

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Management



Diploma Thesis

A Cognitive Knowledge-Based Decision-Making

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DIPLOMA THESIS ASSIGNMENT

Bc. Tomáš Konrád

Economics and Management
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Thesis title

A Cognitive Knowledge-Based Decision-Making

Objectives of thesis

The aim of the thesis is to evaluate respondents' cognitive knowledge-based decision-making abilities using managerial simulation.

Methodology

The theoretical first part consists of the theoretical basis which defines and describes important terms from the field, especially the terms management and managerial skills, cognition process, decision-making.

In the practical second part there are used methods on quantitative and qualitative research.

The proposed extent of the thesis

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Management, managerial skills, decision-making, cognition process.

Recommended information sources

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Declaration

I declare that I have worked on my diploma thesis titled "A Cognitive Knowledge-Based Decision-Making" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break any person's copyrights.

In Prague on 31.3.2021

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A Cognitive Knowledge-Based Decision-Making

Abstract

This Diploma thesis is focused on the ability of strategic decision-making based on knowledge acquired through cognitive processes using managerial simulation that simulates a manufacturing company.

The diploma thesis's main aim is to evaluate respondents' cognitive knowledge-based decision-making abilities using managerial simulation. The partial goals are to assess respondents' cognitive abilities, consider the ability to implement strategy, identify failures when implementing strategy, and provide a recommendation.

This diploma thesis is divided into two parts, theoretical and practical. The theoretical part, literature review, consists of the theoretical basis which defines and describes essential terms from the field, especially the terms management and managerial skills, decision-making, strategy, and cognition process. It is developed based on the study, analysis, and comparison of professional literature.

The practical second part is qualitative research focused on respondents' strategic decision-making ability based on knowledge acquired through cognitive processes using FactOrEasy® managerial simulation.

Keywords: Management, Managerial Skills, Managerial Role, Managerial Simulation, Decision-Making, Strategy, Cognition Process, Qualitative Research.

Kognitivní rozhodování založené na znalostech

Abstrakt

Diplomová práce je zaměřena na schopnost strategického rozhodování na základě znalostí získaných prostřednictvím kognitivních procesů pomocí manažerské simulace, která simuluje výrobní podnik.

Hlavním cílem diplomové práce je zhodnotit kognitivně znalostní rozhodovací schopnosti respondentů pomocí manažerské simulace. Dílčími cíli je posoudit kognitivní schopnosti respondentů, zvážit jejich schopnost implementovat strategii, identifikovat selhání při implementaci strategie a poskytnou doporučení.

Tato diplomová práce je rozdělena na dvě části, teoretickou a praktickou. Teoretická část, literární rešerše, se skládá z teoretického základu, který definuje a popisuje základní pojmy z oboru, zejména pojmy management a manažerské dovednosti, rozhodování, strategie a kognitivní proces. Je vyvinut na základě studia, analýzy a srovnání odborné literatury.

Praktickou druhou částí je kvalitativní výzkum zaměřený na strategické rozhodovací schopnosti respondentů založené na znalostech získaných kognitivními procesy pomocí manažerské simulace FactOrEasy®.

Klíčová slova: management, manažerské dovednosti, manažerská role, manažerská simulace, rozhodování, strategie, kognitivní proces, kvalitativní výzkum.

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1 Introduction

The topic of this diploma thesis is decision-making in a managerial role. Decision-making is the process of selecting the best of all possible options, and it is perhaps the most critical component of a manager's activities. Only effective decision-making can result in success, and ineffective decisions will fail. But like a manager in the company, people in their personal lives make decisions daily. Above all, it is about organising activities and managing time, which is also our primary source. Therefore, making the right decisions is not just a matter for managers but determines whether a person can succeed.

A person vested with the responsibility of decision-making must possess particular skills, of which intelligence is probably the most important. Experience, on the other hand, throws more lights into the situation and aids in decision-making. It also requests some amount of imagination to assume and compare the consequences of each alternative to decide adequately. But why is it so important? Because no human activity can evade decision-making as it is crucial to the functioning of any life, for that matter.

Students gain academic knowledge during studies, which are preparing them for a career life. After graduation, it will be up to them to apply educational experiences – soft skills – in practice and transform them into hard skills. Students decision-making ability is one of the capabilities that need to be developed to face the transition from academic to professional life.

The managerial simulation FactOrEasy® used is a tool supporting this transformation. It is a challenge that evaluates the ability to make decisions and take reasonable risks. The result does not depend only on luck, but one must rely on experience and judgment. In a way, this research could be an output test for the respondents, which can provide feedback and constructive criticism.

2 Objectives and Methodology

2.1 Objectives

The diploma thesis's main aim is to evaluate respondents' cognitive knowledge-based decision-making abilities using managerial simulation. The partial goals are to assess respondents' cognitive abilities, consider the ability to implement strategy, identify failures when implementing strategy, and provide a recommendation.

2.2 Methodology

To meet objectives, this diploma thesis is divided into two parts, theoretical and practical. The theoretical part, literature review, consists of the theoretical basis which defines and describes essential terms from the field, especially the terms management and managerial skills, decision-making, strategy, and cognition process. It is developed based on the study, analysis, and comparison of professional literature.

The practical second part is qualitative research focused on respondents' strategic decision-making ability based on knowledge acquired through cognitive processes using FactOrEasy® managerial simulation.

2.2.1 Research Sample

For the need of this diploma thesis topic, homogenous sampling is used. Each respondent is a student of Czech University of Life Sciences in Prague, Faculty of Economics and Management, and has not own experiences with either FactOrEasy® simulation or manager job. The sample size is not given in advance. The goal is to find at least five causal relationships between the cognitive process and decision-making, which is to be evaluated after.

2.2.2 Research Tools

2.2.2.1 FactOrEasy® Simulation

FactOrEasy® simulation is the primary used tool. It is a business simulation game developed at the Faculty of Economics and Management of the Czech University of Life Sciences in Prague as a collaboration between the Department of Information Engineering

and the Department of Management. FactOrEasy® simulates a manufacturing company's management and operations in the market with three competitors represented by artificial intelligence.

2.2.2.2 Observation

Respondents are observed throughout the simulation processing to collect primary data on the cognitive and decision-making processes. The observations' output is observation notes, which follow the development of the respondents' thinking while playing the simulation. They capture data on understanding and perception of the simulation, development of decision-making patterns, strategy formation, and other relevant research-related determinants.

