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CHOICE ARCHITECTURE IN DIGITAL DOMAIN

Influencing user's behaviour in mobile applications via choice
architecture methodologies

Master of Science Thesis
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ABSTRACT

Rudolf Valli: Choice architecture in digital domain – Influencing user’s behaviour in mobile applications via choice architecture methodologies

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Decisions are part of our everyday life. But more often than we realize, the very decisions we make might in fact not be entirely ours – no matter how much we like to think otherwise. The decisions and judgment of humans are influenced by a multitude of factors, ranging from emotions to social norms and from weather outside to even personal rules of thumb. And, above all, sometimes deliberate actions are being taken to influence our decisions in order to steer our choices towards a desired direction. But equally often that might just be what is needed. In contrary to our often common beliefs, we humans might not always be as good or rational decision-makers than what we would hope. To aid us in making better decisions a *choice architect* enters the picture.

The power of *Choice Architecture* lies within its underlying principle to understand the psychology of the decision-making process of humans. In addition to search for answers *why* humans are affected and influenced in such numerous ways, choice architecture also exposes a pragmatic side in it as well, from which tangible and implementable tools can be derived.

In the following pages we dive into the world of choice architecture. The goal of this thesis is to build a foundational and coherent understanding of what choice architecture is, where it originates from and how it bridges to the modern digital domain. Theory covered in the literature review of this thesis works as a basis from where connections are then made to the digital world, and more specifically to mobile applications. A total of 98 sources were analysed for the research and 42 contributed to building the knowledge base.

After the literature review, the theory is put into practice via case studies. A process framework to design choice architecture methods for digital use is examined. As an outcome is a set of proposals in which various implementations are explored. In conjunction with the framework, reasoning is derived from previous research and discoveries found within the field of choice architecture.

The results of the research conducted in this thesis show great potential in combining the tools of choice architecture and the digital domain. A person working among digital products or services can greatly benefit from understanding choice architecture, since it can offer a supplementary layer that has the capability to co-operate with a variety of other skills required in designing digital products.

Keywords: Choice architecture, behavioural economics, behavioural psychology, user behaviour, decision making, nudges, nudging, persuasive technology, biases, mobile applications, human-computer interaction

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Päätökset ovat osa jokapäiväistä elämäämme. Mutta useammin kuin tiedostammekaan, ja vaikka kuinka haluaisimme toisin ajatella, tekemämme päätökset eivät välttämättä aina kuitenkaan ole täysin omiamme. Ihmisten päätöksiin vaikuttaa lukematon määrä tekijöitä, aina tunteista sosiaaliin normeihin ja säästä henkilökohtaisiin nyrkkisääntöihin. Toisinaan päätöksiimme pyritään myös tietoisesti vaikuttamaan, jotta tekemiämme valintoja voitaisiin ohjata haluttuun suuntaan. Monesti tämä voi kuitenkin olla juuri se mitä tarvitsemme. Nimittäin, vastoin yleistä näkemystä, me ihmiset emme ehkä olekaan niin taitavia tai rationaalisia päätöksentekijöitä kuin mitä toivoisimme olevamme. Ja juuri silloin kuvaan astuu *valinta-arkkitehti* – henkilö, jonka tehtävänä on auttaa meitä tekemään parempia päätöksiä.

Valinta-arkkitehtuurin voima perustuu yhteen sen keskeisistä periaatteista: ihmisen päätöksentekoprosessin psykologian ymmärtäminen. Sen lisäksi, että valinta-arkkitehtuuri pyrkii selvittämään *miksi* ihmisiin vaikuttavat niin monet eri tekijät, tuo valinta-arkkitehtuuri esiin myös käytännöllisen ulottuvuuden, josta voidaan johtaa niin konkreettisia kuin sovellettaviakin työkaluja.

Seuraavilla sivuilla syvennymme valinta-arkkitehtuurin maailmaan. Tämän työn tavoitteena on rakentaa perustavanlaatuinen ja koherentti ymmärrys siitä, mitä valinta-arkkitehtuuri on, mistä se on lähtöisin ja miten se linkittyy nykyaikaiseen digitaaliseen ympäristöömme. Kirjallisuuskatsausosiossa esitetty teoria toimii työn lähtökohtana, josta sen jälkeen muodostetaan yhteys digitaaliseen maailmaan ja tarkemmin rajaten mobiilisovelluksiin. Tutkimuksessa analysoitiin yhteensä 98 lähdettä, joista 42 toimi osana teoriapohjan rakentamista.

Kirjallisuuskatsauksen jälkeen teoriapohjaa sovelletaan käytäntöön tapaustutkimusten avulla. Tarkastelun kohteena on prosessikaavio, jonka avulla voidaan suunnitella sovellettavia valinta-arkkitehtuurimenetelmiä digitaaliseen käyttöön. Tapaustutkimusten yhteydessä esitetään joukko ehdotuksia, joiden avulla mahdollisia sovellusmenetelmiä tarkastellaan. Ehdotusten perustelut ja syyt pohjataan prosessikaavion ohella aiempaan valinta-arkkitehtuurin alalla tehtyyn tutkimukseen sekä havaintoihin.

Tässä opinnäytetyössä toteutetun tutkimuksen tulokset osoittavat havaittavaa potentiaalia valinta-arkkitehtuurin työkalujen sekä digitaalisen ympäristön yhdistämisessä. Digitaalisten tuotteiden tai palveluiden parissa työskentelevän henkilön voisi näin ollen katsoa mahdollisesti hyötyvän merkittävästikin valinta-arkkitehtuurin ymmärtämisestä, sillä sen myötä hänelle avautuisi täysin uusia näkökulmia joita hyödyntää muiden digitaaliseen suunnitteluun liittyvien taitojen kanssa.

Avainsanat: Choice architecture, behavioural economics, behavioural psychology, user behaviour, decision making, nudges, nudging, persuasive technology, biases, mobile applications, human-computer interaction

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PREFACE

First and foremost, I would like to thank both of my thesis instructors from Tampere University: primary instructor Päivi Majaranta and secondary instructor Thomas Olsson. While some of my questions along the way most probably sounded trivial to you, your ability to answer all my concerns and explain everything in a profoundly clear and concise way helped me tremendously.

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Last, but far from being least, I would like to thank Mika Yrjölä from the Faculty of Management and Business in Tampere University. Your kind gesture to let me attend your course “*Decision-making behaviour*” (suom. “*Päätöksentekokäyttäytyminen*”), even when the course was not by any means mandatory for my degree programme, is ultimately the reason why this thesis now exists. I enrolled to the course out of personal interest and curiosity, only to find out that the contents of the course were throughout excellent. During the course a topic called *Choice Architecture* was covered which, by no accident, can now be also found in the name of this thesis.

Indeed, even the slightest actions can truly have a great impact.

Tampere, 10 June 2025

Rudolf Valli

CONTENTS

1.	INTRODUCTION	1
2.	METHODOLOGY.....	4
2.1	Research questions.....	4
2.2	Research method	5
2.3	Academic literature search	5
2.4	Validity evaluation and limitations	6
3.	CHOICE ARCHITECTURE	9
3.1	Definition	9
3.2	Studies and research.....	11
3.3	Nudging.....	11
3.4	Digital Nudging	13
3.5	Choice architecture tools	15
3.5.1	Heuristics.....	16
3.5.2	Emotions.....	20
3.5.3	Social influence.....	21
3.5.4	Default options.....	22
3.5.5	Priming	23
3.5.6	Framing	23
3.5.7	Loss Aversion	24
3.5.8	Biases.....	25
4.	PRACTICAL IMPLEMENTATIONS.....	30
4.1	Example Case 1: Enhancing user experience via influencing decision-making	32
4.2	Example Case 2: Improving desirability of a selected product in a shop view	41
5.	RESULTS AND DISCUSSION.....	49
5.1	Understanding Choice Architecture	49
5.2	Enablers of Choice Architecture	51
5.3	Of influencing a decision.....	52
5.4	Bridging Choice Architecture and the digital domain	53
6.	CONCLUSIONS.....	54
7.	REFERENCES	56

LIST OF FIGURES

<i>Figure 1: Structure of the thesis. 1) Theoretical overview 2) Practical implementation through case studies.....</i>	<i>3</i>
<i>Figure 2: An overview of the literature review process, presented as an UML diagram.</i>	<i>7</i>
<i>Figure 3: An adapted categorization of nudges by Caraban et al. (2019). Adapted from the work by Hansen and Jespersen (2013).</i>	<i>13</i>
<i>Figure 4: A guideline by Schneider et al. (2018) for designing digital nudges.....</i>	<i>15</i>
<i>Figure 5: Heuristic-analytic theory created by J. St. B. T. Evans in the 1980's presented as a graph, showing the steps of decision-making alongside moments when the proposed processes affect it (Evans, 2006).</i>	<i>17</i>
<i>Figure 6: A revised version of the heuristic-analytic theory (Evans, 2006).....</i>	<i>18</i>
<i>Figure 7: An example task from research on prospect theory conducted by Kahneman and Tversky (Thaler, 2016).</i>	<i>25</i>
<i>Figure 8: A chart adapted from Dr. Schneider's showing how simply portraying scarcity an option was made to become more desirable (Yi, 2018).</i>	<i>27</i>
<i>Figure 9: An adaptation of the graph seen in Dr. Schneider's video interview at 03:42, displaying results regarding their research on the effectiveness of Middle Option Bias. The middle option was chosen by majority of users, even on the most expensive end of the spectrum. (Yi, 2018)</i>	<i>28</i>
<i>Figure 10: A comparison of two charts adapted from graphs seen in the video interview by (Yi, 2018). In this comparison we can see how employing a decoy alternative increased the probability of the Option 2 to be chosen.....</i>	<i>29</i>
<i>Figure 11: A screenshot of the storefront page of the language learning application Duolingo in Google Play service: https://play.google.com/store/apps/details?id=com.duolingo&hl=en</i>	<i>32</i>
<i>Figure 12: An illustrative comparison of how even a simple choice task could potentially benefit from a default option</i>	<i>35</i>
<i>Figure 13: An illustrative example of a multi-choice step where even one pre-selected default option could ease the task for the user, thus potentially enhancing the UX.....</i>	<i>36</i>
<i>Figure 14: An illustration of an idea how Priming could be implemented by embedding non-intrusive image-word-annotations to the UI.....</i>	<i>37</i>
<i>Figure 15: An illustrative example of a pop-up window (on the right) aiming to prevent a mistake due to a faulty answer and therefore negative emotions from emerging.</i>	<i>39</i>
<i>Figure 16: A screenshot of a storefront page of the mobile game Survivor.io in Google Play service. https://play.google.com/store/search?q=survivor%20io&c=apps&hl=en</i>	<i>41</i>
<i>Figure 17: A screenshot of a section of the shop view in Survivor.io in application version 3.9.4.....</i>	<i>42</i>
<i>Figure 18: An illustrative proposal for the implementation of Middle Option Bias</i>	<i>44</i>
<i>Figure 19: An illustrative proposal for the implementation of Asymmetric Dominance Effect</i>	<i>45</i>
<i>Figure 20: Illustrative examples of two proposals on how Social Influence could be put into effect.....</i>	<i>47</i>
<i>Figure 21: A comparative illustration showing on the right how an overuse of a label claiming popularity among other users may lead to decreased informative credibility</i>	<i>47</i>

LIST OF SYMBOLS AND ABBREVIATIONS

IAP	In-App Purchase
IS	Information Systems
UI	User Interface
UX	User Experience

1. INTRODUCTION

While making decisions of any scale occurs naturally and frequently to us humans, studies through history seeking to truly understand the decision-making process and behaviour of decisions have ranged from philosophy to neuroscience (Morelli et al., 2022). Among the fields of research stands also *Behavioural Economics*, seeking to discover the answers and gain understanding in the psychological aspects that construct human behaviour, especially in the segment of economical behaviour (Thaler, 2016). *Choice Architecture* on the other hand, a sub-field under Behavioural Economics, recognizes various tools that help understand users and their decisions on multiple levels. By utilizing these tools *choice architects* can affect and steer users in their decision-making in ways that open doors for better usability and increased profits. (Thaler et al., 2010)

By diving into the tools of choice architecture, this thesis aims to create a connection between two entities: *understanding* the psychological aspects of user behaviour in decision-making and *transforming* its concepts and learnings into usable practices when designing mobile applications. As mobile applications are viable forms of business in the modern-day world, the ultimate outcome behind each example and solution provided in this thesis via the use of choice architecture tools is to provide, either directly or indirectly, value addition to a business operating in the field of mobile applications.

The importance of the subject stated in this thesis is in its novelty value. By combining economical and psychological research on decision-making with conventions used in designing digital products, their strengths together could potentially be utilized to reach both improved user experience as well as increased monetary profit. In addition, since methods used in choice architecture could be argued of not having spread to common knowledge among developers and designers working in digital media, there could be seen to be a need for further research on the topic.

The purpose of this thesis is to provide an overview and knowledge of the most commonly used choice architecture methodologies as well as how these methodologies could be implemented into design thinking for mobile applications. Since the implementations of different methods can vary from one situation to another, in this thesis the focus is set to seek for and provide understanding *why* the chosen methods could be the best fit in different situations – therefore, concrete examples and ideas are explored to work

as bridging factors and to aid understand the presented connections between choice architecture and the digital domain.

The chosen research method for this thesis was *Case Study*. Through case studies different methods and concepts alongside with plausible limitations could be explored with pragmatic approaches and explanatory illustrations. In addition, case studies allowed a clearer relationship to be examined between the more theoretical nature of choice architecture and practical implementation of a design or feature to an application. Topics for the case studies originated from challenges and situations often faced by developers in real life when designing mobile applications while simultaneously aiming to turn the application into a product, and eventually, a profitable business. Other main criteria for choosing the case studies were the following: 1) as wide range of choice architecture methods as possible could be covered and 2) a broad overview of unique scenarios could be explored. As a result, the thesis divided into two distinct parts: *theoretical* and *practical* (see **Figure 1**).

In chapter two, *Methodology*, the materials and methods used in this thesis are discussed alongside their application to the case studies. The chapter comprises of both the research questions and the academic literature search process used in detail. Finally, the evaluation and limitations of the chosen research method are discussed.

The third chapter, *Choice Architecture*, covers the *theoretical* part of this thesis by concentrating on what choice architecture means and what tools it offers. Choice architecture is viewed in the chapter on a generic level, providing an overview of the topic. In addition to theoretical knowledge, understanding on choice architecture and its use are built using examples from everyday life and research. In later chapters these learnings are translated into implementable solutions within the digital domain.

Following the theory the chapter four, *Practical Implementations*, covers the *practical* part of this thesis via case studies. By combining the theoretical knowledge learned in chapter two with tools of user experience and user interface, or “UX” and “UI”, design, the case studies provide examples and further explanations how the methods of choice architecture could translate into tangible design thinking as well as ways of implementation. A set of two individual case studies are included. **Example Case 1: “Enhancing user experience via influencing decision-making”** studies and provides ways to implement psychological concepts acknowledged in the field of choice architecture that could carry a potential to offer a greater or improved user experience for the user in a mobile application. In the case study improvements to the UX are sought after by focusing on the moments of decisions and how deliberately adjusting them we could potentially enhance

the UX of the application. **Example Case 2:** “*Improving desirability of a selected product in a shop view*” on the other hand seeks for psychological traits and tools derived from choice architecture that could be utilized to increase the likelihood of making a certain product appear more desirable in the eyes of the user when browsing the shop view in a mobile application, eventually even leading to an In-App Purchase, or “*IAP*”, within the application.

Results and discussion of the research conducted in this thesis are covered in chapter five. Within the contents of the chapter the results that emerged during the research phase are brought up with additional details and reflecting views on multiple aspects. Also, while the discussion provides further insights and findings regarding the conducted research it also inspects the faced limitations and challenges.

In chapter six, *Conclusions*, the thesis, its underlying meaning and its creation process are viewed as a whole and condensed into a brief thoughtful summary, followed by the closing words.

