, or make you aware of alternate viewpoints. These are to be seen as "food for thought". The iconography is used to help you recognize the type of blurb at a glance. This book contains the following types of blurbs:

Informational blocks, that provide you with additional context. These can be used to highlight parts of the main content that are particularly noteworthy; or to share apropos information that is relevant to the topic at hand, but did not fit into the narrative of the main text.

A question to the reader, to help you engage with the topic at hand. When these blurbs appear, take a moment to consider the question, and see if you can come up with a response. If you are reading this book with a group, these questions can be a great starting point for a discussion. Usually, the following paragraphs will provide additional information, context, or a suggested answer to the question.

Tips, tricks, and key takeaways. These blurbs are intended to provide you with a quick reference to the most important points of the topic that is being discussed. They are designed to be easy to remember, and to help you apply the knowledge in your day-to-day work. Think of them as a mnemonic device to help you recall the most important parts of the topic you are reading about.

Provides a summary of the main content of the book. These blurbs are intended to help you remember the most important parts of the book, and to outline the main topics that are covered in a certain chapter. You will find them at the start of each chapter, and sprinkled throughout the main text when a particular topic has been discussed in full. They will also appear at the start of a topic, in order to outline what you will gain from reading the following paragraphs.

Definitions are important, as they provide a common language for us to communicate with. These "message" blurbs contain a definition or explanation of a concept that is important to understand the topics being discussed in this book. They will be inserted when a new concept is introduced, or when a word is used that might not be familiar to all readers. The goal of these is to provide an even playing field for all readers, regardless of their background or experience.

Alternate reading routes

You can read this book linearly, from front to back. As this is the most common way to read a book, the text was written under the assumption that most readers will follow this route. However, if you are interested in a particular topic, you can also read the book in whichever order you favour. The chapters are designed to be self-contained, and the content is cross-referenced where applicable. On digital mediums, these cross-links are clickable, allowing you to jump around the text easily.

Some of the overarching topics in this book are divided across multiple chapters. As such, if you are interested in exploring a certain cross-cutting idea, you can follow one of the suggested alternate reading routes below. These routes are designed to provide you with the information that is most pertinent to your learning needs.

reader profile	description	suggested route

STUB: This section is still under construction.

Core idea: provide a few reader profiles, and suggest a reading route for each of them. This will help various readers find the most interesting information for their needs. Envisioned profiles include: junior developers, experienced developers, team leads, managers.

Incremental publishing

You will notice that this book is published in an unfinished state. Do not worry, you have not been scammed. This book is being published incrementally, as it is being written. This approach allows me to gather feedback from you, the reader, and to adjust the content or layout accordingly. I hope it will also help me to stay motivated and focussed on the work of bringing this book to completion.

For your consumer safety:

- While the book is incomplete, you can download it for free.
- If you choose to pay for the book, you will receive all future updates for free.
- If you choose to pay for the book, you can request a refund within 60 days of purchase.

Think of this as a "living document", slowly evolving into maturity. While the overall ideas and high-level structure are defined, the details, ordering, and examples are still open for change. This way of working has been coined "Lean Publishing" by the founder of LeanPub, Peter Armstrong. You can read more about it in his free online book "Lean Publishing".

You can find the most notable changes in the changelog, near the end of the book.

From time to time, you will discover a few lines of text accompanied by a wrench icon. This is a special insert —or *blurb*–used only in the work-in-progress version of the book. These blurbs outline the current state of the material, and provide you an idea of the content that will be added later on. They are intended to give you a clue as to where the book is headed, and to provide you with a sense of the envisioned structure. These "wrench" blurbs are to be removed from the final version of the book, much like how **TODO** comments in code should not make it to the final product.

Occasionally, these work in progress bulbs will be used to ask for your feedback. They will be accompanied by a link to a feedback form, where you can share your thoughts and suggestions with the author. Your feedback is greatly appreciated, and will help improve the book.

As I write this book, I intend to do the same. Armed with a rough sketch of the topics I want to guide you through, I will set off and start writing. As I go, I will adjust the plan, add new topics, remove others, and change the order of things. The goal and vision remain the same, but the path to get there is not set in stone.

I have been discussing "the vision" and "the goal" of this book, but I have not shared it with you yet. So, without further ado, here it is:

> I want to write a book that helps you, the reader, to become a better (software) professional. This so you are armed to tackle your day-to-day work, borrowing from the wisdom of the industry masters, and understanding the nuances of the techniques you hear people talk about. I want to help you understand the "why" and "when" of things, not just the "how".

The current plan is to cover the topics outlined in the mind map in Figure 1: Mindmap of the book structure on page xii. I will start of by writing the introduction to each chapter, clarifying the intent and scope of what the text should say. Knowing myself and my thinking process, I will likely start writing the first chapter, and then jump around a bit.

Feedback and suggestions

If you have any feedback or suggestions, I would greatly appreciate hearing them. You can reach out to me via LinkedIn, or through LeanPub's feedback platform.

I hope you enjoy the journey, and I hope you will join me in making this book the best it can be.

Chapter 1: The road to proficiency

Learning new skills, techniques, and ideas is a foundational human skill. We make use of it daily, whether we are researching what new movies are coming out soon(ish) on our favourite online streaming platforms, making our acquaintances and learning the name of that new co-worker, searching a video on how to fix that leaky faucet in our kitchen, or simply remembering the new developments in the lives of our friends and family.

We are constantly receiving new information, processing it, and integrating it into our existing knowledge base. This is the essence of learning, and it is a skill that can be honed and improved, just like any other skill. Some people are naturally better at it than others, but almost everyone can improve their learning abilities with practice and dedication. What makes this tricky is that learning new things is often uncomfortable and difficult. While trying to grasp some new piece of information, we often feel discouraged when we do not understand it immediately, or when we make mistakes. You will often hear the phrase *"I am just not good at this"* or *"I am simply not a math person"* or *"I am not the creative type"*. You will even hear these words escaping your own lips, as you struggle to understand a new concept or skill.

Rest assured, you are definitely not alone in this. Everyone who has ever learned something new has felt this way at some point. And everyone who has attempted to learn has made mistakes, and will continue to make mistakes. As Yoda said to Luke, *"The greatest teacher, failure is"*. Wise words, those are. But make us feel better, they do not.

The key to learning is to understand that making mistakes is not only normal, but essential. That being all fine and dandy, the other key to learning is to get a sense of accomplishment and satisfaction from the process of learning itself. This entails allowing yourself to experience some "winning moments" along the way, and to celebrate your progress, no matter how small it may seem.

My favourite metaphor for this is "undertaking a journey". You are not going to reach your destination in a single step, but you can enjoy the scenery along the way, and take

pride in the progress you have made. That last part is essential, because it is what will keep you going when the going gets tough. When going on an actual journey, such as walking a long distance, you will inevitably get tired, and you will need to rest. When you sit down, and look over your shoulder, you can see how far you have come, and you can take pride in that. Go on walks often enough, and you will find that you can walk further without getting tired.

Most of us have experienced this feeling of accomplishment when we have learned something new, whether it is a new recipe, a new dance move, lifting heavy weights, or solving a difficult problem. This feeling is what keeps us coming back for more, and it is what makes learning fun. If you have ever watched a child learn to walk, you will have seen this in action. The child falls down many times, but it gets up again, and keeps on keeping on. Eventually, it learns to waggle about. Later on, it learns to walk properly. And when it does, the smile on its face is heartwarming. Now ask yourself:

How would you explain to someone how to walk? Not show them, but explain it to them in words. How would you go about it? What would you say?

And most importantly: Do you think they would be able to walk after you have explained it to them?

STUB: This section is still under construction.