2.2.2.3 Form Measuring Cognition Process

The first observed subject of research is the cognition process. The cognitive approach is a qualitative indicator, but it needs to be quantified to be comparable with the simulation result. Respondents' cognition process is numerically estimated using a simple form. This form contains a wide range of information necessary for the respondent to realise and understand to complete the assigned task successfully. It follows the whole process of simulation and its functions (purchase, production, sale, costs, and general).

These information pieces are segmented into four sections according to the difficulty of obtaining or understanding the information or interrelationship. The sections are 5 point section, 10 point section, 20 point section, and 50 point section. It indicates the number of points based on information complexity that the respondent receives for understanding and applying each given information.

2.2.2.3.1 5 Point Section – Information from the Interface

The pieces of information directly provided in the simulation interface are evaluated for 5 points each. These are:

- **General** – the player (Human) and competitors (Robot 1, Robot 2, and Robot 3) start the game under the same conditions. At the beginning of the first round, they all have 5.800 cash, 4 materials in stock, 2 products in stock and 2 factories at their disposal.

- **Purchase** – the player can demand only as much material as is available on the market (which was formerly explained to all respondents, but not each of them initially kept it in mind with all the information provided, so it was later included in the evaluation).
- Respondent is also given 5 points when he proved awareness of his cash situation when:
 1. requests material for a specific price per unit – material costs (**purchase**); or
 2. requests production of a certain number of products for production costs (**production**).
- **Sale** – the player can offer for sale only as many products as he has in stock (which makes sense in itself, but it is similar to the material demand. At first, the respondents did not pay much attention to the table Competition Window, so they were not aware of their products in stock and often tried to offer a larger quantity).
- **Sale** – according to the Product Market table, the player can only set up the selling price per product to the Maximum Possible Price (the same case as for the material demand and products offered).

In this section, it is possible to achieve a total of 30 points for 6 pieces of information.

2.2.2.3.2 10 Point Section – Easily Obtainable Information

The next part of the form, which is scored at 10 points each, is a set of information that is easy to identify but requires a certain level of thinking to understand. These are:

- **Costs** – material storage costs are 300 per unit.
- **Costs** – product storage costs are 500 per unit.
- **Costs** – fixed factory costs are 1.000 per factory. However, in the English version of the simulation, it is not clear at first glance whether these fixed costs are unit or total. Respondent is to monitor these costs when deducting cash so that he can determine it with certainty.
- **Costs** – production costs are 2.000 per unit. As with fixed costs, it is not evident whether these are unit costs or total costs. Respondent encounters

this phenomenon relatively early in the game and is able to distinguish it (regarding all types of costs, these are also directly given in the simulation interface, but this information is not relevant for the respondent in itself. To be usable, it requires thinking or a simple calculation concerning other facts. For this reason, they are listed here and evaluated for 10 points).

- **Production** – one factory can produce one product per round; with which is connected but does not equal to:
- **production** – the number of factories indicates the production capacity (from the beginning, the respondents did not act megalomaniacally, and their requested products usually did not exceed two factories' production capacity. Understanding one of these two facts, notwithstanding which one first, later led to an understanding of the other. But in some cases, it was in separate games. For this reason, they are left divided).
- **Purchase** – when demanding material, the respondent should be considering also:
 1. own material in stock; and
 2. products demand on the market to determine the optimal need for purchase.

In this section, it is possible to achieve a total of 80 points for 8 pieces of information.

2.2.2.3.3 20 Point Section – More Difficult to Obtain information

Respondents can obtain 20 points for each realised information or interrelationship that is already advanced and more difficult to follow. These are:

- **General** – the simulation starts with 4 materials, 2 products, and 2 factories. The production capacity is then 2. Therefore, it is unnecessary to purchase any material in the first round (unless the respondent's strategy was about taking a loan and acquiring another factory right away).
- **Purchase** – monitoring competitors' material in stock to discover the interest of competitors on material, therefore, to estimate competitors' offered price, which leads to the setting of respondents' own provided price.

- **Production** – connection of products demanded on the market and own products in stock, possibly even competitors products, according to which the need for output can be decided.
- **Sale** – the player is able to determine the level of market saturation and estimate competitors' selling price by counting the total products in stock and comparing it with the number of products demanded on the market. This can help respondents to set their price.
- **General** – when requesting a loan, the player obtain 10.000 cash with ten periodic payments in the amount of 1.120 per round. The loan can be used to:
 - avert bankruptcy; or
 - raise funds for investments.
- **General** – the requested factory costs 5.000 cash and, at the same time, increases fixed costs. Another factory increases production capacity (factory and loan request is not evaluated for 10 points, although its conditions are quite easily detectable, because the only way for the player to find out is to try. However, unknown conditions pose a risk and, if unprepared, can significantly affect the course of the game).

In this section, it is possible to achieve a total of 140 points for 7 pieces of information.

2.2.2.3.4 50 Point Section – Deeper Understanding of Interrelationships

The final part of the form is devoted to interrelationships already at a proficient level that expects effort for understanding, deeper insight into the simulation, and intentional, more complex calculations. Defining these is intricate because there could be included numerous different techniques and approaches. Some have been pre-defined, and some were supplemented after observation. Each of the following interrelationships is scored at 50 points. These are:

- **General** – analysis of competitors' decisions under different conditions is a tool of the more profound understanding of simulation. Comprehending the competitors' decisions is one way to gain a sustainable competitive advantage in this simulation.

- **General** – monitoring the cash flow of competitors to the delimitation of their possibilities. Together with the analysis of competitors' decision, the respondent should predict the competition's subsequent steps with certainty.
- **Costs** – calculation of the expenses per product unit when setting the selling price is a tool to determine break-even price.
- **General** – another evaluated item was the overall cost awareness. The costs for which the respondent can get 10 points are often used for individual functions, but overall awareness helps determine the break-even point.

The upper limit of points does not limit this section. In the first three sections, which are described by enumeration only, it is possible to achieve a total of 250 points. A score of over 250 points means that the respondent has reached a more profound understanding or at least tried to do so and partially succeeded. Research assumes the greater cognition leads to better decision-making and simulation result.

2.2.2.4 Interview

In conclusion, respondents are interviewed using a non-directive interview. The content of this interview is to recapitulate and summarise respondents' findings and perceptions of the simulation, their strategy, and the outcome.

2.2.3 Work with Respondents and Data Collection

The home environment of the respondents is chosen as the place of research. It is assumed that respondents will be relaxed rather than stressed in their home environment, which could affect the quality of the study.

2.2.3.1 Description of FactOrEasy® Simulation to Respondents

Respondents are acquainted with the simulation. It is very briefly revealed to respondents what the simulation is about and how does it work. They receive only an elementary description because any additional information provided would facilitate the cognition process observed from the very beginning.