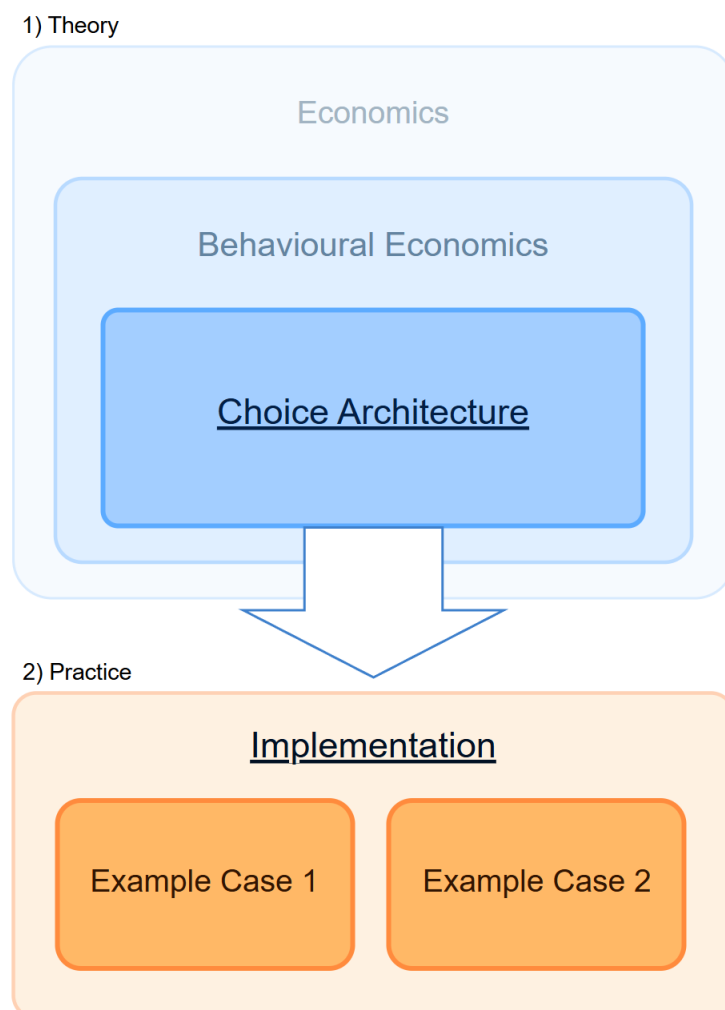


Figure 1: Structure of the thesis. 1) Theoretical overview 2) Practical implementation through case studies

2. METHODOLOGY

In this chapter an overview of the materials and methods for the research of this thesis is provided. We will cover the chosen methodology, how data was collected and what steps were taken to form the final set of sources for an observation and evaluation process.

2.1 Research questions

The aim of this thesis is to build and broaden the theory basis regarding Choice Architecture and the tools and concepts it holds within, as well as build understanding how choice architecture interconnects with modern day domains, especially with digital media. To prevent the topic from being too vast and vague, the topic was delimited to remain within the frames of mobile applications and mobile devices.

The following research questions (“RQ”) were formed based on the frames set by the aim of the thesis:

RQ 1: *What connections can be recognized between choice architecture and the digital domain?*

The first research question leads us to look for and recognize any interconnectivity between what is often seen as “traditional” choice architecture and the modern digital world which we, the users, are in dialogue with.

RQ 2: *How digital products can benefit from the use of choice architecture?*

The aim of the second research question is to move away from a broader inspection and tighten the focus. We target our concentration to build understanding around how digital products in particular can make use of the tools of choice architecture. The focus will be kept on mobile applications on mobile devices.

RQ 3: *Why understanding choice architecture is important for designers working in digital media?*

With the third research question the goal is to enlighten why it would be important for designers working among digital products to understand the possibilities as well as concerns and limitations choice architecture comes with.

2.2 Research method

The research method adopted in this thesis was *Case Study*. Case study was chosen due to its exploratory nature to broaden understanding on subjects, relations and contexts by analysing specific cases (Ferasso & Walter, 2022). Case studies were used to provide a deeper understanding around the chosen subject and create both a tactile and applicable examples between theory and practice. Case studies allow multi-level analysis to be conducted, even on a per case study basis, which suits the needs and goals set for this thesis (Eisenhardt, 1989). Furthermore, Eisenhardt (1989) points out that the evidence gathered to justify reasoning proposed in case studies can be qualitative, creating an opportunity to draw observations from the data collected via literature review.

2.3 Academic literature search

To build a theory basis to work as the foundation for the case study research, a literature review was conducted first. Literature review was an essential part of this thesis because of its internal goal to seek theory development by incorporating research within a specified area (Post et al., 2020).

Criteria for selecting suitable journal articles and publications for the literature review were tailored to find both generic and profound information on the topic. Due to choice architecture deriving its origins from the field of Behavioural Economics and is closely linked to Psychology, instead of trying to construct a single search string to cover all needs multiple search queries and sources were utilized. The used search queries were constructed to include primary keywords and followed by secondary, or even tertiary, supplementary keywords. An example of such a query would for instance be: (“*behavioural economics*” OR “*behavioural psychology*” OR “*choice architecture*”) AND (“*representativeness heuristics*” OR “*heuristics*”). Additionally, both forward and backward snowballing was used to identify potential new topic-related references from existing sources.

Since literature and studies commonly held valid and relevant to the topics of this thesis were found to contain publication dates covering a range of multiple decades, time constraints were decided to be excluded from the search queries.

The main bibliographic sources and databases used to search for scholarly literature were Scopus (<https://www.scopus.com/>), Google Scholar (<https://scholar.google.com/>) and Andor (<https://andor.tuni.fi/>). The searches totalled in 98 plausible articles or publications that were taken into closer inspection. First and foremost, the general suitability of the search results was evaluated through reviewing their abstracts. As for the outcome

of the first iteration of evaluation a total of 40 sources were excluded from the source pool. The remaining 58 search results proceeded into more detailed inspection, which in addition included an analysis of their discussion and conclusion sections as well as methods reported. After conducting deeper analyses, another 16 sources were discarded. As a result, the final source pool equalled to a total of 42 sources.

2.4 Validity evaluation and limitations

The inclusion – and exclusion – criteria used in evaluating the validity of the source material were adjusted regarding the stage of the evaluation analysis. Firstly, as briefly observed earlier, relatedness of the source was evaluated based on their abstract as well as references sections, to get an overview what the literature in question generally consists of and what approaches has it applied for its own research. Exclusion criteria to rule source material out at this stage included the following: 1) general suitability of the topic 2) relevancy to the research of the thesis and 3) high level of overlapping content and/or references.

At the second iteration of evaluation, a more detailed inspection of the remaining source material was performed. The materials were further verified based on analysing their reported discussion, conclusions and methods. This approach gave a better understanding of the contents of the sources on an individual level, thus helping to decide should any discarding be made. Exclusion criteria at this point included, in addition to the previous, the following: 1) notable lack of connections between topics and sub-topics within the thesis and 2) considerable gaps or inconsistencies found. Sources discarded at this point were mainly found to cover a topic too vaguely or disconnected from the rest of the source pool, making them in bigger picture provide no noticeable nor remarkable value addition in terms of research.

The final set of sources were then thoroughly examined as the literature review part of the research of this thesis. An overview covering the whole literature review process is illustrated as a diagram in **Figure 2**.

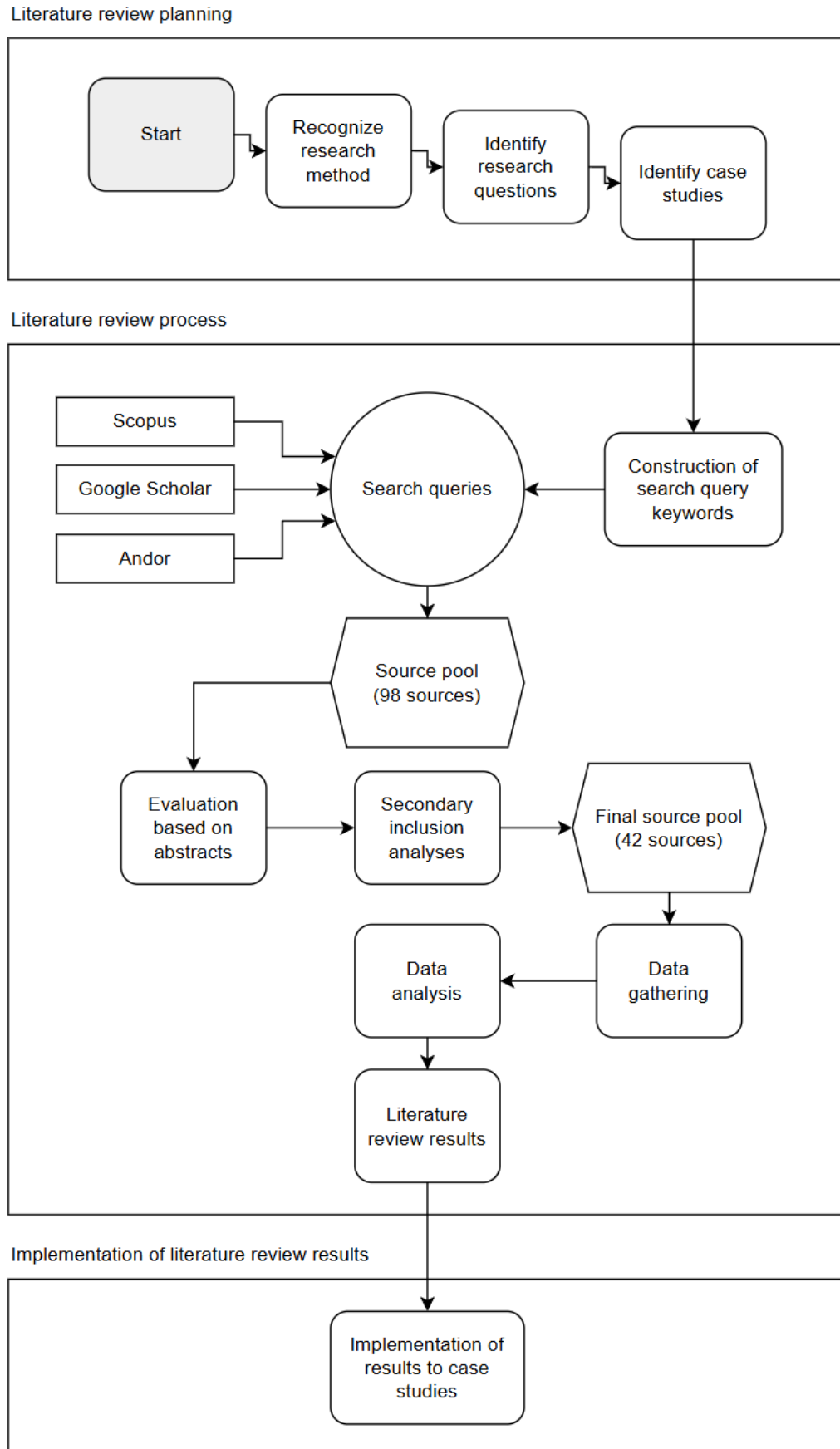


Figure 2: An overview of the literature review process, presented as an UML diagram.

While a great number of insightful findings were managed to be found during the research process of this thesis, also challenges and limitations were faced. The most distinct limitation of the research was the lack of user research for the implementations of the choice architecture tools. Focused and case specific user research could have created an additional layer of validation for the effectiveness of the implemented tools. Also, it could have potentially provided valuable feedback if an alternative method or tool would have performed better, especially when targeting mobile devices where great variance on multiple factors can exist. For instance, A/B testing various options could have provided data that, especially when performed to a multitude of participants, would have been able to be quantified, thus resulting in a dataset that would reveal which option in each test has the highest probability to get chosen. Being able to quantify the research data would be of great importance since, after all, the tools and methods recognized by choice architecture target the decisive systems of the human mind, meaning that gathering a cohesive and comparable answers via questionnaires, forms or other qualitative approaches would introduce a high probability for the results to turn into faulty or unusable data. Providing answers via qualitative methods the participants could let their personal interpretations, subjective views or even rational – let alone irrational – reasoning affect their perception why a certain option or options were chosen.

3. CHOICE ARCHITECTURE

3.1 Definition

When diving into what choice architecture is and where it originates from, it is important to first understand concepts closely connecting to decision-making. From a psychological point of view, humans rely on separate cognitive systems when evaluating information for the process of making a decision. Further, the cognitive system of humans consists of *Automatic System* and *Reflective System*, or as often respectively referred to in psychology, *System 1* and *System 2*. (Mirsch et al., 2017; Thaler et al., 2010; Thaler & Sunstein, 2008) The automatic system is responsible for making rapid decisions and is what is often referred to as “intuition” or “gut instinct”. Reflective system on the other hand deals with decisions that require systematic thinking or conscious thought processes. It also performs in a more goal-oriented manner. While the systems are separate, they do also co-operate. (Caraban et al., 2019; Thaler et al., 2010) If you suddenly realize a ball is approaching your head with high velocity, it is your automatic system that makes you dodge it (Thaler & Sunstein, 2008). Empirical studies conducted have shown that the automatic system is responsible for handling most, even up to 95%, of our everyday activities. This high level of “automation” plays also a major role in exposing our decision-making to influences. (Caraban et al., 2019; Mirsch et al., 2017) Examples of tasks the reflective system could take care of would for instance be calculations and reasoning (Thaler & Sunstein, 2008).

Perspectives from other fields of research are as equally important to understand when talking about choice architecture. In the eyes of economists, consumers have for long been perceived as what they call “*Homo economicus*”, or shortened, “*Econs*” – a concept that assumes humans rely solely on their reflective system in their decision-making and are capable of processing vast amounts of information at any given time. (Thaler, 2016; Thaler et al., 2010) In contrast to the traditional view of economists, the rise of *Behavioural Economics* shed light for a new concept where the consumers were seen as beings whose decisions were affected by a much greater amount of variety and aspects (Mirsch et al., 2017). Behavioural economics can be viewed as a mixture of psychology and economics (Thaler, 2016). Amos Tversky, Daniel Kahneman and Richard Thaler are often mentioned as the founders of modern behavioural economics due to their groundbreaking research on the topic (Kao & Velupillai, 2015).

The goal of choice architecture is to create either visible or invisible features or situations that can influence people in their decision-making process. It should be remembered and realized that seldomly, or even never, anyone making decisions makes them in absence of at least some amount of information or cues. And the people who deliberately create such features or situations, enabling influencing to occur, are called *choice architects*. (Thaler et al., 2010; Thaler & Sunstein, 2008) Furthermore, decisions in general tend to be greatly context-dependent and draw influence from the context they exist within, often referred to as *choice environments* (Mirsch et al., 2017). To shape these choice environments choice architects have a vast toolset at their disposal. For instance, choice architects can influence decision-making by altering presentation order of choices or utilize the power of pre-selected defaults. (Johnson et al., 2012)

Bucher et al. (2016) describe how choice architecture can include features such as chosen delivery of information, alterations in physical surroundings or utilization of social norms. One could even argue that we humans are all choice architects – at least to some extent. While affecting decisions of someone else could easily alarm the moral side of us, our attempts to steer and guide the decisions of others occur more often than we might realize. Have you ever placed one of the two glasses of water you were carrying closer to your friend on a table? Or perhaps wanted your colleague to join a company party and decided to follow your question with “*Everyone else is coming as well*”? Even though these examples might be as subtle as they get, still, in those moments you made an effort to influence the decision of someone else. Maybe your friend would be more likely to choose the glass of water closer to him, or maybe your colleague would be less likely to opt out from the party had she realized that by choosing otherwise would make her behaviour deviate from the behaviour of the rest of the group. But when can the use of choice architecture truly arise to the occasion? Thaler and Sunstein (2008) answer the question in their book by stating that the use of choice architecture tools can be especially important when people are offered decisions that are difficult or rare for them.

While the modern world we are living in is and has been rapidly digitalizing, attempts and intentions to influence decisions of people in the digital domain are far from absent. Since people increasingly make decisions based on what they take in while browsing digital content, such as websites or mobile applications, we are faced with enormous quantities of information that test our limits in making decisions. (Mirsch et al., 2017)

In connection with choice architecture often two names arise: *Richard Thaler* and *Cass Sunstein*. A great deal of the terms and concepts revolving around choice architecture have a path leading to them one way or another – this is simply because Thaler and

Sunstein have done groundbreaking work in bringing choice architecture to daylight. (Frischmann, 2022).

Finally, the ethical aspects of choice architecture should not be neglected either. Even though the goal of choice architecture tools should be to help people in making better choices, their use in unethical ways is not unprecedented. For instance, deliberate choice presentation methods have been reported to be used aiming to make customers purchase unneeded options. (Thaler & Cass, 2008; Weinmann et al., 2016) But, as Thaler and Sunstein (2008) remind us in their book: *“Freedom to choose is the best safeguard against bad choice architecture”*.

3.2 Studies and research

Choice architecture raises multiple interesting perspectives and thoughts around relationships between decisions and the decision-makers. Above all the following is a question noteworthy to consider: How willing a person actually is to engage in a decision process? Furthermore, what is the satisfactory level of a decision-making process of a person, or, what characteristics would be typical for the processes used in making decisions? (Johnson et al., 2012) Research in psychology has shown that humans are bound to their cognitive limitations when rationality is at stake, leaving us to be open for various aspects that can affect our decision-making (Weinmann et al., 2016).