Core ideas: Explain how learning is a skill that can be honed. Separate the ideas of "competences" and "capabilities". Discuss the concepts of"Skill and progression levels". Explain how expertise is the ability to apply knowledge and skills in a practical setting, and how mastery is based on the reduction of cognitive load. Discuss the concept of "Monkey see, monkey do", and how it relates to learning new skills (refer to Shu-Ha-Ri). Conclude with the idea that learning is a lifelong journey, and that the more you learn, the more you realize how much you do not know.

Know Thyself!

Growth vs Fixed Mindset

STUB: This section is still under construction.

Core ideas: are skills and capabilities fixed, or can they be developed? Are your skills the result of nature or nurture? Discuss the concept of a "growth mindset" and a "fixed mindset" as polar opposite answers to this question. Introduce the idea of "learned helplessness" and how it can freeze people into adopting a fixed mindset. Outline that structural growth is not about being naive or overly optimistic, but about being grounded and realistic. It is about understanding that you are able to improve your skills, given enough effort and time. Practically, there are limits to what you can achieve, but these limits are generally much more flexible than one might think. Furthermore, these limits are often self-imposed by our own view of our abilities. If you want to get good at something, you need to be willing to be bad at it first, and to put in the effort to improve. Core tenet: *"I can not do this . . . yet"*

Know the terrain!

Know thy enemy!

Errors in thinking

Errors in judgement

Errors in action

Chapter 2: What is knowledge?

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Chapter 3: Biases and how to recognize them

A *cognitive bias* is an "error in thinking" that affects how we perceive the world, make decisions, and interact with others. These biases are the result of how our brains work. What we think of as reality is not an accurate representation of the world. That might sound like a line from a dystopian novel, but it is true. Our eyes and brains deceive us constantly. Biologically, our eyes are much like pinhole cameras: they capture light, focus this light through a lens, and project that onto receptors near our skull. These receptors transform the optical signal to an electrical one, and send these impulses to our brains. The brain interprets these signals as visual images, allowing us to see.

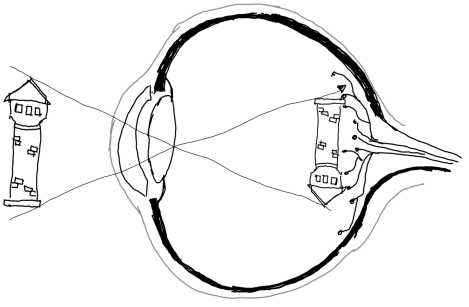

Figure 3.1. A rough, simplified, sketch of how our eyes work.

If you are wondering how this counts as "deceiving", did you consider that our brain flips the image we see upside-down, and flipped left-to-right? Our brains correct this image, making us see the world as it should be. Right side up, left side to the left, right side to the right.

Interestingly, our brains alter the raw data captured by our eyes. For example, the brain flips the images upside-down and reverses them left-to-right. Our brains correct this, presenting the world right-side-up. Colors are another example of brain processing. The cones in our eyes detect light wavelengths and send this information to our brains, which interpret these signals as colors. Each wavelength corresponds to a different

colour. We attribute colours to objects based on the wavelengths of light they reflect and which they absorb.

The sky is blue because the light from the sun is scattered by the atmosphere, and the blue light is scattered more than the other colours. Our brains are constantly interpreting the signals from our eyes, and making sense of the world around us. We see other colours than animals, so we see the world differently than they do. We perceive the world differently than people with colour blindness, or those with perfect vision.

Most things in life -sometimes quite literally- depend on our point of view.

As a child, you probably hear the sentence *"You should know better than that"* quite often. This is a common phrase used by parents, teachers, and other care-takers to berate children for making mistakes. It is a way of telling them that they should have known the right thing to do, and that they should "think before they act". If you are a parent yourself, you might have used similar phrases with your own children. It is a way of teaching them to be more careful, thoughtful, and aware of the consequences of their actions. Interestingly, this phrase never really goes away. We continue to tell it to ourselves and to our peers throughout our lives.

So why do we keep making mistakes, even though we know better? Why do we keep falling into the same traps, even though we have been warned about them? Why do we keep making the same errors in judgement, even though we know better?

The answer lies in the lazy, error-prone, and illogical ways our brains work. Scientists have long been researching the way our minds function, trying to understand why we make the decisions we do. They have found that we are not as rational, logical, or intelligent as we would like to believe. Evolutionary psychologists have discovered that our brains are not designed to be perfect, but to be good enough. Their reasoning is that we survived as a species not because we were the smartest or the strongest, but because we were the most adaptable. We were able to make quick decisions based on incomplete information and act on them in ways that benefited our survival. This is why we have a tendency to avoid pain, seek pleasure, and make decisions based on emotion rather than reason.

These shortcuts, or heuristics, were critically important in the past when we lived in a world of scarcity, danger, and uncertainty. However, in our modern, information-rich environment, they often lead to significant errors in judgement.

While discussing the quirky behaviour of our brains and common lapses in judgement, there is a helpful model to keep in mind: Paul D. MacLean's Triune Brain theory. This model proposes that our brains have evolved from a basic structure to a more complex one, like layers being added to a cake. These evolutionary layers are the Reptilian Complex, the Limbic System, and the Neocortex. Each of these layers is associated with different cognitive functions: the primal lizard brain, the emotional limbic system, and the rational neocortex.

A helpful model for understanding our cognitive biases is Paul D. MacLean's Triune Brain theory. Although the neuroscience community has debunked the strict layers-of-a-cake model, it remains a valuable metaphor. The model divides the brain into three parts: the Reptilian Complex, the Limbic System, and the Neocortex, representing the primal, emotional, and rational aspects of our minds. We can consider our brains as being controlled by three separate personas, each with their own way of thinking:

- **The Self-absorbed Toddler:** This part of our brain is responsible for our most basic instincts and drives. The toddler in us is preoccupied with our own survival and base desires. It seeks pleasure, avoids pain, and acts on impulse. It is the part that is most concerned with our immediate needs and desires, reacting instinctively when faced with a threat or opportunity. It is the part of us that screams when we are hungry, cries when we are tired, and panics when we are scared.
- **The Playful Child:** This part of our brain governs our emotions and social behaviours. It is the source of our feelings and attachments, driving us to seek connection, love, and approval from others. It remembers previous experiences and can recognize similar situations in the present moment. While this thinking mode is more sensible and less egocentric than the toddler, it still operates on a rather instinctual and emotional level. The child often engages in imaginative wishful thinking, crafting plans based more on fantasy than practicality.
- **The Sensible Adult:** This is the most advanced part of our brain, responsible for rational thought, planning, and decision-making. It allows us to think abstractly, consider long-term consequences, and make reasoned judgments. It is the part of us that can override the impulses of the toddler and the emotions of the child, guiding us to act in ways that are thoughtful and considered. This persona knows better than to eat the contents of the cookie jar in one sitting and can resist the urge to buy that shiny new gadget we don't really need.

By recognizing these different aspects of our brain, we can better understand our behaviour and the cognitive biases that influence our decisions. Acknowledging the interplay between these "personas" helps us appreciate the complexity of our minds and the challenges we face in striving for rationality in an often irrational world. We can learn to recognize when our inner toddler is acting up, when our inner child is feeling hurt, and when our inner adult needs to step in and take charge.

So far, we have seen how our brains are wired to make quick decisions based on incomplete information, and how this can lead to errors in judgement. We have also seen how our brains are divided into different "personas", each with their own way of thinking. Combine these two notions, and it is easy to see how we can act against our own best interests and make decisions that are not in our favour. The next sections will delve deeper into the most common cognitive biases that affect our decision-making, arming you with the knowledge to spot these biases in yourself and others, and stopping them from steering you off course.

