



UNIWERSYTET
EKONOMICZNY
W KRAKOWIE



KSB Krakowska
Szkoła Biznesu
MBA Studia Podyplomowe



**CRACOW UNIVERSITY OF ECONOMICS
CRACOW SCHOOL OF BUSINESS**

MASTER OF BUSINESS ADMINISTRATION IN INFORMATION TECHNOLOGY

**Behavioural aspects of suboptimal decision making of
leaders in the tech industry**

AUTHORS:

**DAWID STRONCZAK, MSc
WIESŁAW PAŁKA, PhD**

SUPERVISOR:

BARTŁOMIEJ BIGA, PhD

CRACOW, 2023

**I EDITION 2021-2023
COPYRIGHT © CSB CUE**

Contents:

Contents:	2
1 Introduction	4
1.1 Background	4
1.2 Problem formulation	5
1.3 Aim	7
2 Literature review - theoretical background	8
2.1 What is a decision?	8
2.2 How decisions are made?	11
2.3 What might affect the decision making process?	11
2.3.1 Environment	12
2.3.2 Mental fatigue and deep work	14
2.3.3 Social norms	15
2.3.4 Power dynamics, hierarchy and culture	18
3 Research methodology and findings	21
3.1 Research construction	21
3.1.1 Survey construction	22
3.1.2 Sampling strategy	26
3.1.3 Data collection procedure	28
3.2 Results overview	28
3.2.1 Data processing and cleanup process	28
3.2.2 Responses Summary	29
4 Product description and benefits confirmation	32
4.1 Introduction	32
4.2 Anchoring effect	33
4.2.1 What is an anchoring effect	33
4.2.2 Validating the effect in the research	33
4.2.3 Results	34
4.2.4 Conclusions	35
4.2.5 Business recommendation	35
4.2.5.1 Use of objective data	36
4.2.5.2 Encourage diversity	37
4.2.5.3 Promote deliberative thinking and decision making protocols	37
4.2.5.4 Use external consultants	38
4.3 Similarity Bias	38
4.3.1 What is a similarity bias?	38
4.3.2 Validating the effect in the research	39
4.3.3 Results	39
4.3.4 Conclusions	42

4.3.5 Business recommendation.....	43
4.3.5.1 Implement structured interview process.....	43
4.3.5.2 Creating a culture of inclusion.....	44
4.4 Priming Effect.....	45
4.4.1 What is a priming effect?.....	45
4.4.2 Validating the effect in the research.....	45
4.4.3 Results.....	46
4.4.4 Conclusion.....	47
4.4.5 Business recommendation.....	48
4.5 Fairness Norm.....	48
4.5.1 What is Fairness Norm?.....	48
4.5.2 Validating the effect in the research.....	49
4.5.3 Results.....	49
4.5.4 Conclusion.....	50
4.5.5 Business recommendation.....	51
4.5.5.1 Implement objective criteria for people allocation.....	51
4.5.5.2 Encourage Experimentation and Innovation.....	52
4.6 Better Than Average Effect.....	52
4.6.1 What is an above average effect?.....	52
4.6.2 Validating the effect in the research.....	53
4.6.3 Results.....	53
4.6.4 Conclusion.....	54
4.6.5 Business recommendation.....	54
4.6.5.1 Implement Performance Evaluation Processes Based on Objective Criteria.	54
4.6.5.2 Addressing Knowledge Gaps through Training and Technology Reports.	55
4.7 *Ability to focus and avoiding mental fatigue.....	56
5 Final Conclusions, business insights and recommendations.....	59
5.1 Research problem, objectives and research question.....	59
5.2 Results and main conclusions.....	60
5.3 Future Work and Next Steps.....	61
6 Bibliography.....	62

1 Introduction

1.1 Background

It is trivial to say that every day each of us has to make decisions. Not only one's life, their loved ones, but also colleagues or people they do not know at all are affected by the quality of those decisions. Starting from a simple “what to have for dinner today”, to more advanced issues, like what school to send a child to, how to guide one's future career or whether marrying this person is a good idea. The spectrum of issues and decisions is vast and ranges from the short and simple like today's dinner, to a marriage that is expected to last decades, a lifetime.

It is researched that humans make about two hundred food related decisions a day, “*While the typical person estimated they made around 15 food and beverage decisions in a day, the average that was calculated from subsequent questioning was 219, approximately 200 more*” by Wansink & Sobal, 2007. It is estimated that humans may make as many as thirty five thousand decisions per day but it is not confirmed by any formal research yet.

Managers and directors additionally to personal life decisions need to make professional ones too. Teams, departments, stakeholders who may have had put their life savings into the success of a particular venture, and sometimes the whole company, which provides work and livelihoods to many people will be affected by them. Therefore, the quality of the decisions made by people in those roles is of colossal importance, not only in business terms, but also in human terms.

It could be easily observed that the variety and quantity of daily decisions to make is considerable. And, of course, high quality decisions are wanted by everybody. Unfortunately, the human brain is constrained here. It was shown, in a rigorous way, by the advent and development of behavioural economics that to bypass this constraint people heavily rely on heuristics. It is also shown that while those heuristics are sometimes useful, results produced by them do not align with a model rationality. Therefore, only when focused on small and uniform problems high quality decisions are produced. Otherwise, when juggling between too many problems, the produced results are poor, if any. This phenomenon is known as decision fatigue and related to ego-depletion. Pignatiello et al., 2020, asserts “*The concept of decision fatigue is derived from the Strength Model of Self-Control posited by Baumeister, Bratslavsky, Muraven, & Tice (1998). A central tenet of their model is that humans have a limited capacity to regulate their behaviour. Akin to muscle fatigue after exertion, humans deplete internal resources when performing acts of self-regulation, such as processing information to formulate a decision. The depleted state of internal resources (executive function, emotion regulation) is referred to as ego depletion (Baumeister et al., 1998). Evidence from Vohs et al. (2008) suggests that making decisions can elicit ego depletion.*”

Ego depletion can be also caused by other factors than decision making, *“When a person's faculties are impaired by tiredness, distraction or stress (a process known as ego depletion), they are more likely to revert to less rational ways of solving problems.”* Kahneman, 2013.

The decision fatigue peculiarity is already well known by the best leaders and managers. Therefore, the number of daily decisions to make is reduced by them to a great extent. *“(...)professionals are aware and concerned enough about the negative effects of decision fatigue to take active steps to counteract it. For example, President Barack Obama has explained that he minimises his food and clothing choices to improve his other decisions. Steve Jobs and Mark Zuckerberg famously wear only limited styles and colours of clothing.”* David Hirshleifer et al., 2019, (p.83-98). Setting up a upper constraint on a number of decisions made per day is another approach practised by Jeff Bezos, in his own words during interview with David Rubenstein, 2018 *“As a senior executive you are paid for a small number of high quality decisions. Your job is not to make thousands of decisions every day(...). If I make like three good decisions a day, that's enough and they should be as high quality as I can make them.”* ‘Think Week’ is another decision fatigue lowering method devised and applied by Bill Gates, a well known and successful IT leader. Such a week takes place twice a year and is spent in a remote location, in complete solitude, with all distractions and connectivity removed - he is only visited by the caretaker who brings two meals a day. This time is fully devoted to uninterrupted books reading, thinking, and strategic decision making, Guth, 2005.

Behaviour of the world's best leaders and managers strongly implies that decision fatigue is real and should be factored. However, the existence of ego depletion and by extension decision fatigue is denied by some scientists like Hagger et al., 2016, Friesse et al., 2019, and Dang et al., 2021. In this paper, the existence of ego depletion and decision fatigue is acknowledged by authors.

Lately an awareness of decision fatigue has risen. In the public space discussions, publications, and notable examples of fatigue mitigation are visible and presented by the leaders and field experts. Despite that, good practices are not easily implemented into one's life. It is caused by a few factors, sometimes a strong will is needed to drive change in behaviour or close environment, sometimes resources which are out of reach are needed, sometimes the theoretical results are too abstract for efficient application or just too vague, etc. Therefore, this paper is focused on the IT industry and reasons why suboptimal decisions are made by managers. Especially, as shown above, practices helping to fight decision fatigue are shared, and recommended by the high performing IT leaders.

1.2 Problem formulation

Leaders are responsible for making a large number of decisions on a daily basis, many of which have a ripple effect on the behaviour of multiple people. (Hoomans, 2015) argued that these leadership decisions compound over time, much like the way individual spending decisions impact a balance sheet. While individual choices that only affect oneself, such as

what to eat for lunch, may seem minor, a leader's decisions always interact with the choices and actions of others and can have a far-reaching impact on spouses, families, teams, business units, organisations, communities, and beyond.

Technically the aim of each decision made by a leader would be the best possible outcome - especially in the long term perspective. However, due to the “human aspect”, the decision making process of leaders is affected by a number of factors and psychological biases. It can often be observed that the decisions made are frequently leaning towards short term wins, instead towards the ones optimal in the long term. Also, the decisions made are often focused on the individual gains or only the specific part of the organisation the decision maker is from is benefited.

When taking decisions or making judgments, individuals regularly apply heuristics: cognitive shortcuts or rules of thumb. A heuristic can be defined in the following way: *“Heuristic is a broad term that, according to Shah and Oppenheimer (2008: 207), “has been used to describe nearly everything.” In the game-theoretic literature, for example, a heuristic is defined as “a method or rule for solving problems” (Peyton Young, 2008: 1).”* Vis, 2019.

There are several types of heuristics that have been found to potentially impact managers' judgement, including the affect heuristic. According to (Bazerman & Moore, 2009), this type of heuristic is characterised by an emotional evaluation that occurs before higher-level reasoning and is often not conscious. However, people may still rely on these affective evaluations as the basis for their decisions rather than engaging in a more thorough analysis process. The affective heuristic is more likely to be used when people are busy or under time constraints and can be influenced by various variables, such as the mood of the manager or the applicant's appearance. Environmental conditions that alter affect, such as weather, can also impact decision making. While affect can be a useful guide, it can prevent optimal choices if it replaces more reflective decision making.

Nevertheless, heuristics should not be considered from a negative perspective only. *“In managing an enterprise, uncertainty belongs to the attributes of the decision making processes. In competitive environments, where success depends on high quality decisions, taking the wrong steps can lead to loss of market share or even contribute to running out of business. That is why it is important to choose from the many alternatives those methods which will be most effective in solving problems in a simple and quick way, and heuristics offer such a solution, which has proved its usefulness in uncertain business environments.”* Mazurkiewicz, 2022.

It is believed that this problem is even deeper for leaders in the tech industry. Due to the high complexity of the problem domain, heuristics may become a natural and even more polar necessity for managers working in tech. It can be observed that the context in which most tech managers operate in, meets the definition of Complex or Chaotic, as described by Cynefin framework (*About - Cynefin Framework - The Cynefin Co*, n.d.). This fact makes the authors believe that the decision making for managers in the tech industry is much more

difficult and requires a more “experimentative” approach, backed up with various heuristics to navigate uncertainty.

In this study, research work is focused on the decision making process, along with the decision quality, and checking whether there is room to improve the way the decisions are made.

The following areas would be considered:

- Hiring of software engineers
- Suboptimal decisions related to individuals, e.g. not ensuring that the engineers are compensated according to their expectation and the market, which may cause experienced individuals to leave the project
- Focusing on meeting the business goals, and how it can be impacted by seemingly insignificant factors
- How similarity may cause issues
- Optimization or fairness
- Self-awareness within a community of managers

Additionally, in this paper a recommendation on how to improve the decision making process of leaders is proposed by authors.

1.3 Aim

The aim of this work is to gather data which provide insight into how hard it is to make decisions in a professional technical environment. On top of these results tools and recommendations for managers on how to make better and higher quality decisions, i.e. quicker and unbiased, would be proposed by authors.

2 Literature review - theoretical background

In this chapter the scientific research literature related to the decision making process and the relevant factors influencing it, would be presented and discussed by authors.

In this dissertation, the behavioural aspects of suboptimal decision making in leaders within the tech industry will be explored. To accomplish this, literature on deep work, critical thinking, and psychological research on decision biases and heuristics will be reviewed. The interconnection of these factors in the daily work of managers and the impact on the quality of decisions made by leaders will be examined. Additionally, the unique characteristics and challenges of the tech industry and their potential influence on decision making in this field will be considered. Through this analysis, a deeper understanding of the factors contributing to suboptimal decision making in tech industry leaders is aimed to be attained.

2.1 What is a decision?

An important question should be raised at the very beginning - what do we mean when speaking about “decisions”? The *Cambridge Dictionary of English* defines the term as “*a choice that you make about something after thinking about several possibilities*”.

However, due to the nature of this paper, a question might be raised about the meaning of “decisions” in the context of management. What would be the definition then?

In an article from 1969, a following answer by Samuel Eilon is included:

“The decision process is described as a series of steps, starting with information output and analysis and culminating in resolution, namely a selection from several available alternatives” (Eilon, 1969, 1). The article also discusses various aspects of rationality in decision making and the concept of personalistic versus impersonalistic choice. Eilon suggested that over time, time management control tends to involve more formal procedures and become more impersonalistic in nature.

In the same article, the role of a manager in term of decision making is also described:

“The manager is the man who decides among alternative choices. He must decide which choice he believes will lead to a certain desired objective or set of objectives.” (Eilon, 1969, 1)

Based on those definitions, a following conclusion can be drawn: managers are faced with situations, where choosing between several alternatives is necessary. The choice is made, using various aspects of rationality, and the goal is to reach a desired outcome at the end.

In practice, there are many different ways how the process might look exactly. Sometimes a decision is resulted by heuristic and therefore made quickly, sometimes it is a longer process which requires focus and deep thinking beforehand. Nevertheless, the goal remains the same,

which is “reaching the desired outcome” - based on previous observation this is what might be called a “rational decision”.

However, the concept of "rationality" is not well-defined. (March, 1994) pointed out that the term is used in various ways, including to describe actions that have desirable outcomes, actions that are materialistic in spirit, and actions that display mental health: *“Like many other commonly used words, "rationality" has come to mean many things. In many of its uses, "rational" is approximately equivalent to "intelligent" or "successful." It is used to describe actions that have desirable outcomes. In other uses, "rational" means "coldly materialistic," referring to the spirit or values in terms of which an action is taken. In still other uses, "rational" means "sane," reflecting a judgement about the mental health displayed by an action or a procedure for taking action”*. Additionally, the literature on decision making tends to use the term loosely or inconsistently."

Despite this ambiguity, this has been discussed by a great number of authors in literature. Definitions might differ, depending on the specific field of research. For instance, from the field of behavioural economy, Herbert Simon proposed a following definition:

“The judgement that certain behaviour is ‘rational’ or ‘reasonable’ can be reached only by viewing the behaviour in the context of a set of premises or ‘givens.’ These givens include the situation in which the behaviour takes place, the goals it is aimed at realising, and the computational means available for determining how the goals can be attained. In the course of this conference, many participants referred to the context of behaviour as its ‘frame,’ a label that I will also use from time to time. Notice that the frame must be comprehensive enough to encompass goals, the definition of the situation, and computational resources.” (Simon, 1986)

Despite the ambiguity surrounding the concept of "rationality," it has been widely discussed in literature. Definitions may vary depending on the field of research. For example, in the field of behavioural economics, (Simon, 1986) defined "rational" or "reasonable" behaviour as that which is viewed in the context of certain "givens," including the situation in which the behaviour occurs, the goals it aims to achieve, and the computational means available for achieving those goals. These "givens," which Simon referred to as the "frame" of the behaviour, must be comprehensive enough to encompass these elements. *“The judgement that certain behaviour is ‘rational’ or ‘reasonable’ can be reached only by viewing the behaviour in the context of a set of premises or ‘givens’. (...) In the course of this conference, many participants referred to the context of behaviour as its ‘frame (...)’ Notice that the frame must be comprehensive enough to encompass goals, the definition of the situation, and computational resources.”* (Simon, 1986)

According to this, we may observe the following - what is considered rational depends on “frame” or “context”. Such context might depend on the desired outcomes, assumed by an individual. Therefore a “rational decision” might be treated as a choice made by an individual, which, in their best judgement, would lead to the assumed outcomes. E.g. if an

individual made decisions, which, on purpose, would not aim to reach the desired goals, such decisions could be treated as “irrational”.

Some authors have driven the further development of what might be called “rational”. Looking at “rationality” from the game theory perspective - according to (Bicchieri, 2004, 190), the theory of rational choice is based on the assumption that a decision maker will choose the best action available based on their preferences. These preferences can be diverse and may reflect values and dispositions that are outside of the realm of rationality. However, for the purpose of rational choice, these preferences must be “well-behaved,” meaning that they fulfil certain formal conditions that can be represented by a utility function. Therefore, rational choice involves maximising one's utility, or finding the maximum value of their utility function (Bicchieri, 2004, 190). In this context, making a choice that leads to the best outcomes can be understood as maximising one's utility. This definition could be considered relatively aligned with the previous one, if a following assumption is made - that “leading to best outcomes” would mean “maximising one's utility”.