Research has also found factors affecting the unconscious influencing of humans. A study conducted by Kiesel et al. (2006) found out that of its study participants only up to 60% were successfully steered to choose the primed response before the unconscious influence was interfered by response bias. On the contrary, in the digital world users have been found to often make their decisions in a rapid and automated fashion. Such behaviour could potentially open a door for effective influencing on the decisions of a person. (Mirsch et al., 2017)

3.3 Nudging

Nudges are deliberate alterations or adjustments in the environment that aim to influence the behaviour of people in a foreseeable way, often containing a use of selected psychological effects. It is also characteristic for nudges to act in such a manner that they do not try to exclude any options from the decision-maker nor do they notably try to shift their economic incentives. When intentional use of nudges is practiced, the action is cited

as *nudging*. Nudging is often even used as an umbrella term in choice architecture, referring to methods that steer the behaviour of people in an expected way. (Bucher et al., 2016; Mirsch et al., 2017; Thaler & Sunstein, 2008) Additionally, nudging that aims to help people make better choices is sometimes called *libertarian paternalism* – a term meant to encapsulate the idea that people should possess the freedom to choose, but simultaneously allow choice architects to attempt influence people to make choices that would result in “longer, healthier and better” life (Thaler et al., 2010; Thaler & Sunstein, 2008).

In a traditional economic view humans behave rationally, but the power of nudging lies within the fact that we do not always do (Weinmann et al., 2016). For a nudge to reach its highest potential it should originate from the understanding of a choice architect on human behaviour (Sunstein, 2014). In their paper Bucher et al. (2016) also provide an example from research regarding a simple nudge; decreasing dishware size led to reduced food consumption due to unconsciously resulting in smaller portions. Furthermore, even positioning of food have been found to possess power to nudge people. In a research consisting of eighteen studies, sixteen participants resulted in being nudged to alter their food choices towards healthier options simply via changing the placements of the food provided to them. (Bucher et al., 2016; Thaler & Sunstein, 2008) Nudges can sometimes even be as simple as suggestions. A study reported by Caraban et al. (2019) found out that merely suggesting a similar, yet to some degree better, alternative to the choice of a customer resulted to a median of 4 products out of 12 to be replaced. A closer inspection revealed that replacing the product was more likely to take place at a selection phase than at the time of checkout (Caraban et al., 2019).

In **Figure 3** we can see a two-by-two matrix displaying a proposed categorization for nudges. The types of nudges are divided into four categories based on two axis: level of transparency and tendency to prompt either the Reflective or the Automatic System. (Caraban et al., 2019; Hansen & Jespersen, 2013)

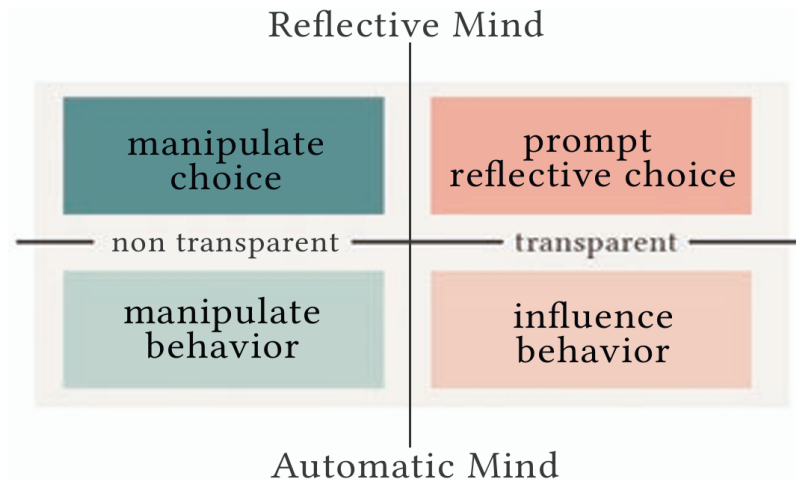


Figure 3: An adapted categorization of nudges by Caraban et al. (2019). Adapted from the work by Hansen and Jespersen (2013).

Common concept in creating nudges is to preserve the liberty of choosing while simultaneously aiming to steer the decision-making of a person to a particular direction. The person is therefore not prohibited in any way to choose whichever option they actually desire to proceed with, since it is only the direction of the triggered decision process that is being influenced to turn towards a desired alternative. (Mirsch et al., 2017; Sunstein, 2014; Thaler & Sunstein, 2008). Nudges are often chosen to be used due to their generally low cost while simultaneously offering a potential to be highly effective: a text message reminding a customer of a bill being due, nutrition information guiding towards healthier eating or even graphical warning labels on cigarette packages. (Sunstein, 2014) In his paper Sunstein (2014) also brings up the note that on many occasions the ultimate goal of a nudge is to simply make the life and decisions easier for people. In contrast, not all nudges are necessarily deliberate or tailored. Even weather can act as a nudge – undesired weather can alter our decision just as easily as any other nudge (Sunstein, 2014). Also, when utilizing or applying nudges, it is not uncommon to employ more than one nudging technique simultaneously (Mirsch et al., 2017).

3.4 Digital Nudging

Weinmann et al. (2016) define *digital nudging* as a use of such design elements in user interface, or “UI”, that aim to influence the behaviour of a user in *digital choice environments*. Moreover, a user interface is viewed to be a digital choice environment when operating it requires the user to make judgements or decisions. (Weinmann et al., 2016) But, since all design-related decisions in creating a user interface can be seen as

deliberate choices of the designer, the decisions can therefore also be seen as attempts to influence the behaviour of a user. For that reason, it is important for the designer to understand what consequences their work may potentially have. (Mandel & Johnson, 2002) Already from the ethical point of view designers should be aware that decisions they make when designing user interfaces can, even unintentionally, steer users to desired or undesired directions (Weinmann et al., 2016). Digital nudging can be seen to offer numerous advantages over nudges performed in the physical world; digital nudges tend to be easier, faster and cheaper to implement. Furthermore, various other digital tools provide a possibility to track the behaviour of users or even personalize nudges on an individual level. (Mirsch et al., 2017) In their paper Mirsch et al. (2017) also point out that while digital nudging is, when compared to “traditional” non-digital nudging, still building up its pace, it has not yet found a wide audience within the scholars in the field of information systems, or “IS”.

To design digital nudges a guideline has been suggested by Schneider et al. (2018). In its visual representation, as seen in **Figure 4**, the design guideline follows a cyclical form, consisting of four individual steps that advance the process of designing a digital nudge. Schneider et al. (2018) explain the steps as follows:

- **Step 1: Define the goal**
 - First, designers need to have or acquire a firm understanding of the general goals an organization has. Such goals can for instance be to make tax filing easier or to increase sales.
- **Step 2: Understand the users**
 - Designers also need to understand to who they are designing for and what their decision process might be like.
- **Step 3: Design the nudge**
 - Select an applicable nudge that helps in achieving the defined goal and implement it into the work.
- **Step 4: Test the nudge**
 - Select an appropriate testing method to validate the effectiveness of the designed nudge.

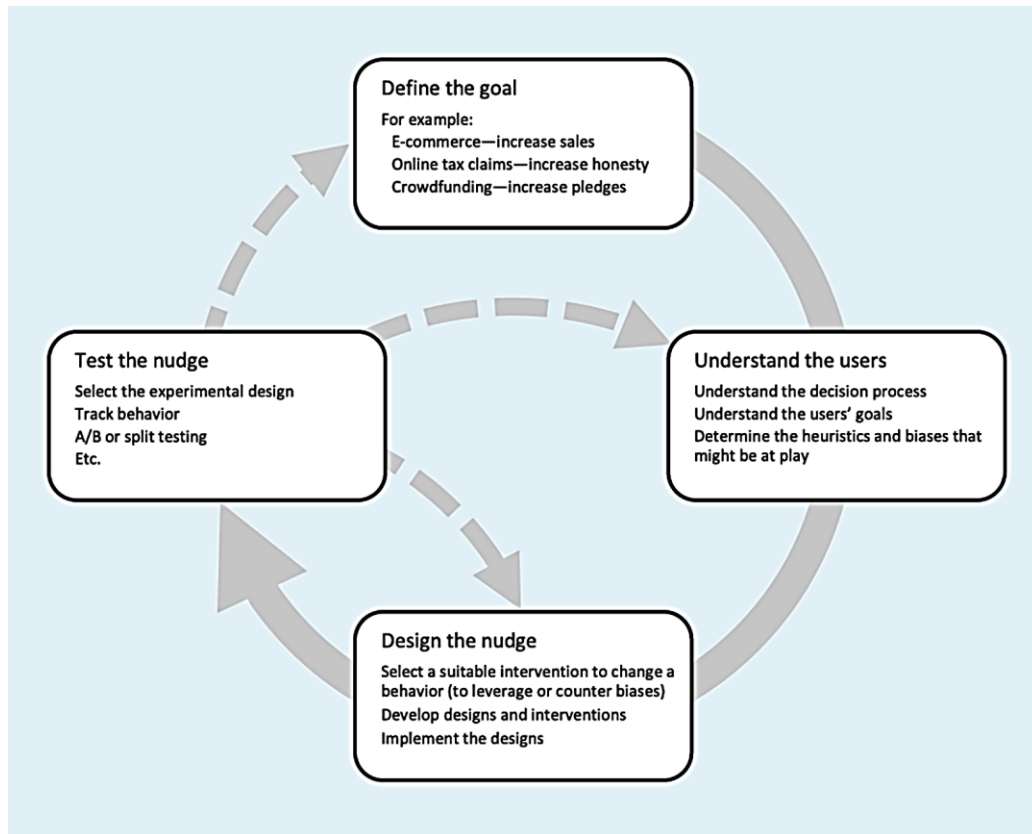


Figure 4: A guideline by Schneider et al. (2018) for designing digital nudges.

3.5 Choice architecture tools

A selection of methods recognized in choice architecture was decided to include in this thesis. The selection was in general based on their level of relativity and potential usability with digital products such as applications, services or games. It should be noted that the following set is not an exhaustive list of all available or known principles and tools in choice architecture. The individual methods included were chosen by their general characteristics as well as perceived potential effectivity when implemented into a digital product consisting of direct interaction with a user. Behavioural economics and choice architecture recognize also many commonly known decision influencing methods other than the ones included in this chapter, such as pricing or the use of incentives, but they were excluded mainly due to their perceived limitations in adaptability, vastness of the topic or highly specified use cases.

3.5.1 Heuristics

Heuristics, or “*rules of thumb*” as they are often referred to, are tools people use to ease their decision-making processes and lower the possible cognitive burden decisions could otherwise cause (Hutchinson & Gigerenzer, 2005; Mirsch et al., 2017; Schneider, Weinmann, & Brocke, 2018). Weinmann et al. (2016) remind that the importance of using heuristics emerges especially when a person is faced with straightforward or repetitive decisions, since heuristics have the tendency to lower the amount of information needed to be processed and, if needed, to leave room to focus on more essential aspects of decision making. Relying too much and deeply on heuristics, particularly in front of complex decisions, can introduce us to problematic situations though, resulting in cognitive biases and routine-like errors (Tversky & Kahneman, 1974). Characteristic for heuristics is that they provide us an adequate and sufficient solution, which by any means, may not always be the optimal one (Bílek et al., 2018).

A theory created in 1980's by J. St. B. T. Evans, the *heuristic-analytic theory*, raised to unfold the factoring weight of cognitive biases in the process of making decisions. The fundamental proposal of the theory was based on the view that – as its name suggests – two cognitive processes coexist in decision-making: *heuristic* and *analytic* process (see **Figure 5**). (Evans, 2006) Furthermore, Evans (2006) clarifies that when a decision is being made heuristic processes are responsible for generating selective overviews regarding the problem, and analytic processes then extract conclusions and reasoning from these overviews and representations – therefore, analytical reasoning is only available for the outcome formed by heuristics. In other words, heuristics can be held accountable for coming up with hypotheses regarding a choice set, which are then critically evaluated by the analytic system. The theory also holds in a notation of biases, and how they have the power to reject even logically relevant information. (Evans, 2006) Biases are further examined in the last section of this chapter.

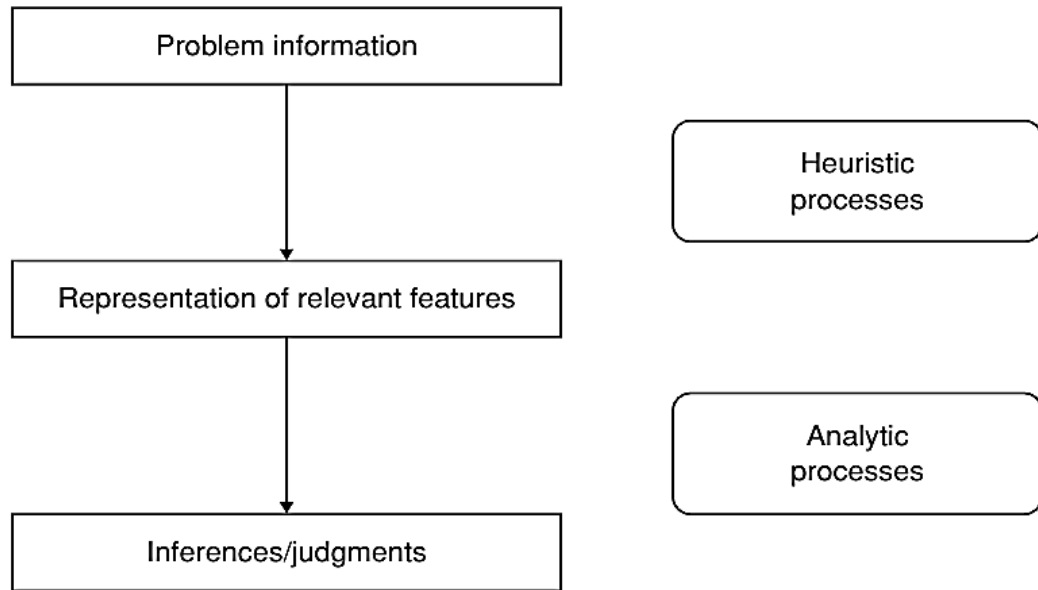


Figure 5: Heuristic-analytic theory created by J. St. B. T. Evans in the 1980's presented as a graph, showing the steps of decision-making alongside moments when the proposed processes affect it (Evans, 2006).

In his revised version of the heuristic-analytic theory, seen in **Figure 6**, Evans (2006) has refined his model to include the relationship between heuristics and analytic processes during the formation of a decision. A stronger emphasis is put onto the capability of the analytic side to interfere with the initial model formed by heuristics, and even to reject it if it is not viewed satisfactory enough. The raised significance of the analytic process to work almost as a doorman for the proposals sent by heuristics was a key finding in the new theory, and its existence was even suggested to potentially be the reason why individuals with higher IQ could more often end up to correct solutions when encountered with reasoning or judgemental problems. (Evans, 2006)

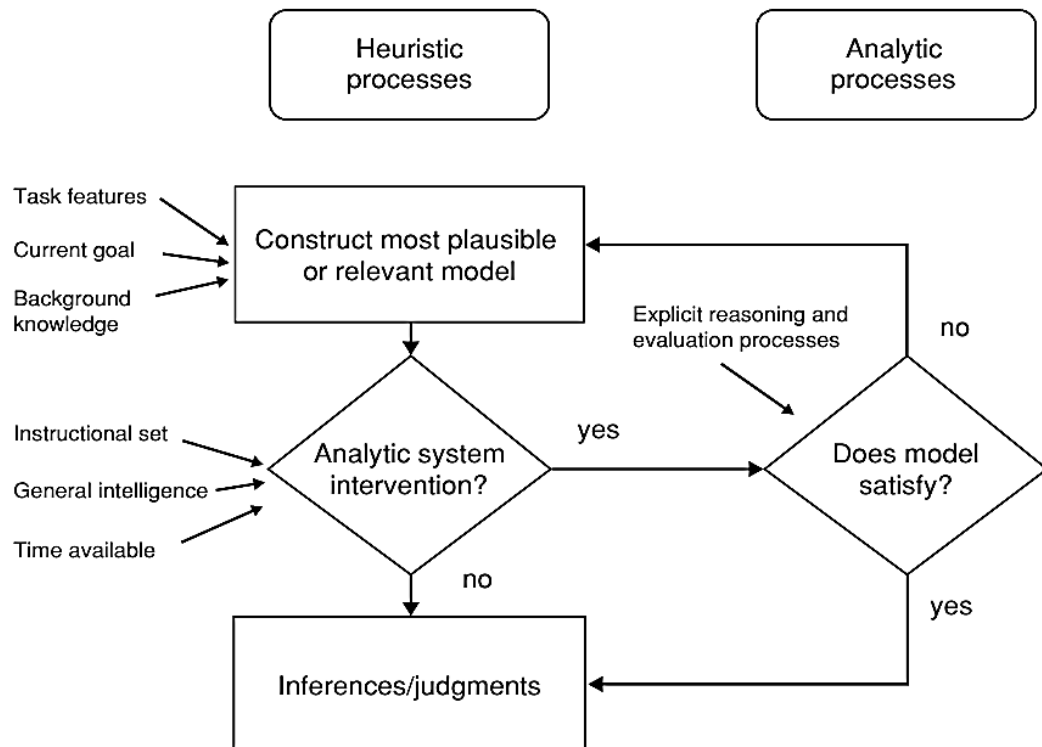


Figure 6: A revised version of the heuristic-analytic theory (Evans, 2006).