It is explicitly presented that this simulation simulates the manufacturing company. The player (respondent), as a manager of this company, decides about its operations.

Specifically, he purchases material at some unit price, produces products, and sells it at some unit price. The player also has an option of requesting an extra factory (factories) or taking out a loan (loans) (viz. Figure 1, Decision Making Window on the right middle). However, there is no information in the simulation interface about how much another factory costs, nor how much cash a player can get out of a loan and how much its repayment will be unless the player tries.

The company operates on the market with three competitors, which are represented by artificial intelligence, and about which one can find information in Competitions Window (left bottom corner in Figure 1). In the same window, the player can see data about competitors decisions once his own decision is made (after clicking on the buttons Buy, Produce, Sell, respectively, or Skip).

The player can obtain information about market conditions from the left middle tables (Figure 1) Material Market and Product Market. These conditions are common to all businesses in the market, are variable and change once per round. The Minimal Possible Price in the Material Market table is per unit, and the player can opt for a higher price to ensure the purchase. Similarly, the Maximum Possible Price in the Product Market table is per unit, and the player can opt for a lower price to ensure sales of products.

In the table Costs Window (top right corner in Figure 1) is information about both fixed and variable costs that do not change during the game. The item Sum of Purchased Material(s) is not really important and only shows the sum of the historically received material. The item Periodic Payment (at the amount of 0 from the start) refers to the loan's repayment, which is mentioned above.

In the table Game Status on the left top corner (Figure 1), there is a report in which round of the game the player is currently in and the number of presently active businesses on the market. The player has 12 game rounds available, inclusive.

2.2.3.2 Observation of Respondents

After the introduction, the observation begins. Respondents have to recognise other data and facts themselves. They can get their gained knowledge verified, but they are not allowed to consult during the game.

Respondents are asked to play one game of FactOrEasy® simulation. For them, the simulation is entirely unknown (except for the introductory description). Observation is used to assess how well they understand the simulation over time and what results they

achieve. After respondents are finished playing the initial game, they are asked to develop a suitable strategy based on the accumulated knowledge, with which they are to make as much money as possible and implement it. Respondents are not limited in the number of games played. They are free to play until they are satisfied enough with the result.

The cognition process is measured in each game played. Each time the respondents realise given information, they are rewarded with the appropriate number of points in the form. Cognition points add up cumulatively because it is assumed that once discovered information does not need to be obtained again. The result is expressed in cognition points. It is not ascertaining whether the respondent forgets any information already collected. Points are not deducted. Such cases are to be detected in the modelling of the decision-making process.

2.2.3.3 Simulation Output

The simulation results are either bankruptcy or numerical expression of the total assets acquired after 12 successful rounds played. The simulation result is calculated cash and costs of acquiring another factory (factories), and debt is deducted. The result does not include material and products in stock. Bankruptcy occurs when a player falls into the red in terms of cash. Since FactOrEasy® is a simulation, not a game, the result cannot be labelled as a victory. Achieving the goals or desired outcomes defined in strategy can be a victory. These outcomes may vary from respondent to responder.

Another source of primary data is the anonymous report of successfully played games provided by FactOrEasy®. It is in the form of a numerical table, which summarises every single detail of the game. The simulation output demonstrates the quality of the obtained information and its application in making decisions.

2.2.3.4 Interview

The interview is sequentially the last part of the research. Its content varies according to the performance of the respondents. This interview does not have its own output but is reflected in other primary data. It serves to complete the cognition process measurement and to consolidate observation notes so that the subsequent modelling of the decision-making process is as accurate as possible.

2.2.4 Primary Data Processing

Obtained primary data, which are the point evaluation of the cognition process, simulation result, simulation report, and observation notes, are analysed using qualitative and quantitative approaches.

The output of the evaluation of the cognition process is a point rating. This point rating expresses respondents' ability to receive and use information. The cognitive assessment of individual respondents is analysed, compared with the simulation result (which results from the decision-making process) to find a causal relationship, and used for decision-process modelling.

The simulation result is a numerical expression of the assets acquired in a given game (or bankruptcy).

The Decision-making process is modelled retrospectively, based on the evaluation of the cognition process, simulation report, observation notes, and interview. The structure of the decision-making process is according to defined stages by Fotr (1997) in Chapter 3.4.2. Evaluation of the cognition process considerably helps model the decision-making process, as the decision's preparation, the first five stages, deals with the processing of information.

The observation notes capture the overall behaviour of the respondents in the simulation. The analysis of simulation output, observation notes, and support interview is used to model the latter stages of the decision-making process. The decision-making process is modelled only once for each respondent as a summary of his decision-making ability. With regard to the cognition process, the decision-making process is analysed and commented on.

3 Literature Review

3.1 Management

3.1.1 Nature of Management

When thinking of management, the first thing that comes to mind is an association with work and employment, something that managers do when contrasted with other employees who do not have the same responsibilities. In this context – work context – managing has strong connotations of being in control, directing things, designing and implementing systems and processes (Hendry, 2013).

However, outside the work context, the human ability to manage, to purposefully organise, is as characteristic of the species – and probably as old – as the opposable thumb, says Magretta (2013).

The word „*management*“ originates from the Latin term for handling or controlling a horse, and it was gradually extended from controlling a horse only. According to the Cambridge Dictionary (©2021), the meaning of management is the control and organisation of something, the activity of controlling something or using or dealing with something in a way that is effective. The language of managing is often used ironically to suggest a lack of control (e.g., managing to break a leg). It is also used as synonymous with coping or getting by, where control is more about preventing things from falling apart than actively directing them (Hendry, 2013).

The discipline of management itself is relatively new. The origin of management is often connected with F. W. Taylor, who published the book „*The Principles of Scientific Management*“ in 1913. Since that time, the term management had become an international term, frequently used in various situations and consequences. Management had become domesticated in many countries, and it also spread all over the world (Pošvář and Erbes, 2005). Magretta (2013) adds that innovation of the discipline of management allowed many other inventions – such as antibiotics, automobiles and aeroplanes, communication technologies – to take hold so rapidly and spread so widely. Technology gets all of the credit, but in fact, management, accumulating body of thought and practice, is primarily responsible for the productivity gains that drive prosperity. Mintzberg (1989) suggests that the 20th century might be, in a certain sense, characterised as the age of management.