An important point, from the context of “outcome”, was raised in the book “Thinking in bets” by Annie Duke. The author's suggestion would be to treat life's decision more like a game of poker, instead of a game of chess. Most often, the decisions that are made have a significant degree of uncertainty - therefore, decisions should not be evaluated on their outcome alone.

“What makes a decision great is not that it has a great outcome. A great decision is the result of a good process, and that process must include an attempt to accurately represent our own state of knowledge. That state of knowledge, in turn, is some variation of “I'm not sure.” (Duke, 2018)

Nowadays, with the latest rise of psychological and social sciences, decisions and its biases are thoroughly examined through their lens. Therefore, it is important that the economical aspect of decision making is also covered. For an agent who always acts rationally with the best self-interest, egoistic even, in mind the term *homo economicus* is coined. As noted by Adam Smith it is neither good nor bad “(...)he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it” Smith, 1776.

Based on the quoted literature, it can be assumed that when “decision making” is mentioned, the following definition can be crafted:

A rational decision is a choice made by an individual that, according to their best knowledge, has the greatest chance of leading to assumed outcomes. In case of decisions made by managers “maximising utility” won't necessarily be a correct assumption, rather utility of the team, organisation or the entire company. Nevertheless, when decisions are being evaluated, the outcome alone should not be the only factor taken into account - rather the quality of the whole decision making process, and the way it is managed to accurately represent the relevant state of knowledge.

2.2 How decisions are made?

In the previous subsection, multiple definitions of the “decision making process” have been quoted. However, a further look should be taken at the specifics of the decision making process and how it exactly takes place in the human brain. One of widely accepted theory is well described in “Thinking fast and slow”(Kahneman, 2013), the famous book by Daniel Kahneman, a Nobel Prize Laureate, who metaphorically splits our mind into two systems:

- ***System 1** operates automatically and quickly, with little or no effort and no sense of voluntary control.*
- ***System 2** allocates attention to the effortful mental activities that demand it, including complex computations. The operations of System 2 are often associated with the subjective experience of agency, choice, and concentration.*

In other words, roughly all automated, unconscious tasks are processed by System 1, any tasks where focus is required are processed by System 2. For example, normally food chewing is done automatically by humans; ergo System 1 is used. However, in a special situation like when a fish is eaten and fishbone needs to be taken care of, then a focus is put on chewing and is controlled by System 2. As soon as focus is lost control is taken back by System 1.

It may be seen as the results of the first system are characterised by averaging, estimating and approximating, while of the second system can be described as accurate, literal, careful. Additionally, some actions done by our mind are almost always executed by System 1, others only by System 2, and some can be switched between those two.

The decisions made by people are an outcome of a combination of all those above elements. And the human brain/thinking process is influenced by the environment, society, fatigue, emotions, medications, etc. Therefore those factors must be accounted for in the final result. And they are, and it is called decision or cognitive bias; in short it is an error that is made by our mind influenced by psychological factors. Cognitive bias defined by Cambridge dictionary “*the way a particular person understands events, facts, and other people, which is based on their own particular set of beliefs and experiences and may not be reasonable or accurate*” - Cambridge Dictionary, 2023.

Some common bias factors will be discussed in the next section.

2.3 What might affect the decision making process?

In this chapter, an exploration of some of the factors that may affect the decision making process will be undertaken. These factors can be grouped into three main categories: environment and things around an individual, mental fatigue, and social norms. An understanding of these factors can help to make more informed decisions and avoid common pitfalls in the decision making process.

The impact of the environment and things around an individual on decision making will be examined first. This can include factors such as the availability of information, the presence of distractions, and the influence of various environmental elements. It is important to consider how these factors may affect the ability to gather and process information, as well as the likelihood of making a rational decision.

The impact of mental fatigue on decision making will be discussed next. Mental fatigue can occur when sustained, effortful tasks have been engaged in for an extended period of time. It can lead to a decrease in the ability to focus, think creatively, and make good decisions.

The influence of social norms on decision making will be explored last. Social norms are the unwritten rules that govern behaviour in a given group or society. They can shape expectations of how behaviour and decisions should be made, and may lead to conformity to certain behaviours even if they do not align with personal values or goals.

By considering these factors, a better understanding of the factors that may affect the decision making process can be gained and steps can be taken to mitigate their impact.

2.3.1 Environment

In addition to biases, which are inherent to human nature, there are multiple other factors that can affect judgement and decision making, such as the environment. In 1981, Langer (Langer, 2015) conducted an experiment called the "counterclockwise study," in which eight men in their late 70s were placed in a monastery in New Hampshire and immersed in an environment that was designed to transport them back to 1959, when they were in their prime. The environment included cultural references from that time period and no mirrors, only photos of the participants from their 20s. The results of the experiment were reportedly extraordinary, with the participants showing increased strength, manual dexterity, improved vision and hearing, and sitting taller. However, due to the small sample size and unorthodox nature of the experiment, Langer did not publish the results at the time but continued to work on similar studies. Many years later, she described the experiment and other findings in her book (Langer, 2015). In more recent years, there have been attempts to replicate the study in a more scientific manner. For example, (Pagnini et al., 2019) designed a similar study in which a group of older adults (aged 75+) participated in a one-week retreat in Italy and were instructed to act as if they were living in 1989. The study, which was conducted as a randomised control trial with three conditions (experimental, active control, and no treatment), aimed to test the impact of the "counterclockwise" intervention on medical, cognitive, psychological, and age appearance outcomes.

There have also been different examples, showing the level of environmental impact of human behaviours. The article describes a case of U.S. soldiers addicted to heroin in Vietnam. According to Robins et al. (2010), in May 1971, two congressmen who visited Vietnam reported widespread heroin use among American soldiers. In response, the Department of Defense implemented a urine-screening program to detect and detoxify soldiers using heroin at the time of their departure from Vietnam.

*“Practically every man we interviewed had had an opportunity to use heroin in Vietnam. Eighty-five percent of the men told us that they had been offered heroin while they were there—often quite soon after their arrival. (One soldier was offered heroin as he descended from the plane on which he arrived in Vietnam by a soldier preparing to board that same plane to return home. He was offered the heroin in exchange for a clean urine so that the man due to leave would be able to get through the urine screen. **Thirty-five percent of Army enlisted men actually tried heroin while in Vietnam, and 19% became addicted to it.**” (Robins et al., 2010, 1)*

In terms of data gathered, it has been certain that an unlikely high percentage of the U.S. soldiers garrisoned in Vietnam, were highly addicted to heroin. This fact has been concerning and disturbing, especially in the context of their future after coming back to the United States. However, according to Clear (2018), a surprising finding was that the issue of addiction did not arise when soldiers returned home from Vietnam. In a study conducted by (Robins et al., 2010, 1), it was found that only 5% of soldiers who had been heroin users became re-addicted within a year of returning home, and only 12% relapsed within three years. This suggests that approximately nine out of ten soldiers who used heroin in Vietnam eliminated their addiction nearly overnight, contradicting the belief at the time that heroin addiction was a permanent and irreversible condition. The study found that addictions can dissipate spontaneously if there is a radical change in the environment. In Vietnam, soldiers were surrounded by cues that triggered heroin use, such as the easy access to the drug, the constant stress of war, the presence of fellow soldiers who were also users, and their distance from home. When these soldiers returned to the United States, they were no longer exposed to these triggers, and their habits changed accordingly.

Results presented above are indisputable. However, the example is a bit extreme and it may be perceived as not applicable to daily work, which is incorrect. In a book “Deep Work” Newport, 2016, some real life examples are provided, two distinctive ones would be presented here. Carl Jung and J.K Rowling, those two names are well known. Jung, a worldwide recognised psychiatrist who has worked at the beginning of 20th century. And Rowling, a worldwide known writer, whose works were translated into at least 70 languages, who has published her works at the end of 20th century and beginning of 21st century. Although their productive time was in different centuries, they both had done a similar thing, and had a separate space for thinking and working. A tad excessive approach was made by Jung. After his trip to India, where he noticed a special space in regular houses devoted to meditation, a special house in Switzerland had been built by him. *„he expanded the complex to include a private office. “In my retiring room I am by myself,” Jung said of the space. “I keep the key with me all the time; no one else is allowed in there except with my permission.” (...) Though it’s tempting to think of Bollingen Tower as a vacation home, if we put it into the context of Jung’s career at this point it’s clear that the lakeside retreat was not built as an escape from work.”* Newport, 2016.

More practical approach was made by Rowling. Instead of building a house, a hotel room had been rented by her *„(...) she was finding unbroken concentration increasingly difficult to achieve at her home office in Edinburgh, Scotland. “As I was finishing Deathly Hallows there came a day where the window cleaner came, the kids were at home, the dogs were barking,”*

(...) “So I came to this hotel (...), but I didn’t intend to stay here,” she explained. “[But] the first day’s writing went well so I kept coming back... and I ended up finishing the last of the Harry Potter books.” ” Newport, 2016.

It is easily noted that those two authors were at the peak of their careers. High quality results were expected from both. The results were delivered and in order to do that the environment had been changed by both of them.

The important conclusion which might be drawn from the all above cases: the environment an individual finds themselves in can significantly impact their behaviour, the way their brain functions and their judgement. Also the decision being made would be environment dependent.

2.3.2 Mental fatigue and deep work

In his famous aforementioned book, Kahneman (Kahneman, 2013) is focused on presenting System 1 and System 2, and on the dynamics between the systems. It is mentioned by him that mental and decision fatigue influence this dynamic. However, he is concentrated on mechanisms and results of the imbalances and the nature of these systems, not on the fight with fatigue or on the fatigue itself. That is why the topic should be discussed separately here.

The Attention Restoration Theory (ART) is a theory developed by Rachel and Stephen Kaplan (Kaplan & Kaplan, 1989) that explains the importance of taking breaks and spending time in natural environments for restoring mental fatigue and replenishing our ability to focus. According to the theory, mental fatigue is a state of mental exhaustion that results from prolonged periods of effort or stress, and is characterised by difficulty in focusing and a lack of motivation “*The worn-out state in these situations is generally not physical; in fact, one might even complain of a lack of physical activity. Rather, these situations involve what we are calling mental fatigue. (...) For a mentally fatigued person, paying attention to something uninteresting is burdensome, but attending to something of great interest poses no particular challenge.*” Kaplan & Kaplan, 1989. Further, authors mentioned two types of attention, involuntary and direct. Involuntary is a type of attention triggered by something that excites a person; it’s not forced. Direct is a type of attention where an effort is put, where an uninteresting fact or knowledge needs to be taken care of. And the repercussions of inability to induce direct attention are of colossal magnitude „*The role of directed attention in human functioning is, however, far more pervasive and more crucial than it might seem. (...) Thus, without directed attention one is likely to be rash, uncooperative, and far less competent. (...) after exposure to such an experience [mental fatigue] individuals are less likely to help someone in need (...) are also more aggressive, less tolerant, and less sensitive to socially important cues.*”, Kaplan & Kaplan, 1989. Therefore, the ability to combat mental fatigue is instrumental.

In this paper the decision making process by people in a leadership position is discussed. Now, it is easy to imagine how a company led by people with depleted directed attention would look, the social interactions, the quality of decisions. Earlier Bill Gates, Jeff Bezos,

Barack Obama and others were mentioned, and their distinctive approach to fight with decision fatigue. Their behaviour might be considered as oddities but in fact they epitomise extremely successful modern day attention restoration and/or mental fatigue reduction techniques. It is important that the modern day is stressed here. First iPhone release was dated in June 2007. Year later, in 2008 a new research (Berman et al., 2008) with Kaplan involvement was released, about twenty years after the book was published. In the paper it was presented that a walk through the city increases mental fatigue while a walk in the forest actually decreases it. Now, it can be easily imagined how a simple walk through the city combined with usage of a smartphone, a device with apps designed to fight for our attention, influences fatigue. Or how our mental fatigue is increased with the omnipresent smartphone and companies who profit proportionally to how much of our attention they take. Given that, Gates, Bezos, Obama and others' habits are a Northstar of what should be considered while building habits and planning activities.

2.3.3 Social norms

Another important factor that might have direct impact or indirect impact on our decision-making processes by shaping our perception of reality is social norms. These unwritten rules, which dictate our behaviour in various aspects of life, are often followed without conscious thought or questioning. Our innate desire to belong can affect the way we interpret and perceive things, and as an effect indirectly influence our decisions.

Social norms and influence of the group can also be considered as significant factors that influence human behaviour. In "Atomic Habits", a book about habits and the way our brains work, James Clear explained the degree of impact other people can have on an individual. The main reason can be considered the following - people are herd animals, which lived in tribes, as this was essential to survival. The ones that managed to collaborate and bond with others could enjoy increased safety, mating opportunities, and access to resources (Clear, 2018, 98). As Charles Darwin noted, "*In the long history of humankind, those who learned to collaborate and improvise most effectively have prevailed.*" As a result, one of the deepest human desires is to belong. And this ancient preference exerts a powerful influence on our modern behaviour.

One immediate consequence of following social norms is that people imitate others in order to fit in. Clear (2018) explained that we follow the script handed down by our friends and family, our church or school, our local community, and society at large. These cultures and groups come with their own set of expectations and standards that dictate our behavior, such as when and whether to get married, how many children to have, which holidays to celebrate, and how much money to spend on a child's birthday party. These social norms are the invisible rules that guide our behaviour every day and are often followed without thinking, questioning, or remembering. As the French philosopher Michel de Montaigne wrote, 'The customs and practices of life in society sweep us along.'

According to J. Clear (Clear, 2018, 99), people are believed to imitate three groups in particular:

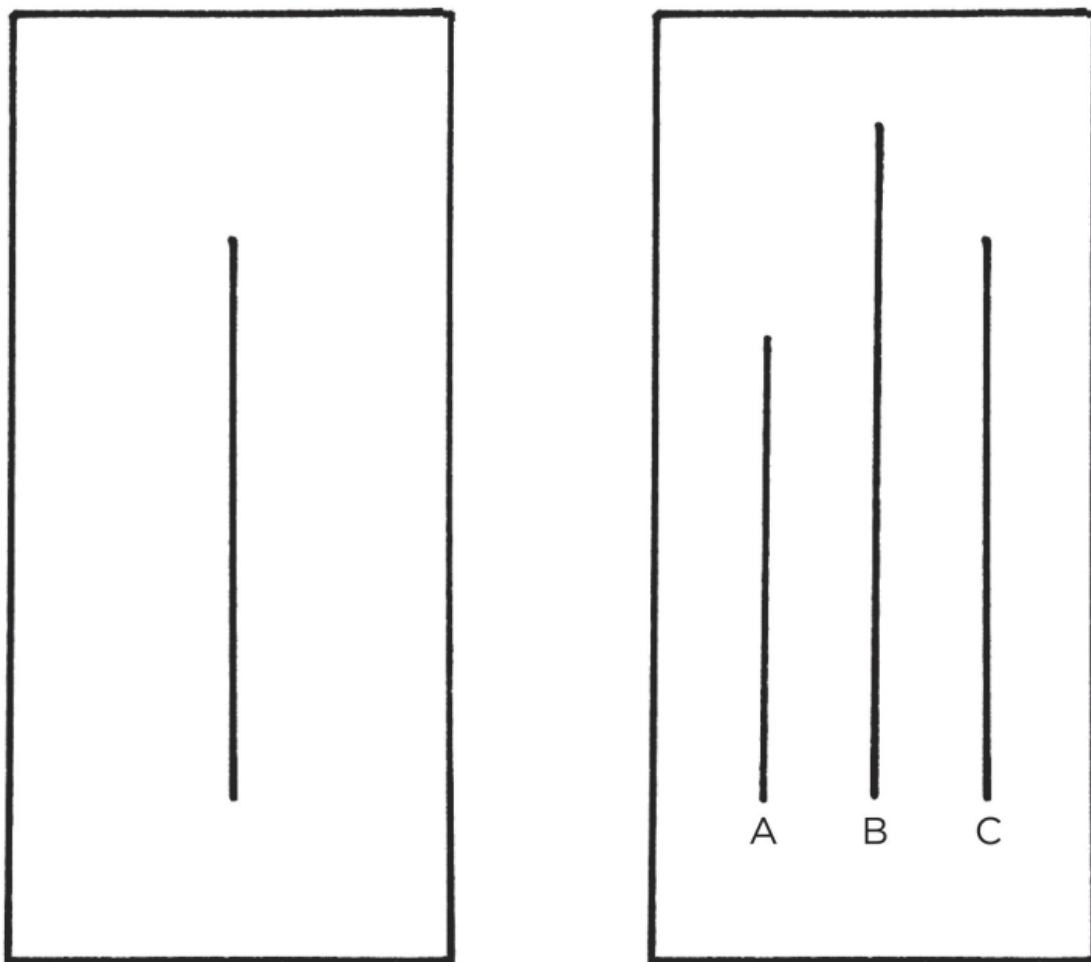
- The close - family, friends, coworkers
- The many - groups of people, we are in

- The powerful - people that are acknowledged, recognised and praised

This, undoubtedly, may be considered something that affects the decisions which are being made by people.