Amos Tversky and Daniel Kahneman recognized three heuristics in their research in 1974 – *Anchoring*, *Availability* and *Representativeness* heuristic. Further studies later on in the field of psychology have revealed that heuristics are a result of co-operation between the Automatic system and Reflective system in our brain. (Thaler & Sunstein, 2008). These three fundamental heuristics are covered next.

Anchoring heuristic

The anchoring effect takes place when information unrelated to a decision work as a reference point, or an *anchor*, from which a person unconsciously derives influence (Brewer & Chapman, 2002; Wong & Kwong, 2000). Also, in the absence of tangible information, people are prone to enter their decision process by deriving an estimate from a certain starting point. For instance, one might enter the process of comparing washing machines using energy classification labels provided with them. But it is important to notice that should a person choose some other sorting factor as their anchoring point for the washing machine comparison, the resulting preference order could end up being drastically different. (Mirsch et al., 2017)

As pointed out by Brewer & Chapman (2002) in their paper, research has shown that even if being mild, simply presenting a number to someone is enough to act as an anchor

and bias a decision of a person. One of the most widely known study regarding the anchoring effect was done by Amos Tversky and Daniel Kahneman (Strack & Mussweiler, 1997); in the study the participants were provided with a random number between 0 and 100 and then asked if the percentage of African nations in the United Nations was higher or lower than the drawn number. Results were clear – the participants who received a higher random number gave in general a higher estimate for the percentage value than participants with lower initial number. (Strack & Mussweiler, 1997; Tversky & Kahneman, 1974) Anchoring should not be viewed as a binary effect though, being either present or not. The influence of anchoring effect has been found to fluctuate for instance depending on the level of possible prior knowledge or beliefs the person has regarding the matter in question. What has been further found out is that the values used as anchors cannot be completely arbitrary, instead they should be seen both as somehow applicable and representative when compared to the value being estimated. (Strack & Mussweiler, 1997)

In a digital world the anchoring effect can be achieved in various ways. One alternative often encountered by users is in online stores where a product is simultaneously presented with various price options, each for a slightly different version of the product. In such cases the far end prices act as anchor prices, which often results the customer to be drawn towards the price option in the middle. (Mirsch et al., 2017)

Availability heuristic

Availability heuristic takes place when judgement is driven by an easily accessible trait or piece of information in the mind of a person. Events or memories that are easier to recall or are considered to occur more frequently are often viewed as the preferred choice in decision making, even when they do not align with actual probabilities. (Caraban et al., 2019; Mirsch et al., 2017) As for a digital nudging method utilizing availability heuristic, online banner campaigns provide a tactile example. When a user is repeatedly faced with an ad while using an application or browsing a website, the likelihood of the advertised product to be recalled from the memory of the person grows significantly higher, leading to a greater probability of its purchase at a moment of decision. (Mirsch et al., 2017) In their paper Caraban et al. (2019) also mention that nudges employing availability heuristic often make use of ways to point out about possible consequences of the actions of the user, such as hinting what the outcome of a selection might be.

Representativeness heuristic

In contrast to the first two heuristics, *Representativeness heuristic* comes to our aid when we make judgements regarding the inclusion of a target in a certain class (Shah & Oppenheimer, 2008). In their paper Shah and Oppenheimer (2008) supplement the definition by outlining that in representativeness heuristic a person bases their decision on the level of resemblance between the target and an archetypical sample of it. In other words, how much the target of our current judgement process represents an archetype version of a similar entity? Bílek et al. (2018) simplify the explanation to an even greater degree, stating that representativeness heuristic can be viewed as a relationship between two events or processes. For instance, a person may conclude the occupation of another person based on attributes they perceive the other person has or portrays. Also, the prevailing perceived information is even found to weigh more at the moment of decision, even overriding general applicable knowledge. (Bílek et al., 2018) Reported by Bílek et al. (2018), representativeness heuristic carries the potential, in certain occasions, to produce even more accurate results than other heuristics.

3.5.2 Emotions

Based on the research studied by Lerner et al. (2015), a repeating pattern was found; emotions influence decision making strongly and on multiple levels. As one of the emotion types that frequently affect our decision-making process Lerner et al. (2015) raise *Integral Emotions* – emotions that are or are thought to be the outcome of a decision, thus affecting the decision itself. For instance, a person who anticipates regret due to a decision might use the potential foreseen emotion as a reason to avoid taking risks. It is also not unusual for integral emotions to have a noticeable influence even when conscious thinking, or the Reflective system, is active. What makes integral emotions powerful is the difficulty to remove them from the equation once they get attached to the decision making process. The effect can even be so strong that they may overrule rational thinking. (Lerner et al., 2015) An excellent example was also presented in the paper by Lerner et al. (2015): A person who is afraid of flying might decide to travel by car instead, even when acknowledging that statistically travelling by an aeroplane would be safer.

The second emotion type affecting decision-making process presented by Lerner et al. (2015) is *Incidental Emotions* – the emotions we carry on from one situation to another even when no apparent reason to do so exists. A person might, for instance, carry anger

over from an event that occurred earlier on to a present event and aim the residues of that anger towards other people, even when there is no correlation between the people and the origin of the anger. Often this type of carryover behaviour occurs unconsciously. (Lerner et al., 2015) Interesting findings proposed by Lerner et al. (2015) also suggest that when people are in a good mood they tend to make positive judgements, and vice versa when feeling miserable. Economical studies have even found a connection between sunny days and positive stock market performance (Hirshleifer & Shumway, 2003; Lerner et al., 2015).

3.5.3 Social influence

Since humans by nature have a social side to them, pointing out what “most people” do can have a profound impact on us. The weight of realizing that majority of others are doing something can influence our decision making process greatly. (Sunstein, 2014) In his paper Sunstein (2014) brings forward that the power of such social influence even gets amplified if the source is localized, for instance noting that most people in “*your community*” are doing something.

In addition to communities or “others”, groups are also a major source of influence for humans. Various studies in both consumer behaviour and social psychology have found that decisions made within a group often depend on decisions made by others in the same group. (Ariely & Levav, 2000) Consumer research conducted by Corfman and Lehmann (1993) also showed that other team members are taken into account when a group decision is formed. Further studies have even raised a belief that two distinct entities exist: goals of a group and goals of an individual (Ariely & Levav, 2000). On the other hand, in their paper Ariely & Levav (2000) remind that often “group decision” is merely a sequence of decisions made by individuals within the group.

Simply the presence of a group can pose a significant influence on an individual. For instance, a person might reject their primary decision to order a specific dessert in a restaurant, merely because others in the group had already ordered it. Suddenly an unselected dessert raises its stakes to be chosen, so that choosing it would result the person in question seem more unique. In a group, tendency to steer towards choices that provide diversity and variety within the outcomes of choices are preferred. (Ariely & Levav, 2000)

To decide whether or not a choice architect should use social norms as means to nudge decisions of people, Thaler and Sunstein (2008) point out an important reminder that can cause a social nudge to even backfire: one should not let people know if their current

actions are in fact better than the referred social norm. In California, when a selection of households were in hope for energy savings informed if their energy consumption was above or below the average consumption within the area, many of the households resulting below the level felt they actually had room to consume more energy and, therefore, did so (Thaler & Sunstein, 2008).

The action of following what others do or mimicking their behaviour is sometimes also called “*herd instinct*” (Caraban et al., 2019). People in addition possess the proneness for collective conservatism – a tendency to stick with what is seen as the norm or an established pattern, even without questioning or sometimes knowing where the norms or patterns originate from. To resonate with this finding you can ask yourself the following question: why do men often wear a tie with a suit? (Thaler & Sunstein, 2008)

3.5.4 Default options

When choice alternatives are presented to a user, there is often a pre-made choice, a *default option*, already in place for the user. On the contrary, this does not mean an option has to be pre-selected – none selected can be a default option too. (Johnson et al., 2012) In their paper Johnson et al. (2012) suggest that default options are most likely the best-known example of tools used by choice architects. They are sometimes even claimed to be the most effective tools, or nudges, in choice architecture (Sunstein, 2014).

The option set as the default often has the highest probability to get chosen (Johnson et al., 2012). Or, if put in other words, when faced with a default option, it is least likely a user will deviate from it. People also often make the choice that is the easiest for them (Sunstein, 2014). This promotes the concept of the strength of default options, since usually the easiest option is to go with what is already chosen. Sunstein (2014) appends this idea by pointing out that whenever being easy the choice is also fun, the likelihood of choosing it rises even higher. Additionally, from the perspective of the user, the default option also carries an endorsement power with it, assigned by the setter of the option (Thaler & Sunstein, 2008).

How should the default options themselves be chosen then, even in the digital sphere? A thought raised by Thaler and Sunstein (2008) to answer the question in a libertarian paternalist way would be to start off by defining what the users would actually *want* to choose. Further practice could be to go for an “opt-out policy”, in which a beneficial, yet harmless, option is pre-chosen on behalf of the user, and the user needs to make a deliberate effort to switch away from it (Caraban et al., 2019). Finally, Thaler and

Sunstein (2008) remind in their book of a principle about good choice architecture: *“Choosers are human, so designers should make lives as easy as possible.”*

3.5.5 Priming

The underlying idea of priming is to provide a hint or mental association that eases the effort of the Automatic system to summon or fetch certain information. (Thaler & Sunstein, 2008) In priming the actor – or the *“prime”* – that is meant to steer the user towards a desired choice is, prior to the moment of choosing, presented subliminally (Kiesel et al., 2006). Types of such actors can include associations even for instance to certain topics, moods or questions (Mirsch et al., 2017).

A simple experiment focusing on the effect of priming conducted by Kiesel et al. (2006) revealed that participants reacted faster and were less prone to make errors when the priming used was congruent with the instructions. The study also showed that when faced with a free choice option in addition to the instructed tasks, the participants still ended up choosing the primed option more often (Kiesel et al., 2006).

An example of a connection between priming effect and the digital domain is presented by Mirsch et al. (2017) in their paper; a commercial airplane company used travelling pictures saturated with an emotional load on their social media account as a tool to prime the viewers with possible outcomes should they choose to use their services to fly to a desired destination. Another study, outlined by Caraban et al. (2019), found out that priming was an effective factor when products on a retail website were arranged in a qualitywise descending order. By doing so, users ended up mentally marking the first item on the list as a reference item to which they then compared the remaining products. Descending order made the users put more value on the perceived quality of the product, while ascending order resulted in users focusing more on the monetary value. (Caraban et al., 2019)

3.5.6 Framing

Framing occurs when the way a piece of information is presented to a person ends up influencing the decision-making process or its parts (Gál, 2018). In framing, the decision problem is introduced to a person in a controlled manner (Mirsch et al., 2017). A pragmatic example of the use of framing raised by Mirsch et al. (2017) was a series of stripes that were painted across the lanes on a curvy road; by doing so, the amount of accidents

in that road section was reduced since the stripes made the drivers perceive their velocity greater than it in fact was, causing them to instinctively slow down.

Studies have shown that people favour probabilities in gambling when they are framed as a chance to win rather than chance to lose (Yang et al., 2013). In general, the way of presenting prospects to people are found to have an effect on how the potential outcome of the prospects are perceived. According to research people are more comfortable with facing an evident monetary loss if the cost is for instance framed as being an “insurance premium”, but far less if the same value is certain to be lost in a gamble. (Yang et al., 2013). One could easily argue that paying for insurance versus gambling could have further psychological annotations included in them as well, but it should be remembered that in the example the focus of interest lies within the fact that in both cases the measurable monetary loss was exactly the same – why should they be rationally viewed as different?

Yang et al. (2013) also bring up in their paper the importance of associations words and terms carry with them. When informed prospects in a study were framed with terms such as “lottery”, “gamble” or “coin flip” their raised associations with the concept of risk grew higher than when framed with terms such as “gift certificate” or “voucher”. From the study conducted by Yang et al. (2013) results were drawn that when framing alerts the association of risk in the eyes of a person, willingness to pay decreases. Therefore it should be noted that the labelling of an offer can substantially influence the willingness of people to pay for it (Yang et al., 2013).

In the digital realm framing could for instance occur in a way how different presented products are intertwined on the screen. Mirsch et al. (2017) point out how in an online store, when a user is browsing or purchasing a product, additional products related to the product in question are shown to the customer, which raises a potential opportunity for the customer to perform an additional unplanned purchase.

3.5.7 Loss Aversion

On average, the value of losing something is perceived by humans to be twice as high than it is to gain the same thing. In other words, losses hurt us two times the amount they bring us happiness. The behaviour is so strong it even steers humans to act *loss averse* and seek for alternatives to avoid losses. (Thaler & Sunstein, 2008) In their book Thaler and Sunstein (2008) also point out that loss aversion takes the form of a sort of a cognitive nudge, trying to prevent us from making changes – even if changes

are what we are after. Kahneman and Tversky (1979) explain the behaviour in their foundational paper via a theory they proposed, *prospect theory*, describing how humans tend to be more sensitive towards potential losses when faced with decisions including uncertainty or risk. **Figure 7** displays a decision task “*Problem 1*” from research conducted by Kahneman and Tversky. By observing the results it shows how risk aversion played a major role in the decisions of the participants; in both **Decision (i)** and **Decision (ii)** over 80% of the participants chose the option that minimized the chance of loss. (Thaler, 2016)

Problem 1.—Imagine that you face the following pair of concurrent decisions. First examine both decisions, and then indicate the options you prefer.

Decision (i) Choose between:

- | | |
|-------------------------------------------------------------------------|-------|
| A. A sure gain of \$240 | [84%] |
| B. 25% chance to gain \$1,000 and
75% chance to gain or lose nothing | [16%] |

Decision (ii) Choose between:

- | | |
|---------------------------------------------------------------------|-------|
| C. A sure loss of \$750 | [13%] |
| D. A 75% chance to lose \$1,000 and a
25% chance to lose nothing | [87%] |

Figure 7: An example task from research on prospect theory conducted by Kahneman and Tversky (Thaler, 2016).

The utilization of prospect theory can often be encountered especially in certain digital platforms or online booking services. The customer might notice to be informed that there are X amount of other people browsing the same product right now as well or that the best fitting result is currently in an elevated demand. Often such notifications are purposefully chosen to create a sense of urgency, as if not acting quickly the customer loses their opportunity. (Mirsch et al., 2017)

3.5.8 Biases

To be counted as an *Econ*, a person is expected to be able to perform perfectly unbiased decisions – one after another. Since humans are known to make errors, we can safely draw ourselves back into reality and view humans alongside their faulty manners. (Thaler & Sunstein, 2008) A *bias* can be said to have taken place when structured alteration from normative judgement and decision making occurs (Lerner et al., 2015). The research conducted in the field of Behavioural Economics has recognized a vast category of different cognitive biases, of which a selection is covered next in this thesis (Caraban et al., 2019).

Status Quo Bias

The Latin originated term “*status quo*” is defined as “*the existing state of affairs*” (Oxford Dictionary, 2025). The bias named after it, *Status Quo Bias*, draws a connection to the tendency of humans to maintain the state they currently possess, since downsides introduced by leaving that state are perceived to be greater than simply remaining the status they already are in (Mirsch et al., 2017). It is greatly because of status quo bias why, once subscribed for instance to a magazine or a service, people often stick with the subscription even after the product becomes obsolete to them (Thaler & Sunstein, 2008). One reason Thaler and Sunstein (2008) bring up status quo bias occurs is the lack of attention which they playfully, yet alertly aptly, call “*yeah whatever*” heuristic.

Due to the nature of status quo bias and its implications for humans to view the current state as the optimal, it can effortlessly be linked to the previously mentioned choice architecture tool *Default options*. When accompanied with loss aversion, the power of the default option becomes even more difficult to neglect. (Thaler & Sunstein, 2008) Results reported by Samuelson and Zeckhauser (1988) even claim that, based on experiments, status quo bias portrays a significant role in our decision-making.

For a designer to tackle the stickiness of status quo bias, a study reported by Caraban et al. (2019) found out that at the time of choosing an alternative from a list, using both a messaging colour coding and vertically ascending position as cues to indicate the preferred sorting of the visible options, a desired selection was made by 60% of the participants. The colour coding used in such a scenario could for instance be that green is used to indicate a “good” option and red a “bad” option (Caraban et al., 2019).