Types of biases

As we have seen, our brains are prone to errors in judgement, and are easily influenced by a variety of factors. We tend to take shortcuts when processing information or making decisions. These shortcuts, or **heuristics**, are mental rules of thumb that help us make quick decisions based on incomplete information. While heuristics can be helpful in many situations, they can also lead to cognitive biases. To help you recognize these biases in yourself and others, we will discuss some of the most common ones in the following sections. Before we do so, let's first take a look at the different types of biases that you are likely to encounter:

- **Social biases:** These biases are based on how we perceive and interact with others. Examples include the halo effect (where our overall impression of a person influences our judgment of their specific traits), the bandwagon effect (where we adopt beliefs because others do), and the fundamental attribution error (where we overemphasize personal characteristics and ignore situational factors in judging others' behavior).
- **Memory biases:** These biases are related to how we remember past events. Examples include the availability heuristic (where we judge the likelihood of events based on how easily examples come to mind), recency bias (where we give undue weight to recent events), and the hindsight bias (where we see events as having been predictable after they have already occurred).
- **Emotional biases:** These biases are based on how we feel about certain situations. Examples include the sunk cost fallacy (where we continue an endeavor because of previously invested resources), loss aversion (where we fear losses more than we value gains), and the status quo bias (where we prefer things to stay the same).
- **Attention and Decision-making biases:** These biases are related to how we pay attention to information and make decisions. Examples include the anchoring effect (where we rely too heavily on the first piece of information we receive), confirmation bias (where we seek out information that confirms our beliefs), and survivorship bias (where we focus on successful examples and overlook failures).

There are a great many more biases than the ones we will cover in this text. However, the ones we will discuss are some of the most common and impactful. By understanding these biases, you can learn to recognize them in yourself and others, and take steps to

mitigate their stranglehold over your judgement. If you are interested in learning more about cognitive biases, consider reading the excellent book "**Thinking, Fast and slow**" by Daniel Kahneman.

Fundamental attribution errors

Interviews with politicians, celebrities, or athletes often reveal th is bias: our tendency to overestimate the impact of personal actions and characteristics while underplaying external factors. We like to think that we are in control of our own destiny, and that we are the masters of our own fate. This is a comforting thought, as it gives us a sense of agency and possibility. Though severely flawed, it is a way of thinking deeply entrenched in our collective psyche. It is an error of judgement that is hard to shake, as it feels so valid.

- *"If you had been more careful, you would not have gotten into that accident."*
- *"If only I had worked harder, I would have gotten that promotion."*
- *"If you had studied more, you would have passed the test."*
- *"They are poor because they are lazy."*
- *"Good things happen to good people."*

Statements like these are common, and are often used to explain why things happen the way they do. They are comforting, as they give us a sense of empowerment and control. In the sixth century CE, the bubonic plague ravaged the Byzantine Empire. TConstantinople was decimated by the outbreak, which, as the center of the Byzantine Empire, left the empire reeling. The "Black Death", as the disease became known in later centuries, took the lives of millions of people. The hundreds of years that followed were marked by a seemingly never-ending series of plagues, famines, and wars.

People were distraught, scared, and looking for answers. They turned to their religious leaders, who told them that the plague was a divine punishment for the sins of the people. They were told that the only way to escape the wrath of their god was to repent, pray for forgiveness, and to live a devout life. Even though the plague was caused by fleas that lived on rats, and was spread by the trade routes that criss-crossed the empire, the people were convinced that it was their own fault. They had angered their god, and were now paying the price.

In Europe, the plague was seen as a punishment from god. In China, it was seen as a natural disaster. In the Middle East, it was seen as a test of faith. In Africa, it was seen as a curse, and in the Americas, indigenous people saw it as a sign of the end of the world. The same event, wildly different interpretations. Going further back in time, the ancient

Greeks believed that the gods controlled everything that happened in the world. They believed that if you were successful, it was because the gods favored you. If you failed, it was because the gods were angry with you. This belief was so deeply ingrained in their culture, that they built temples, made sacrifices, and held festivals to appease the gods.

In modern times, we like to think that we have moved beyond such superstitions and flawed reasoning. We like to believe that we are rational, calculated, and intelligent beings. Though we never stopped to think that we are in control of our own destiny, and that whatever happens to us is in large part due to our own actions. It does not take much to see that this is not the case. Most things in life are outside of our control. They just happen, and we are left to deal with the consequences. We can not control the weather, the economy, or the actions of others. We can not even control our own bodies, as they are the plaything of genetics, environment, and time. We are not in control of our own destiny, and we certainly are not the masters of our own fate. We are but passengers on the ship of life, being sloshed around by the waves of chance and the winds of fortune.

Consider the following scenario:
You are driving to work, and it starts to rain. The person in the car in front of you is in a hurry, and distracted by their phone. At that moment, a lightning bolt strikes a tree, causing it to fall on the road. The person in front of you swerves to avoid the tree, and crashes into a ditch. You hit the brakes, and manage to stop just in time. You get out of your car, and see that the driver of the other car is injured. You call an ambulance, and wait with them until help arrives. The driver is taken to the hospital, and you go to work. You are late, but you are safe. You tell your colleagues about the accident, and they are amazed that you were not hurt. In awe, they ask you how you managed to avoid a crash.
How would you respond?

You might say that you were lucky, that you were paying attention, and that you barely managed to stop in time. You might say that you are an excellent driver, and that you have quick reflexes. You could say that you were in the right place at the right time, and that if you had left a few minutes earlier, you would have been the one in the ditch. You could say that you were saved by divine intervention, and that you were rewarded by the gods for your virtuous life.

The truth is that you were in the right place at the right time, **and** that you took the right actions to avoid a crash. You were lucky, and you were prepared. You were not in control

of the situation, but you were able to influence the outcome. This holds true for many things in life. A large part of what happens to us is outside of our control, but given the right preparation, we can make the most of the situation. In the words of racing driver Bobby Unser, *"Success is where preparation and opportunity meet"*.

The ancient civilizations were not entirely wrong in their beliefs. They were on to something when they said that the gods controlled the world. Lady Fortuna -the Roman goddess of luck- is a fickle mistress, and she can make or break a person with a flick of her wrist. The ancients knew this, and though they tried to appease the gods, they also knew that they had to be prepared for whatever came their way. *"Deo volente"*, they would say; *"God willing"*. If fortune smiled upon them, they would be ready. If she frowned, they would be prepared. This is a lesson we can all learn from. We are not the masters of our universe, nor are we playthings of the gods. A talented musician will not become famous if they do not practice. But inversely, someone who practices their craft diligently will not necessarily become famous. The world is a complex place, and success is not guaranteed. But neither is failure.

Key take-away:
The fundamental attribution error is a common bias that affects us all. We tend to overestimate the impact of personal characteristics and actions while underestimating the role of external factors. This bias leads us to believe we are in control of our destiny, ignoring the significant influence of luck and external circumstances. Recognizing this bias is the first step to overcoming it. By acknowledging the importance of external factors, we can better understand the world around us, empathize with others, and prepare ourself to deal with the expected and unexpected challenges life throws our way.

Selective Perception & Confirmation Bias

The familiar adage *"Seeing is believing"* lacks a second part: *"Believing is seeing"*. We tend to see what we want to see, what we know to be true, and what we expect to see. This is known as *confirmation bias*.

How often have you proofread a document multiple times only to have someone else point out a typo you missed? Even though you went over the document multiple times, and had the goal of finding issues, you missed it. Convinced that your work was flawless, you did not spot the glaring mistake. It took a fresh pair of eyes to point it out to you.

When reading the work for the first time, you might have found most of the shortcomings and typos. But as you went over the document again, your brain inadvertently started skipping over parts of the text. Because your brain was already familiar with the content, it decided to save itself some effort, and recalled the text from memory. You fully believed you were proofreading the document, while actually you were skimming over it. As you know what you wanted to see, you saw it. You did not see the mistakes, because you did not believe there were any to be found.

This is *"Selective Perception"*: the tendency to notice and accept objects and information consistent with our beliefs, while ignoring or rejecting information that conflicts with them. Our brains play these tricks on us all the time. In plain terms: We tend to see what we want to see, and we tend to ignore what we do not want to see.