In the 1950s, psychologist Solomon Asch conducted a series of experiments, in order to assess the impact of group pressure on the judgement being made. The subjects of the experiment would enter a room with a group of people they did not know, who were actually actors planted by the researcher and instructed to give scripted answers to certain questions.

The group would be shown one card with a line on it and a second card with a series of lines, and they were asked to select the line on the second card that was similar in length to the line on the first card. An example line set would like like the one below:



Picture 1: Experiment's test card (Clear, 2018)

"The experiment always began the same. First, there would be some easy trials where everyone agreed on the correct line. After a few rounds, the participants were shown a test that was just as obvious as the previous ones, except the actors in the room would select an intentionally incorrect answer. For example, they would respond "A" to the comparison

shown in Figure 10. Everyone would agree that the lines were the same even though they were clearly different. The subject, who was unaware of the ruse, would immediately become bewildered. Their eyes would open wide. They would laugh nervously to themselves. They would double-check the reactions of other participants. Their agitation would grow as one person after another delivered the same incorrect response. Soon, the subject began to doubt their own eyes. Eventually, they delivered the answer they knew in their heart to be incorrect.” (Clear, 2018, 100-102)

It is also worth noting that the experiment was done multiple times, with different parameters. According to (Clear, 2018), in the Asch experiments, the conformity of the subject increased as the number of actors in the room increased from one to eight. When there was just one actor present, there was no effect on the subject's choice. However, as the number of actors increased to two, three, four, and eventually eight, the subject became more likely to second-guess themselves and conform to the group's incorrect answer. In fact, nearly 75% of the subjects agreed with the group's incorrect answer by the end of the experiment.

The above finding has a great impact on people's judgement and, as an effect, the decisions made. The bigger the group is, the harder it is to make a decision that would be against the majority.

The situation described above provides great insight into peer pressure on the decision making process. The more the peers the greater the pressure. However, it is important to realise that in one on one situations the making of the decisions can be influenced by the other side too.

In the book titled “Games people play” Berne, 1973, insights on how people communicate and interact according to Transactional Analysis rules are provided. Three ego states of a human psyche; the Parent, the Adult, and the Child are defined in TA. The rituals, and social behaviours and interactions could be seen as a result of dynamics between those states. When interaction between two human beings is conducted on the same level of ego, then communication is smooth and without misunderstandings. Otherwise, unpredicted outcomes may happen and for example influence a decision making process. It is illustrated by the following example „ (...) in the following exchange. Salesman: ,This one is better, but you can't afford it.’ Housewife: ,That's the one I'll take.’ The salesman, as Adult, states two objective facts: ,This one is better’ and ,You can't afford it.’ At the ostensible, or social, level these are directed to the Adult of the housewife, whose Adult reply would be: ,You are correct on both counts.’ However, the ulterior, or psychological, vector is directed by the well-trained and experienced Adult of the salesman to the housewife's Child. The correctness of his judgment is demonstrated by the Child's reply, which says in effect: ,Regardless of the financial consequences, I'll show that arrogant fellow I'm as good as any of his customers.’ At both levels the transaction is complementary, since her reply is accepted at face value as an Adult purchasing contract. (...) On the surface the Adult seems to have the initiative, but as in most games, the outcome is determined by the Child, and the participants may be in for a surprise.” Berne, 1973.

The following situation can be easily imagined. In a one to one meeting a discussion goes in a similar direction as in the above example and as a result the manager is influenced by a subordinate. And a decision in favour of a personal subordinate's gain is made and the organisation is impacted.

2.3.4 Power dynamics, hierarchy and culture

The hierarchy and power dynamics definitely should be considered another non-negligible factor in the decision making, especially in the work environment. These would very often be related to the culture in the relevant region of the world, where people involved originate from. In the 1970s, a model called "Six Dimensions of Culture" was published by psychologist Geert Hofstede. The model was based on studies conducted on people working for IBM in more than 50 countries, which aimed to create an internationally recognized standard for understanding cultural differences. Finally, six main "cultural dimensions" were identified, which were:

- Power Distance Index (high versus low),
- Individualism Versus Collectivism,
- Masculinity Versus Femininity,
- Uncertainty Avoidance Index (high versus low),
- Long- Versus Short-Term Orientation,
- Indulgence Versus Restraint.

Human behaviour, and therefore decisions made, can be hugely impacted by these dimensions. For instance - considering the Power Distance index: as Chen and Starosta write in the book "Foundations of Intercultural Communication": *"the dimension of power distance specifies to what extent a culture adapts to inequities of power distribution in relationships and organizations"* (Chen & Starosta, 1998, 52). Hofstede's research (Hofstede, 1984) identified a distinction between those belonging to high-power-distance and low-power-distance cultures, with the former characterised by comparatively larger hierarchical gaps among individuals on the basis of differentiators such as age, sex, generation, and status. In high-power-distance cultures, power tends to be more centralised and much value is placed on status and rank (Zelley & Dainton, 2010). In contrast to the prevalence of vertical, authoritarian-leaning relationships in high-power-distance cultures, low-power-distance cultures exhibit much more horizontal modes of interpersonal interaction. Cultural dimensions research has resulted in the quantification of power distance scores for several countries. For example, the United States has a power distance score of 40, compared to a score of 80 for Ghana (Hofstede Centre, n.d.). This means that comparatively, status and rank distinctions matter less in the United States, but they have a greater influence in Ghana's cultural and value system.

A specific research, related to Hofstede's cultural dimensions and management in corporations, has been done in 2016 by Alexandrina Cristina Vasile and Luminita Nicolescu (Vasile & Nicolescu, 2016, 1). The paper goal was to describe and assess the relation between overall management quality and the management's adjustment to cultural dimensions.

“People build organizations and rule them according to their values, but in the corporation field specific values might be successfully applied or implying the whole company failure. The analysis is made based on Hofstede research and having in mind his dimensions on a dynamic hypothetical case where there are taken into account cultural dimensions for Romania, Germany, Kazakhstan and United States of America.” (Vasile & Nicolescu, 2016, 1).

The following conclusions were drawn: it was found that cultural dimensions and economic and political threats can greatly impact the results of certain actions. Ignoring cultural factors in decision-making can lead to economic disruption in the implementation of new sites. Therefore, management should consider cultural values, history, and national identity, rather than using a standardised approach, in order to avoid negative consequences. It is also worth considering whether culture itself directly affects the decisions being made. This would allow the following observation: ignoring cultural aspects of the environment in which the decisions are being made, could lead to potential negative economic consequences. Would, however, the culture really affect the decisions themselves?

According to a research paper published in 2016 by (Yates & de Oliveira, 2016), people from different cultures tend to make decisions differently. One factor that can impact decision making is the type of information that individuals pay attention to before making a decision. For example, some people may focus on positive information while others may focus on negative information. This can reflect an individual's orientation towards either approaching opportunities or avoiding threats. In a study conducted by Hamamura, Meijer, Heine, Kamaya, and Hori (2009), it was found that Canadians and Americans tended to recall more positive information than negative information after reading about hypothetical life events or product reviews, while Japanese participants showed the opposite tendency or an equal preference for approach and avoidance information. Additionally, the personal goals of Korean nationals, Asian Americans, and Russians were found to be more focused on avoiding threats, compared to European Americans (Elliot, Chirkov, Kim, & Sheldon, 2001).

Another factor that can vary across cultures is the speed at which decisions are made. Some cultures may value more deliberative decision making processes, while others may prioritise rapid, intuitive decision making. For example, in a study by Buchtel and Norenzayan (2008), Koreans were found to favour intuitive decision making modes over logical modes, while Canadians favoured both equally. Similarly, research has suggested that Chinese individuals tend to prefer simpler decision modes, such as lexicographic modes (Chu & Spires, 2008) or recognition-based decision making (Weber, Ames, & Blais, 2004), compared to Americans. Overall, it seems that among East Asians, Japanese tend to prefer slower, thorough decision making processes, while Koreans and Chinese prefer faster, intuitive or rule-based modes (Yates & de Oliveira, 2016).

When it comes to being “confident” about one’s decisions - interesting research was made in 1977 by Philips and Wright: *“English and Chinese participants answered trivia questions and indicated how confident they were in each of their answers. The Chinese judgments were much more overconfident than English judgments. Consider the items for which the*

participants said that they were 80% sure that their chosen answers were correct. The English students were, in fact, correct on about 67% of those occasions. The corresponding statistic for the Chinese students was only 52%.” (Phillips & Wright, 1977).

According to (Yates & de Oliveira, 2016), the degree to which personal values influence decisions can vary depending on culture. *“Cultures differ with respect to the influence of personal values on decisions. There is evidence that Indians make choices that are less closely linked to their personal preferences than do U.S. students“* (Yates & de Oliveira, 2016). Research has shown that individuals from collectivist cultures, such as India, tend to make choices that are less closely linked to their personal preferences than those from individualistic cultures, such as the United States. This is because collectivist cultures often use decision-making modes that involve taking other people into account, meaning that the values and expectations of others become important considerations in the decision-making process. As a result, the decision maker's own values may have relatively less impact in collectivist cultures compared to individualistic cultures, where fewer concerns need to be taken into consideration. People in collectivist cultures may even find value in choosing options that adhere to norms rather than following personal preference. For example, a study found that both Brazilians and Americans (Bontempo et al., 1990) indicated that they were likely to follow norms when deciding on behaviour, but the Brazilians were more likely to also indicate that they would be happy about following those norms. Similarly, Indians have not reported feeling constricted or burdened when accommodating others in their decision making. Overall, these findings suggest that while personal values are important in Westerners' decision-making, they may be less important in other cultures due to their collectivism and tightness.

Based on all the examples of research described in this section, a following conclusion can be drawn: cultural aspects and differences are an important factor that affect the way a decision process might look in different cultures. The cultural environment in which the decision is made is also something that should not be ignored by a decision maker - otherwise serious economical consequences might arise as an effect

3 Research methodology and findings

3.1 Research construction

In earlier chapters a decision was defined as well as factors that could influence the decision making process were listed. Therefore, in our research we focused on checking how impactful those factors are. If known biases are still significant, if presence of less obvious ones is noticeable.

A bias when observed once can be seen as an honest mistake or it can be interpreted as just a fluke. Therefore, research needs to be done on a larger group of participants, where statistical significance is assured. That is why the conducted research is quantitative in its nature and data was gathered by survey.

Survey was conducted in the Computer-Assisted Web Interviewing (CAWI) method. In CAWI, the respondent receives an invitation to participate in the survey via email, a pop-up message on a website, a message or sms, etc., and the survey is completed online using a computer or mobile device. The survey is programmed using specialised survey software that ensures consistency in the survey administration and respondents' answers. Among its advantages one may find the ability to reach a large and diverse group of respondents quickly and cost-effectively, as well as its ability to collect data in real-time. However, the security and privacy of the data collected, and the possibility of technical issues that can impact response rates and data quality, may be seen as some of the limitations of this method.

In Particular, when Compared to traditional qualitative research methods such as in-depth interviews (IDI) and focus group interviews (FGI), CAWI has several advantages. Firstly, as mentioned above, it provides a wider reach to participants, which is particularly useful for studies that require a diverse sample or a large sample size - as occurrence of biases were researched, quantitative not qualitative approach was needed. Secondly, the advantage of CAWI is the degree of anonymity it provides to participants, which can increase their willingness to share personal information or opinions, particularly in sensitive topics. Additionally, CAWI can ensure consistency in the delivery of questions and responses across all participants, as the questions and instructions are standardised and delivered in the same format to everyone. This can help to reduce bias and increase the reliability of the data. Thirdly, the next advantage of using CAWI is the flexibility it provides to participants in terms of choosing the time and device they use to complete the survey. Participants can access the survey at their own convenience and use their preferred device, such as a desktop computer, laptop, or mobile device. This can improve the response rate and reduce the dropout rate, as participants can complete the survey in a comfortable environment without feeling rushed or pressured.

The survey was directed towards IT managers and leadership. Therefore, digital means of communication was a perfect medium for reaching out. A CAWI survey allowed surveyees to provide anonymous answers at any time and place, and at any convenient device.

3.1.1 Survey construction

The questionnaire used in this study comprised a total of twenty-two questions, which were divided into two groups - Group A and Group B - due to the presence of variations in some of the questions. The group assignment was done randomly, with each survey participant being directed to a URL that contained a redirection script. This script randomly redirected the participant to one of the survey links, either Group A or Group B, without the participants being aware of the different survey versions.

The decision to not include a control group, which would have had no "suggestions" or variations in the survey questions, was based on the practical constraint of the limited number of respondents in the survey. The research aimed to collect data from a specific target population (managers in the tech industry) within a short timeframe, and including an additional control group was not feasible under these circumstances. Despite the absence of a control group, the data collected from Group A and Group B can still provide valuable insights and comparisons.

The inclusion of two groups, Group A and Group B, was necessary to facilitate the comparison of different question variants and to observe the presence of heuristics and biases. Most of the heuristics and biases that were measured by the survey could only be observed if there were two question variants that could be compared. By having two question variants, the research aimed to capture variations in participants' responses and behavioural patterns, which would not have been possible with just one set of questions.

The use of Group A and Group B allowed for a controlled comparison of responses and behaviours between the two groups, enabling a deeper analysis of the research question at hand. The random assignment of participants to Group A or Group B ensured that any observed differences in responses could be attributed to the variations in the survey questions. It is important to note that the participants were not explicitly informed about the existence of different survey versions or the concept of groups in order to prevent potential biases in their responses.

The biases which were tested are described in detail in [Product description and benefits confirmation](#) chapter and graphically presented on Picture 2.

Table 1 lists the question of the survey (Group A and Group B).

Question Number	Group A	Group B
1	<p>Assume that your organisation allows you to buy and use applications that are not officially authorised by the company. Would you:</p> <ul style="list-style-type: none"> • Prefer to have a standardised set of tools used by your team • Prefer to allow everybody to use any tool they wish 	
2	<p>Assuming that nobody interrupts you, how many hours can you work in full focus?</p> <ul style="list-style-type: none"> • 2h • 4h • 6h • 8h 	
3	<p>Team leading: Is Scrum better than waterfall?</p> <ul style="list-style-type: none"> • Yes • No • It depends 	
4	<p>Did you know that 73% of senior developers from Top 5 American tech companies prefer to use MacBook Pro?</p> <ul style="list-style-type: none"> • Yeah, obviously • Nope, I learned it now 	<p>Did you know that 73% of senior developers from Top 5 American tech companies prefer to use ThinkPads?</p> <ul style="list-style-type: none"> • Yeah, obviously • Nope, I learned it now
5		<p>Would you like to receive a 10\$ Amazon coupon after the survey?</p> <ul style="list-style-type: none"> • Yes • No
6	<p>You are looking for a specialist to join your team. The candidate's CV shows that his skills perfectly match the desired profile. A photo of the candidate is included. Which of these photos would incline more to hire the person?</p>	





Answer 1)



Answer 2)

Both pictures downloaded from <https://www.pexels.com/pl-pl/collections/home-office-jhpji8m/>

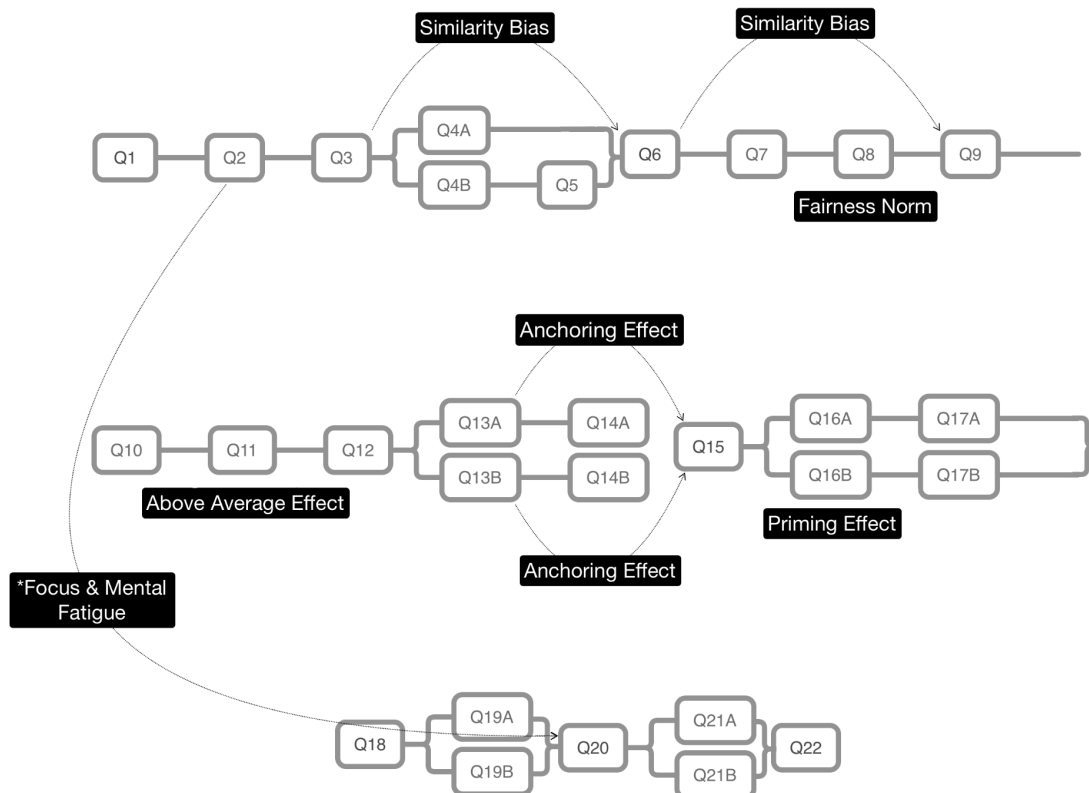
7	Why did you choose this picture? (* the only non-mandatory and open question)
8	<p>Imagine that your team has 3 developers. Another project has ended and your boss has 8 people to "give away". You have to decide to divide those people between your team and another team. Then the other manager can either accept or reject your proposition. If he rejects then those people will be moved to another department. How many people will you keep for yourself?</p> <p>-Choice of a number from interval 1-8</p>
9	<p>At work, which do you prefer using?</p> <ul style="list-style-type: none"> • A Mac with OS • A PC with Windows • I don't care
10	<p>Would you prefer to get 5000\$ today or 6500\$ in one year?</p> <ul style="list-style-type: none"> • 5000\$ today • 6500\$ in one year
11	<p>Do you think your professional skills in your current position are better than those of the average person in the same position in your country?</p> <ul style="list-style-type: none"> • Yes • No
12	<p>Your employer wants to recognize your commitment at work and give you an extra bonus. Which form of additional reward do you prefer?</p> <ul style="list-style-type: none"> • A gift • A cash prize • Other (participants were able to type their preferred custom option in the text field)