3.1.2 Definition of Management

Magretta (2013) says that management remains the least understood of modern professions despite unprecedented success. Watson (2001) found management to be simple in principle but highly complex in practice. This finding corresponds with Gabriel (2003), saying there is no universally accepted definition of management, and Combe (2014), saying there are many definitions of management from different authors. However, most coalesce around common themes to offer a general explanation.

As already mentioned, there are many definitions of management. Several examples are given:

- According to Combe (2014) words on general explanation. *„Management is the organisation and coordination of the activities of a business in order to achieve defined aims and objectives.“* (Combe, 2014, p.5) He also notes that these activities, besides business, might be applied to any other organisational setting. Veber (2009) mentions, for example, the army, the church, sports organisations, universities, and more.
- Drucker (1986) admits that interpreting the term management is problematic in itself. *„Management is a function, a discipline, a task to be done.“* (Drucker, 1986, p.10)
- *„Management is the process of designing and maintaining an environment in which individuals, working together in groups, efficiently accomplish selected aims.“* (Wehrich, Cannice, and Koontz, 2008, p.4) The authors also agree with Combe (2014) and Veber (2009), that management applies to any kind of organisation.
- *„Management’s business is building organisations that work.“* (Magretta, 2002, p.7)
- *„Management is the process undertaken by one or more individuals to coordinate the activities of other to achieve results not achievable by one individual acting alone.“* (Donnelly et al., 1987, p.23)

Pošvář and Erbes (2005) explain that the development of management is close to business development. But management is necessary for all modern organisations, regardless of the type of organisation. This fact leads to differentiating (theoretically and

practically) the management of companies whose objective is to make a profit and management of a so-called non-profit organisation.

Pošvář and Erbes (2005) identified four contextual spheres of corporate management, considering a specific categorisation and generalisation of different approaches of different definitions from other authors. The four contextual spheres are then:

1. The complex of activities connected with coordination and managing people in particular, that leads to achievement and fulfilment of the set goals.
2. The complex of specific activities – including managerial functions – that have to be performed by managers using not just the labour force (personnel management) but the material and financial resources as well. With the help of optimal usage of all the organisation's resources, that should lead to exact results.
3. Identification of the workers who perform managerial activities and functions in an organisation. According to this contextual concept, management is defined as a particular group of leaders of an organisation (managers) and the functions adopted by these people.
4. Branch of science as a structured complex of pieces of knowledge gained from the practical experience of more branches, including economics, mathematics, statistics, psychology, and sociology.

The definitions of management may vary from author to author, but what they have in common are specific activities that lead to achieving the set objectives. Given that, management is applicable to everyday life, and every person could be referred to as a manager.

The diploma thesis's stated objectives require an understanding of management primarily as business management, focusing on the manager as the executor of management. It is also necessary to define the concept of strategic management.

3.2 Strategic Management

3.2.1 History of Strategic Management

Drejer (2002) suggests the origin of strategic management as early as 1916, when Fayol stated: „*Management means looking ahead..., if foresight is not the whole of management, at least it is an essential part of it. To foresee in this context means both to assess the future and make provisions for it.*“ (Fayol, 1916, p.6) However, little attention was paid to more formal strategic management processes of business-planning until the end of World War II. Tichá (2005) adds that much of the 20th-century literature related to strategic management has emphasised a warlike philosophy. The term „*strategic*“ comes primarily from the literature on the war. In this context, business is a battle, competitors are the enemy, and government makes and enforces the rules. Kachru (2005) compares corporate survival to a war, which can be successfully negotiated with the right strategy.

The term „*strategic management*“ originates in Greek *stratego*, which means *the art of a general*, strategist, the leader of an army, who has to consider many apparently independent decisions in one framework – strategy (Drejer, 2002).

3.2.2 Strategy Definition

Kachru (2005) defines strategy as a set of critical decisions made to meet objectives. Dobson, Starkey, and Richards (2004) claim the vital issue that should unite all discussion of strategy is a clear sense of an organisation’s objectives and how it will achieve these objectives. White (2004) says that strategy is regarded as a unifying idea that links purpose and action in its most straightforward conception.

Capon (2008) noticed that common to nearly all strategies is understanding the external environment and the resources available to compete in it. So, a strategy is about understanding what an organisation does, where the organisation wants to be, and mainly focusing on how the organisation plan to get there, the course of action. It identifies the objective and direction that managers and employees at every corporate and operating unit level of an organisation – aligned with the larger corporate strategy – need to make their organisation successful (Harvard Business Review, 2005).

But Mintzberg (1987), who is also the author of 10 schools of strategy, says the field of strategic management cannot afford to rely on a single definition of strategy.

However, the word has long been used in different ways, even if it has traditionally been defined formally in only one. He introduced the 5 Ps for strategy as an explicit recognition of multiple definitions that allow a better understanding of different views of strategy. It is a plan, a ploy, a pattern, a position, and a perspective.

- Strategy as a plan – by this definition, he mentions two essential characteristics of strategy. They are made in advance of the action to which they apply, and they are developed consciously and purposefully.
- Strategy as a ploy is a specific, short-term manoeuvre intended to outwit an opponent or competitor. A ploy tends to have a limited and very concrete objective, and it may change according to the situation.
- Strategy as a pattern – it means consistency in behaviour, whether or not intended. Unlike plan and ploy, the pattern may appear without preconception.
- Strategy as a position – positioning means locating the organisation within a specific environment or in a particular market space area. The position is deemed to be the best match between the organisation and the environment, and strategy, by this meaning, is mediating force.
- Strategy as perspective – while position looks out to locate the organisation in the external environment, a perspective strategy is about the internal environment, organisations culture, beliefs, and perceiving of the world, about organisations personality (Mintzberg, 1987).

Porter (2011) states that strategy is not operational effectiveness; even both are essential to superior performance, which is the primary goal of many organisations. They work in very different ways. Operational effectiveness means performing similar activities better – faster or with fewer inputs and defects – than rivals perform them. In contrast, the strategy requires to make trade-offs in competing when creating a unique and valuable strategic position with a sustainable competitive advantage that fit the company's activities. It means performing different activities from rivals or performing similar activities in different ways.

The strategy is a highly complex concept. Sadler (2003) listed key elements of strategy, among many definitions in the literature, that are linked in some way with the notion of strategy:

- purpose or mission – statement of why the company exists;
- policies – guiding rules or principles regarded as a part of the success model.