Now, let's imagine a senior manager at a large company that recently expanded abroad. Noticing their peers and trusted employees are struggling to adapt to the new situation, they decide to distribute the following tongue-in-cheek pamphlet to a few colleagues. Our senior manager hopes to gain some popularity, have a laugh, and make their peers understand the company must stay as profitable as possible, regardless of any difficulties encountered due to cultural differences.

Satirical Pamphlet: A pocket guide to working in a multicultural environment

- **Belgians:** Bureaucratic, lazy, and pragmatic. Experts at finding loopholes in any set of rules. Love complaining about things so much that they actively avoid solving problems. Will uphold the law at any cost, unless if it inconveniences them or someone they like. Experts at malicious compliance. Will deliver work that is barely good enough to pass inspection.
- **The Dutch:** Energetic, communicative, efficient. Prefer to talk about things for hours on end, rather than taking action. Will waste 90% of the allocated time on discussions, will then sometimes proceed to come up with a highly innovative and efficient solution in the remaining 10%. Will spend twice that time afterwards talking about what they did.
- **The English:** Strategic, sneaky, polite. Can't be bothered with what you think. Will find some way to take the moral high-ground, regardless of their actions. Hold grudges that span lifetimes. Will wait for the right moment to take you down, in a highly polite manner (think: stabbing someone with their pinky raised). Will find a way to blame the French for anything that goes wrong. Will shun coffee, and will only drink tea if it is served with a side of scones and jam.
- **The French:** Vindictive, sadistic, pragmatic. Love to see people suffer. Will pretend not to speak English in order to see you stumble in French. Will then proceed to pretend not to understand your French either. Once they see you die inside, they will reveal a near-native level of fluency in English. Highly likely to start riots when things are not to their liking. Don´t care about how things look, as long as they work. The only exceptions to this are food and fashion. Dislike anyone that is not French; the Dutch and the Americans in particular for stealing their national colours.
- **Indians:** Polite, dedicated, unimaginative. Taking non-aggression a bit too far, they will generally not speak their mind, and avoid confrontation at all costs. Will tell you that they understand your request, and then proceed to do something completely different. All Indians are computer wizards, and will be able to fix any technical issue, regardless of their job description, age, or field of expertise. Will generally miss deadlines, as they did not know what to do, but didn't want to inconvenience you asking for direction. Will then proceed to work 24/7 to make up for it. Will generally be vegetarian, and are likely to have one relative that is a doctor, and another that runs the local night shop.
- **Germans:** Hierarchical, precise, cold-blooded. Will generally be very friendly, unless they believe you are wrong. Favour being correct over making progress

of any kind. Are prone to spending most of their budgets on minor issues, just to satisfy their OCD. Will only respect your opinion if you have the appropriate credentials, or are higher in station than they are.

- **Americans:** Loud, capitalist. Will twist any conversation into a show of power and personal wealth. Prefer to throw money at problems, and will sue you for no apparent reason. Hold extremely strong opinions on the things they know least about. Will start most of their discussions with *"Maybe this makes sense to you people, but in America ...."*.
- **Italians:** Passionate, expressive, and careless. Value relationships and enjoyment over strict adherence to timelines. Renowned for using gestures to hypnotize coworkers into submission. Have a tendency to take two-hour coffee breaks and will generally show up at the office one hour before closing. Given half a chance, will turn any workplace gathering into a celebration, complete with lively discussions, delicious food, and lots of wine. Will generally be late for any meeting, claiming it is fashionable to do so, and berating you for starting without them.
- **Australians:** Laid-back, friendly, unreliable. Have an excellent work-life balance, due to the fact that they will only work when they run out of funds. Can generally be found at the beach, or at the pub. Notoriously cheerful, and macho, they use humour as a coping mechanism. Highly likely to crack jokes during funeral services, or foreclosures. Will suggest unconventional solutions with a casual attitude, making you forget that they just proposed to solve a technical problem using a kangaroo and a jar of Vegemite.
- **The Japanese:** Disciplined, reserved, dedicated to keeping up appearances. Known for their precision and attention to detail, they are likely to spend days mulling over the perfect letterhead for the lift's "out of order" sign. Will excel at creating harmony in the workplace, by refusing to deliver bad news. More likely to work themselves to death, than to admit defeat. Are best allocated to desks furthest from any emergency exits, as they consider dying in an office fire to be the honourable course of action. All know martial arts, and are highly likely to be ninjas.
- **Austrians:** See "Germans". If not applicable, see "Italians".
- **The Swiss:** See "Austrians".

Did you find the pamphlet amusing? Did you find it offensive? Maybe a bit of both? Did you think to yourself there is an ounce of truth to some of the statements? The fictitious corporate pamphlet you just read is a clear example of *confirmation bias*. Your response to reading the "guide to working in a multicultural environment" will depend on your

pre-existing beliefs, and whether you identify with any of the nationalities mentioned.

Regardless of your response, without taking the time to reflect on the content, you have just been primed to notice or recall examples of these stereotypes in your daily life. You are more likely to spot the negative traits and behaviours mentioned in the people you work with. If your colleague is late for a meeting, you might think to yourself: *"Typical Italian behaviour"*. If your Dutch colleague spends a lot of time talking about a problem, you might think they are displaying the trait you read about in the pamphlet. Without awareness of confirmation bias, you could begin convincing yourself that these stereotypes are true. Coupled with the selective perception bias, you are at risk of overlooking your co-workers' capability to deliver quality work. Such biases can lead to misunderstandings, hinder collaboration, and create a negative work environment. It's crucial to treat each individual on their merits rather than relying on stereotypes.

Confirmation bias is the most common, and most dangerous, form of selective perception. We look at the world through a lens that is tinted by our prior beliefs. In doing so, we are more likely to remember events that confirm our beliefs. What is more, we are more likely to interpret observations in correspondence with our beliefs. While the example of the typo in the document is relatively harmless, confirmation bias can lead to some outright dangerous situations and rhetoric. It is one of the main reasons why people are prone to believing in conspiracy theories. This is what makes it so difficult to change someone's mind about a deeply held belief, even if you have reliable evidence.

In recent years, the term "fake news" was coined to capture stories that the public believed to be accurate, but were in fact figments of the imagination. These stories were often shared on social media, designed to be sensational, to evoke strong emotions, and to push a political agenda[1].

Survivorship bias

What do college dropouts, fighter planes in WWII, and the music industry have in common?

A common thread among these seemingly unrelated topics is the notion that for every success story you hear, there are countless failures that fall into obscurity. Survivorship bias refers to the logical error of concentrating on people or things that thrived or survived a process, while overlooking those that did not.

Think of the highly successful college dropout who made it big in the tech industry. Their stories are often shared as inspiration to other, applauding their determination, creativity, and willingness to take risks. What is often overlooked is that the majority of tech start-ups fail, whether they are founded by college dropouts or not. Add to this the additional risk of dropping out of college, and reducing your marketability in the job market, and the odds of professional success become even slimmer. Those that do not succeed are rarely heard from, and their stories are not shared. This creates a skewed perception that dropping out of higher education leads to success, ignoring the broader population of dropouts who struggle without a degree. The same principle applies to creatives in the music industry. For every artist that makes it big, there are thousands that never get past the "playing at local bars"-stage of their career.

Focusing solely on these success stories can distort our perception of reality, creating unrealistic expectations and leading to poor risk assessment. It can create unrealistic expectations, and lead to poor risk assessment. It can also lead to a lack of empathy for those who are struggling, as they are seen as not having the same drive, creativity, or gusto to succeed. It is pivotal to remember that success is not solely determined by the actions -or even genius- of an individual. A multitude of factors play a role in determining the outcome of any endeavour. Success is a combination of luck, skill, determination, and the ability to learn from failure. As the song goes: *"It is ten percent luck, twenty percent skill, Fifteen percent concentrated power of will, Five percent pleasure, fifty percent pain. And a hundred percent reason to remember the name"*[2].