13	<p>Memorise the result on a dices (it's six)</p> 	<p>Memorise the result on a dices (it's two)</p> 
Both pictures downloaded from https://www.pexels.com/pl-pl/@markus-winkler-1430818/		
14	<p>Do you think Bill Gates is the most important figure in the history of technology development?</p> <ul style="list-style-type: none"> • Yes • No 	<p>Do you think Steve Jobs is the most important figure in the history of technology development?</p> <ul style="list-style-type: none"> • Yes • No
15	<p>How many tasks a developer should on average do during one sprint? -(Any number can be provided)</p>	
16	<p>Self-organising teams: Should teams have the freedom to choose their own tools even if they are not sanctioned by the company?</p> <ul style="list-style-type: none"> -Yes -Yes, but to only some extent -No 	<p>Effective standardisation: Should teams have the freedom to choose their own tools even if they are not sanctioned by the company?</p> <ul style="list-style-type: none"> -Yes -Yes, but to only some extent -No
17	<p>Self-organising teams: which is better, Kanban or Scrum?</p> <ul style="list-style-type: none"> -Kanban -Scrum -It depends 	<p>Self-organising teams: Which methodology would you recommend to a team?</p> <ul style="list-style-type: none"> -Kanban -Scrum -It depends
18	<p>Which laptop do you think is better: MacBook Air or ThinkPad X1 Carbon?</p> <ul style="list-style-type: none"> -MacBook Air -ThinkPad X1 Carbon 	
19	<p>Given the current market situation - do you think you are being underpaid?</p> <ul style="list-style-type: none"> -Yes -No 	<p>Given the current market situation - do you think you are being overpaid?</p> <ul style="list-style-type: none"> -Yes -No
20	<p>Do you think it would be easy for you to find a new job which is at least as attractive as your current one?</p> <ul style="list-style-type: none"> -Yes -No 	
21	<p>Is it true that Steve Jobs died at the age of 80?</p>	<p>Is it true that Steve Jobs died at the age of 32?</p>

	-Yes -No	-Yes -No
22	How old was Steve Jobs when he died? -(Any number can be provided)	

Table 1: Survey questions

Biases tested throughout the survey are presented in the picture below. In the survey there are abundant questions whose purpose is to put space between tested biases and help relax and distract surveyees' minds.



Picture 2: Survey Structure and researched biases annotated

3.1.2 Sampling strategy

The research is focused on decisions made by leaders. Therefore, professionals who work in leadership roles were contacted by authors and asked to participate in the survey. The data about cohorts and their details is presented in Table 2.

	Group Name	Group Description	Group reach
1	MBA IT	The MBA IT program is designed for leaders and managers who work in the IT industry or manage IT departments in other industries.	Link was shared via internal group chat.
2	Executive MBA	The Executive MBA Program carried out at the Cracow School of Business CUE is addressed to business owners, middle and senior managers, including current and future management board members, who aim to acquire General Management competence.	Program director was asked to share the survey link with the students.
3	International MBA	The Cracow School of Business International MBA Program is designed for middle and senior managers, who want to acquire competencies in Integrated Management. The program is also addressed to entrepreneurs and startupperes who want to develop their knowledge and competencies in various management functions.	Program director was asked to share the survey link with the students.
4	LinkedIn	Authors' friends and professional connections who work in managerial/leadership roles in high tech companies.	Direct request asking to participate in the survey.
5	Coworkers	Author's colleagues who work in managerial/leadership roles in high tech companies.	Direct request asking to participate in the survey.
6	EMS	Worldwide community of Engineering Managers interacting through Slack https://engmanagers.github.io/	Invitation through one of the general discussion channels (Slack)
7	Agile	Managers from Agile Coach Camp Community https://www.accpl.pl/	Invitation through one of the general discussion channels (Slack)
8	Tech Leaders	Managers from Tech Leaders Mentoring Community https://techleaders.eu/	Invitation through one of the general discussion channels (Slack)

Table 2: Cohorts

3.1.3 Data collection procedure

The survey was constructed with care of anonymity from the very beginning. Each participant received a link to the same online survey described earlier. The participant was randomly assigned to a question group, A or B.

3.2 Results overview

3.2.1 Data processing and cleanup process

The survey was answered by 185 individuals. After collecting the survey responses, the first step of input processing was data validation and cleanup. The aim of the cleanup process was to remove any invalid or duplicate responses and to ensure that the data was consistent and accurate. This involved checking for missing values, outliers, and inconsistencies in the responses.

During the data validation and cleanup process, it was discovered that some respondents provided numerical answers that were clearly invalid for the survey questions. This was particularly evident in the two questions that allowed for any numerical response to be entered, namely Question 15 which asked for the average number of tasks a developer should complete during one sprint, and Question 22 which asked for the age at which Steve Jobs passed away. Upon review, it was found that five respondents provided numerical answers that were excessively large and thus, lacked credibility and could potentially impact the data analysis process, especially when calculating summary statistics such as mean and average values. For instance, one respondent provided the answer '1000' for Question 15, while others provided responses such as '1000000' and '1234' for both questions. Therefore, these responses were deemed to lack merit and were excluded from the final results to ensure the accuracy and validity of the findings. It is important to note that such exclusions were made based on established research practices and aimed to ensure the integrity of the study's results.

It is important to note that these exclusions were made in accordance with established research practices and aimed to ensure the accuracy and reliability of the study's findings. By removing such responses, the results of the survey were strengthened, allowing for a more comprehensive and meaningful analysis of the data.

Following the exclusion of the invalid responses, a total of 180 valid responses were collected for analysis. These responses were distributed between two groups, namely Group A and Group B, with 96 respondents in Group A and 84 respondents in Group B:

Group		Frequency	Percent
Valid	A	96	53.3
	B	84	46.7
	Total	180	100.0

Picture 3: Population and group distribution of the survey.

The resulting dataset was deemed suitable for further analysis and formed the basis for the research findings in this study. Once the data had been cleaned, the next step was to analyse the survey results. The data was analysed using statistical software - IBM SPSS. Descriptive statistics were used to summarise the results.

3.2.2 Responses Summary

The responses summary section presents a detailed overview of the data collected from the survey. This section aims to provide a comprehensive understanding of the responses given by the participants, as well as the distribution of these responses across the various survey questions. In order to achieve this, the section presents a table that includes descriptive statistics for each survey question, including the number of responses, the range of responses, the minimum and maximum values, the mean, and the standard deviation. These statistics provide valuable insights into the nature of the data collected, and help to identify any trends or patterns that may be present.

In addition to the descriptive statistics presented in the responses summary section, further analysis was conducted to examine the relationship and correlation between pairs of questions in the survey. For this purpose, Pearson correlation and chi-square methods were employed. The Pearson correlation coefficient is a statistical measure that assesses the linear relationship between two continuous variables. It is used to determine the strength and direction of association between variables, with values ranging from -1 to 1. A positive value indicates a positive correlation, meaning that as one variable increases, the other tends to increase as well. Conversely, a negative value indicates a negative correlation, indicating that as one variable increases, the other tends to decrease. The Pearson correlation coefficient was utilised to assess the degree of association between pairs of continuous variables in the survey data, providing insights into the strength and direction of any observed relationships.

The chi-square method, on the other hand, is a statistical test which was used to examine the association between two categorical variables. It assesses whether the observed frequencies of the categories in a contingency table are significantly different from the frequencies that would be expected if the variables were independent. Chi-square analysis was utilised to explore potential associations and dependencies between pairs of categorical variables in the survey data, helping to identify any significant relationships or patterns.

Kendall's tau-b was employed in this study to complement the Pearson correlation analysis and provide a more comprehensive understanding of the relationships between variables in the survey data. It allowed for the examination of potential associations and dependencies between variables that may not be adequately captured by Pearson correlation, particularly when dealing with ordinal data or when the assumptions of normality and linearity may not hold. The use of Kendall's tau-b added an additional layer of analysis, helping to strengthen the validity and robustness of the research findings.

By employing multiple statistical methods, including Pearson correlation, chi-square, and Kendall's tau-b, the analysis of the research results was comprehensive and robust, providing a thorough examination of the relationships between variables in the survey data. These methods were carefully selected based on their appropriateness for the types of variables and research questions examined, and their ability to provide reliable and valid insights into the patterns and associations present in the data.

Descriptive Statistics						
	N	Range	Minimum	Maximum	Mean	Std. Deviation
[Q1] Tools standardisation	180	1	1	2	1.78	.417
[Q2] Hours of focus	180	6	2	8	3.94	1.787
[Q3] Is Scrum better than Waterfall?	180	2	1	3	2.36	.504
[Q4] Computer suggestion ("Did you know...")	180	1	1	2	1.22	.413
[Q5] {gr. B only} Do you want a voucher?	84	1	0	1	.45	.501
[Q6] Choosing candidate photo	180	1	1	2	1.59	.492
[Q8] New developers split (how many do you keep)	180	7	1	8	3.61	1.489
[Q9] OS Preference	180	2	1	3	1.87	.899
[Q10] Money: today or in 1 year?	180	1	1	2	1.47	.501
[Q11] Are your skills better than average?	180	1	0	1	.71	.457
[Q12] Form of bonus	180	2	1	3	1.42	.776
[Q14] Bill Gates / Steve jobs – most important?	180	1	0	1	.11	.308
[Q15] How many tasks in one sprint?	180	100	0	100	5.16	9.407
[Q16] Should teams choose their tools?	180	2	1	3	1.99	.461
[Q17] Scrum vs Kanban	180	2	1	3	1.98	.539
[Q18] Which laptop is better: Thinkpad vs Mac?	180	1	1	2	1.51	.501
[Q19] Are you underpaid / overpaid?	180	1	0	1	.26	.440
[Q20] Would it be easy to get a new job?	180	1	0	1	.50	.501
[Q21] Did Steve Job die at the age of 80/32?	180	1	0	1	.02	.128
[Q22] How old was Steve Jobs when he died?	180	99	0	99	52.51	13.735

Picture 4: Summary of responses

In conclusion, the responses summary section provides a detailed and comprehensive overview of the data collected from the survey. This data can be further analysed to validate specific hypotheses related to the behavioural aspects of suboptimal decision-making among leaders in the tech industry. For example, correlations or cross-table analyses can be conducted to identify patterns and relationships in the data.

The descriptive statistics presented in this section offer a solid foundation for drawing meaningful conclusions and identifying trends in the data. Furthermore, the insights gained from this data can be leveraged to suggest practical improvements that can be introduced in tech companies to mitigate the impact of cognitive biases on decision-making processes.

4 Product description and benefits confirmation

4.1 Introduction

This part summarises the key insights and findings derived from the survey data. The focus of the analysis was on various cognitive biases that may impact decision-making processes within this group. The section presents hypotheses about the presence of certain biases in this group, assumptions made, ways of validating these biases using the data, validation results, and conclusions drawn from the analysis. In addition to providing insights into the cognitive biases that impact decision-making processes in the tech industry, this part will also provide specific recommendations for managers and companies about things that could be implemented to reduce the negative impact of those biases on business.

The survey data was analysed using statistical techniques to provide insights into the presence or absence of various cognitive biases, including the anchoring effect, similarity bias, priming effect, fairness norm, and over average effect. These biases were chosen for analysis because they are particularly relevant to the tech industry, and may have a significant impact on decision-making processes among managers. For instance, the anchoring effect could influence how managers evaluate job candidates or negotiate salaries, as they may be influenced by initial information or numbers presented during the process. The similarity bias could affect how managers evaluate team members or potential hires, as they may unconsciously favour those who share similar backgrounds or interests. Additionally, the priming effect could influence how managers make decisions by unconsciously influencing their perception of a situation or person. The fairness norm could impact how managers make decisions about allocating resources, such as promotions or bonuses, based on what they perceive to be fair or just. Finally, the over average effect could lead managers to overestimate their own skills and abilities compared to others in their organisation, potentially impacting their decision-making processes.

The presence or absence of these biases was tested using specific questions from the survey, and statistical tests were used to validate their presence or absence in the data. The preceding analysis has shed light on the biases that have been validated by the survey data, pointing to their prevalence among managers in the tech industry. Furthermore, the study explores biases that were anticipated to be present but lacked confirmation in the data, thus providing valuable insights into the possible absence of these biases among tech industry managers.

Overall, the section provides a comprehensive analysis of various cognitive biases that may impact decision-making processes in the tech industry. By identifying the presence or absence of these biases, the section provides insights into potential areas for improvement in decision-making processes and suggests ways in which organisations can mitigate the impact of these biases on their operations.

4.2 Anchoring effect

4.2.1 What is an anchoring effect

The anchoring effect is a well-known cognitive bias that can have a significant impact on decision making. It refers to the tendency of individuals to rely too heavily on an initial piece of information, called the "anchor," when making subsequent judgments or decisions (Caceres, 2021). This phenomenon has been observed in a wide range of contexts, including pricing decisions, negotiations, and even medical diagnoses. The initial information acts as a reference point for all future decisions, leading to suboptimal outcomes in decision making. Individuals may fixate on the anchor and fail to consider other relevant information, leading to biased or irrational decision making.

The anchoring effect has been extensively studied in the field of psychology and behavioural economics. The concept was first introduced by psychologists Amos Tversky and Daniel Kahneman in the 1970s, as part of their research on heuristics and biases in decision making. Their seminal work showed that people's judgments and decisions are often influenced by irrelevant information, such as the initial values presented to them. Since then, numerous studies have confirmed the existence of the anchoring effect and explored its underlying mechanisms (Kahneman, 2013, 118).

In the tech industry, where decision making can have far-reaching consequences, understanding the anchoring effect is particularly important. Leaders in this industry face complex and rapidly changing environments, where they must make critical decisions under uncertainty. These decisions can impact not only the success of their companies but also the broader societal and economic implications of their products and services. By being aware of the anchoring effect and its potential impact on decision making, leaders can make more informed and rational decisions that lead to better outcomes for their organisations and stakeholders.

4.2.2 Validating the effect in the research

To validate the presence of the anchoring effect, the study utilised a survey with two groups, A and B. In question 13, both groups were presented with an image of two dice and the instruction to "memorise the result on the dices." However, the dice images in each group differed. Group B was shown an image of two dice with the number one on each, resulting in a sum of two, while Group A was shown an image of two dice with the number three on each, resulting in a sum of six.

Following this, both groups were presented with question 15, which asked: "How many tasks should a developer on average do during one sprint? (Any number can be provided)." This question was intended to measure the potential influence of the anchor from question 13 on subsequent judgments. The hypothesis was that the number shown on the dice would serve as an anchor and influence the number participants provided in response to the question.

Specifically, participants in Group A (higher number on the dice) were expected to provide a higher average number of tasks for a developer in one sprint than those in Group B.

4.2.3 Results

The results of the survey revealed interesting insights into the effects of the anchoring bias on decision making. Kendall's tau-b was employed in this analysis to provide a more comprehensive understanding of the relationships between the variables. It allowed for the examination of potential associations and dependencies between variables that may not be adequately captured by Pearson correlation, particularly when dealing with ordinal data or when the assumptions of normality and linearity may not hold.

The Kendall rank correlation method analysis showed a significant negative correlation between the dice numbers shown in Question 13 and the responses to Question 15 (correlation coefficient = $-.145$, $p\text{-value} < .05$, two-tailed significance 0.028):

Correlations			
		[info only] Result on dices	[categorized] How many tasks in one sprint?
Kendall's tau_b	[info only] Result on dices	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	180
	[categorized] How many tasks in one sprint?	Correlation Coefficient	$-.145^*$
		Sig. (2-tailed)	.028
		N	180

*. Correlation is significant at the 0.05 level (2-tailed).