Decisions about corporate purpose and company policies are closely linked to critical sets of strategic choices:

- what business the company is in – or is to be in;
- what kind of company it is – or is to be;
- interchangeably used terms – strategic objectives or goals to be achieved over medium to long-term. They may be financial or non-financial, but in theory, they should be capable of being quantifiable and thus susceptible to measurement;
- key success factors – the things that a business must be able to do exceptionally well if it is to attain a leading position;
- key decisions – that are of fundamental importance to the company. Among the most critical decisions are the ones about the allocation of different resources, that according to Campbell, Edgar, and Stonehouse (2011), refers to the fact that there is likely to be a cost associated with the actions required to achieve the objectives;
- capabilities or competencies – they need to be difficult for competitors to copy;
- implementation;
- sustainable competitive advantage – what the strategy is designed to achieve (Sadler, 2003).

3.2.3 Strategic Management Process

The design school of strategic management, one of 10 schools of strategy, perceived a basic model as a prescriptive conception intended as a practical guide for dealing with a complex environment. It is more focused on the formulation of strategy. The approach is best encapsulated in the SWOT model, probably the most commonly applied method in strategy making. Analysing the internal environment helps the identification of

Strengths and Weaknesses. Scanning the external environment identifies Opportunities and Threats. This combined allows and leads to the **formulation of strategy** (White, 2004).

Strategy formulation is followed by consideration of all possible combinations (creation of strategies). Concerning managerial values and social responsibility, all possible strategies are then compared. **Comparison of strategy** means evaluating the most suitable matches for an organisation, which leads to the choice of one strategy and its implementation (White, 2004).

Strategy formulation results in a plan of action for the company and **implementation of strategy** represents a pattern of decisions and activities intended to carry out the plan. Strategy implementation involves managing – planning and scheduling, and decisions about such things as organisation structure, the allocation of resources or the level of risk that is acceptable (Sadler, 2003) – in a manner that moves the organisation toward the successful execution of the strategy, consistent with its strategic direction (Tichá, 2005).

The cognitive school of strategic management focuses on the strategist's mind, individual thinking through what is required, and the options, coming to a grand design (strategy). It includes work on cognitive bias, the information-processing view of strategy and the idea of strategic cognition as a process of construction. The premise of this school is that strategy formulation is a cognitive process in the strategist's mind (Sadler, 2003).

The learning school perceives the world as too complex to develop all possible strategies (specific plan or vision) at once and in advance. Therefore, it says that strategies must evolve (form) in small steps as the organisation adapts to environmental changes and learn from them (Mintzberg, Ahlstrand, and Lampel, 2005).

Hiriyappa (2018) claims there are many differences between strategy formulation and implementation process, yet many managers fail to distinguish between strategy formulation and implementation. He outlined the major contrast, one of which strategy formulation is primarily entrepreneurial activity based on strategic decision making (similar to the design school). In contrast, strategy implementation is mainly an administrative task based on strategic as well as operational decision making (alike the learning school).

But the strategy can be neither formulated nor adjusted to changing circumstances (formed) without strategy evaluation. It is an essential step in the process of guiding an enterprise. The critical factors determining the quality of current results are often not

directly observable or simply measured. Thus, strategy evaluation attempts to look beyond the apparent facts and appraise more fundamental factors that govern success. At any time, the manager has to consider whether the set objectives are appropriate, whether the major policies and plans are appropriate, and whether the results obtained to date confirm or refute critical assumptions on which the strategy rests. For a strategy to be flawless, it must meet broad criteria of consistency (mutual consistency of goals and policies), consonance (adaptive response to external environment changes), advantage (and its creation and maintenance), and feasibility (not overtaxing available resources and not creating insoluble problems) (Dobson, Starkey, and Richards, 2004).

The concept of the strategic management process, and subsequently, strategy, has been defined. Key stages of the strategy process are, according to Combe (2014), formulation, implementation, and evaluation and control. The nature of the simulation used does not allow the perception of the strategy as a perspective, as this view of strategy is irrelevant (according to Mintzberg's 5 Ps).

When developing strategy (strategies), the manufacturing company manager – respondent in the role of a manufacturing company manager – can use both strategy formulation and formation. Strategy formulation defines the strategy in advance, while strategy formation evolves and changes the strategy over time (according to the learning school example).

In the practical part, qualitative research is focused on respondents' decision-making as executors of strategic management. Thus, the term „manager“ needs to be defined.

3.3 Manager

3.3.1 Definition of Manager

Early in the history of management, a manager was defined as someone responsible for other people's work. This definition distinguished the manager's function from that of the owner. Managing then was a specific kind of work, which could be analysed, studied, and improved systematically (Drucker, 2011).

American Management Association notes that a standard definition is a person who gets things done through other people. Management is the collective effort of every

manager in a given organisation. Thus, in the broadest sense, a manager is responsible for carrying out the activities required to reach organisational goals by performing certain essential functions (Allen and Gilmore, 1993).

„If you ask a manager what he does, he will most likely tell you that he plans, organises, co-ordinates and controls. Then watch what he does. Don't be surprised if you can't relate what you see to those four words.“ (Mintzberg, 1989, p.9) Those four words first introduced Henri Fayol in 1916, and since then, they have dominated management vocabulary. The fact is that they tell just a little about managerial work. At best, they indicate some vague objectives managers have when they work (Mintzberg, 1989).

Hannagan et al. (2008) explain that the world in the 21st century is one of continuous change and the most crucial management skill is the management of change. The importance of retaining a competitive advantage over competitors and pressures of the marketplace in the changing world means that a skilful part of a manager's job is setting up the method of working in creative and innovative in the first place, and then renewing and refreshing these methods again and again. Gabriel (2003) adds in that ever-changing and complex environment, a manager is frequently called upon to assume some additional roles of a diplomat and public relations officer, a politician, negotiator and arbitrator, an entrepreneur, a communicator, a teacher and a trainer, or others. Flexibility is the key.

Mintzberg (1989) described different roles according to specific tasks a person performs, which are three broad role categories: interpersonal, informational, and decisional.

The interpersonal role of a manager includes being the organisation's figurehead, leader, and liaison. They are to interact with employees and coordinate them and provide direction to the organisation. By virtue of interpersonal contacts, the manager emerges as the organisational unit's nerve centre (Mintzberg, 1989).

The manager may not know everything but typically know more than any of the subordinates. The informational role is associated with the tasks needed to obtain and transmit information for the organisation's management. The roles are a monitor, a disseminator, and a spokesperson (Mintzberg, 1989).

But information is not an end in itself, but it is the primary input to decision-making. One thing is evident in the study of managerial work: the manager plays a significant role in the unit's decision-making system. Only the manager can commit the department to required new courses of action. Only the manager has complete and current

information to make the set of decisions that determine the unit's strategy. The manager can then be described as a decision-maker (Mintzberg, 1989). Managers are confronted with decision-making duties daily and require a range of skills and attributes to be effective, Combe (2014) adds.