Survivorship bias is not limited to individual success stories. It can also be found in historical accounts, scientific studies, and business decisions. In the 1940s, during World

War II, the US military was alarmed by the ratio of enemy take-downs versus fighter planes lost. The Luftwaffe aeroplanes were outperforming their Allied counterparts, and the US Navy needed to find a solution. They decided to analyse the bullet holes in the vehicles that returned from battle. The idea was to reinforce the areas that were most frequently hit, as these were the areas that were most in need of protection. The military brought in a team of statisticians to analyse the data and provide recommendations on where to add additional armour. One of the statisticians, Abraham Wald, took a different approach. He realised that the data they were looking at was flawed.

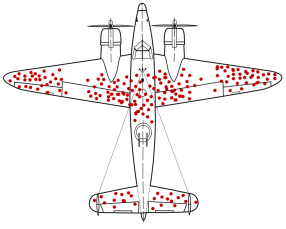

Figure 3.2. Illustration of hypothetical damage pattern on a WW2 bomber. credit: McGeddon CC BY-SA 4.0

Wald's insight was that the planes that returned were hit in areas that could take damage without crashing the plane. The planes that were hit in critical areas, such as the cockpit, engines, or fuel tanks, did not return. The military was looking at the wrong data. They were looking at the survivors, not the casualties. The solution was not to reinforce the areas that were hit most frequently, but to reinforce the areas that were undamaged on the returning planes. These were the areas that, if hit, would likely cause the plane to crash. The military followed Wald's advice, and though exact numbers are hard to come by, it is believed that this change in strategy saved countless lives and aircraft.

By acknowledging and addressing survivorship bias, we can make more informed decisions, develop more robust strategies, and cultivate a deeper understanding of the complexities in various fields. The examples above teach us that stories of successful people seldom paint the full picture. Beneath the surface lies a vast expanse of untold stories, unseen failures, and uncelebrated efforts. This deeper understanding can help us cultivate empathy, make better decisions, and lead to more resilient approaches to problem-solving.

Negativity Bias

STUB: This section is still under construction.

TODO: People are 5-6 times more likely to remember negative events than positive ones. Discuss the evolutionary reasons for this, and how it affects our decision-making, self-worth, perception of the world, and our relationships with others. Discuss the idea of "catastrophizing" and how it can lead to overreaction and anxiety. Tie this in with the the idea of "learned helplessness" (refer to the experiment with the dogs / monkeys) and how it can lead to self-imposed stagnation.

The sunk cost fallacy

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TODO: example of going to a bad film, and staying because you already paid for the ticket. TODO: example of high-stakes poker, and how it is important to know when to fold, even if you have already invested a lot of money.

The Dunning-Kruger effect

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Core ideas: introduce the concept of "imposter syndrome", and explain how it inversely relates to the Dunning-Kruger effect. Discuss Aristotle's idea of "the more you know, the more you realize you don't know". Be sure to point out the irony of the effect: it is only by learning about a topic, that you can become aware of how little you know about it.

Beat the bias

We have just discussed some of the most common cognitive biases that affect our decision-making. Armed with this knowledge, let's explore some strategies to help you counter these biases.

STUB: This section is still under construction.

Core ideas: Introduce the concept of "critical thinking", and how it can be used to counteract cognitive biases. Impart some practical strategies to diminish the impact of cognitive biases on your decision-making.

- seeking out diverse perspectives, and actively challenging your beliefs
- being open to changing your mind, by regarding your beliefs as hypotheses that can be tested
- split complex situations into smaller, more manageable parts, and evaluating them separately
- look for similarities and differences between situations, and use them to inform your decisions
- know yourself and your susceptibility to certain biases, actively work to counteract them. Disclose your biases to others, and ask them to verify your conclusions.

Being aware of our tendencies to jump to conclusions, and for our brains to play tricks on us, is the first step to overcoming biased judgement. After all: to overcome an obstacle, we must first acknowledge its existence.

Notes

1 Confirmation bias has been shown to be one of the five main reasons why people are prone to believing in fake news. The other four are "herd mentality", "framing bias", "overconfidence", and "anchoring bias". These are discussed in the 2023 paper *"The impact of cognitive biases on the believability of fake news"* by French, A. M.; Storey V. D., and Wallace, L. (DOI: 10.1080/0960085X.2023.2272608).

2 The song "Remember the Name" by Fort Minor, from the album "The Rising Tied" (2005). The artists got the ingredients right, but seem to have gotten their dosages mixed up. A more realistic breakdown would state: *"It is 50% luck"*.

Chapter 4: Context matters

This content is not available in the sample book. The book can be purchased on Leanpub at http://leanpub.com/adapt_and_evolve.

Silver bullets and Cargo Cults

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Improving your contextual awareness

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Chapter 5: Methodologies and Mindsets

Things are never as simple as they seem. The world is a complex place, where simplicity is a rare gem. The intricacies of our surroundings often elude us, leading to a maze of details that can easily overwhelm. This complexity has led to the birth of many different fields of study, and fostered the prevalence of specialization in our society. Gone are the days when one could claim mastery over all there is to know – a feat last achieved centuries ago[3].

During antiquity (the Ancient Greek and Roman times) and through the eighteenth century, it was possible for a single person to grasp most of the scientific ideas of the time. Many admired luminaries, such as Aristotle, Galileo, Da Vinci, and Isaac Newton, were considered *"Polymaths"*. Holding expertise in multiple fields, and able to make significant contributions to each of them. However, the relentless surge of knowledge has rendered such breadth of understanding unattainable for individuals today.

The amount of human knowledge is estimated to double every 13 months. Consider the scale of this data explosion: in 2020 alone, global data production reached an estimated 64 zettabytes[4]. To put this into perspective, Cisco's data insight lead Shruti Jain explained this as, *"if each terabyte in a zettabyte were a kilometre, it would be equivalent to 1,300 round trips to the moon and back (768,800 kilometres)"*. Our daily data creation now surpasses the cumulative output of all humanity until 2003, without the faintest sign of abating.

The table below gives you an idea of the scale of data storage units, using the ISO/IEC 80000 standard. The standard is used to simplify calculating data storage sizes, as it is based on the metric system rather than the binary system used in computing. Each step up in the table represents a thousandfold increase in size.

abbreviation	unit name	number of bits
kB	kilobyte	10^3
MB	megabyte	10^6
GB	gigabyte	10^9
TB	terabyte	10^{12}
PB	petabyte	10^{15}
EB	exabyte	10^{18}
ZB	**zettabyte**	10^{21}
YB	yottabyte	10^{24}
RB	ronnabyte	10^{27}

Of course, raw data is not to be confused with knowledge. Data is merely a representation of information, and does not necessarily contain any useful insights. To derive meaning from it requires processing, analysis, and interpretation. Nonetheless, making informed decisions without data is near impossible. The surge in data availability presents a dichotomy: while we are increasingly able to extract knowledge from the raw figures we have at our disposal, we are struggling to keep pace with its influx. Our modern world is rapidly evolving into one of information overload. At times, it seems we moved out of the *"Information age"* and into the *"Age of perpetual distraction"*.

Our capacity to filter out the noise, focus on what matters, think abstractly, and reason about complexity is becoming paramount to our success as a species. These skills are not only advantageous in the job market but also essential for maintaining sanity amidst the barrage of novel information.

The human mind is a complex machine. We are capable of processing vast amounts of information, and make sense of the world around us. Experts estimate that the human brain has about 100 billion neurons. Each of these neurons can form thousands of connections with other neurons, forming a network of unimaginable complexity. This network is what allows us to think, to reason, and to make decisions. It is what makes us human. Neuroscientists have been attempting to unravel the mysteries of human thought for centuries, in a quest to understand what makes us tick. A lot of progress has been made in recent years, but we are still a long ways off from understanding the full extent of what goes own inside our own heads.