Picture 5: Correlation of Q13 and Q15

The results of the survey indicate a significant influence of the dice numbers shown in Question 13 on the participants' responses to Question 15. Specifically, Group B, which was presented with a picture of two dice showing a sum of 2 (one and one) in Question 13, had a mean response of 3.61, with a median of 3.00 and a mode of 3, for Question 15: "How many tasks a developer should on average do during one sprint?". In contrast, Group A, which was presented with a picture of two dice showing a sum of 6 (three and three) in Question 13, had a significantly higher mean response of 6.51, with a median of 4.00 and a mode of 5.

[Q15] "Tasks in one Sprint" – Group A

Statistics		
How many tasks in one sprint?		
N	Valid	96
	Missing	0
Mean		6.51
Median		4.00
Mode		5

[Q15] "Tasks in one Sprint" – Group B

Statistics		
How many tasks in one sprint?		
N	Valid	84
	Missing	0
Mean		3.61
Median		3.00
Mode		3

Picture 6: Anchoring Effect results. Group A anchored with number six, Group B with number two.

These results provide strong evidence that the dice numbers in Question 13 served as an anchor and influenced the participants' responses to Question 15. The findings are consistent with the anchoring effect, where the initial information (the dice numbers) influenced subsequent decisions (responses to Question 15) even when it was not relevant to the task. This confirms that managers and decision-makers should be aware of the potential impact of anchoring bias on their decision making.

4.2.4 Conclusions

Based on the findings of this study, it is evident that the anchoring bias can have a significant impact on decision-making in the technology industry. The results indicate that providing initial information, such as the dice numbers in Question 13, can influence subsequent decisions, even when the information is irrelevant to the task.

In light of these results, it is important for managers and companies in the technology industry to be aware of the potential for anchoring bias and take steps to mitigate its effects. For instance, when making important decisions, it may be helpful to gather and consider a wide range of information, rather than relying on a single piece of information as an anchor. This could include consulting with multiple experts or conducting extensive research to ensure that decisions are based on a broad and accurate understanding of the situation. By promoting awareness of this cognitive bias and providing employees with strategies for avoiding its effects, companies can improve the quality of decision-making and potentially avoid costly mistakes.

4.2.5 Business recommendation

Based on the analysis conducted in the previous subsection, this section describes the main business recommendations and processes to implement, which could mitigate the impact of the anchoring effect in companies.

4.2.5.1 Use of objective data

The use of objective data can be a powerful tool to mitigate the anchoring effect in the tech industry. Given the technical nature of products and services offered in this industry, it is essential to use objective data to make decisions.

One approach is to use A/B testing for products and services. A/B testing involves randomly assigning users to different versions of a product or service to determine which version performs better. This method can help eliminate bias and assumptions that may lead to the anchoring effect. For example, a tech company can test different versions of its app or website to determine which design or feature set performs better, rather than relying on assumptions or personal preferences of designers or managers.

Another approach is to use data-driven decision-making frameworks. These frameworks can help guide decision-making by relying on data and analysis, rather than subjective opinions or assumptions.

There are several data-driven decision-making frameworks that organisations in the tech industry can use to help mitigate the impact of the anchoring effect. Here are a few examples:

1. **Lean Startup:** The Lean Startup methodology is a popular framework for developing products and services in a way that maximises efficiency and minimises waste. It involves creating a minimum viable product (MVP) and using data and customer feedback to iteratively improve the product over time. By constantly testing and validating assumptions, the Lean Startup approach can help avoid anchoring bias and prevent teams from becoming overly attached to initial ideas.
2. **Design Thinking:** Design Thinking is a human-centred approach to problem-solving that emphasises empathy, experimentation, and iteration. It involves gathering input from a variety of stakeholders, including customers, employees, and partners, and using that data to develop prototypes that can be tested and refined over time. By focusing on user needs and preferences, rather than preconceived ideas, Design Thinking can help teams overcome anchoring bias and develop more innovative solutions.
3. **Six Thinking Hats:** Six Thinking Hats is a decision-making framework developed by Edward de Bono that involves looking at a problem from multiple perspectives. Each perspective is represented by a different "hat" that team members wear during the decision-making process. For example, the "white hat" represents data and facts, while the "red hat" represents emotions and intuition. By forcing team members to consider a problem from different angles, Six Thinking Hats can help avoid anchoring bias and encourage more creative and well-rounded solutions.

In the tech industry, data-driven decision-making frameworks can be used for various purposes, such as product development, marketing, and customer service. For example, a data-driven approach to customer service could involve using customer feedback data to identify common issues or complaints, and then using this information to develop solutions or improve processes.

Overall, the use of objective data and decision making frameworks can help mitigate the anchoring effect in the tech industry, and lead to more informed and effective decision-making.

4.2.5.2 Encourage diversity

Encouraging diversity in decision-making processes can help to reduce the impact of the anchoring effect. This can be achieved by including individuals from diverse backgrounds and perspectives in the decision-making process. By including diverse perspectives, decision-makers can be exposed to a wider range of opinions and ideas, which can help to mitigate the anchoring effect.

One way to encourage diversity is to establish a diverse team to evaluate decisions. This team should be composed of individuals with different backgrounds, experiences, and expertise. They should be encouraged to provide their own perspectives and opinions on the decision being made, and their input should be given equal weight in the decision-making process.

Another way to encourage diversity is to seek input from external sources. This can include soliciting feedback from customers, suppliers, or industry experts. By seeking input from external sources, decision-makers can gain a broader understanding of the decision being made, which can help to mitigate the impact of the anchoring effect.

4.2.5.3 Promote deliberative thinking and decision making protocols

Another recommendation for mitigating the impact of anchoring effect on decision-making, is to establish decision-making protocols that promote deliberative thinking. Anchoring effect often stems from quick, intuitive, and automatic decision-making processes that rely heavily on initial information. Deliberative thinking, on the other hand, involves taking the time to thoroughly evaluate all relevant information, consider alternative perspectives, and weigh the pros and cons before arriving at a decision.

Implementing decision-making protocols that encourage deliberative thinking can help professionals to avoid falling into the trap of anchoring. This can be achieved by setting clear guidelines for decision-making processes, such as requiring decision-makers to thoroughly review and consider all available information, actively seek out diverse perspectives, and engage in systematic analysis and evaluation of options (Sibony et al., 2021, 255-257).

In addition, decision-makers should be encouraged to take breaks and reflect on their decisions to prevent impulsive or biased decision-making. This can involve stepping back from the immediate decision at hand and allowing time for critical reflection and analysis. By slowing down the decision-making process and engaging in deliberate and systematic thinking, decision-makers can reduce the influence of anchoring and make more informed and objective decisions.

Furthermore, implementing decision-making protocols that involve peer review or external validation can also be effective in mitigating the anchoring effect. This can involve seeking

feedback from colleagues, mentors, or external experts to challenge and validate decision-making assumptions and biases. Peer review and external validation can help decision-makers to gain a fresh perspective, identify potential biases, and make more rational and evidence-based decisions.

In conclusion, based on the insights from Dan Kahneman's book "Noise," implementing decision-making protocols that promote deliberative thinking, encourage breaks for reflection, and involve peer review or external validation can help to reduce the impact of anchoring effect on decisions made by professionals. These strategies can foster more objective and rational decision-making processes, leading to better outcomes and mitigating the potential biases associated with anchoring effect.

4.2.5.4 Use external consultants

Another effective way to mitigate the impact of the anchoring effect is to use external consultants. Hiring outside experts who are not emotionally or psychologically attached to the company can provide a fresh perspective and objective analysis.

External consultants can bring new ideas, experiences, and knowledge that can help identify potential biases in decision-making processes. They can help the company avoid the pitfalls of groupthink and confirmation bias by challenging assumptions and introducing alternative perspectives.

Additionally, external consultants can provide an independent review of the company's existing decision-making protocols, suggest new ones, and facilitate the implementation of these protocols. They can also provide training to employees on how to recognize and avoid the anchoring effect.

However, it is important to carefully select the right external consultant for the company's needs. The consultant should have relevant expertise, experience, and a proven track record of successfully helping companies improve decision-making processes. The consultant should also be able to work effectively with the company's employees and stakeholders and be able to communicate their findings and recommendations clearly and effectively.

4.3 Similarity Bias

4.3.1 What is a similarity bias?

The similarity bias is a cognitive bias that describes the tendency for people to be attracted to, like, and form relationships with individuals who are similar to them in some way. This bias is based on the idea that people feel more comfortable and have a greater sense of belonging with individuals who share commonalities (Chen, 2023, 5-6).

In the tech industry, the similarity bias can have significant implications for decision-making processes. For instance, it can lead to a lack of diversity in the workplace, as individuals may

unconsciously prefer to work with others who are similar to them. This can result in a lack of diverse perspectives and ideas, which can hinder innovation and creativity.

Moreover, the similarity bias can also impact hiring practices, as hiring managers may prefer candidates who are similar to them in terms of personality, values, and beliefs. This can lead to a lack of diversity in the workplace and can limit the range of experiences and perspectives that the organisation can draw upon.

In conclusion, the similarity bias is a significant cognitive bias that can have far-reaching implications for decision-making processes in the tech industry. It is essential for leaders to be aware of this bias and to actively work towards promoting diversity and inclusion in their organisations. By doing so, they can foster a more dynamic and innovative workplace culture that is better equipped to tackle the challenges of the future.

4.3.2 Validating the effect in the research

To validate the presence of similarity bias, the study used questions related to preferences, such as team leading methodology, candidate photos, and preferred operating systems. These topics often generate passionate discussions among industry professionals and can reveal unconscious biases.

Question 3 asked participants about their preference for team leading methodology, specifically whether they believed Scrum was better than waterfall. Question 6 presented participants with two candidate photos, one in a suit and the other in casual clothes, and asked which photo would incline them to hire the candidate. Finally, Question 9 asked participants which operating system they prefer using at work.

The survey aimed to collect data that could show any unconscious biases towards individuals who share similar characteristics.

4.3.3 Results

The first check was made on Q6 and Q9.

Chi-Square Tests				Symmetric Measures			
	Value	df	Asymptotic Significance (2-sided)		Value	Approximate Significance	
Pearson Chi-Square	9.048 ^a	2	.011	Nominal by Nominal	Phi	.224	.011
Likelihood Ratio	9.068	2	.011		Cramer's V	.224	.011
Linear-by-Linear Association	8.958	1	.003	N of Valid Cases		180	
N of Valid Cases	180						

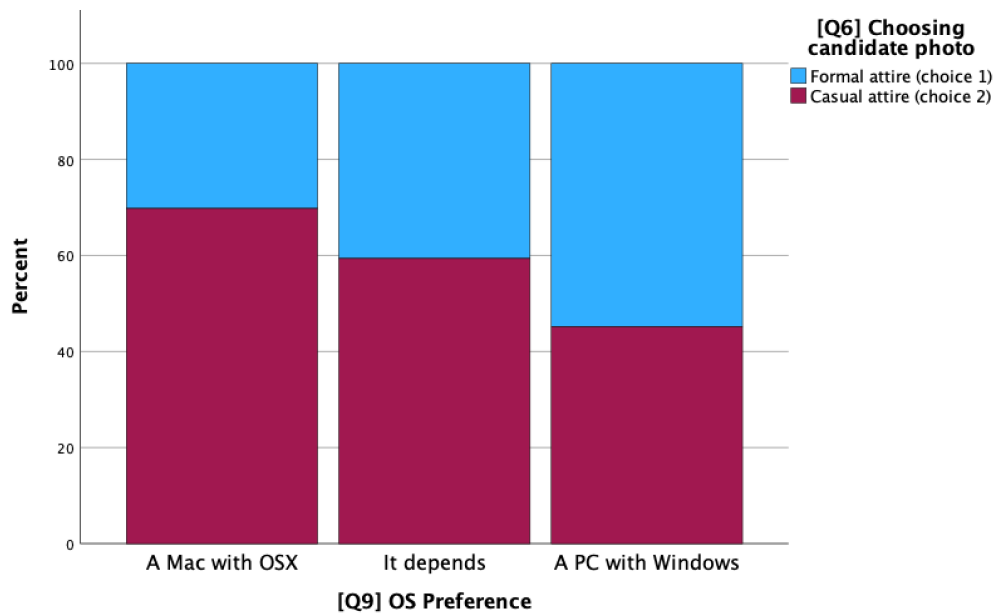
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 12.98.

Picture 7: Statistical parameters of Q6 and Q9

[Q9] OS Preference * [Q6] Choosing candidate photo Crosstabulation

		[Q6] Choosing candidate photo		Total
		Formal attire (choice 1)	Casual attire (choice 2)	
[Q9] OS Preference	A Mac with OSX	Count	26	60
		Expected Count	34.9	86.0
		% within [Q9] OS Preference	30.2%	100.0%
		% within [Q6] Choosing candidate photo	35.6%	47.8%
		% of Total	14.4%	47.8%
	It depends	Count	13	19
		Expected Count	13.0	32.0
		% within [Q9] OS Preference	40.6%	100.0%
		% within [Q6] Choosing candidate photo	17.8%	17.8%
		% of Total	7.2%	17.8%
	A PC with Windows	Count	34	28
		Expected Count	25.1	62.0
		% within [Q9] OS Preference	54.8%	100.0%
		% within [Q6] Choosing candidate photo	46.6%	34.4%
		% of Total	18.9%	34.4%
Total	Count		73	107
	Expected Count		73.0	107.0
	% within [Q9] OS Preference		40.6%	59.4%
	% within [Q6] Choosing candidate photo		100.0%	100.0%
	% of Total		40.6%	59.4%

Picture 8: Contingency table of Q6 and Q9



Picture 9: Similarity Bias results of Q6 and Q9

The second check was made on Q3 and Q6.

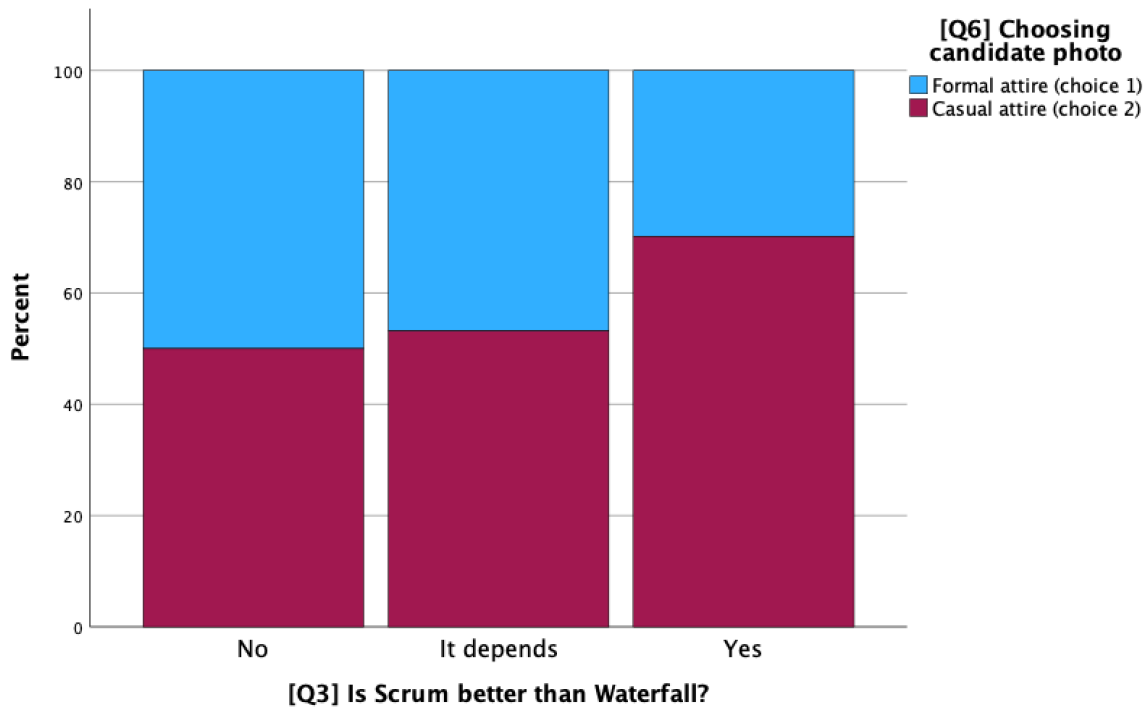
Chi-Square Tests				Symmetric Measures			
	Value	df	Asymptotic Significance (2-sided)		Value	Approximate Significance	
Pearson Chi-Square	5.081 ^a	2	.079	Nominal by Nominal	Phi	.168	.079
Likelihood Ratio	5.177	2	.075		Cramer's V	.168	.079
Linear-by-Linear Association	4.909	1	.027	N of Valid Cases		180	
N of Valid Cases	180						

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .81.