3.3.2 Levels of Management

Although the term manager refers to anyone in an organisation who holds a position of authority and decides about the allocation of resources, in large organisations, managers perform different activities at different levels, each with their span of control, authority, and roles. The three distinct – but overlapping – management layers are typically first-line (operational, functional) managers at the lowest level, middle managers, and top managers at the highest level (Bedeian, 1993).

Top managers (executive managers) are at the organisation's apex and have job title such as CEO, president, executive vice-president. They determine the form of an organisation and define its character, mission, and direction. They shape an organisation's long-term goals and strategies and are responsible for the performance of all departments (Bedeian, 1993)

Middle managers occupy roles positioned between the top management and operational management. They must be able to communicate the strategies devised by top management to those who have to implement them. They have a supervisory role in overseeing the work of first-line managers. Thus, middle managers manage other managers and are charged with integrating different workgroups' activities to operate in harmony (Bedeian, 1993).

First-line managers (or operational or functional managers) comprise the largest managerial group in most organisations, that is responsible for the day-to-day running and operations of the organisation. They are the only managers who do not manage other managers. They supervise operative (nonmanagerial) employees performing the activities required to implement the strategy developed by top managers and directed by middle managers (Bedeian, 1993).

Katz (1974) has identified three necessary developable skills – technical, human, and conceptual skills – to which successful managerial work rests. All managers must dispose of some minimum technical skills, some minimum human skills, and some minimum of conceptual skills, but the required mix of these skills varies by management

level. Human skills are equally needed for all levels of management. While conceptual skills are of substantial importance, particularly for top management in strategy development, technical skills are essential for lower management to perform specific tasks following strategy implementation.

3.3.3 Managerial Functions

Wehrich, Cannice, and Koontz (2010) writes that managerial functions provide a valuable structure for organising management knowledge. Concepts, principles, theories, and techniques of management are grouped into managerial functions. It is helpful to break it down into five managerial functions – planning, organising, staffing, leading, and controlling – around which the knowledge that underlies those functions can be constructed.

3.3.3.1 Planning

Planning (and forecasting) involves assessing the future and making provision for it. It is a process of establishing goals and selecting a future course of action. This requires decision-making – a commitment of human or material resources. The manager decides on how the organisation is to accomplish its stated goals. There are many problems with forecasting and planning. However, it is an essential tool for understanding the organisations' environment to make more effective and informed decisions. The manager should also ensure unity of direction within the organisation, continuity, flexibility, and precision (Combe, 2014).

3.3.3.2 Organising

Organising involves the preparations necessary for implementing plans. It ensures that the organisation has the resources required in terms of staff, money, and materials in the correct balance. Its purpose is to help create an environment for human performance. Organising is the process of dividing work among individuals and group and coordinating their activities to accomplish goals. The manager must also establish lines of authority and responsibility to member that will determine who reports to whom in the organisation (Wehrich, Cannice, and Koontz, 2010).

3.3.3.3 Staffing

Staffing, in other words human resource management, is the process of ensuring that positions in the organisation structure are filled – and kept filled – with competent people. This is done by identifying work-force requirements, but it includes not only the initial hiring of employees but also their subsequent development (Wehrich, Cannice, and Koontz, 2010).

3.3.3.4 Leading

Leading is the process of inducing individuals or groups to assist willingly and harmoniously in accomplishing goals. Problems of leading arise from people and their desires and attitudes as well as their behaviour. Therefore, besides achieving the organisations' goals, the manager must satisfy their subordinates' needs (Allen and Gilmore, 1993).

3.3.3.5 Controlling

Controlling involves guiding the organisation in the proper direction. The manager is required to effectively assess the extent to which the organisation is achieving its goals and to initiate corrective action of possible deviations (whether the improvement is needed, where, how much is needed, and how quickly). Controlling facilitates the accomplishment of plans because they are not self-achieving. Control and monitoring performance feature at all levels of the organisation, and it will vary according to the organisational setting and context (Combe, 2014).

Decision-making is not included as one of the functions of a manager. After all, it is an integral part of all managerial functions and underlines everything the manager does. Whether planning, organising, staffing, leading, or controlling, the manager always makes decisions and is still choosing among available alternatives. The most important decision is the one on the organisation's strategy, and all other decisions flow from this direction (Allen and Gilmore, 1993).

Respondents, as managers, are going to decide about manufacturing company operations in the simulation. The simulation does not recognise individual departments or

levels within the firm and does not include any labour force. Respondents decisions will be then applied on strategy formulation (or formation) – i.e. external and internal environment and information analysis and planning – and its subsequent implementation through resource management and control to achieve their set goals. Decision-making ability, decisions alternatively, are crucial not only for managerial work. Hence, it is to be identified as a separate managerial function.

3.4 Decision-Making

3.4.1 Decision-Making Definition

A decision is a choice made from available alternatives or options. Making a choice is only a part of the process, where decision-making is the process of identifying and clarifying issues. They may be problems or predicaments but can be opportunities as well. Decision-making is then making an appropriate choice according to the circumstances and constraints (Band and Partridge, 1999).

Pošvář and Erbes (2005) say decision-making, as a continuous managerial function, is a process of solving decision problems and selecting one possible solution. It pervades all of the basic management functions, i.e. planning, organising, staffing, leading, and controlling. But Weihrich, Cannice, and Koontz (2010) notes that decision-making is at the core of planning. Managers constantly choose what is to be done, who is to do it, and when, where, and occasionally even how it will be done. Plan cannot be said to exist unless a decision has been made.

Hundreds of decisions are made daily at all levels in the organisation, and decision-making is a central aspect of the managerial role. Regardless of its goals, managers' decision-making skills are what an organisation's long-term survival depends on. Decisions are closely linked to the function of planning, but they are a fundamental aspect of the entire management process (Bedeian, 1993).

According to Band and Partridge (1999), making the right choice involves effort both before and after the decision. These decisions may vary significantly. The type of decision and the circumstances in which decision have to be made can range from day-to-day operational decisions to longer-term strategic decisions made in conditions of uncertainty, ambiguity, and risk. There are several ways of classifying managerial decision into types, but they can be said are focused on three types of issue:

- Crisis – serious difficulty requiring urgent action.
- Non-crisis or routine – an issue that needs to be resolved but does not have the importance or urgency of a crisis. Most decisions in an organisation should be routine.
- Opportunities – a situation that offers high potential for gain if appropriate action is taken, usually within a relatively short timescale. If the opportunity is to be analysed, and the decision is to be made, it requires new ideas on innovation and resource allocation (alongside management time and effort). Opportunity can be missed when managers are too busy dealing with crisis or routine issues (Band and Partridge, 1999).