Philosophers, scientists, and thinkers of all kinds have made significant efforts to understand how the slimy mass of grey matter inside our skulls is able to produce such

marvels as culture, art, science, and emotion. A fascinating aspect of these studies is that they are not only concerned with understanding the processes that go on in our heads, but also with how we can use this knowledge to improve our lives. Research into habit formation, neuroplasticity, and sleep patterns have all helped us to understand how we can become healthier, happier, and more effective individuals.

As wondrous as it may be, the brain does have its limitations. We are not capable of processing all the information that is available to us. We forget things, we make mistakes, we fail to notice a clear and present danger as we are too focussed on a detail. Often times, we are not even aware of the reasons behind our decisions or actions. If you have ever challenged yourself, really challenged yourself, to learn something that was difficult, you will have noticed the feeling your get when you are stretching your mental muscles. It is a feeling of discomfort, of slight confusion, and of being out of your depth. Do this for long enough, and you will notice that your brains slowly start hurting. You start feeling mentally exhausted, and you might even get a headache. This is your brain telling you that you are pushing it to its limits, and that it is time to take a break. We are not built to be in a constant state of high alert, or to be constantly learning new things. We, and our brains, need recuperation time. We need time to process the information we have gathered, to make sense of it, and to integrate it into our existing knowledge base.

These limitations are not a sign of weakness, but rather a sign of our humanity. We are not databases, capable of storing and retrieving vast amounts of information at a moment's notice. Neither are we supercomputers, capable of complex calculations and simulations. We can not perfectly capture images, sounds, or smells, and store them for later use. Our brains know this all too well, and have evolved to ameliorate these limitations. Evolution made us capable of abstract thought, of reasoning, and of making decisions based on incomplete information. Humans use mental shortcuts, or heuristics, to make sense of the world around us. We use pattern recognition to identify threats, opportunities, and familiar situations. We use our emotions to guide our decisions, and to help us make sense of complex situations. We are not machines, we are hunan beings, and we excel at being human.

A key element of any learning journey is to understand our limitations, to understand how we think, and to attempt to train ourselves to think in different ways. We touched on how our mind uses mental shortcuts to make sense of our surroundings. It does this by using mental models, and heuristic reasoning. These are cognitive structures that help us understand complex situations by simplifying them. They are a way of representing

your knowledge and experience in a way that is easy to understand, and easy to apply to new situations. We rely on our set of mental models to be effective in the situations we find ourselves in. Think of them as a set of tools, that we bring with us wherever we go. Depending on the context, we grab a couple of them from our toolbox, and use them to do what needs to be done.

This is why reading books, attending lectures, and watching documentaries can be so beneficial. They expose us to new ideas, new ways of thinking, and help us form new cognitive models. They help us expand our mental toolkit and make us more effective at solving problems, and understanding our day-to-day life. The more tools you have at your disposal, the more they were honed and sharpened, and the more you are comfortable using them, the more effective you will be at tackling the challenges life throws your way.

This section of the book explores some of the more effective mental models and mindsets that you can use to hone your thinking, and to improve your decision-making. Understanding that our brain has a tendency to simplify situations, we will look into the various shortcuts it uses to We will discuss how you can use these cognitive tools in practical situations to make sense of your environment. This will help you pick the tools you want to add to your kit, and teach you how to use them effectively.

The Scientific Method

> "Strong opinions, weakly held"
>
> —Paul Saffo, 2006

This quote is a reminder to stay open to new ideas, and to be willing to change your mind when new information comes to light. It is a call to apply scientific rigour to our beliefs, to live our lives acting congruently with what we believe to be true, but to stay open-minded and willing to throw ideas out the window when they are proven to be false. This is the essence of the scientific method, and it is how the world has made so much progress in the last few centuries.

STUB: This section is still under construction.

Core ideas: form hypothesis, experiment to test them, analyse the results, accept the outcomes, and adjust your beliefs or theories accordingly. Refer to Newton's laws of motion, and how they were proved to be incorrect, even though they were widely accepted and useful for centuries. They failed to explain the orbit of planets, and were replaced by Einstein's theory of general relativity. This is a good example of how the scientific method works, and how iteration of ideas leads to refinement of knowledge. Point out that even an incomplete or incorrect theory can be useful, and conversely that a useful theory can be incomplete or objectively incorrect. Refer to the previous sections on context, and how expanding your ideas to larger scopes tend to make their limitations clearly visible (if you are willing to look for them).

Systems thinking

As touched upon in Section 2.2: The knowledge gathering system on page 7, viewing situations as systems is a powerful sense-making technique when dealing with complex situations. By focussing on fundamental building blocks and their interactions, we can reduce the level of detail we need in order to reason about complicated situations or structures. In doing so, we give ourselves the mental breathing room to think about the big picture and gain clarity amidst chaos. If at any time you feel overwhelmed by the complexity of a situation, try to take a step back, and think about the situation as a system.

Systems thinking is a way of understanding the world that emphasizes the relationships between the parts of a system, rather than the details of the parts themselves. It helps us understand the big picture, and how each cog in the machine interacts with all others. By focussing on the interactions between the parts, we can gain a better understanding of the system as a whole, and how it behaves. This approach helps us to step back from the nitty-gritty details, and to see the forest for the trees. We know our minds have their limits, and have a tendency to overlook certain aspects of a situation. By building a holistic, systemic, view of the situation, we can force ourselves to consider all the relevant influences, before diving into the details. As the literature on systems thinking is vast, and quite academic in nature, we will only touch upon the basics in this section. To illustrate the concept, we will use a practical example of applying systems thinking to a real-world problem.

We have all seen teams stuck in a rut, unable to meet deadlines and losing trust. Picture this: you're called in as an advisor, tasked with helping one such team get back on track. This group of people was struggling to meet their deadlines, unable to deliver their work on time, and is starting to lose the trust of their stakeholders and bosses. You are asked to join the team for a few weeks, observe their work, take part in their endeavours, and figure out what is going on. At the end of your stay, the organization's leadership calls you in for a meeting. As you sit down, they pose the question:

So, how can I get my team to deliver on time?

You know there's no one-size-fits-all answer. There are various reasons a team might

falter, and fail to meet expectations. Any endeavour that involves multiple people, and that requires a non-trivial amount of work to be completed, is bound to run into challenges. To help the team, and in order to present a coherent plan to the upper management, you will need to understand what is going on before you can hope to fix it. Understanding the context means deciphering what makes these people tick, what hinders them, and what can propel them towards success. You will need to distinguish internal challenges from external ones.

Imagine sitting down with the team, and asking them about their work. As you try to get a sense of the different aspects that contribute to their situation, you learn that this group of people spend most of their days in meetings. They tell you how they are constantly forced to drop their given assignments to fight fires in production. They tell you that their tasks are seldom completed on time, and that they need to resort to last ditch death marches in order to ship something, anything, to their stakeholders. You make a mental note that the team is likely unskilled at assessing the amount of time it takes to complete a task, causing them to consistently bite off more than they can chew. Having been in similar situations before, you know that this is a common problem in software squads. You also know the detrimental effects to the mental and physical health of people who are relying on heroics to keep the proverbial cogs from grinding to a halt.

The weeks you spend in the trenches, shoulder-to-shoulder with the development team, reveal an atmosphere fraught with perpetual stress and frustration. The team members are constantly on edge, anxious, and rushing to get their individual tasks completed. Despite their dedication, the realization they are in a bad spot, and their efforts to please their stakeholders, the team finds themselves trapped in a cycle of overwork and errors.

These are not lazy, malicious, or utterly incompetent people. They seem to be caring individuals that got caught in a bad situation, and are unable to find a way out. It is evident: the team is not delivering on time because they are overloaded, and overworked. This causes them to rush, and make mistakes. The mistakes end up being shipped to customers, and cause even more work for the team. They are caught in a vicious downwards spiral, and are unable to break free.