Picture 10: Statistical parameters of Q3 and Q6

[Q3] Is Scrum better than Waterfall? * [Q6] Choosing candidate photo Crosstabulation					
		[Q6] Choosing candidate photo			
		Formal attire (choice 1)	Casual attire (choice 2)	Total	
[Q3] Is Scrum better than Waterfall?	No	Count	1	1	2
		Expected Count	.8	1.2	2.0
		% within [Q3] Is Scrum better than Waterfall?	50.0%	50.0%	100.0%
		% within [Q6] Choosing candidate photo	1.4%	0.9%	1.1%
		% of Total	0.6%	0.6%	1.1%
	It depends	Count	52	59	111
		Expected Count	45.0	66.0	111.0
		% within [Q3] Is Scrum better than Waterfall?	46.8%	53.2%	100.0%
		% within [Q6] Choosing candidate photo	71.2%	55.1%	61.7%
		% of Total	28.9%	32.8%	61.7%
	Yes	Count	20	47	67
		Expected Count	27.2	39.8	67.0
		% within [Q3] Is Scrum better than Waterfall?	29.9%	70.1%	100.0%
		% within [Q6] Choosing candidate photo	27.4%	43.9%	37.2%
		% of Total	11.1%	26.1%	37.2%
Total	Count		73	107	180
	Expected Count		73.0	107.0	180.0
	% within [Q3] Is Scrum better than Waterfall?		40.6%	59.4%	100.0%
	% within [Q6] Choosing candidate photo		100.0%	100.0%	100.0%
	% of Total		40.6%	59.4%	100.0%

Picture 11: Contingency table of Q3 and Q6



Picture 12: Similarity Bias results of Q3 and Q6

4.3.4 Conclusions

The results indicate the following findings:

- Q9 and Q6:
 - People who prefer a PC with Windows, don't have a very strong preference toward specific candidate's attire type
 - People who prefer a Mac with OSX, have a strong preference toward candidates in a casual attire
- Q3 and Q6:
 - People who don't have a strong opinion about the "best" working methodology (Scrum vs Waterfall) also don't have strong preferences when it comes to candidate's attire
 - People who think Scrum is definitely better than Waterfall would prefer a candidate in a casual attire in most of the cases (70.1%)

This indicates the presence of a similarity bias, where individuals who prefer Mac computers are more likely to prefer candidates who share similar characteristics, such as a preference for a more casual attire. It can be associated with the fact that Mac computers are considered to be a product for creative professions, early adopters and tech savvy.

A similar effect can be observed in relation to preferred working methodology and preferred attire. People who have a strong preference toward Scrum (which is considered less formal, flexible and with much less structure and formalities) would choose the candidates in casual attire.

These results have important implications for recruitment processes, particularly in the tech industry, where there is a strong focus on culture fit and team dynamics. The findings suggest that candidates who fit a particular profile, may be more likely to be preferred by hiring managers who share those preferences. This can limit diversity in the workplace and potentially exclude qualified candidates who don't fit the preferred profile (or are not “similar” enough). To promote diversity and inclusivity in the hiring process, managers should be encouraged to focus on the qualifications and skills of candidates rather than their personal preferences. It's important to create a hiring process that is fair, transparent, and inclusive, and that values a range of perspectives and backgrounds.

In summary, the presence of the similarity bias in the tech industry highlights the need for organisations to actively work towards promoting diversity and inclusion in their recruitment and workplace practices.

4.3.5 Business recommendation

4.3.5.1 Implement structured interview process

Using structured interview questions is an effective way to reduce the impact of personal biases in the hiring process. Structured interviews consist of a set of predetermined questions that are asked of all candidates in a consistent manner. By using this approach, hiring managers can objectively evaluate candidates based on their responses to the same set of questions.

In a tech company, implementing structured interviews can involve several steps. First, the company should develop a set of standard interview questions that are relevant to the job position being filled. These questions should be carefully crafted to assess the candidate's relevant skills, experience, and abilities.

Next, the company should provide training to hiring managers on how to conduct structured interviews. This training should cover how to ask questions in a consistent manner and how to evaluate responses objectively.

During the interview process, hiring managers should ask the same set of questions to each candidate and record their responses. They should also score the responses according to a predetermined scoring system that is based on the job requirements and the company's values.

By using structured interviews, tech companies can reduce the impact of personal biases in the hiring process. Structured interviews can help ensure that candidates are evaluated based on their qualifications and skills, rather than on factors such as their race, gender, or other personal characteristics.

Moreover, the use of structured interviews can also help to promote diversity and inclusivity in the hiring process. By using a standardised set of questions, hiring managers can ensure

that all candidates are evaluated on the same criteria, regardless of their background or personal characteristics.

In summary, implementing structured interviews is an effective way for tech companies to reduce personal biases in the hiring process. By using a standardised set of questions, hiring managers can evaluate candidates objectively based on their qualifications and skills.

4.3.5.2 Creating a culture of inclusion

Creating a culture of inclusion involves not only the efforts of managers but also the commitment of executives and the whole company. The following are some recommendations on how companies can promote a culture of inclusion:

1. Encourage employee resource groups: Employee resource groups (ERGs) can provide a safe space for employees to connect, network, and share experiences with colleagues who share similar backgrounds or interests. ERGs can also help companies identify and address specific issues related to diversity and inclusion within the workplace.
2. Incorporate diversity and inclusion metrics into performance evaluations: Companies can incorporate diversity and inclusion metrics into performance evaluations to hold managers accountable for promoting a diverse and inclusive workplace. This can also incentivize managers to take steps to create a more inclusive environment.
3. Review company policies and practices for potential biases: Companies should review their policies and practices to ensure they do not unintentionally discriminate against certain groups of people. For example, companies should ensure that their dress code policies do not unfairly target certain cultural or religious attire.
4. Create opportunities for professional development: Companies can create opportunities for professional development that are accessible to all employees. This can help ensure that everyone has the chance to advance their careers, regardless of their background or identity.

In conclusion, creating a culture of inclusion requires a commitment from the entire company, including executives, managers, and employees. By developing and implementing a clear diversity and inclusion strategy, fostering an open and respectful environment, encouraging employee resource groups, incorporating diversity and inclusion metrics into performance evaluations, offering unconscious bias training, reviewing company policies and practices for potential biases, creating opportunities for professional development, and implementing diversity and inclusion training for all employees, companies can create a workplace culture that values and respects diversity and promotes inclusion.

4.4 Priming Effect

4.4.1 What is a priming effect?

The priming effect is a cognitive bias that describes how exposure to a stimulus can influence an individual's response to a subsequent stimulus. This bias is based on the idea that prior exposure to a particular stimulus can activate related concepts or associations in an individual's mind, which can then influence their perception, behaviour, or decision-making (Kahneman, 2013, 54-56).

In the tech industry, the priming effect can have significant implications for various processes, such as marketing, product development, and team management. For instance, when designing a product, the use of certain colours, symbols, or images can prime consumers to associate the product with specific qualities or features, which can influence their perception and purchase decision. In team management, the way a leader frames a task or issue can prime team members to approach it in a particular way, which can impact the team's performance and outcome.

Moreover, the priming effect can also influence hiring practices, as the way a job posting is framed or advertised can prime potential candidates to associate the job with specific qualities or characteristics, which can influence their interest and application.

In conclusion, the priming effect is a significant cognitive bias that can have far-reaching implications for various processes in the tech industry. It is crucial for leaders to be aware of this bias and to actively work towards using it in a way that promotes positive outcomes and avoids any negative impact on decision-making processes. By doing so, they can harness the power of this bias to create a more innovative, efficient, and inclusive workplace culture.

4.4.2 Validating the effect in the research

To validate the priming effect in the research, two groups of participants were asked to respond to a question about their preference between self organisation and standardisation (Question 16). Group A received the question "Self-organizing teams: Should teams have the freedom to choose their own tools even if they are not sanctioned by the company?" while Group B received the question "Effective standardization: Should teams have the freedom to choose their own tools even if they are not sanctioned by the company?"

The questions were similar except for the introductory phrase, which served as the priming stimulus. The hypothesis was that the priming effect would influence participants' responses to the questions, with those in Group A more likely to respond with "Yes" or "Yes, but to only some extent," while those in Group B more likely to respond with "No."

4.4.3 Results

The results indicate that there was no significant difference between the responses of Group A and Group B. Group A had 11.5% of respondents answering "No", 79.2% answering "Yes, to some extent", and 9.4% answering "Yes". Similarly, Group B had 10.7% of respondents answering "No", 78.6% answering "Yes, to some extent", and 10.7% answering "Yes".

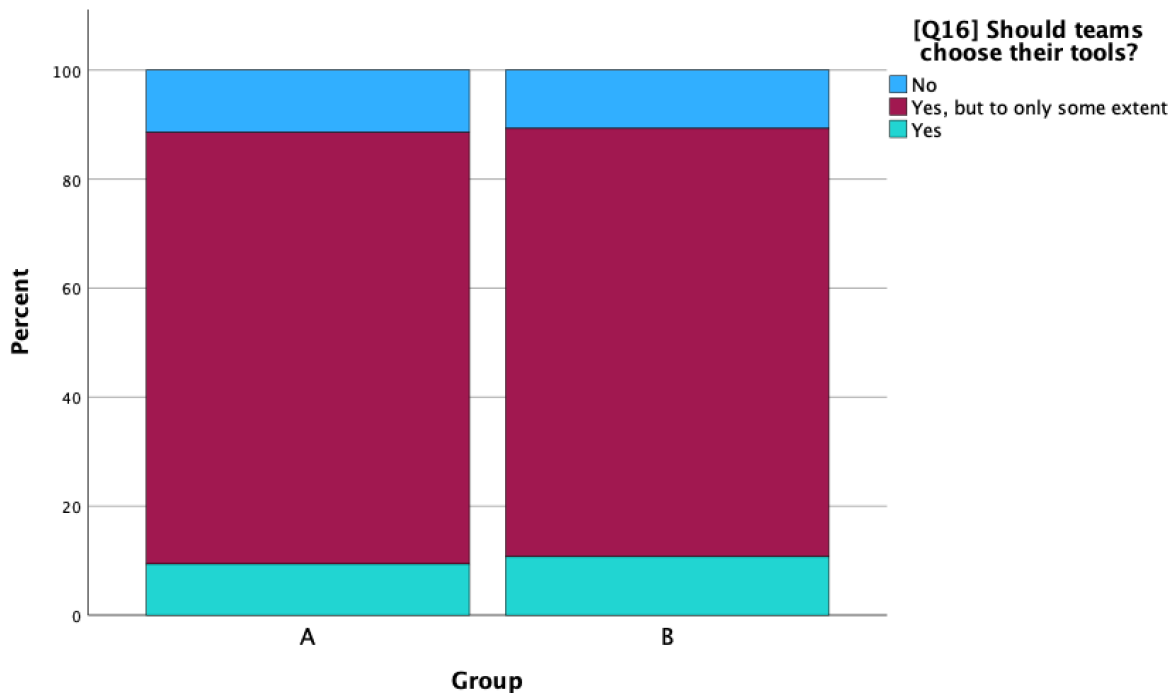
Group * [Q16] Should teams choose their tools? Crosstabulation						
		[Q16] Should teams choose their tools?				
			No	Yes, but to only some extent	Yes	Total
Group	A	Count	11	76	9	96
		Expected Count	10.7	75.7	9.6	96.0
		% within Group	11.5%	79.2%	9.4%	100.0%
		% within [Q16] Should teams choose their tools?	55.0%	53.5%	50.0%	53.3%
		% of Total	6.1%	42.2%	5.0%	53.3%
	B	Count	9	66	9	84
		Expected Count	9.3	66.3	8.4	84.0
		% within Group	10.7%	78.6%	10.7%	100.0%
		% within [Q16] Should teams choose their tools?	45.0%	46.5%	50.0%	46.7%
		% of Total	5.0%	36.7%	5.0%	46.7%
Total	Count	20	142	18	180	
	Expected Count	20.0	142.0	18.0	180.0	
	% within Group	11.1%	78.9%	10.0%	100.0%	
	% within [Q16] Should teams choose their tools?	100.0%	100.0%	100.0%	100.0%	
	% of Total	11.1%	78.9%	10.0%	100.0%	

Picture 13: Contingency table of Group and Q16

Chi-Square Tests				Symmetric Measures			
	Value	df	Asymptotic Significance (2-sided)		Value	Approximate Significance	
Pearson Chi-Square	.105 ^a	2	.949	Nominal by Nominal	Phi	.024	.949
Likelihood Ratio	.105	2	.949		Cramer's V	.024	.949
Linear-by-Linear Association	.092	1	.762				
N of Valid Cases	180			N of Valid Cases	180		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.40.

Picture 14: Statistical parameters of Priming Effect



Picture 15: Priming Effect results

These results indicate that the presence of the question category did not prime individuals to lean towards a particular answer. One potential explanation for the lack of significant difference between the two groups' responses could be the similarity of the two questions. While the questions were different in terms of their category, they were otherwise very similar, and this may have limited the extent to which the question category could prime individuals. It is also possible that the sample size was not large enough to detect a significant difference in responses between the two groups. Future research with larger sample sizes could help to confirm or refute this possibility.

4.4.4 Conclusion

The results of this study suggest that there is no evidence of a priming effect in response to the questions presented to Group A and Group B. Contrary to the initial hypothesis, there was no significant difference in responses between the two groups, which indicates that the presence or absence of a specific question category did not influence participants' responses.

These findings raise interesting questions about the potential vulnerability of individuals to the priming effect in the tech industry, particularly among managers who are responsible for making important decisions. While further research is needed to explore this topic in more detail, these results suggest that managers may be less susceptible to the priming effect than previously assumed.

4.4.5 Business recommendation

The absence of confirmed evidence for the priming effect in the conducted research suggests caution when applying any related business practices. While the concept of priming has been widely researched, the lack of significant results in the presented study indicates that the effect may not be as prevalent or strong as previously thought. As such, any business recommendations regarding the priming effect should be approached with care and based on a thorough analysis of the specific context and audience.

In the tech industry, it is important to recognize the potential implications of priming and to consider whether and how it might be relevant to a given business practice. For instance, when designing products or advertisements, it may be useful to consider the potential associations that certain colours, symbols, or images might evoke in the audience. However, it is crucial to avoid any manipulative or unethical use of priming, as this could lead to negative outcomes for both the business and its stakeholders.

In conclusion, while the priming effect has been an important concept in the field of psychology and business, the lack of confirmed evidence for its existence in the presented study suggests that any related business recommendations should be approached with caution and based on a thorough analysis of the specific context and audience.

4.5 Fairness Norm

4.5.1 What is Fairness Norm?

The Fairness Norm is a psychological phenomenon that has been extensively studied in the field of social psychology. It refers to people's preference for fairness and equity in social interactions, including resource allocation decisions. The Fairness Norm is particularly relevant in the context of people managers in the tech industry, who are often tasked with making decisions related to the allocation of resources (Bicchieri & Chavez, 2010, 1-3).

Research has shown that people managers are not immune to the influence of the Fairness Norm. In fact, managers may be even more attuned to fairness considerations, given their role in ensuring that their teams are working effectively and efficiently. When allocating resources such as employees between teams, managers are often motivated to create a just and equitable distribution of resources. In the tech industry, where teams are often composed of highly skilled professionals with specialised expertise, the allocation of employees can have a significant impact on team performance.

Given the importance of resource allocation decisions in the tech industry, it is essential to understand how these psychological biases, including the Fairness Norm, impact managers' decision-making processes. While the desire for fairness and equity in resource allocation decisions is generally considered a positive trait, it can also lead to suboptimal outcomes if taken to an extreme. For example, if a manager is overly concerned with creating an equal

split of resources between teams, they may neglect to consider other factors, such as the skills and expertise of the individual employees involved.

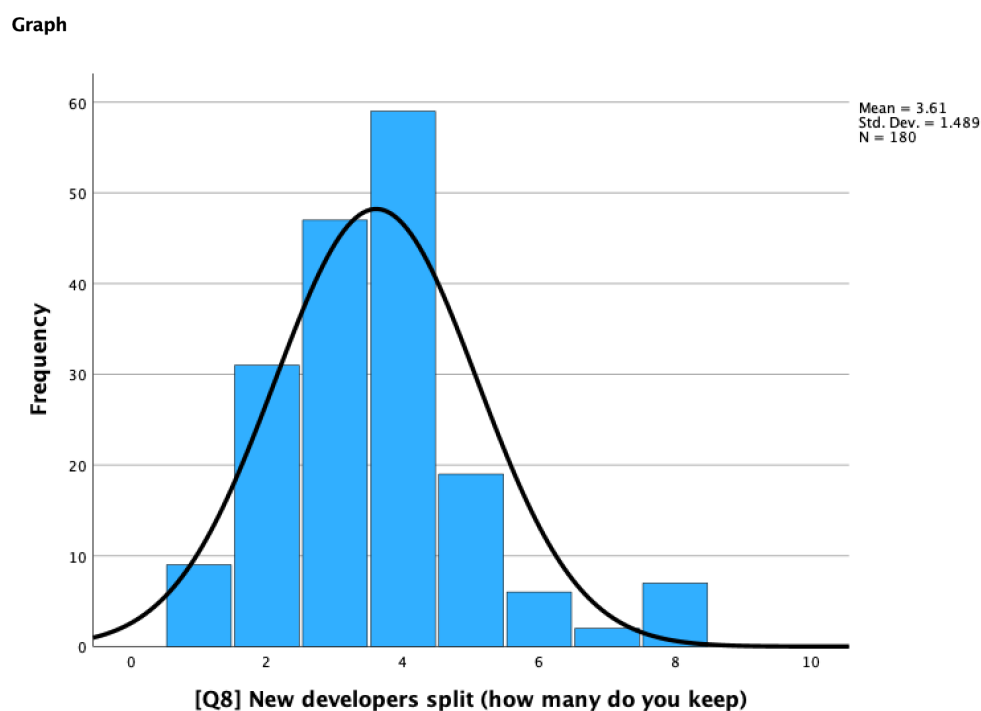
4.5.2 Validating the effect in the research

To validate the presence of the Fairness Norm in the decision-making processes of tech industry managers, the survey asked the managers to imagine a scenario where they had to divide a group of employees between their team and another team, and the other team's manager could either accept or reject the proposal (Q8) . This scenario is a variant of the Ultimatum Game, a well-known experimental paradigm used to study decision-making and fairness norms.