Regret Aversion Bias

Studies have shown that when a certain level of risk is perceived or associated with an upcoming decision, the likelihood of a person to act more carefully in making the decision increases – the person therefore becomes *regret averse* (Caraban et al., 2019). Since humans are capable of anticipating the possibility of regret that might follow their decisions, such possible or foreseeable emotional impact can lead us to seek decisions that minimizes regret. What often is the root cause of regret in decisions is the discovery of a more valuable outcome if an alternative decision was made. (Humphrey, 2004)

Scarcity Effect

Scarcity Effect is triggered in humans when an option is realized to be in short supply. When comparing between common and scarce option, humans are found to view the scarce option as more attractive and desirable. (Yi, 2018) Adding to these findings Caraban et al. (2019) specify that the scarcity effect can get sparked especially when a reduced availability of quantity, rarity or time is perceived. Our tendency to perceive a scarce alternative as more valuable originates from a belief that acquiring the scarce subject might become more difficult in the future (Caraban et al., 2019). Further theory, originally presented by Professor Emeritus of Psychology and Marketing Robert Cialdini and reported by Caraban et al. (2019), points out that *loss aversion* could also be partially responsible for the scarcity effect to influence us, since a fear of missing out on an opportunity might drive us to act more than actually any real need. **Figure 8** portrays a comparative view of two setups from a study, where in the first setup Option 1 was informed to the viewers to remain in a quantity of five whereas in the second setup the labelling was simply switched to the neighbouring more expensive option. The preferred options of the viewers got switched accordingly.

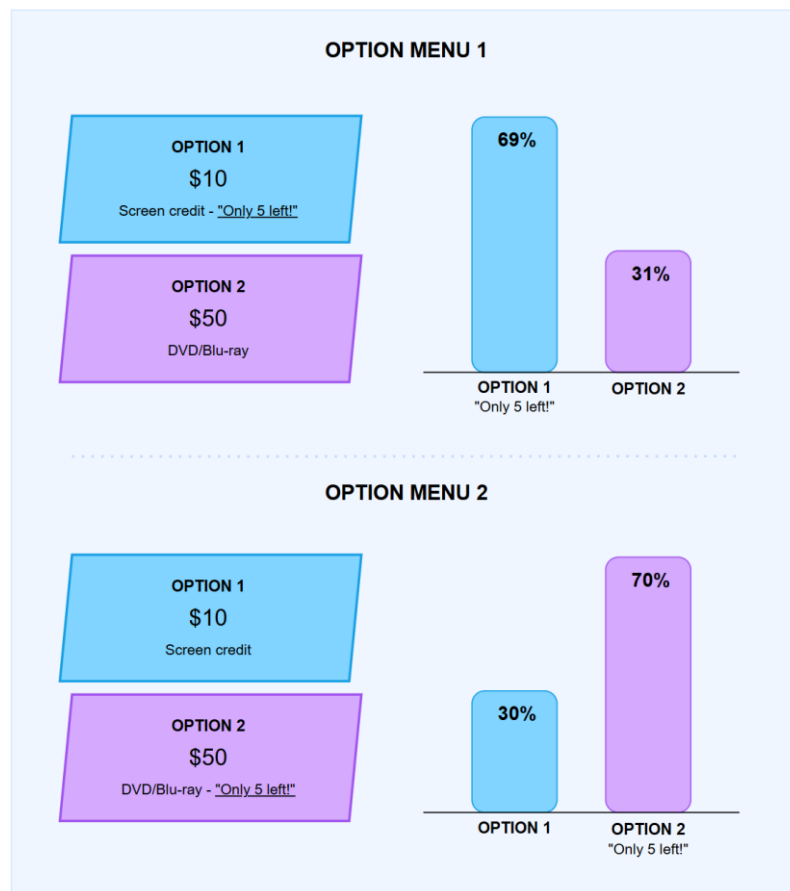


Figure 8: A chart adapted from Dr. Schneider's showing how simply portraying scarcity an option was made to become more desirable (Yi, 2018).

Middle Option Bias

A study discussed in a video interview of Dr. Christoph Schneider (Yi, 2018) brings up a significant finding showing that, within the frames of their research, the eagerness of people to repeatedly choose the middle option from a sequentially presented alternatives remained noticeable, even regardless the price point. Dr. Schneider explains this behaviour by the likeliness of humans to choose neither the cheapest nor the most expensive option (Yi, 2018). See **Figure 9** illustrating their findings.

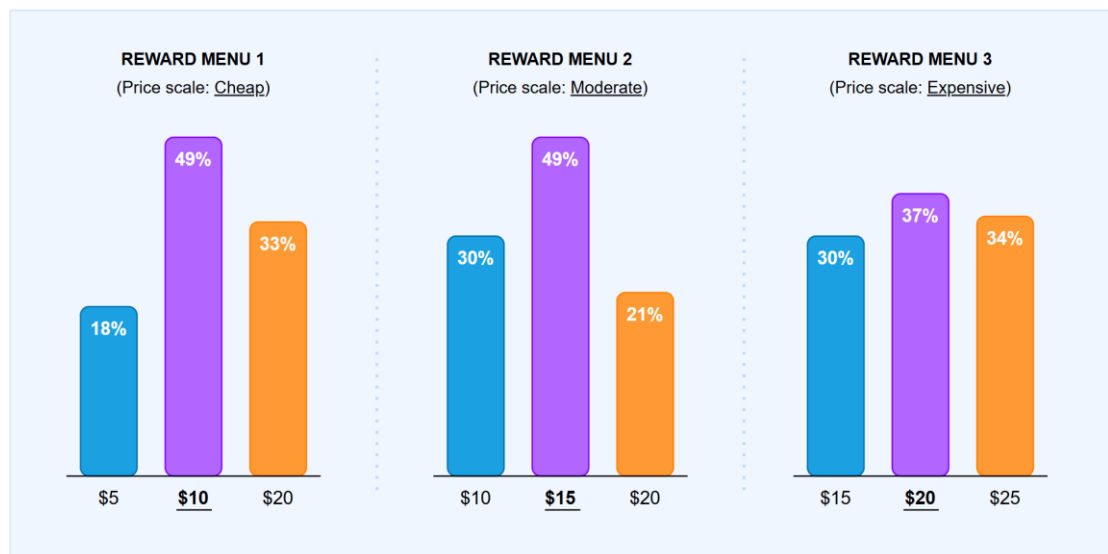


Figure 9: An adaptation of the graph seen in Dr. Schneider's video interview at 03:42, displaying results regarding their research on the effectiveness of Middle Option Bias. The middle option was chosen by majority of users, even on the most expensive end of the spectrum. (Yi, 2018)

Asymmetric Dominance Effect

An event often referred to as decoy effect, *Asymmetric Dominance Effect* underlines a phenomenon in which the preference for a choice of a user is affected by a deliberately added option, a *decoy* option, that carries perceivably lesser qualities or value and therefore makes its competing option look more appealing. (Caraban et al., 2019; Sürücü et al., 2019) The presented decoy option is commonly of such type which users would normally bypass, but its repelling appearance is the very reason why another option eventually ends up looking more appealing (Yi, 2018). In **Figure 10** we can see the decoy effect in action; in the first scenario, where no decoy option is included, the cheaper of the two options gets chosen the most often, but after a decoy option is added, the more expensive option now becomes the preferred one.

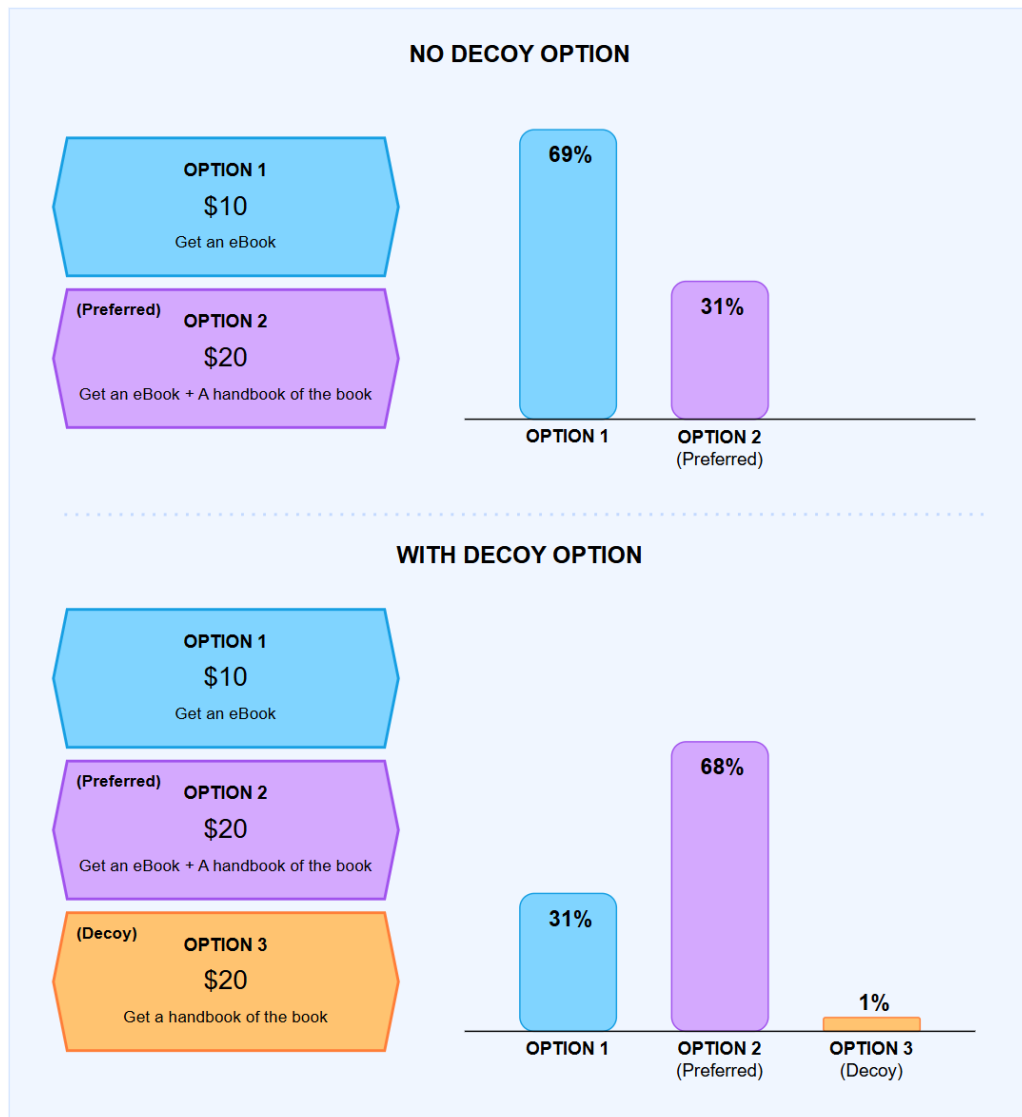


Figure 10: A comparison of two charts adapted from graphs seen in the video interview by (Yi, 2018). In this comparison we can see how employing a decoy alternative increased the probability of the Option 2 to be chosen.

4. PRACTICAL IMPLEMENTATIONS

In the following pages of this thesis two case studies are covered and, alongside their immediate results, discussion is presented. Both case studies act as their own individual entities, and no connection lies between them. The goal of the case studies is to, by deriving theory from the literature review and creating connections to it, explore potential implementations of choice architecture tools in the digital domain by proposing additions to existing mobile applications in their state at the time of writing this thesis. Providing suggestions to existing mobile applications was selected as the preferred approach in order to better examine real-world uses and connections as well as to create a clearer frame in which the potential of the proposals could be evaluated. All proposed additions view and attempt to meet the individually set goals solely within the boundaries of choice architecture. In addition, the intent is to describe the suggested additions in such a manner that their use could be generalized and applied to other similar applications or situations as well. Illustrations are included to further clarify the suggested implementations of the selected nudges. All screenshots included in this thesis were captured on an Android mobile device (*Samsung Galaxy S22 Ultra*); screenshots used for illustrative purposes are embedded into mobile device frames to more closely portray what the user sees when using the application.

The case studies were selected to both cover the use of various choice architecture tools as broadly as possible as well as to provide answers and considerations for goals related to decision-influencing that developers and designers might potentially face when creating mobile applications for their target audiences. Suggestions proposed in this thesis to potentially improve any aspect via choice architecture methods are hypothetical in a sense that they do not try to take a stand if such changes, alterations or additions would fit into the actual design or mechanics set by the company developing the mobile application in question. Possible influences of various additional factors on decision-making processes were also acknowledged but excluded from the implementation phase due to the vast complexity they would have introduced to the case studies and the overall research. Such factors include for instance age, gender, culture, disabilities, distractive events, device specific limitations or even combinations of the beforementioned.

It should be noted that while a selection of two individual case studies is aimed to produce tangible examples and perspectives on how to approach the application of choice architecture tools they do not together, nor separately, possess the capability to provide an exhaustive overview of the whole toolset available. The methods and tools used in

the case studies also do not necessarily represent the only applicable alternatives or ways to achieve the desired results set per case study. Furthermore, to remain within the boundaries of the topic of this thesis, the proposals presented in the following case studies draw connections only from what is covered in the literature review part of this thesis, while simultaneously acknowledging that the effects of the proposals could potentially be complemented or amplified by using additional methods as well, either in conjunction with or on top of what is proposed.

The approach to implement choice architecture tools will follow the digital nudging design guideline by Schneider et al. (2018) seen in **Figure 4**. To remain within the scope of this thesis we will focus on the first three steps of the guideline, labelled as follows: “*Define the goal*”, “*Understand the users*” and “*Design the nudge*”. The last step in the guideline, “*Test the nudge*”, was decided to be excluded from this thesis due to its resource requirements. Evaluation of the results will therefore be conducted by reflecting upon research, studies and guidelines providing views and statistics on how well the chosen tools could potentially perform. Limitations and challenges created by this decision is discussed later in this thesis.

While reading through the case studies, the following should be noted: The proposals and ideas presented in the case studies are interpretations of the author of this thesis and aim to only propose possible improvements and enhancements to the selected scenarios within the case studies; they do not take into account if the current state of the applications or the selected scenarios are, without any further additions, considered by the developers to already perform to their maximum or desired potential. Also, no intentions exist to imply that any improvements or enhancements to the applications or selected scenarios would actually be needed or necessary.

4.1 Example Case 1: Enhancing user experience via influencing decision-making

Decisions of many kinds are made throughout the use of mobile applications. While these decisions and choices may, depending on the application, differ from trivial to paramount, many of the moments when decisions are made could often be fine-tuned for an improved user experience, or “UX”. By providing as good user experience for the users as possible, the application itself could potentially also gain benefits for instance in a form of higher user retention or longer individual session times. In our first case study we will explore how such improvements could be approached and how they might benefit from the tools of choice architecture. As the example application for the first case study we will examine a widely known language-learning application, *Duolingo*, developed by *Duolingo Inc.* (<https://www.duolingo.com/>). The version of the application from where the example scenarios are derived from and the proposals appoint to is 6.32.6 for Android devices. In **Figure 11** the storefront page of Duolingo in Google Play is presented.

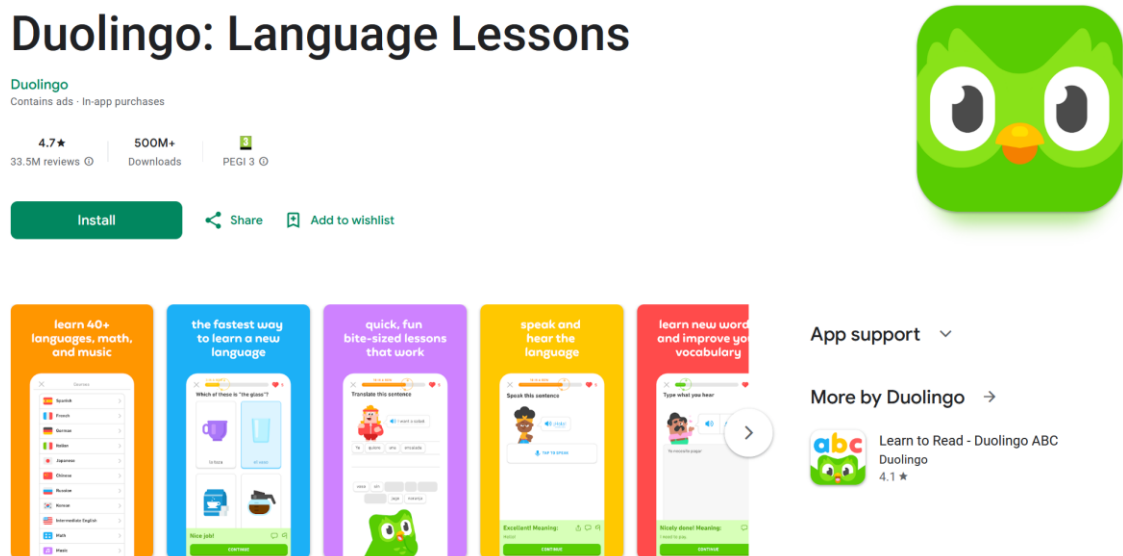


Figure 11: A screenshot of the storefront page of the language learning application *Duolingo* in Google Play service: <https://play.google.com/store/apps/details?id=com.duolingo&hl=en>

In this case study we present various proposals for ways to implement digital nudges that each aim to contribute for enhancing the user experience of a mobile application. The improvements and enhancements are achieved for instance by easing the decision-

making processes of different scenarios and situations, of which many are commonly found in mobile applications and games.