With a clearer picture of the situation, you prepare to return to the boardroom, ready to tackle the problem head-on. Armed with insights, you recognize the need for a structural change in how things are done. But where to begin? Refining your ideas by creating a visual map of their environment seems like the logical first step.

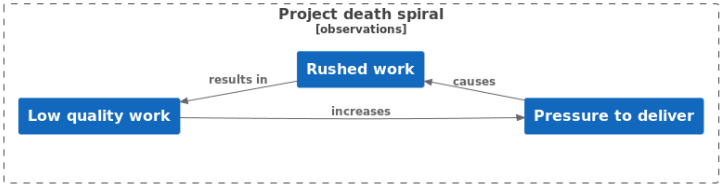

Figure 5.1. Schematic representation of problematic team behaviours

This map serves as a guide, shedding some light on the complex interplay of people, processes, and power dynamics. Effecting change in a complex system is a highly challenging task. By schematically visualizing an ecosystem, you can uncover key leverage points and areas for intervention. As the map is not the terrain, you will likely not get it right on the first attempt. Still, you need some basis to start from; an initial hypothesis to test and refine.

When creating a systemic map, we start by jotting down what we know. These are notions we bring to the table either from prior experience, or from the observations we make in working alongside the people in the corporate trenches.

In this particular case, we know that the team is struggling to keep pace with the demands of their stakeholders. This is a good starting point. We can now map out the different people and groups that are involved in the situation, and try to understand their motivations and goals. We can also try to model the process being used by the team, and how this process is influenced by the different stakeholders we have identified. As we are dealing with a corporate environment, it is generally a good idea to map out the power structures at play. This will help us understand who is making the decisions and allocating budgets. Or, putting it somewhat more cynically: *"Who is controlling the purse strings?"*.

Combining all of our insights results in a lightweight overview of the situation. An example of such a systemic map is shown in
Figure 5.1: Project context analysis on page 44. This diagram illustrates:

- how the team is set up
- *how work gets assigned to them
- the software components the team is responsible for
- how that software fits into the larger ecosystem of the organization

- the most critical interactions between these elements

As mentioned earlier: the systems-based analysis is a simplification of reality. It is bound to lack detail, or omit elements that play a role in the situation. It is also likely to contain errors, or to misrepresent some of the interactions at play. This is the nature of models: *all of them are wrong, but some are useful*. What is more, the situation and dynamics at play are likely to change as you start to intervene. For this reason, it's paramount to keep an open mind, and be willing to adapt your approach as new information comes to light. We will investigate some of the characteristics of situations in #f, and see how different types of systems require different approaches.

Complex systems, by their nature, are difficult to reason about. It is even more challenging to try and effect change inside them. Even if we are able to identify some of the key elements and interactions that contribute to a situation, we are likely to miss some of the factors at play. This is why it is important to stay open to new ideas, and to be willing to adapt your approach as new information comes to light. In general, when dealing with systems like these, it is a good idea to follow the scientific method:
Form a hypothesis, experiment to test it, and let the results guide your actions.

In the words of Dwight D. Eisenhower: *"Plans are worthless, but planning is everything"*.

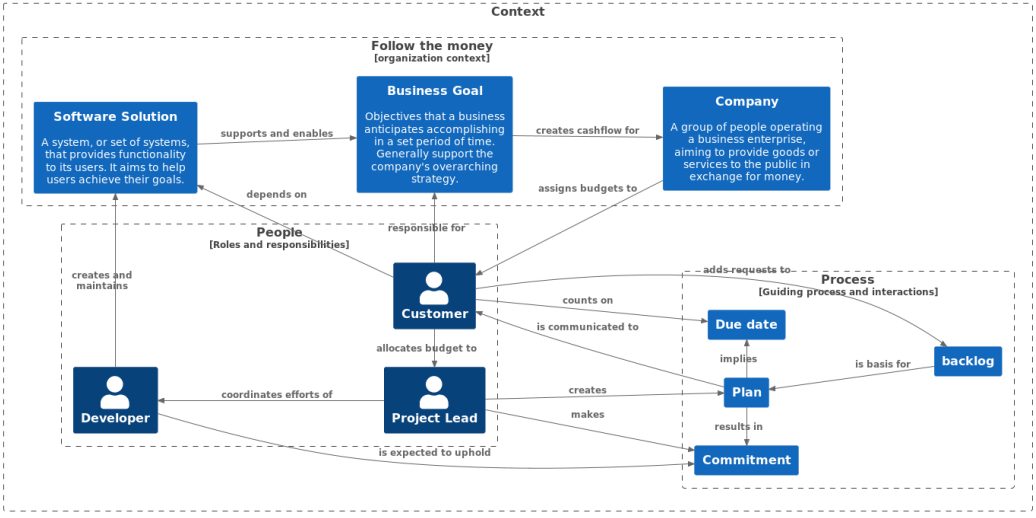

Figure 5.2. Project context analysis

If the team wants to escape the *"project death spiral"*, they will need to act.
What is the most effective way to intervene in the situation? What are the likely outcomes of your actions?
When faced with such a challenge, it helps to identify the contextual factors that either enable certain behaviours inside an ecosystem, or deter them. We call these the *driving* and *restraining* forces - or drivers - acting on a situation. An analysis of the contextual drivers helps us build a deeper understanding of the context, improving our ability to identify potential interventions. Applying this driver-based analysis to the team's death spiral, we end up with a diagram that looks something like the one below.

Key take-away: When faced with a complex situation, try to create a map of the environment you are in. Doing so will help you reason about the situation more effectively, and will guide your actions. Remember that the map is not the territory, and that it is likely to be incomplete or plain wrong in some areas. As you take action, and learn more about the situation, update your map to reflect the new knowledge you have gained.

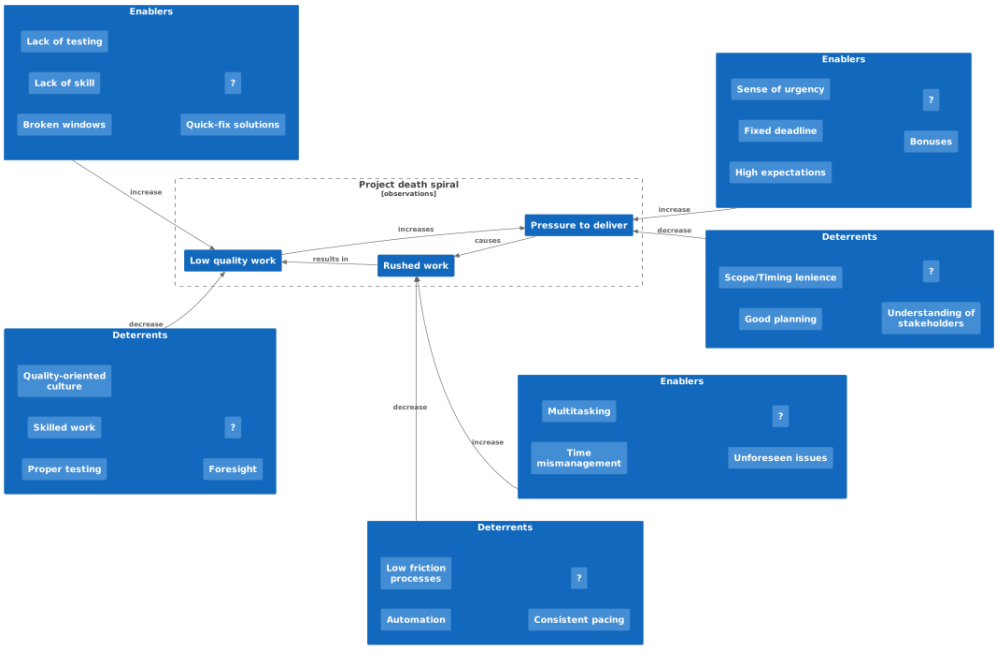

Figure 5.3. Death spiral drivers

To help out the struggling team, you decide share your impressions with them. You explain how they seem to have found themselves in a sticky situation, and how it is likely to deteriorate even further as time goes on. You also share that you will be presenting your findings to the organization's leadership, and that you will be proposing a few interventions that are designed to help them take control of the situation. If this plan is to be successful, you will need the team's buy-in. The team needs to be willing to do their part in tackling the issues that you have identified.