The managers were asked to choose the number of employees they would keep for their team from a range of 1-8. The responses were analysed to determine the frequency of different choices and the distribution of choices across the range.

4.5.3 Results

The results of the survey indicate that the majority of the participants chose to split the eight people between the two teams in a fair manner. Specifically, 47 respondents (26.1%) chose to keep three people for their team and give five to the other team, while 59 respondents (32.8%) chose to keep four people and give four to the other team. In total, 78.9% of the respondents chose a split between two and five people, which indicates a preference for an even split or a slightly more favourable split for their own team.



Picture 16: Fairness Norm, visualisation of results

[Q8] New developers split (how many do you keep)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	keep 1	9	5.0	5.0	5.0
	keep 2	31	17.2	17.2	22.2
	keep 3	47	26.1	26.1	48.3
	keep 4	59	32.8	32.8	81.1
	keep 5	19	10.6	10.6	91.7
	keep 6	6	3.3	3.3	95.0
	keep 7	2	1.1	1.1	96.1
	keep 8	7	3.9	3.9	100.0
	Total	180	100.0	100.0	

Picture 17: Fairness Norm results

In cases where the split was not even, respondents were more likely to choose a split that was worse for themselves than a split that was perceived as overly beneficial for the party making the choice. This suggests that the majority of respondents placed a higher value on fairness rather than maximising the benefit for their own team.

4.5.4 Conclusion

These findings have important implications for the tech industry and managers in the industry. Firstly, it highlights the importance of fairness in the workplace and the need for managers to ensure that their decisions are fair and equitable. Secondly, it suggests that managers who prioritise their personal gain over fairness may be viewed negatively by their colleagues and subordinates.

However, there is also a risk associated with the fairness norm in decision-making. Managers may become too focused on achieving fairness, and this could lead to suboptimal outcomes. In the context of the survey, this could mean that managers were passing up the opportunity to take more resources for their team, even when it was justifiable.

It is important to note that the research conducted in this study diverges from the classical ultimatum game, presenting a unique and creative research variant that is loosely related to the traditional concept. In the present study, the conventional "money splitting" scenario was replaced with a "people splitting" task, simulating a decision-making process in the tech industry where managers were tasked with allocating a limited pool of employees between their own team and another team. Furthermore, unlike the classical ultimatum game where participants are typically anonymous and lack any prior relationship, our study involved coworkers who were familiar with each other. These distinct differences in the decision context and relationship dynamics may have influenced the decision-making process and outcomes.

In conclusion, the survey findings suggest that the fairness norm plays a significant role in the decision-making processes of managers in the tech industry. It is important to note, however, that the unique context of the "people splitting" scenario used in this study, as compared to the conventional "money splitting" scenario in the classical ultimatum game, and the fact that participants were familiar with each other as coworkers, may have influenced the outcomes. Therefore, caution must be exercised in drawing strong conclusions based on these findings. That said, taking into account the limitations of the unique research variant used in this study it can be cautiously concluded that prioritising fairness in decision-making among managers in the tech industry may have both positive outcomes, such as promoting fairness and equity, it is essential for managers to strike a balance between fairness and optimising outcomes for their team and the organisation. Further research and consideration of various contextual factors are warranted to gain a comprehensive understanding of decision-making processes in professional settings.

4.5.5 Business recommendation

4.5.5.1 Implement objective criteria for people allocation

One effective way to reduce the impact of the Fairness Norm on people allocation decisions is to introduce objective criteria for allocating people in the company. These objective criteria should take into account the relevant project business value and impact for the company. When managers rely solely on subjective criteria such as personal relationships or perceived fairness, they risk overlooking the importance of aligning team composition with business goals.

Proper planning in terms of the project and the appropriate team structure is also crucial. The allocation of employees should be based on their skills and expertise, rather than an arbitrary split between teams. By taking into account the specific requirements of the project and the strengths of each team member, managers can optimise team performance and improve the chances of project success.

Finally, seniority distribution in the team should also be considered. It is essential to ensure that teams have an appropriate mix of experienced and junior employees. Senior employees can provide guidance and mentorship to junior team members, while junior employees can bring fresh perspectives and new ideas. By balancing the seniority distribution within the team, managers can create a more effective and efficient team structure, which can ultimately lead to better project outcomes.

By implementing objective criteria for people allocation that take into account project business value, appropriate team structure, and seniority distribution, managers can reduce the impact of the Fairness Norm and create a more effective and efficient team structure. This approach ensures that people allocation decisions are based on rational, business-driven criteria, rather than subjective biases.

4.5.5.2 Encourage Experimentation and Innovation

In order to reduce the impact of the fairness norm on people allocation decisions, it's important for tech companies to encourage a culture of experimentation and innovation. This means creating an environment where managers and teams are encouraged to try new approaches and take calculated risks, rather than always defaulting to the same methods and processes. By embracing experimentation and innovation, managers can focus on finding the best solutions for their projects, rather than being overly concerned with fairness in people allocation.

Encouraging experimentation and innovation can also help ensure that people are allocated based on their potential impact for the company, rather than just being divided equally between teams. This means that managers can allocate people based on a variety of factors, including project business value and the appropriate team structure, rather than solely on considerations of fairness.

Furthermore, by encouraging innovation and experimentation, companies can create a culture where seniority is less of a factor in people allocation decisions. Instead of automatically assigning people to the most senior team members, managers can consider the skill set and potential of each individual team member, and allocate them based on who is best suited for a particular task. This approach can help ensure that the company is making the most of its talent pool and can lead to better outcomes for the projects and the company as a whole.

Overall, encouraging experimentation and innovation can help reduce the impact of the fairness norm on people allocation decisions. By creating a culture where innovation is encouraged and people are allocated based on business value and individual potential, rather than just a desire for fairness, companies can make the most of their talent and achieve better outcomes for everyone involved.

4.6 Better Than Average Effect

4.6.1 What is an above average effect?

The better-than-average effect, also known as the superiority bias, is a cognitive bias that causes people to overestimate their abilities and qualities in comparison to others (Zell et al., 2020, 1). This phenomenon is commonly observed in many areas of life, including the workplace, where individuals tend to view themselves as better than their peers in various aspects of their work.

In the context of the tech industry, this bias may have a significant impact on decision-making processes and managerial practices. As technology is constantly evolving, tech professionals must continually update their skills and knowledge to stay competitive. However, if managers and leaders in the tech industry believe that they are already superior to their peers, they may not see the need to invest time and resources into further professional

development. This can lead to a lack of innovation, complacency, and ultimately stagnation within the organisation.

Furthermore, the above-average effect can also impact team dynamics and employee morale. If managers believe that they are superior to their subordinates, they may not value or appreciate their contributions as much as they should. This can lead to a lack of recognition and support for team members, which can ultimately result in decreased job satisfaction and increased turnover.

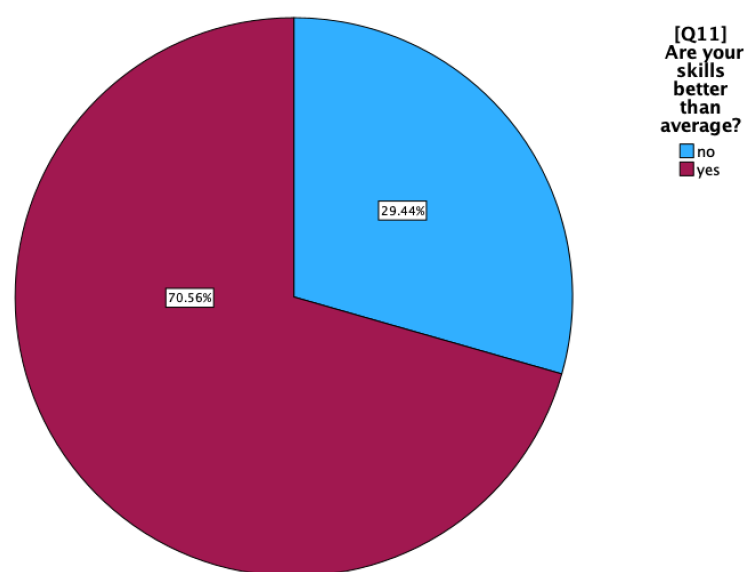
Given the potential negative consequences of the above-average effect in the tech industry, it is essential to explore its prevalence and impact. In the following sections, we will describe how we validated this bias in our research, present the results of our survey, and draw conclusions about its potential impact on decision-making processes and managerial practices in the tech industry.

4.6.2 Validating the effect in the research

To validate the above-average effect in the survey, we asked the following question to the respondents: "Do you think your professional skills in your current position are better than those of the average person in the same position in your country?" (Q11). The respondents could choose between two options: "Yes" or "No".

4.6.3 Results

The results of the survey revealed that out of the 180 respondents, 127 (70.5%) believed that their professional skills in their current position were better than the average person in the same position in their country. On the other hand, 53 respondents (29.5%) answered that their skills were not better than the average person in their position.



Picture 18: Better Than Average, visualisation of results

[Q11] Are your skills better than average?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	53	29.4	29.4	29.4
	yes	127	70.6	70.6	100.0
	Total	180	100.0	100.0	

Picture 19: Fairness Norm results

This indicates a clear prevalence of the above-average effect among the sample of managers in the tech industry. It is worth noting that the prevalence of the above-average effect in this sample is consistent with previous research on this bias. The results suggest that this bias is not unique to the tech industry, but rather a common phenomenon observed across various fields and populations.

4.6.4 Conclusion

Based on the survey data, it can be concluded that the majority of managers in the tech industry suffer from the Superiority Bias, perceiving their professional skills to be better than those of the average person in the same position in their country. This bias was found to be statistically significant and not simply due to chance, as demonstrated by the results of the chi-square test.

This bias has potentially significant implications for decision-making within the tech industry. Managers who overestimate their own abilities may be less likely to seek input and advice from others, which could lead to suboptimal decisions. Additionally, this bias may lead to overconfidence in the success of projects, which could result in poor performance or failure.

On the other hand, it could be argued that a certain degree of confidence is necessary for success in the tech industry, and that this bias could motivate managers to strive for excellence. However, it is important for managers to be aware of this bias and actively seek out diverse perspectives and opinions in order to make well-informed decisions. Overall, it is recommended that companies in the tech industry provide training and resources to help managers recognize and overcome the Superiority Bias.

4.6.5 Business recommendation

4.6.5.1 Implement Performance Evaluation Processes Based on Objective Criteria

Implementing performance evaluation processes that are based on objective criteria rather than subjective opinions can mitigate the above-average effect by providing a clear and measurable standard for performance evaluation. When performance is evaluated based on objective criteria, it becomes more difficult for managers to rely solely on their own

subjective opinions and biases when assessing their own performance or the performance of their team members.

Objective criteria can include factors such as meeting project deadlines, achieving key performance indicators, delivering high-quality work and being considered a good leader based on team's feedback. These criteria are quantifiable and can be objectively measured, reducing the potential for bias or personal opinions to influence the evaluation process.

By using objective criteria for performance evaluation, managers are also forced to acknowledge the contributions of their team members and recognize their strengths and weaknesses. This can help mitigate the negative impact of the above-average effect on team dynamics and employee morale, as managers are less likely to undervalue or ignore the contributions of their subordinates.

Overall, implementing performance evaluation processes based on objective criteria can help mitigate the above-average effect by promoting a more accurate and fair assessment of performance, reducing the influence of personal biases, and recognizing the contributions of team members.

4.6.5.2 Addressing Knowledge Gaps through Training and Technology Reports

As we have discussed, the above-average effect can lead to managers overestimating their own abilities and being less likely to seek input and advice from others. This can result in suboptimal decisions, overconfidence in the success of projects, and ultimately a lack of innovation within the organisation.

To mitigate these negative consequences, companies in the tech industry can implement strategies to address knowledge gaps among their managers and ensure that their skills are up-to-date and aligned with industry best practices. One way to achieve this is through ongoing training and development programs.

Regular training and development opportunities can help managers stay current with the latest technology trends, tools, and best practices. This can include attending conferences, workshops, and training courses, as well as participating in online learning programs. By providing ongoing training, companies can ensure that their managers have the skills and knowledge needed to make informed decisions and stay competitive in the industry.

In addition to training, companies can also leverage technology reports to keep their managers informed about the latest trends and best practices in the industry. For example, the "Tech Radar" report by ThoughtWorks is a useful resource that provides an overview of emerging technology trends and their potential impact on business. By using reports like this, managers can gain valuable insights into the direction of the industry and make informed decisions based on objective criteria.

Implementing these strategies can help mitigate the above-average effect by ensuring that managers have a realistic understanding of their abilities and are continuously improving

their skills and knowledge. This can lead to better decision-making, increased innovation, and improved performance within the organisation.

4.7 *Ability to focus and avoiding mental fatigue

Along with our main research question, we also explored a secondary topic that is relevant to the study. However, it is important to note that the results of this investigation may only provide some contextual information and cannot be strongly interpreted due to the potential influence of respondents' self-confidence on their responses.

While not a cognitive bias per se, the ability to focus and avoid mental fatigue is crucial for high-quality decision-making and learning processes. Being able to focus for longer periods of time without interruptions allows individuals to make well-informed and thoughtful decisions, rather than relying on superficial analyses or snap judgments. This skill is particularly important for high-level leaders such as Gates, Bezos, and Obama, who need to make complex decisions that can have far-reaching consequences. In addition to enhancing decision-making and learning processes, the ability to focus can also lead to higher income and wider professional opportunities.

To validate the importance of the ability to focus and avoid mental fatigue, we combined Question 2 with Question 20 in our survey. The aim was to measure the relationship between an individual's ability to focus and their perceived ease of finding a new job that is at least as attractive as their current one.

Overall, these results suggest that individuals who are able to focus for longer periods of time may feel more confident in their ability to find a new job that is at least as attractive as their current one. These findings are consistent with earlier chapters, which emphasised the importance of the ability to focus for high-quality decision-making and learning processes. Furthermore, they suggest that individuals who possess this ability may be more desirable on the job market and have wider professional opportunities. It is worth adding here that relevant research indicates that trained professionals are able to work in focus for up to four hours a day, Ericsson et al., 1993.

Overall, these results have important implications for employees who seek to advance their careers, as well as for organisations that wish to attract and retain top talent. By improving their ability to focus and avoid mental fatigue, individuals may be able to increase their perceived marketability and professional opportunities. Similarly, organisations that foster an environment that supports and promotes focused work may be able to attract and retain top talent more effectively.