To accompany the design process of the digital nudges the guideline for designing digital nudges, proposed by Schneider et al. (2018) and illustrated in **Figure 4**, will be utilized and referred to. In addition, concepts, views and reasoning are derived from both the theory and research covered in the literature review earlier, aiming to create potential and justifiable proposals that could reach their set goals. While the defined goal to enhance user experience remains the same for all of the scenarios presented next in this case study, the approaches and proposals for each scenario are examined individually and separately from the rest, meaning that their functionality do not require for the other proposals to exist within the application in any form. Also, due to the separated nature of the scenarios, each scenario requires a unique evaluation on understanding the user as well as finding a suitable approach to design an appropriate nudge.

Default Options

Since Default Options are sometimes claimed to be the best known (Johnson et al., 2012) – or even the most effective (Sunstein, 2014) – method to influence the decisions of a person, implementing it to situations where it could be seen to provide aid for a user could be highly profitable. One of the greatest aspects of a default option is its ease of implementation; often the situations where default option could be introduced already exist, meaning the implementation phase can be as easy as pre-selecting one of the alternatives and marking it as active when the screen is shown to a user.

For the user default option on the other hand offers ease in a form of choosing. While the cognitive load caused by a simple decision might be insignificant on singular occasions, the benefits can add up especially when multiple screens containing decisions are presented to a user in a short time or in a row. By providing aid to lower the overall required cognitive load the possible arising feelings of frustration, caused especially by multiple consecutive steps of questionnaires, could perhaps be mitigated, thus enhancing the user experience of the application.

The use of default option does not come with only pros though, because its use can also introduce possible challenges and limitations. By providing the user with a pre-selected option, which the studies show would with a high probability remain as the chosen option, the value of the outcome of the decision task might decrease. In other words, if the presented choosing task exists in order to gain knowledge about the player or the player base, the use of default option would most likely corrupt the data by favouring the pre-

selected option. Therefore, it is crucial to both acknowledge the underlying goals of the situations where default option is wished to be implemented and aim to choose a pre-selected option that could benefit the application and the user simultaneously.

In **Figure 12** we can see rather a simple choosing situation with only two alternatives on the screen – the screen is shown when a returning user opens up the application after a break. In the figure the option *A* on the left illustrates how the screen is currently presented to the user, and option *B* proposes how the screen could actually be displayed with a pre-selection already in place. Even though being simple, the screen nonetheless triggers a decision process in the mind of the user: “*Which one should I choose?*”. By introducing the use of default option to this equation, an opportunity could arise to ease the choosing task for the user. While in option *A* the user might approach the two unselected alternatives by comparing which of them would be more correct and balance between them, in option *B* the user can simply ask if the pre-selected option evaluates as *true* – if not, then the other option might be in place to be considered.

In this scenario, the proposed pre-selection was made solely as a result of an assumption that users would be more likely to continue their previously studied language when returning to the application rather than start learning a new language. If data obtained prior to implementing the default option could provide factual information about which option in similar situation has the highest probability to be chosen by the users, then that option should be set as the default.

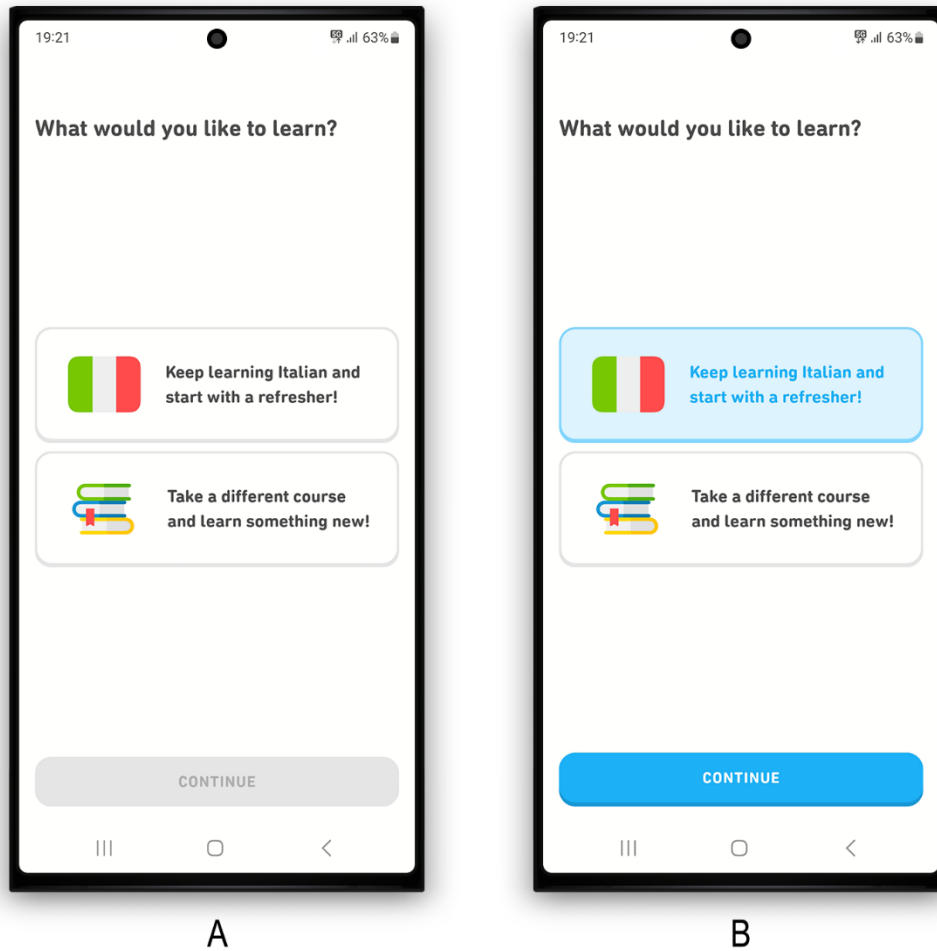


Figure 12: An illustrative comparison of how even a simple choice task could potentially benefit from a default option

For a comparison to the figure above, in **Figure 13** we can see a situation where a screen with multiple alternatives is presented to the user. The figure demonstrates how an increase in the quantity of alternatives immediately conveys a more laborious feeling. When faced with multiple possible options to choose from, in order to know which one – or ones – to choose the user needs to evaluate every presented option before deciding. Providing help in choosing could make the overall process of going through similar situations in applications less cumbersome, thus improving their UX. Similar to the situation in **Figure 12** above, the same concerns also raise in the choosing task present in **Figure 13**; if no deliberate actions are taken by the designers to select the perceivably best option as the default option, the resulting outcome for instance for any gathered data can be harmful, potentially even rendering it useless.

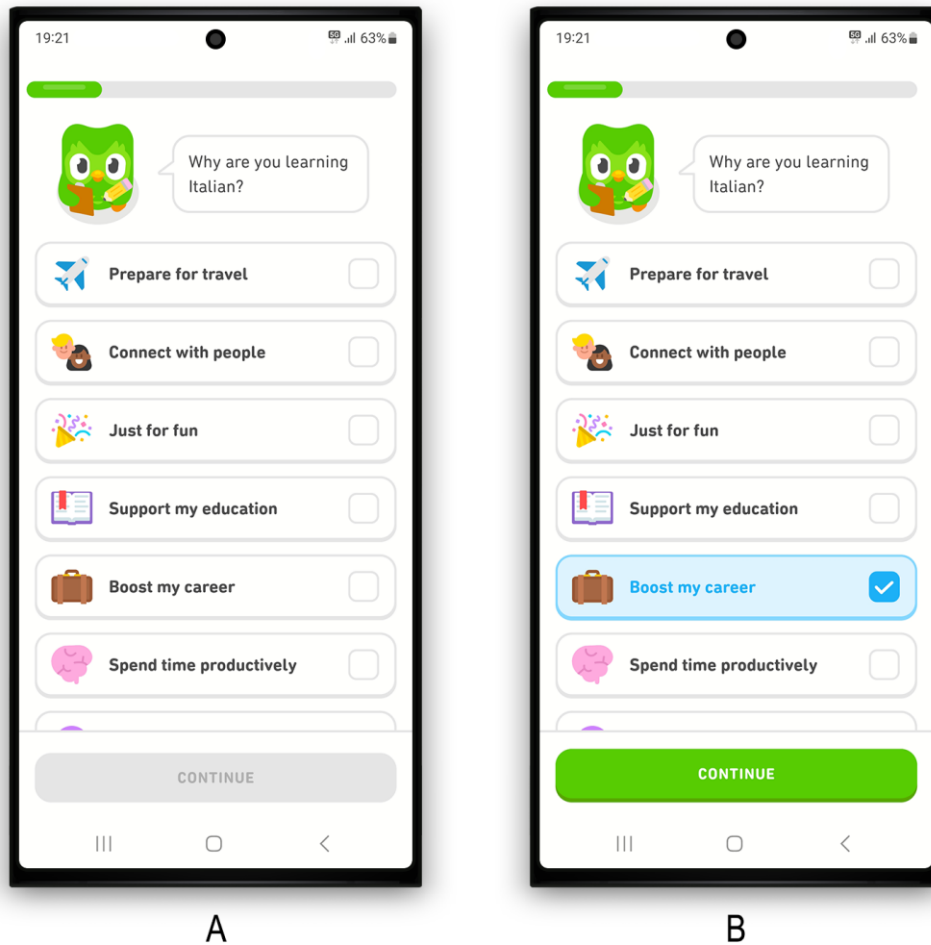


Figure 13: An illustrative example of a multi-choice step where even one pre-selected default option could ease the task for the user, thus potentially enhancing the UX.

Priming

Another way to enhance the user experience via influencing decisions could be achieved with the use of Priming. As described by Thaler and Sunstein (2008), by using priming the choice architect aims to subliminally provide a mental association to a particular choice in advance, so that the choice would be then easier to make at the moment of decision. Such approach could be useful especially in a language learning application where decisions are frequently made, for instance during exercises or quizzes.

Figure 14 portrays a proposal for an implementation of the priming method. To make use of priming the following is proposed: a number of correct choices, which the user will face in the upcoming exercises, gets shown to the user in a non-intrusive way ahead of time. In the proposal this is achieved by embedding an image of a train with its translation (“*il treno*”) into the progress path view (see the middle screen in **Figure 14**). The image as well as the translation are coloured grey, so that they would be visually less attractive, and therefore not draw deliberate attention onto themselves. When browsing or scrolling

through the progress path view the user would most likely still scan the screen with their gaze and subliminally notice the hinted grey image-word-annotations in the peripheral area, resulting in at least vague memory traces of them. Later, when the user is encountered with an exercise to connect the word “*il treno*” to its correct translation (as seen on the right screen in **Figure 14**), the effect of priming would have a chance to emerge and help the user to recall the answer and, eventually, decide to choose “*the train*”.

Such subtle uses of priming could have a positive impact on the user experience of an application in various ways. First and foremost, due to the subliminal nature of priming, the user would likely feel that their skills in the chosen language are growing rapidly since they are able to pass exercises with less mistakes. In addition, by decreasing the number of mistakes, also failures and any possible negative feelings associated to them would occur more seldomly.

An approach similar to what is described above would excel in its ease of implementation and potentially in the internal benefits the user could gain from it. By making sure the image-word-annotations remain visually in the background and barely noticeable, it would increase the probability that the user would not see their placements as intentional.

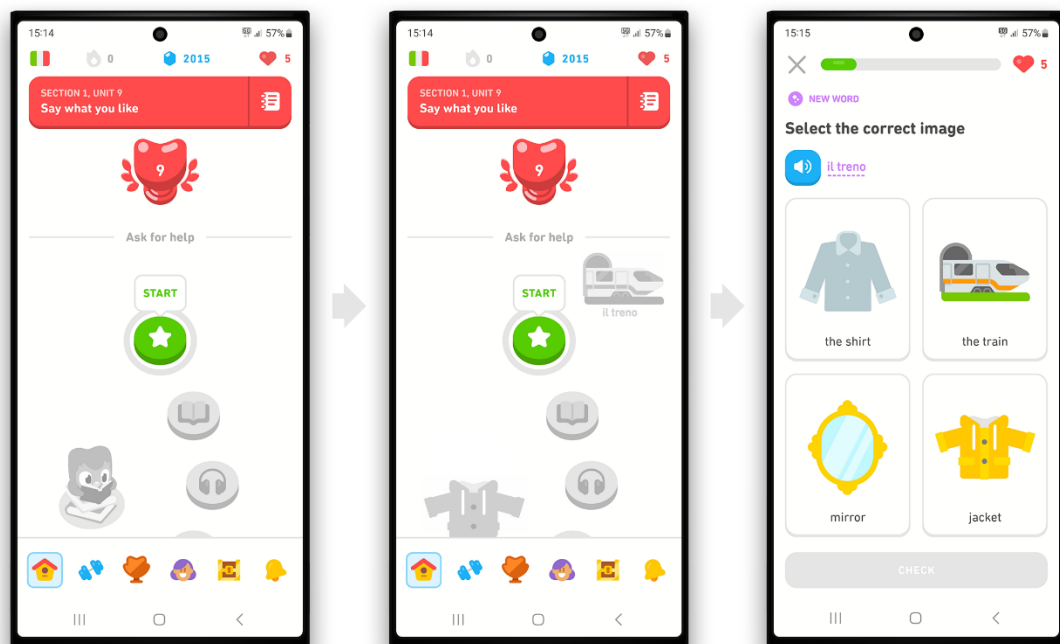


Figure 14: An illustration of an idea how Priming could be implemented by embedding non-intrusive image-word-annotations to the UI.

Regret Aversion Bias

Thirdly, we will examine how *Regret Aversion Bias* could be taken into account and how it could become useful in enhancing the user experience of a digital application. Since humans possess the ability to anticipate the possibility of regret a decision might result in (Humphrey, 2004), mitigating the chance of regret from happening could create more moments of happiness and feelings of success for the user, thus also improving the overall user experience.

The importance of mitigating regret is in how regret affects humans. Should a person make decisions that they afterwards regret, the experienced regret can make them behave *regret aversive*, affecting their future decisions as well. (Caraban et al., 2019) In addition, as pointed out by Lerner et al. (2015), the emotions that are seen as possible outcomes of a decision, *Integral Emotions*, can affect the current decision as well. While it may be difficult, or even impossible, to prevent negative feelings or emotions from emerging altogether, mitigating them whenever potentially possible could result in improving the user experience of an application.

One way to alleviate regret could be to help the user with their doubt by giving an opportunity for a second try. When using a language learning application, a certain level of uncertainty most probably exists since it is likely the users face exercises that include grammar and words unfamiliar to them. Therefore, the proposal suggested in this scenario approaches the moments of uncertainty by offering users an opportunity to redeem themselves should a mistake await them just around the corner. The benefits of preventing mistakes would come up especially in difficult decisions or situations where stakes of any kind might be involved, such as exams or tests that have a chance to fail.

The proposed implementation to tackle regret aversion bias is presented in **Figure 15** – in the screen shown on the left a mistake is made by providing a wrong arrangement of words as the answer. At the moment when the user presses the button “*Check*” to continue and the application recognizes the mistake, instead of prompting a mistake notification the user would be shown a pop-up window suggesting, in a friendly “*just saying*” tone, to reconsider the answer. An idea of the pop-up window is visible in the screen on the right in **Figure 15**. The user is not in any way prevented from providing the wrong answer – it is simply made more difficult.

Since the appearing pop-up window actually creates a new decision task for the user, further measures are taken to ease the sudden choosing process. The desired choice, the “*Fix*” button, which would take the user back to the answering screen, is coloured green as if to indicate it is the correct button to press if one wishes to proceed – similar

to the “*Check*” button the user had just pressed. Also, the “*Continue*” button in the pop-up window is deliberately greyed out, so that it would appear unpressable. The intention of the pop-up window is not to tell the user what the mistake is or how to fix it, but to merely point out that should the user want to prevent a certain failure from happening, a closer look at the answer would be in place. By not providing any further assistance the user is given a chance to discover the correct answer on their own, hence making the second attempt feel as if it was solely their own decision.

While the proposed implementation could to some degree aid users to answer correctly and prevent regret from surfacing, its extensive use could potentially also make it back-fire. If the users learn they are always helped or given another chance to try, it would remove the need from them to think on their own – simply trial and error would make them pass all the exercises. Therefore, even if the proposed digital nudge for this scenario would prove to be successful, there is a chance that its use should be limited to special occasions only or to situations where the user would benefit from it the most.