Bedeian (1993) writes that effective managers make various kinds of decision, but these decisions are, in general, either programmed or nonprogrammed. Programmed decisions are repetitive and routine. For some, a definite method for obtaining a solution can be established so that the decisions do not have to be treated anew each time they occur. Nonprogrammed decisions are novel and ill-structured because they have never occurred before or are too complex and elusive. For this reason, there can be no established methods for handling them.

3.4.2 Decision-Making Process

Decision-making is a fundamental process of management to which most of the managers' efforts are related to. Decisions do not always turn out as planned, but success or failure in decision-making often depends on how well the process steps are handled (Kavan, 2006).

The decision-making process content consists of interdependent and follow-up activities that can be decomposed as stages (steps) of these processes. The decision-making process can be broken down in several ways – in more detailed or more aggregated ways. An example of a more detailed decomposition is divided into the following stages:

1. **Identification** of a decision problem (acquisition and analysis of information).
2. **Analysis and formulation** of a decision problem (deeper knowledge).
3. **Determination of the evaluation criteria** according to which the alternatives are assessed.

4. **Development of alternatives** – the result is finding and formulation solutions to a decision problem.
5. **Determination of possible outcomes** (identification of expected impacts of individual variants).
6. **Evaluation of possible outcomes and selection** of the alternative for implementation.
7. **Implementation** of the chosen alternative – implementation of the decision.
8. **Monitoring the results** (determination of deviations) ensures that desired results are achieved (Fotr, 1997).

Sometimes only the first six characterised stages are included in the decision-making process. Step 6 – a selection of alternative for implementation is then considered the final step, representing the decision itself. The previous steps deal with the processing of information, collectively referred to as decision preparation. Implementation is regarded as a separate process. The monitor of results is then considered part of the organisational unit's control processes (Fotr, 1997).

3.4.3 Decision-Making Environments

Same as there are different types of decision, the conditions (environment) under which decisions occur also vary. These conditions can be classified according to the degree of certainty present. The primary categories are certainty, risk, and uncertainty (and sometimes ambiguity) (Kavan, 2006).

A decision made under conditions of certainty is when the available alternatives and the benefits (or costs) associated with each are known and are considered reliable. There is perfect knowledge about available options and their consequences with no element of chance to intervene between outcomes in such a situation. Exact outcomes are known with complete certainty. Under such condition, the manager simply faces identification of consequences of available alternatives and then chooses the outcome with the greatest desired benefit (Bedeian, 1993).

A decision is made under conditions of risk when the available alternatives, the potential benefits (or costs), and the likelihood of their occurrence associated with it are known. Alternatives are known, but their future outcomes are in doubt because they may

be subject to events outside our control. Decisions under the condition of risk are perhaps the most common (Bedeian, 1993).

A decision is made under conditions of uncertainty when the available alternatives, the likelihood of their occurrence, or their potential outcomes are unknown. These decisions are unquestionably the most difficult. Decision-maker must choose a course of action without complete knowledge of the consequences that will follow implementation. Uncertainty arises when the information about alternatives and future events is incomplete or unreliable. Such a situation generally occurs when no historical data are available, or in instances that are novel or complex, it is impossible to make comparative judgments (Bedeian, 1993).

Ambiguity is the most problematic decision situation. In such a condition, the available alternatives may be challenging to define. The goals to be achieved may be unclear, and information about possible benefits (or costs) may be entirely unavailable. In such circumstances, managers have difficulty coming to grips with the issues and have to rely on judgemental decision-making techniques (Band and Partridge, 1999).

3.4.4 Strategic Decision-Making

A decision, as described above, is simply put, the act of choosing among alternative actions and a specific commitment to action. It is not possible to define management decisions independently from the organisational settings and circumstances under which they are made since they are an empirical phenomenon. And an understanding of what strategic decisions are varies widely between organisations. They are essential for organisations' health and survival because of the substantial commitment of resources and precedents set for subsequent organisational action (Gänswein, 2011).

Strategic decision-making is of great and growing importance because of the following characteristics: it is usually big, risky, and hard-to-reverse, with significant long-term effects; it represents a bridge between deliberate and emergent strategy; it can be a major source of organisational learning; it plays a vital role in the development of individual managers; and it cut across functions and academic disciplines (Papadakis and Barwise, 1998).

Strategic decision-making itself is preceded by strategic thinking.

3.4.4.1 Strategic Thinking

Strategic thinking is a process of developing or examining the assumptions about the future upon which the organisation's mission, goals, and strategy are based to evaluate whether they still reflect the realities the organisation faces. It looks at the organisation's vision and then works backwards by focusing on reaching this vision (Kachru, 2005).

Change becomes increasingly frequent, and the future is progressively uncertain and does not follow any predictable path. All plans and strategies of an organisation eventually become obsolete in the unknown future and an ever-changing world. The assumptions on which they are based must be re-examined and updated (Kachru, 2005).

Strategic thinking is all: intent focused, comprehensive, opportunistic, long-term oriented, built on the past and the present, and hypothesis-driven (Tichá, 2005).

Strategic thinking involves managerial vision concerning where an organisation is and a competitively unique perspective about the future. This is called strategic intent. Although strategic thinking is based on strategic intent, there has to be room for intelligent opportunism – managerial ability to take advantage of unexpected opportunities to further the intended strategy or even redirect it (Tichá, 2005).

„*Thinking in time*“ refer to consideration of the past and the present. The past forms a historical context from which a manager can learn and will be able to avoid the same past mistakes. The present is important to strategic thinking because it places constraints on what the organisation can accomplish (Tichá, 2005).

Strategic thinking is long-term oriented. Based on the top manager's strategic intent, it decides on the actions firm must make now according to the vision of what the firm is to become looking several years into the future. But the organisation should always test their hypotheses (decisions) first to see if they are appropriate or likely to be successful (Tichá, 2005).

3.4.5 Manager and Information

Haslam and Shenoy (2018) noted top-down strategic decision-making, where strategic decisions are made at the organisation's top-level and then cascaded down throughout the organisation for execution. And middle-out strategic decision-making, where middle managers link top and bottom, affects the strategy in several directions: upstream, downstream, and sideways.

But they also described discovery-led strategic decision-making. It means that the way of making decisions depends on the information, a balance between what is known, what is unknown, and what managers think they know (i.e. assumptions) (Haslam and Shenoy, 2018).