[Q2] Hours of focus * [Q20] Would it be easy to get a new job? Crosstabulation

			Would it be easy to get a new job?		Total
			no	yes	
[Q2] Hours of focus	2h	Count	37	22	59
		Expected Count	29.5	29.5	59.0
		% within [Q2] Hours of focus	62.7%	37.3%	100.0%
		% within Would it be easy to get a new job?	41.1%	24.4%	32.8%
		% of Total	20.6%	12.2%	32.8%
	4h	Count	37	45	82
		Expected Count	41.0	41.0	82.0
		% within [Q2] Hours of focus	45.1%	54.9%	100.0%
		% within Would it be easy to get a new job?	41.1%	50.0%	45.6%
		% of Total	20.6%	25.0%	45.6%
	6h	Count	8	16	24
		Expected Count	12.0	12.0	24.0
		% within [Q2] Hours of focus	33.3%	66.7%	100.0%
		% within Would it be easy to get a new job?	8.9%	17.8%	13.3%
		% of Total	4.4%	8.9%	13.3%
	8h	Count	8	7	15
		Expected Count	7.5	7.5	15.0
		% within [Q2] Hours of focus	53.3%	46.7%	100.0%
		% within Would it be easy to get a new job?	8.9%	7.8%	8.3%
		% of Total	4.4%	3.9%	8.3%
Total		Count	90	90	180
		Expected Count	90.0	90.0	180.0
		% within [Q2] Hours of focus	50.0%	50.0%	100.0%
		% within Would it be easy to get a new job?	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

Picture 20: Contingency table of Q2 with Q20

Chi-Square Tests

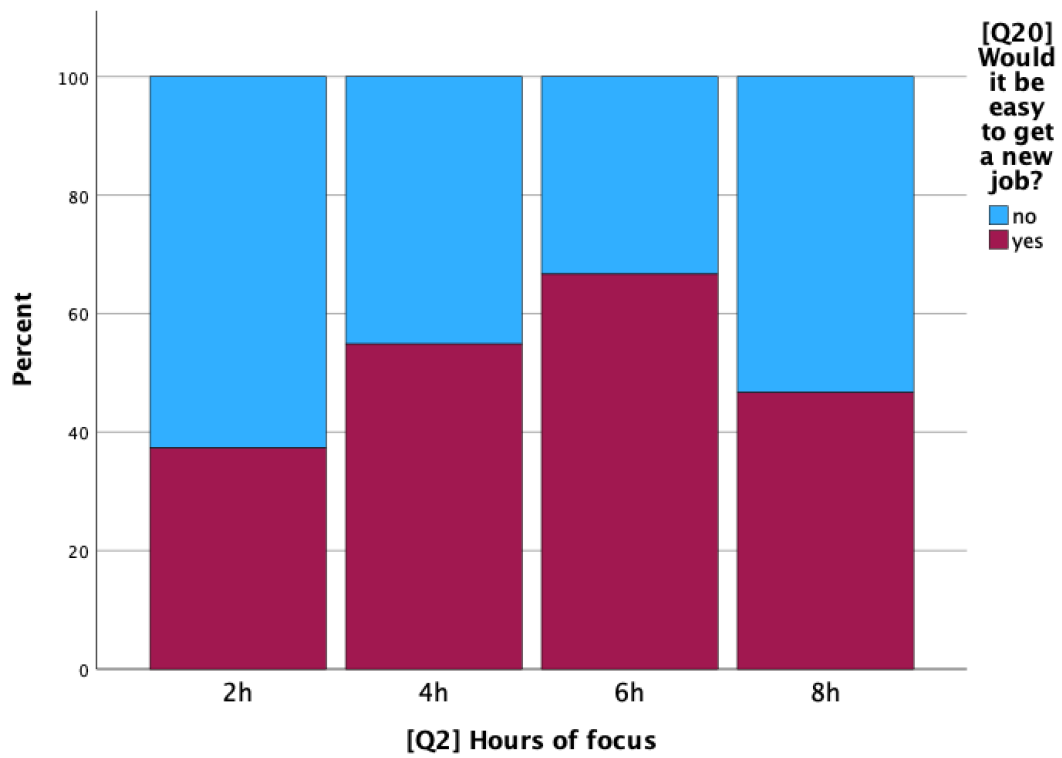
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.327 ^a	3	.062
Likelihood Ratio	7.423	3	.060
Linear-by-Linear Association	3.070	1	.080
N of Valid Cases	180		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.50.

Symmetric Measures

	Value	Approximate Significance
Nominal by Nominal Phi	.202	.062
Cramer's V	.202	.062
N of Valid Cases	180	

Picture 21: Statistical parameters of Q2 and Q20



Picture 22: Ability to focus, visualisation of results

5 Final Conclusions, business insights and recommendations

The goal of this dissertation was to examine the suboptimal decision-making behaviour of leaders in the tech industry. To achieve this goal, a thorough literature review was conducted to identify the most common biases and factors that impact decision making. Based on the literature review, a research was designed and developed to investigate whether these biases are present among managers in the tech industry.

The research findings confirmed the presence of various biases within the decision-making behaviour of leaders in the tech industry, impacting decision-making, including the anchoring effect, similarity bias, fairness norm, and above-average effect.

Based on these findings, specific business recommendations for the tech industry were presented to help mitigate the impact of these biases on decision making. These recommendations include implementing performance evaluation processes based on objective criteria, providing training and knowledge updates for managers to keep up with the latest industry practices and technology advancements, and utilising a diverse range of perspectives in decision-making processes.

Overall, the results of this dissertation suggest that biases can have a significant impact on decision-making behaviour within the tech industry. However, by understanding and acknowledging these biases, organisations can take steps to mitigate their effects and make more informed and effective decisions.

5.1 Research problem, objectives and research question

The research problem addressed in this dissertation was to identify the key factors that impact decision making among managers in the tech industry. To achieve this goal, a comprehensive literature review was conducted, which incorporated sources from various fields and examined decision impacting factors for people and managers in general. These factors included Environment, Mental fatigue and deep work, Social norms and Power dynamics, hierarchy, and culture.

Based on the literature review, the research question was formulated as follows: How much do these factors impact the decision-making behaviour of managers in the tech industry, and what can be done to mitigate this impact? To investigate this question, an appropriate survey was designed, containing 22 questions, and sent to managers working in the tech industry.

The survey received 180 responses, which were properly analysed using statistical methods. The results of the analysis helped identify key biases and factors impacting decision making among managers in the tech industry. The main biases identified were the anchoring effect, similarity bias, fairness norm, and above-average effect.

Based on the identified biases and factors, appropriate business recommendations were made. These recommendations focused on implementing processes and practices in the companies to mitigate the impact of these biases and factors. For example, it was suggested that companies should provide adequate training and support to their managers. It was also recommended that companies establish clear decision-making processes and practices that take into account the social norms and power dynamics within the organisation.

Overall, the research findings provide valuable insights into the suboptimal decision-making behaviour of leaders in the tech industry. The study contributes to the growing body of literature on behavioural economics and decision-making in organisations. The results of this study can be used by leaders in the tech industry to make informed decisions and implement appropriate measures to mitigate the impact of biases and factors on their decision-making behaviour.

5.2 Results and main conclusions

The data collected from the survey provided 180 valid results, which were subsequently analysed through statistical methods. This analysis covered a total of 22 questions and sought to identify the most important insights with the greatest potential impact on organisations.

In the course of the research, several key biases were identified among tech managers. These biases included the Anchoring effect, Similarity Bias, and Fairness Norm, all of which were found to be present within the surveyed population. The Anchoring effect was seen to be particularly pronounced among managers. This bias refers to the tendency of individuals to rely too heavily on the initial piece of information provided when making subsequent decisions.

Similarly, the Similarity Bias was also found to be present among managers in the tech industry. This bias involves individuals making judgments or decisions based on perceived similarities between themselves and others, even when such similarities may be superficial or irrelevant to the situation at hand. Meanwhile, the Fairness Norm was seen to be prevalent among managers who placed a high value on fairness and equity, leading to decisions that prioritised these values over other considerations.

Although the research had anticipated the confirmation of the Priming Effect, this bias was not observed in the surveyed population. It is worth noting, however, that this may be due to limitations in the research methodology or sample size.

Given the insights generated by the research, a set of specific business recommendations were developed. These recommendations provide practical guidance for companies seeking to mitigate the impact of these biases on their decision-making processes. These recommendations include the implementation of specific processes and practices that have been shown to be effective in reducing the influence of biases, such as the use of decision-making frameworks that encourage objectivity and the promotion of diversity and inclusion in the workplace. By implementing the recommended processes and practices,

companies can reduce the impact of these biases and make more informed, objective decisions that support their organisational goals.

5.3 Future Work and Next Steps

While this research provided valuable results, it is not without its limitations. Some areas are discussed below that could be explored in future research to build upon the findings of this study.

Firstly, the number of participants could be increased in future studies to achieve statistical significance with a larger sample size. While this research had 180 valid survey results, a larger sample size could provide a more comprehensive understanding of the biases that exist among tech industry managers. A larger sample size could also help to identify additional biases that may exist but were not captured in this study.

Furthermore, after conducting this research, it was realised that some questions may not have been asked in a clear enough manner. As a result, strong conclusions could not be drawn from some of the questions and their results. In future studies, ensuring that questions are asked clearly and precisely could lead to more conclusive results.

Additionally, exploring the impact of biases on different groups within organisations could be an area of future research. This study focused on tech industry managers, but the impact of biases could be explored among different levels of employees or in different industries.

Lastly, the impact of bias on organisational performance could be explored in future research. This study identified biases that exist among tech industry managers, but it did not investigate how these biases impact organisational outcomes. Future research could investigate the impact of bias on important organisational outcomes such as productivity, innovation, and employee satisfaction.

In conclusion, while this research provides valuable insights into the biases that exist among tech industry managers, there is still much to be explored. Future research could build upon the findings of this study by exploring areas such as sample size, question clarity, impact on different groups, and impact on organisational outcomes.

6 Bibliography

About - Cynefin Framework - The Cynefin Co. (n.d.). Cognitive Edge. Retrieved September

26, 2022, from <https://thecynefin.co/about-us/about-cynefin-framework/>

Bazerman, M. H., & Moore, D. A. (2009). *Judgment in Managerial Decision Making*. Wiley.

Berman, M. G., Jonides, J., & Kaplan, S. (2008, December). The Cognitive Benefits of Interacting With Nature. *Psychological Science*, 19(12), 1207–1212. SAGE Journals. <https://doi.org/10.1111/j.1467-9280.2008.02225.x>

Berne, E. (1973). *Games People Play: The Psychology of Human Relationships*. Penguin Books Limited.

Bicchieri, C. (2004). *The Oxford Handbook of Rationality*. Oxford University Press; 1st edition.

Bicchieri, C., & Chavez, A. (2010). Behaving as expected: Public information and fairness norms. *Journal of Behavioral Decision Making*, 23, 161-178. <https://doi.org/10.1002/bdm.648>

Bontempo, R., Lobel, S., & Traindis, H. (1990). Compliance and value internalization in Brazil and the U.S.: Effects of allocentrism and anonymity. *Journal of Cross-Cultural Psychology*, 21, 200–213. <https://psycnet.apa.org/doi/10.1177/0022022190212004>

Caceres, A. J. (2021, April 1). *The Anchoring Effect* | *St. Louis Fed*. Economic Research - St. Louis Fed. Retrieved April 13, 2023, from <https://research.stlouisfed.org/publications/page1-econ/2021/04/01/the-anchoring-effect>

Cambridge Dictionary. (2023). Retrieved January, 2023, from <https://dictionary.cambridge.org>

Chen, C. (2023). "A Review Examining Biases in Workplace Hiring and Promotion Processes. *CMC Senior Theses*, 3221.

https://scholarship.claremont.edu/cgi/viewcontent.cgi?article=4220&context=cmc_theses

Chen, G.-M., & Starosta, W. J. (1998). *Foundations of Intercultural Communication*. Allyn and Bacon.

Clear, J. (2018). *Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad Ones*. Penguin Publishing Group.

Dang, J., Baumert, A., Bentvelzen, M., Berkman, E., Buchholz, N., & Zinkernagel, A. (2021, January). A Multilab Replication of the Ego Depletion Effect. *Social Psychological and Personality Science*, 12(1), 14-24. SAGE Journals.

<https://doi.org/10.1177/1948550619887702>

David Hirshleifer, Levi, Y., Lourie, B., & Teoh, S. H. (2019, July). Decision fatigue and heuristic analyst forecasts. *Journal of Financial Economics*, 133(1), 83-98. Elsevier.

<https://doi.org/10.1016/j.jfineco.2019.01.005>

David Rubenstein (Director). (2018). *Amazon CEO Jeff Bezos on The David Rubenstein Show* [Film]. <https://www.youtube.com/watch?v=f3NBQcAqyu4>

Decision Fatigue. (n.d.). The Decision Lab. Retrieved September 26, 2022, from <https://thedecisionlab.com/biases/decision-fatigue>

Duke, A. (2018). *Thinking in Bets: Making Smarter Decisions When You Don't Have All the Facts*. Penguin Publishing Group.

Eilon, S. (1969, Dec.). What Is a Decision? *Management Science*, Vol. 16, No. 4, Application Series. <https://www.jstor.org/stable/2628797>

Ericsson, A., Krampe, R., & Tesch-Romer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, 100 (3), 363-406.

<https://psycnet.apa.org/doi/10.1037/0033-295X.100.3.363>

- Frieze, M., Loschelder, D. D., Gieseler, K., Frankenbach, J., & Inzlicht, M. (2019, May). Is Ego Depletion Real? An Analysis of Arguments. *Personality and Social Psychology Review*, 23(2), 107-131. SAGE Journals. <https://doi.org/10.1177/1088868318762183>
- Guth, R. A. (2005, March 28). In Secret Hideaway, Bill Gates Ponders Microsoft's Future. *The Wall Street Journal*. <https://www.wsj.com/articles/SB111196625830690477>
- Hagger, M. S., Chatzisarantis, N. L. D., Alberts, H., Anggono, C. O., Batailler, C., & Zwieneberg, M. (2016, July). A Multilab Preregistered Replication of the Ego-Depletion Effect. *Perspectives on Psychological Science*, 11(4), 546-573. SAGE Journals. <https://doi.org/10.1177/1745691616652873>
- Hofstede, G. (1984). *Culture's Consequences: International Differences in Work-Related Values*. SAGE Publications.
- Hofstede Centre. (n.d.). <https://www.hofstede-insights.com/fi/product/compare-countries/>
- Hoomans, J. (2015, March 20). *35,000 Decisions: The Great Choices of Strategic Leaders*. Roberts Wesleyan College. Retrieved September 26, 2022, from <https://go.roberts.edu/leadingedge/the-great-choices-of-strategic-leaders>
- Kahneman, D. (2013). *Thinking, Fast and Slow*. Farrar, Straus and Giroux.
- Kaplan, R., & Kaplan, S. (1989). *The Experience of Nature: A Psychological Perspective*. Cambridge University Press.
- Langer, E. J. (2015). *Counterclockwise: Mindful Health and the Power of Possibility*. Brilliance Audio.
- March, J. G. (1994). *Primer on Decision Making: How Decisions Happen*. Free Press.
- Mazurkiewicz, M. (2022, March 31). Metody heurystyczne jako skuteczne narzędzie zarządzania przedsiębiorstwem w czasach niepewności. *Kwartalnik nauk o przedsiębiorstwie*, 63(1), 57-70. <https://doi.org/10.33119/KNoP.2022.63.1.5>

- Newport, C. (2016). *Deep Work: Rules for Focused Success in a Distracted World*. Grand Central Publishing.
- Pagnini, F., Cavalera, C., Volpato, E., Comazzi, B., Riboni, F. V., Valota, C., Bercovitz, K., Molinari, E., Banfi, P., Phillips, D., & Langer, E. (2019). Ageing as a mindset: a study protocol to rejuvenate older adults with a counterclockwise psychological intervention. *BMJ Open*. 10.1136/ bmjopen-2019-030411
- Phillips, L. D., & Wright, G. N. (1977). Cultural differences in viewing uncertainty and assessing probabilities. *Decision Making and Change in Human Affairs*, 507-515.
- Pignatiello, G. A., Martin, R. J., & Hickman, R. L. (2020, January). Decision fatigue: A conceptual analysis. *Journal of Health Psychology*, 25(1), 123-135. Sage Journals. <https://doi.org/10.1177/1359105318763510>
- Robins, L. N., Helzer, J. E., Hesselbrock, M., & Wish, E. (2010, May-June). Vietnam Veterans Three Years after Vietnam: How Our Study Changed Our View of Heroin. *American Journal on Addictions*, 19. <https://onlinelibrary-wiley-com-100000ct30bcf.hanbg.uek.krakow.pl/doi/10.1111/j.1521-0391.2010.00046.x>
- Sibony, O., Kahneman, D., & Sunstein, C. R. (2021). *Noise: A Flaw in Human Judgment*. William Collins.
- Simon, H. A. (1986). Rationality in Psychology and Economics. *The Journal of Business*, 209–224.
- Smith, A. (1776). *The Wealth of Nations*. W. Strahan and T. Cadell, London.
- Vasile, A. C., & Nicolescu, L. (2016). Hofstede's Cultural Dimensions And Management in Corporations. *Cross-Cultural Management Journal*, XVIII, 35-46. https://seaopenresearch.eu/Journals/articles/CMJ2016_I1_5.pdf

- Vis, B. (2019, February). Heuristics and Political Elites' Judgment and Decision-Making. *Political Studies Review, Volume 17 (1)*. <https://doi.org/10.1177/1478929917750311>
- Wansink, B., & Sobal, J. (2007, January). Mindless Eating: The 200 Daily Food Decisions We Overlook. *Environment and Behavior, 39(1)*, 106-123. SAGE Journals. <https://doi.org/10.1177/0013916506295573>
- Yates, J. F., & de Oliveira, S. (2016). Culture and decision making. *Organizational behavior and human decision processes, 136*, 106–118. <https://doi.org/10.1016/j.obhdp.2016.05.003>
- Zell, E., Strickhouser, J., Sedikides, C., & Alicke, M. (2020). The Better-Than-Average Effect in Comparative Self- Evaluation: A Comprehensive Review and Meta-Analysis. *Psychological Bulletin, 146*. 10.1037/bul0000218
- Zelley, E. D., & Dainton, M. (2010). *Applying Communication Theory for Professional Life: A Practical Introduction* (M. Dainton & E. D. Zelley, Eds.). SAGE Publications.