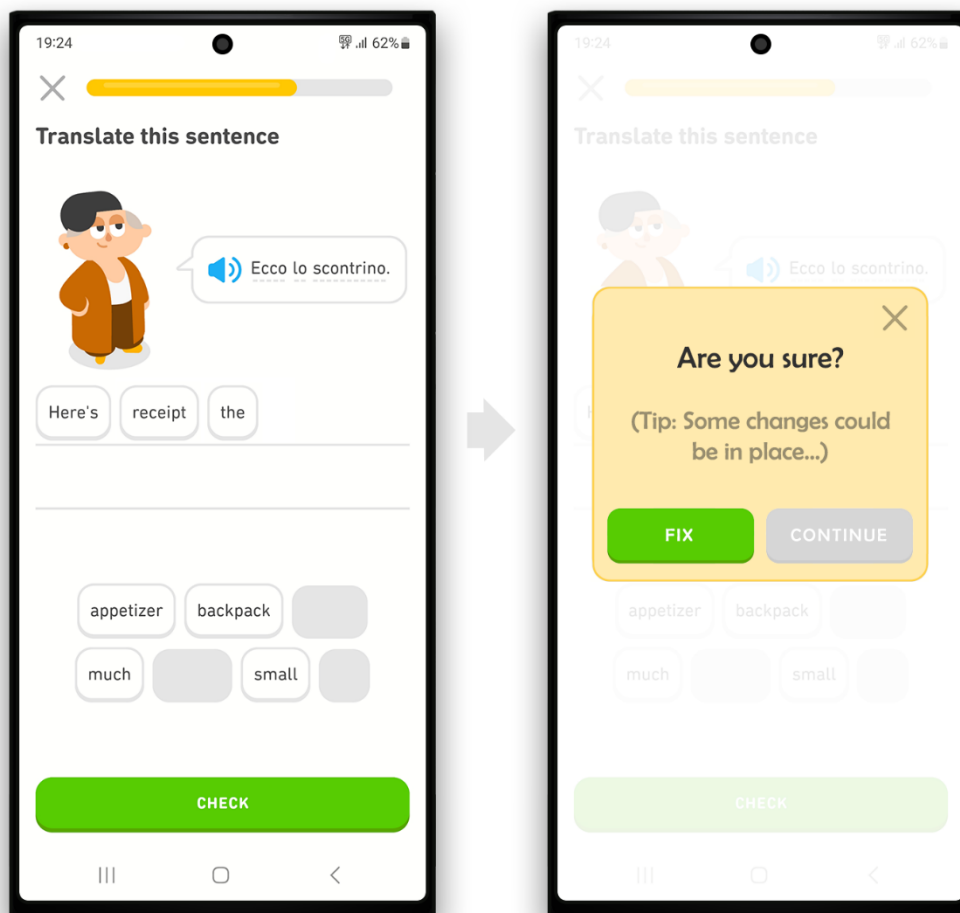


Figure 15: An illustrative example of a pop-up window (on the right) aiming to prevent a mistake due to a faulty answer and therefore negative emotions from emerging.

Summary

User experience of digital products could benefit from the use of choice architecture tools. Aiming to improve UX by adjusting or fine-tuning the digital choice environments could be best achieved with a sum of small incremental steps. Also, the use and true need of each adjustment should be evaluated each time a new addition is intended to be implemented. While the additions might occasionally be easy to implement, for instance simply marking an option as selected on behalf of the user, the consequences need to be carefully inspected to make sure they do not interfere with anything or create undesired results, such as corrupt possible gathered data sets.

When designing digital nudges to improve user experience, a crucial step is to understand the user. First of all, it is important to realize how a user actually perceives the decision-making situation and to recognize different aspects that may affect it. Without understanding the starting point, finding an appropriate nudge is next to impossible. Secondly, it would be wise to think about possible outcomes any changes to the decision situations may cause. Also, as was discussed in the last scenario of this case study, overusing a choice architecture tool could potentially even create problems of its own. Lastly, while in this case study the different scenarios were separated and handled individually on a per-scenario basis, it should be kept in mind that when implemented, they might affect one another or even work in tandem in unexpected ways.

While the different scenarios explored in this case study could be easily seen to have potential in meeting the set goal, further research would be needed to validate their true effectiveness. It should be noted that it is possible that evaluative user research could point out adjustment requirements or tweaks to the chosen nudges in order to make them work better or correctly – or it could even prove them insufficient.

4.2 Example Case 2: Improving desirability of a selected product in a shop view

Since many modern free-to-play mobile games offer the option to perform in-app purchases, or “IAPs”, improving the performance of the shop view of an application would be a great opportunity to increase sales, which could in turn elevate the profitability prospects of the company developing the application. Therefore, a well-performing shop can be seen to offer even substantial monetary benefits as well as incentives for the developing company to seek for ways to make products in the shop of their application more desirable in the eyes of the users. For that reason, the second case study in this thesis focuses on discovering ways to make IAPs catalogued on the shop view of a mobile application more desirable for users via tools of choice architecture. As a basis for the case study a version 3.9.4 of the free-to-play mobile game *Survivor.io* by *Habby PTE. LTD.* (<https://habby.com/>) was selected. **Figure 16** presents the storefront page of *Survivor.io* in Google Play.

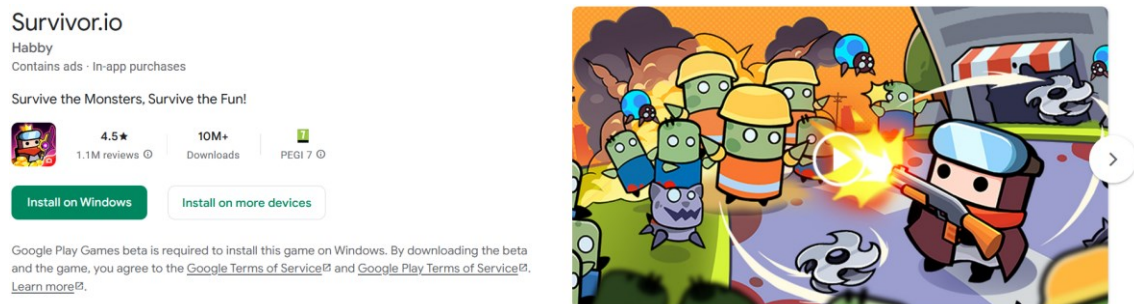


Figure 16: A screenshot of a storefront page of the mobile game *Survivor.io* in Google Play service. <https://play.google.com/store/search?q=survivor%20io&c=apps&hl=en>

In **Figure 17** on the next page we can examine a screenshot of a section of the in-app shop view seen in the mobile game *Survivor.io*. The shop view portrays two distinct sections, “Gems” and “Gold”, which both contain purchasable products. The products under “Gems” can be purchased using fiat currency (in this case Euros), while “Gold” category offers products obtainable via Gems, a game-specific in-game currency. The view itself consists of a base structure commonly used in modern mobile games, where the view is visually subdivided into categories in where the products are then presented as cards. A purchase of an item can be initiated by pressing a card portraying the desired product.

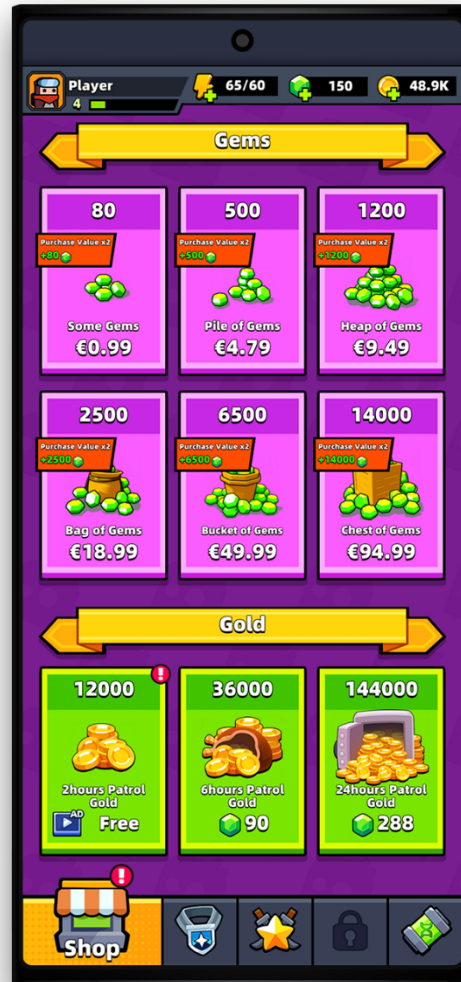


Figure 17: A screenshot of a section of the shop view in *Survivor.io* in application version 3.9.4.

Based on conducted research and findings they provide, we can recognize multiple suggestions how the desirability of product within the shop view could potentially be increased via the use of choice architecture tools. As the guideline to design digital nudges by Schneider et al. (2018) in **Figure 4** first and foremost suggests, the initial step in designing digital nudges contains a definition of the goal that is sought to be addressed. While constraining the aim of this case study to remain within improving the desirability of the products, the goal can be set as follows: *“Increase sales of the product ‘Heap of Gems’ via the shop view”* – above, in **Figure 17**, the chosen product is located on the upper right corner under the sub-section “Gems”. To maintain clarity and comparability the set goal will remain the same for all scenarios in this case study. This way we can inspect alternative ways to approach the same goal and see possible advantages or challenges one digital nudge may have over another. The product “*Heap of Gems*” was

chosen solely for demonstrative purposes. Since the choice architecture tools themselves do not necessarily create any need for a user to buy anything but merely aim to nudge at the moment of decision, for the sake of this case study also a presumption is made that a user possesses an intention to purchase a product while browsing the shop.

As for the second step in the guideline Schneider et al. (2018) advises to focus on understanding the goals of the user and decision process, and what is their connection to the set goal. In addition, the guideline suggests determining which tools of choice architecture could be of use in achieving the goal. At the moment of browsing the shop the user will, due to the fact the shop offers a number of options to choose from, face a series of mental tasks in form of comparisons, judgement and evaluation. This moment would provide an opportunity to introduce nudges to steer the perception of a user in relation to the products, thus influencing the decision-making of the user. Next, we will explore possible choice architecture tools that could show potential in reaching our set goal: to improve the desirability of a selected product within a shop view.

Middle Option Bias

When reflecting on the research conducted by Schneider et al. (2018), examined in detail in chapter 3.5.8 *Biases*, regarding the presentation sets and their effect on desirability of a certain product, the shop view could benefit from an implementation of *Middle Option Bias*. As illustrated in **Figure 18** next page, a set of products could be shown in the shop view with the sole purpose of making the product “*Heap of Gems*” more desirable via the middle option bias. To further emphasize the existence of a “middle option”, the set size would in this scenario be fixed to three products – alternatively, another uneven number of displayed products could potentially suffice as well.

According to research, the use of such a set should increase the perceived desirability of the product in the middle, priced at 9,49€ in **Figure 18**. It should be acknowledged that the true advantage of the possible increase in attention gained via the middle option bias would come only should the user normally aim for the first option in the presented situation, priced at 4,79€. Therefore, if the proposed nudge or similar implementation would cause the users to sway away from naturally selecting the more expensive products in the set, the use of middle option bias in this case should be reconsidered. On the contrary the setup could also simply be adjusted to further amplify the desirability of a more expensive product instead, since the studies by Schneider et al. (2018) showed that the middle option bias was effective regardless the price point.



Figure 18: An illustrative proposal for the implementation of Middle Option Bias

Asymmetric Dominance Effect

Another tool used in choice architecture from which the shop view could benefit, is the *Asymmetric Dominance Effect*, or *Decoy Effect* as it is often referred to. Again, we keep in mind the initial goal of increasing the likelihood of the product “*Heap of Gems*” to be elevated. Contrary to the previously examined middle option bias, the decoy effect adds a seemingly similar version of the targeted product to the set but with the twist that, when compared, it can be noticed to possess perceivably lesser qualities than the target product (Yi, 2018). And then, at the moment of comparison, the target product is viewed as the better offer, thus increasing the likelihood of making it more appealing in the eyes of the user.

When creating a deliberate decoy to amplify the perceived value of another product or offer, one should be cautious not to differentiate the products too much by, for instance, exaggerating the superiority of the target product. Should the perceived differences grow too big, a situation can appear where it is difficult to justify why the decoy product would even exist in the first place. The decoy product could even expose itself as being fraudulent or deceiving, which could in the worst scenario lead to a decreased reliability towards the shop – or even towards the whole application. As seen in the adapted chart derived from an interview done by Yi (2018) in **Figure 10**, the only difference between *Option 2* and *Option 3* is that *Option 2* – the target option – has an additional perk when compared to the decoy option. Instead of receiving merely a handbook version of the sold book (*Option 3*), the preferred option ships also with an eBook version of the same

book with no additional costs. While this difference could be argued to be relatively minor, it is enough to raise the perceived value of the target option enough to make it more desirable. An interesting aspect that should be noted is that in the study discussed in the interview by Yi (2018) the three presented options all contain essentially the same products – it remains unclear should the set of options always be assembled this way, or is simply the perceived value difference between the target and the decoy the dominant factor.

In **Figure 19** we can inspect a plausible proposal for how asymmetric dominance effect could be implemented into our case study. For the sake of the case study, the section in the shop view where the displayed products can be found is altered slightly; to justify the bundling of items and variety of different type of products, an additional section called “Offers” was created. The offers included under the section are merely examples and do not necessarily represent the optimal selection. Also, even though the product images have gone through minor visual adjustments, the resulting visuals should not be considered as “correct” or the only viable solution. Above all, their function is illustrative.

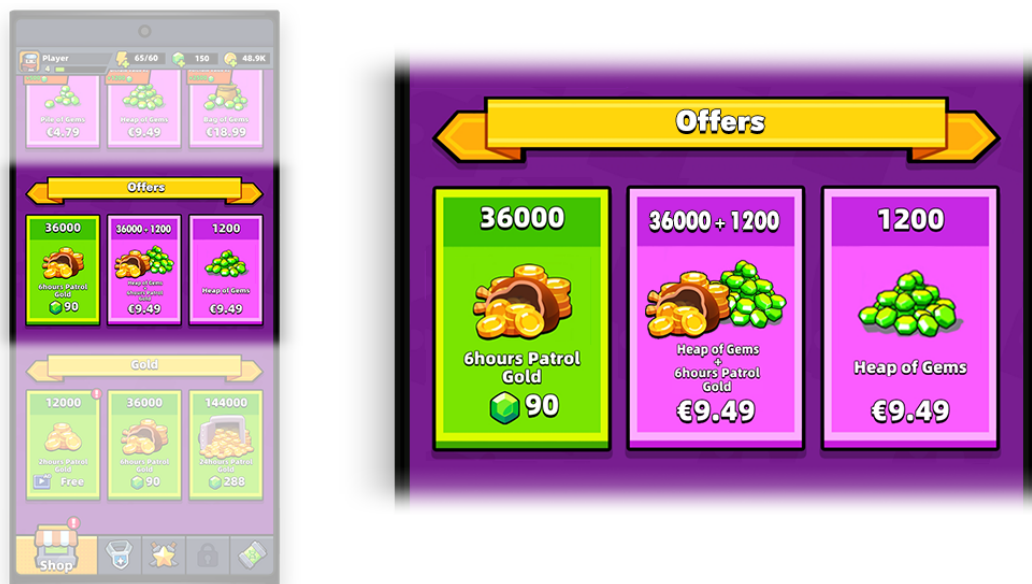


Figure 19: An illustrative proposal for the implementation of Asymmetric Dominance Effect

Social Influence

Other than directly manipulating the displayed products or their contents, we could also seek for an increase in desirability of a product by attaching external factors to it. As pointed out by Sunstein (2014), a realization that others are doing something or acting

in a particular way can be a major driver for humans to act accordingly. Therefore, in order to create an additional layer of interest for a selected product or products, we could make use of the power of *social influence*. In **Figure 20** on the next page two alternative approaches are illustrated, options **A** and **B**. For both alternatives, no changes have been made other than a red label with text was added to the upper right corner of the product card. The placement or the design of the labels are not intended to play any major significance. Also, for easier examination, the product cards are detached from their shop view context.

The label in option A in **Figure 20** portrays a text "*Popular!*". By choosing such a wording we could indicate a general interest towards the product, which could be interpreted by the user that the product is something other users favour or have favoured recently. This interpretation could create a sense of validation in the eyes of the user, since the value or usefulness of the product would be proved via its popularity among other users.

In option B the label instead carries the following phrase: "*Your friends have bought this!*". As described in their papers by Sunstein (2014) as well as Ariely and Levav (2000), humans show a tendency to react even more strongly when they find out their *community* behaves in a certain way. Therefore, as done in the label text in option B, including an annotation about a community or group to which the user can relate to or is part of should by a notion of previous research perform even better than a general information of something being merely "popular". The annotation in the label text in option B is made of two words: "*Your*" and "*friends*". While "*friends*" depicts the type of community, "*your*" is used to create an even greater emphasis that it is in fact the group of the user that is in question, making the statement one step more personal and defined.