Agreeing to your proposal, the team lead asks your help in formulating a plan of action. They are eager to improve their lot in life, but are unsure how to go about it. Armed with the maps of their ecosystem, you start by explaining the different factors contributing to their downfall. You also explain that if they are to break the cycle they are in, they will need to take a step back, and focus on improving their processes and skills.

The developers believe their highest chance of success lies in effecting a change to one of the three key elements that keep them spiralling downwards. Together, you come up with a plan to address the following issues:

- **rushed work:** Reduce the amount of work in progress, and focus on completing tasks before starting new ones. This can be achieved by limiting the amount of work taken on at any given time, and by improving the team's estimation skills.
- **low quality deliverables:** Improve the team's testing practices, and make sure that the software is finalized before it is shipped to customers. This can be achieved by introducing automated testing, and by making sure that the team has the time to properly perform their work.
- **pressure to deliver:** Lower the expectations of the stakeholders, and give them a realistic view of the team's capabilities. This can be achieved by improving the team's estimation skills, and by making sure that the stakeholders are kept in the loop on the progress the team is making.

As they have a fairly good mutual understanding, the team decides to kick off their quest by talking to their end-users. They explain the situation they find themselves in, and how that contributes to the high amount of defects in their software. They also explain that they are willing to work with the customers to improve the situation, but that it will take time to dig themselves out of the hole they are in. As such, they ask for a few months to get their house in order. The team would like to pause all new feature work, focus on stabilizing their software, and improving their processes. The customers are understanding, and realize that they helped put the team in a tough spot. They agree to the team's request, on the condition that they are kept in the loop on the progress the team is making, and that the existing backlog of issues is addressed during this proposed "functional freeze period". The team decides to take this opportunity to improve their estimation skills, as they realize that their inability to estimate the time it takes to properly complete a task is a major contributing factor to their struggles. They also decide to work on their testing skills, as they realize many of the defects in their software are due to lacklustre testing practices.

In your final meeting with the organization's leadership, you present the findings of your investigation, and the proposed plan of action. You explain that the team has agreed to take up the brunt of the work, and that they have started putting in the effort to improve their skills and processes. You ask the management to support the team in their efforts, and to give them the time they need to get their house in order. Additionally, you suggest a couple of training sessions for the team, to help them improve their estimation and testing skills. The management agrees to your assessment, and together with the team, they agree to pause new feature development, focusing instead on stabilizing their

processes and improving their skills. It's a strategic move, supported by their customers who understand the need for change.

With management's backing and a clear roadmap for improvement, the team sets off on their journey to break free from the project death spiral. They're committed, supported, and open to change. While challenges lie ahead, they're poised to turn their situation around and embrace a brighter future.

Types of systems

STUB: This section is still under construction.

Finish the section by discussing the importance of staying open to new ideas, the power of experimentation, and the need to understand the context you are operating in. Use that as a segue to discuss the most simple ideas of the "Cynefin" framework, and how different types of environments require different approaches to problem-solving.

Pragmatism

STUB: This section is still under construction.

Core idea: discuss the etymology of the word "pragmatic", and the concept of "doing what works". Make sure to highlight that this is not an excuse to be lazy, avoid thinking, or take ill-advised shortcuts. It is about being willing to change your mind, and to adapt your approach to the situation at hand. "Do the best you can, given the situation you are in". The crux of the matter is to achieve the most progress possible, given your current resources and constraints. Cross-reference to sections on "trade-offs" in earlier chapters, and in this chapter. Make a note to the reader that this is a difficult practise to master, and that it requires constant reflection, self-awareness, and willingness to change your mind. Instil the notion that "doing what works" is about being effective, but that considerations need to be made to make sure your effectiveness does not come at the cost of your integrity, or the well-being of others.

Personal Values

STUB: This section is still under construction.

Core ideas: introduce the idea of value systems, and how they influence our decision-making. Point to the graphic in the introduction section of the chapter to illustrate this. Discuss how these affect your sense of purpose and accomplishment, and how these differ from one person to the next. Add the "mountain range" exercise to help readers reflect on their own personal values. Discuss writing down these values as commandments, or a creed if you will. As an illustration, add your own personal values list, written as tenets. Make sure to mention the concept of "congruence".

Notes

3 According to the biography by Andrew Robinson, The last person to "know everything" was the British polymath Thomas Young (1773-1829). From: Thomas Young, the Anonymous Polymath Who Proved Newton Wrong, Explained How We See, Cured the Sick and Deciphered the Rosetta Stone, ISBN: 978-1851684946

4 The data growth estimate is based on the 2020 IDC report. For further background reading on the mind-boggling amount of data we are creating, the Wikipedia article on the "Zettabyte Era" is a good starting point.

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I will try to avoid that. To make this section more interesting to read, I have divided each list of references into two main parts. One part contains the publications I recommend you to explore, the other part is the aforementioned default academic style list. If you are interested in the topic, be sure to use to the first part to find your next read. If you are interested in my source material, you will find a selection of them in the second part.

Selected Bibliography

Pragmatic Thinking and Learning: Refactor Your wetware

Hunt, A. (2008) Pragmatic Thinking and Learning: Refactor Your wetware. Pragmatic Bookshelf. ISBN: 978-1934356050. pragprog.com.

Dive into your own brain and learn about efficient learning. Hunt discusses various techniques that have helped him stay on top of his game over a career spanning decades. As a professional, your main weapon is your ability to learn. Unfortunately, many of us are left to our own devices in figuring out which approaches work well for us. This book helps by providing a plethora of time-proven learning techniques and tools to discover your own preferences.

Apprenticeship Patterns: Guidance for the Aspiring Software Craftsman

Hoover, D.; Oshineye, A. (2009) Apprenticeship Patterns. O'Reilly Media. ISBN: 978-0596518387. oreilly.com.

For individuals transitioning to new teams or roles, Apprenticeship Patterns offers invaluable advice. In this book, the authors provide practical guidance on seamlessly and efficiently integrating into a new work environment. The book's unique structure presents these insights in the form of a pattern list, each offering actionable advice. One particularly memorable pattern, *'Sweep the Floor'*, underscores the importance of performing the *'grunt work'* to be of immediate value to a team.

The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change

Covey, S. R.; Collins, J. (2004) The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change. Free Press. ISBN: 0743269519. goodreads.com.

A revered classic in the realms of both software development and management, Stephen R. Covey's book delves into the transformative power of effective habits. Covey introduces readers to a set of values and practices that promote mindful time management. He explores the art of personal management systems, the significance of mastering the skill of saying "no," and the profound notion that "saying yes to something means saying no to something else." Covey's book invites the reader to introspection, encouraging them to reflect on their desired self and guiding them toward tangible steps to achieve personal growth and effectiveness.

Ego Is the Enemy

Holiday, R. (2016) Ego Is the Enemy. Portfolio. ISBN: 978-1591847816. goodreads.com.

In *Ego Is the Enemy*, Holiday presents a contemporary exploration of Stoic principles, emphasizing the importance of authenticity and resilience when faced with adversity. He weaves a compelling narrative by drawing on the stories of historical figures to illustrate how unchecked success can corrupt one's character.

The book is a mix of inspirational success stories and cautionary tales, offering readers a fresh perspective on their own decisions. After reading Ego Is the Enemy, individuals are encouraged to reflect on a fundamental question: "Do I aspire to do something meaningful, or do I seek to be important?" This thought-provoking book challenges readers to examine their ambitions and the role of ego in their pursuit of success and fulfilment.

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