While social influence can be a significant driver in affecting our decision-making (Ariely & Levav, 2000), its use in a situation painted by this scenario should be approached with care. For instance, how believable would it render the information if all the products shared the same label stating their popular status (see an example taken to the extreme in **Figure 21**)? Another noteworthy aspect arising when social influence is utilized as a tool is a requirement for its truthfulness; if a claim is declared that the friends of the user have purchased a certain product, that information should be derived from a definite source. It is far too easy for the user to find out if the claim is false – their friends might not even play that particular game.



Figure 20: Illustrative examples of two proposals on how Social Influence could be put into effect

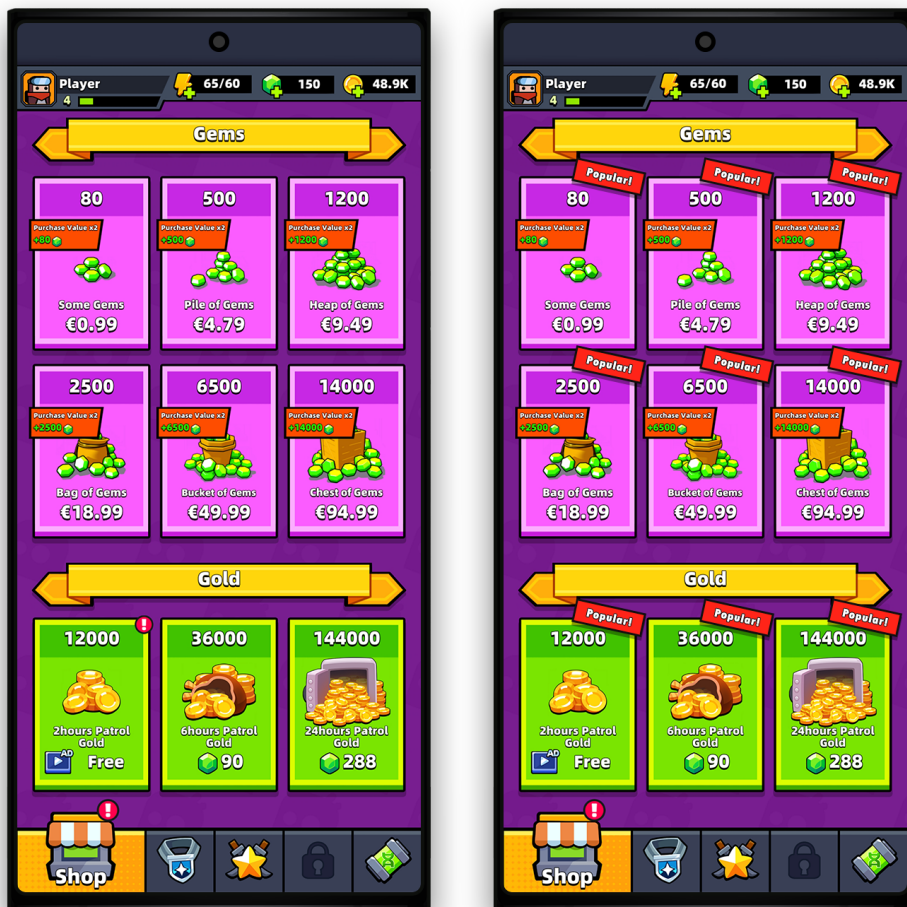


Figure 21: A comparative illustration showing on the right how an overuse of a label claiming popularity among other users may lead to decreased informative credibility

Summary

Since many of the tools recognized in choice architecture derive their origins from Behavioural Economics and therefore from research conducted to understand consumers, how behaviour is connected to purchasing is far from being a niche subject. Therefore many of the nudges aiming to influence the desirability of a product also revolve around such core principles of human psychology that, on some occasions, their ineffectiveness would be difficult to believe.

Nudges that could be seen to improve the perceived desirability of a product could be categorized in two different segments. The first includes nudges that provide solutions to improve desirability more or less as they are, since their underlying purpose is to make one option stand out from the presented set of options. The second segment on the other hand consists of nudges that could be capable of achieving similar improvements regarding desirability, but their effect would be achieved in a more indirect way. Nudges in the latter segment would most often incorporate tools of choice architecture that recognize psychological traits of humans that are not directly related to making one option seem more desirable, and then redirect those traits to affect the desirability of a product. Therefore, such nudges could have a heightened vulnerability to also introduce an inclusion of deliberate misleading of the user, since the modifications and solutions would often require ways of implementations that could potentially be ethically questionable. For instance, *Loss Aversion* might not be immediately considered to be a psychological aspect that would be associated with increasing the desirability of a product within a displayed set. But, simultaneously, it probably would not take too long for one to find a way to make use of it to achieve the same goal – especially if questionable measures are taken. Since any ethically questionable solutions are not encouraged by this thesis to be used, the use of nudges that fall into the latter segment were deliberately excluded from being explored for any proposals.

While the solutions proposed in this case study could be argued to be on some level even more direct than the solutions covered in the first case study, their effectiveness too would require further research. Even though nudges were able to be translated to be used in the digital domain, simply relying on the research done among consumer goods in the physical world is not sufficient to make water-proof conclusions.

Nonetheless, when designing digital nudges with a goal to improve desirability of a product in a shop view, a good starting point still is to look for studies conducted among consumer goods. Translating their ideas into the digital domain can be less cumbersome than it might first appear, making their implementation often quite straightforward.

5. RESULTS AND DISCUSSION

In this section, we will examine the results concluded from the research of this thesis and regarding the research questions (“RQ”) presented in *Chapter 2: Methodology*. The overall goal set for this thesis was, with the help of case studies, to seek for a theoretical understanding of choice architecture as well as how choice architecture could be connected to digital media and the design process of digital products. Within digital domain the focus was specified to target mobile applications – further focusing was excluded to prevent the goal from spreading too much and becoming too vague.

Next, a reflective discussion alongside an overview of the results of the research conducted in this thesis are covered, while simultaneously maintaining a link to the research questions. The contents of this chapter are divided into four sub-chapters that emerged during the research process, each taking part in answering the research questions but also outlining and approaching a different segment within the research.

The research questions defined were:

RQ1: *What connections can be recognized between choice architecture and the digital domain?*

RQ2: *How digital products can benefit from the use of choice architecture?*

RQ3: *Why understanding choice architecture is important for designers working in digital media?*

5.1 Understanding Choice Architecture

In order for a designer or a developer to fully understand what choice architecture is and how connections can be drawn from it into the digital domain, acquiring a basic understanding of its origins is highly advisable. In the theory part we learned how in a traditional view in the field of Economics humans were most often viewed as an all-round rational decision-makers, capable of processing vast amounts of information and taking into account nearly every plausible option there is for any given decision – until that view was dared to be challenged. What if other factors than simply rational thinking could affect our decisions? What if we humans possess an ability to be irrational? Understanding even the basics of how choice architecture came to be can help to understand the field of research it represents and, more importantly, what further opportunities it may hold in.

One of the main components of the theory behind choice architecture is *psychology*. As we learned in *Definition* in the chapter *Choice Architecture*, the human decision-making relies heavily on the two cognitive systems found in human brain: *Automatic System* and *Reflective System*. Having a solid grasp on how the systems behave and what their roles are in making decisions showed to be useful especially for the second step “*Understand the user*” in the guideline by Schneider et al. (2018). While the foundational theory regarding choice architecture might not offer any tangible tools from which the digital products would necessarily benefit, it helps the designers vastly to recognize various decision-making situations within an application and also put themselves in the boots of the user when evaluating different nudges and their potential effectiveness.

Understanding the psychological traits of the human mind can also provide another, perhaps an unusual, aid for designing digital products: an ability to recognize situations that, even when having the most visually stunning design, could cause the product to fail due to an unbearable decision environment it provides for the user. It can therefore even be beneficial for designers to challenge the design decisions they have done or found in work of others and stop for a moment to think if there would be room for a nudge or two.

When further creating bridges between choice architecture and the digital domain, many of the methods and tools recognized by choice architecture can often, sometimes even naturally, be seen to have potential use cases in digital products and applications. For instance, we examined social influence in the sub-chapter *Social influence* under *Choice architecture tools*. While social influence itself cannot really be seen as something tangible that could be simply added into a digital application “as is”, its principles on the other hand are, often even seemingly easily. As we saw in the first case study, merely labelling a product “*popular*” can be enough to create a sense of social presence in the eyes of the user.

The case studies in addition revealed that there exists a potential for mobile applications to benefit from a broader use of choice architecture. Depending on the set goal, different tools and methods found in the arsenal of a choice architect could be implemented or included into various parts in mobile applications without necessarily increasing the likelihood of jeopardizing the user experience or usability of the application. Different use cases within the case studies would nonetheless require planned testing and user research before conclusions or statements of any kind can be drawn. A further investigation should also be done regarding to what extent can the methods found in the field of choice architecture be translated to be used in mobile applications.

While designers often have a vast toolset already at their disposal, understanding choice architecture could also be seen to carry the potential to introduce deeper knowledge on how certain design decisions might appear to a user. Furthermore, such understanding could help recognize how the design could benefit from an alternative approach, for instance adjusting something as simple as a word.

5.2 Enablers of Choice Architecture

The tools and techniques discovered via research and studies conducted in the field of choice architecture work almost as a practical gateway between the human mind and the real world. The theory provides knowledge why something works, and the practice shows that difference really can be made. In the literature review it became evident that the tools studied within the field of choice architecture connect to often a very specific psychological trait that eventually enables the tool to become effective. *Loss Aversion* was a good example of this – the functionality of humans to act aversive towards losses is something very specific and simultaneously it seems to be rooted so deeply into human behaviour that its mere existence steers our decisions. And whenever a designer recognizes a situation in an application when loss aversion gets triggered, it opens a door to influence the situation and even its outcome.

The effectiveness of choice architecture comes often from recognizing the very moments a person is in struggle to make up their mind and then offering a gentle push – a *nudge*. While the ways choice architects influence our decisions seem often surprisingly simple or even trivial, the research showed it is that trivial nature which makes them difficult to also ignore. For instance, as we found out with *Decoy Effect*, if an offer is viewed as superior when compared to another one, in our mind it is best to take the opportunity and buy the better of the two. If you feel you made the decision straight away and your choice seems to offer the best outcome, why would you suspect anything? It must be the right decision if all the signs say so. Perhaps it is the tangible presence of the situation when a decision takes place that blinds us from thinking that deliberate actions may have been taken to influence how we choose. For us, it simply may seem as if merely two entities exist at the moment of deciding: we and the options. But, via sensible and ethically acceptable use of even the most trivial choice architecture tools benefits can be created for digital products. As the second case study showed us, especially tools that aim to improve sales in a mobile application can in the best scenario create highly desired opportunities to increase the profitability of even the whole company developing the application.

5.3 Of influencing a decision

Throughout the conducted literature review a concept that often was not particularly thoroughly discussed but raised its head as being seemingly important was *perception*. Perception eventually also appeared to be a crucial term to internalize when dealing with the learnings and findings of choice architecture. Because on many occasions, it is the *perceived* state or quality of something that acts as a major contributor for a decision to be formed in the mind of a person. Not necessarily reality nor logic, but *perceived* reality and *perceived* logic. For instance, triggering the *Availability heuristic* can feed the mind even with potentially arbitrary information which, nonetheless, gets perceived by the person as a perfectly logical way to approach the current situation and ultimately form a conclusion that results in perceivably acceptable outcome. From the point of the view of a designer both the opportunities and the dangers of human decision-making lie within what is perceived, since it is the perceived results which humans treat as being sufficient and internally reason to be either adequate or not.

The research process also revealed that whenever the factors contributing to a decision-making process grow too large in quantity or beyond our comprehension, we humans have the tendency to optimize the situation by grasping something from where we can derive conclusions and, ultimately, a decision. And that “something” may as well emerge from the irrational side of us. The sheer volume of possibilities or comparable parameters between options can quickly become overwhelming, resulting in a situation where the overflow of information can simply prevent us from making any decision at all. If there are some qualities or traits that we know, or sometimes just think, to suffice to form a conclusion, it is often enough for us. Humans are in fact sometimes even said to often settle for an option that satisfies us rather than what would be optimal, meaning that when our minimum requirements get fulfilled, we consider the decision as adequate.

Even though factors enabling influences to enter our mind exist, their presence often make our life a lot easier too. In addition, they come with a capability to provide us means and ways to make decisions that are far more frequently beneficial for us than harmful. Still, what we could all use more is to understand that influences do possess the power to steer our decisions, and when they do, how should we deal with them. It would also be important for people designing digital products to internalize this. The importance comes forth especially when one needs to understand possible limitations a digital nudge can potentially have – if the nudge is too obvious or obscure, there is a chance it could even become so noticeable the user might end up perceiving it as suspicious.

5.4 Bridging Choice Architecture and the digital domain

In this thesis, multiple proposals on how to implement tools and theory recognized by choice architecture into the digital domain were examined and presented via case studies. The chosen tools showed no major difficulties when determining how the implementations should be handled while at the same time trying to avoid from drifting too far away from their counterparts in the literature review. The guideline proposed by Schneider et al. (2018), seen in **Figure 4**, played a significant role in transforming the theory drawn from the scholarly literature regarding choice architecture into usable solutions for the case studies. While the guideline formed a coherent and pragmatic step-by-step process for designing nudges that aim to be used in the digital domain, more research could be in place to show how widely known the guideline is and to what degree is it generally adapted in different design processes or phases. Also, possible existence of other guidelines or comparative research between them would be valuable.

While the guideline by Schneider et al. (2018) was crucial in converting theory into practice in this thesis, being able to create the conversions and find connections did not come without concerns. On many occasions during the implementation phase for the case studies, choosing the tools as well as implementing them had to be done by relying on the assumption that results derived from the studies and research would carry on to the digital side and into the mobile applications as well. This concern was kept in mind when choosing the individual tools for the scenarios presented in the case studies; tools with the highest perceived replicability regarding their chance to succeed on a similar level in both the external studies and the case studies were chosen.

The potential value addition choice architecture could provide for digital products can be derived from the research and studies reported in the source material. Since majority of the tools outlined aim to result in a decision that would in the end work in favour of the decision-maker, incorporating them as an additional layer for any design or design process of a digital product could be estimated to provide a distinguishably larger amount or pros than cons. Therefore, the inclusion of choice architecture tools and techniques could be seen as a lucrative option for digital products.

6. CONCLUSIONS

While having its most prominent origins rooting back to the 1970s, choice architecture is a robust field to understand even still in the 21st century. Choice architecture has found its way from consumer goods and the physical world into the digital domain, where its tools and methods can be encountered more often than one could at first hand even imagine. By deriving knowledge from the fields of *Economics* and *Psychology*, choice architecture has expanded to offer a great number of tools, which can be utilized to influence, or in other words *nudge*, the decisions and judgement we humans make in our everyday life.

Understanding the decision-making process of users is a powerful tool to wield in the arsenal of a designer. Let it be a user interface or a path a user is intended to take when using an application, having a grasp what the user thinks and perceives at each moment can open doors for ideas and approaches one could easily otherwise be blind to. Especially when fused with conventions, guidelines and frameworks more commonly known by designers, an understanding of psychological aspects introduces a layer that can make the designers see their work in a drastically new way.

The implications of this thesis regarding the possibilities of utilizing choice architecture in mobile applications were foundational. By bridging theory and guidelines between *Choice Architecture* and *Digital Nudging*, and implementing findings they provided via *Case Studies*, the research conducted in this thesis was able to find and propose several practical approaches different scenarios could potentially benefit from the use of choice architecture. As for the chosen research method, Case Study proved to offer a profound overview of the topic of this thesis and allowed the research conducted to study, investigate and explore its subjects.

While the underlying psychological concepts and choice architecture methods could be derived from earlier studies and translated into usable solutions for mobile applications, their actual quantifiable benefit would still have to be proven and validated via further research. Due to the lack of solid evidence of the performance of the solutions executed in the case studies, it is highly possible that further research could find fine-tuned, or even alternative, methods to achieve the presented goals more efficiently or with greater probability. Since this thesis focused on finding solutions for various individual scenarios that were deliberately detached from one another, any work expanding from the research of this thesis could for instance also take into account possible interconnectivity

between such scenarios and how they might affect each other. Additionally, a direction for further research could consist of factors or tools exceeding the psychological traits and look for other aspects that may contribute to decisions made by the users.

Both the theory and the case studies presented in this thesis contribute valuable insights of the potential choice architecture has to offer. Especially when combined with commonly recognized visual design conventions and guidelines, the tools and methods introduced by choice architecture can work as an effective addition to the repertoire of a designer. With the number of recent publications focusing especially on Digital Nudging, the current momentum of the teachings of Choice Architecture could even be claimed to prove that interesting times indeed lie ahead.

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