Quality performance of managerial decision-making (but also any other managerial function) is conditioned by sufficient knowledge acquired by continuous study and experience by executing management functions. When solving a specific problem, a necessary condition is knowledge of the problem and especially sufficient actual information. The term information is defined in different ways in different fields and publications. These might be news, fact, data, information, etc. (Pošvář and Erbes, 2005)

Economists advocate marginal analysis and opportunity costing in the evaluation of decision alternatives. This information is imperfect, and, in fact, informational deficiencies become apparent even before the evaluation stage is reached. Given inadequate knowledge, decision theory has evolved to improve the analysis of decision-making. Decision theorists have tended to concentrate on the lack of certainty surrounding outcomes rather than the problem of discovering all alternative solutions to a specific problem (Bridge and Dodds, 2018).

Decision-making under specific circumstances and conditions is not just a matter for managers, but more or less every person. Depending on the quality of the decision, the quality of the manager can be assessed. Rustomji and Sapre (1986) write about the requirements for the right decision. They argue that a good decision should be accurate, legal, objective and impartial, honest, acceptable and fair, prompt and timely, cost-effective, practicable, harmonious, moral, and should include risk.

The manager should be entirely rational in his decision and should have all the necessary information available. This is not always possible. The processing of information is to be defined as well.

3.5 Cognition

Behavioural and social sciences can be characterised in terms of their concern with the processing and transforming information. Adaptation to an ever-changing environment depends on acquiring information about environmental regularities and using it as the basis of adaptive response. Cognitive psychology is concerned with how knowledge is cognised

or gained and how it is used to guide decisions and perform effective actions. Knowledge enables one to survive in a hostile environment, satisfy needs, or plan the future (Estes, 2014).

Halpern (2012) says cognitive psychology is the branch of psychology concerned with how people think, learn, and remember. These abilities are related to the concept of intelligence, which is a very general mental capability involving the ability to reason, solve problems, plan, think abstractly, comprehend complex ideas, learn quickly, and learn from experience.

Cognition refers to the mechanisms by which information from the environment is acquired, processed, stored, and acted on. These mechanisms include perception, learning, memory, and decision-making (Shettleworth, 2010).

In the cognitive process, mental contents are operated to produce some response. These mental contents may be representations or encodings of external stimuli or images, pieces of knowledge, rules, and similar materials from short-term or long-term memory. A cognitive task is any task in which correct or appropriate mental information processing is a significant determinant of whether the task is successfully performed. Then, cognitive ability is any ability that concerns some class of cognitive tasks (Carroll, 2004).

Cognitive abilities are sometimes referred to as general intelligence and are essential for human adaptation and survival. It supports the ability to comprehend the situation, figure out what is needed, and prepare a course of action (Newman and Newman, 2020).

Cherry (2020) described different types of cognitive processes:

- Attention – a cognitive process that allows people to focus on a specific stimulus in the environment.
- Language – involve the ability to understand and express thoughts.
- Learning – requires cognitive processes involved in taking in new things, synthesising information, and integrating it with prior knowledge.
- Memory – critical cognitive processes that allow people to encode, store, and retrieve information.
- Perception – allows people to take in information through their senses and utilise it to respond and interact with the world.
- Thought – an essential part of every cognitive process that allows people to engage in decision-making, problem-solving, and higher reasoning.

Cognitive processes affect every aspect of life, including learning new things and making decisions. Learning requires being able to take in further information and make connections with other things people already know. When making any type of decision, it involves making judgements about processed things. It might include comparing new information to prior knowledge, integrating further information into existing ideas, or even replacing old experience with new knowledge before making a choice (Cherry, 2020).

4 Practical Part

4.1 FactOrEasy®

FactOrEasy® is a managerial simulation game developed at the Faculty of Economics and Management of the Czech University of Life Sciences in Prague as a collaboration between the Department of Information Engineering and the Department of Management. This tool follows the established decision-making steps, tries to support them, and helps players gain valid and specific experience. This experience is considered to be the transformation of theoretical knowledge into practical behaviour. This behaviour is partly intuitive and partly gained from studies. Intuitive behaviour can be understood as tacit knowledge, and this tool helps highlight it and combine it with practical experiences. The knowledge transformation process (from theoretical to practical) is crucial for the educational process and is provided by the simulation game FactOrEasy® (Pavlíček et al., 2016).

The simulation game FactOrEasy® simulates the operation and management of the company. As a simulation, it is unique in terms of unprecedented market, production, purchasing, and sales conditions. Competitors for players are artificial intelligence in the form of neural networks. Therefore, the simulation can be used to test a player's ability to cope with a new and unexpected environment or the ability to decide or take risks. The leading innovative solution lies in the use of artificial intelligence in the field of business simulation. Such a solution is not yet offered by any known business simulation (Švec et al., 2016).

4.1.1 Why Fact or Easy

The name of the managerial simulation is not random. It indicates that there are two approaches that the player can play simulation. They are the so-called „fact“ or „easy“ ways.

The „fact“ way of playing the simulation game consists of paying approximately the same attention to all process elements and their more in-depth understanding. This can be achieved by analysing the competition and its steps when market conditions change. The most comfortable way is to write notes on paper and look for connections in them. At

best, a player may understand why a competitor has made the decision he has made and, based on that, make more effective own decisions that will bring genuine benefits.

In the „easy“ way of playing, the player does not look for reasons for the competitors’ decisions. The player does not take notes or takes them without a system and cannot assume anything. As a result, he cannot predict competitors’ future behaviour with certainty and thus loses the benefits he could gain over the competition (Vrábelová et al., 2018).

4.1.2 FactOrEasy® Simulation Interface

Figure 1 FactOrEasy® Simulation Interface


FactOrEasy® version 2.2.7

Game status	
Game Round	1
Number of Businesses	4

Material Market	
Material Available	5
Minimal Possible Price	531

Product Market	
Product(s) Demanded	6
Maximum Possible Price	5632

Costs Window			
Material Storage Costs (per unit)	300	Fixed Factory Costs	1000
Product Storage Costs (per unit)	500	Production Costs	2000
Sum of Purchased Material(s)	0	Periodic Payment	0



Competitions Window				
	Human	Robot 1	Robot 2	Robot 3
Cash	5800	5800	5800	5800
Material(s) In Stock	4	4	4	4
Product(s) In Stock	2	2	2	2
Material(s) Demanded	0	0	0	0
Offered Price for Material (per unit)	0	0	0	0
Purchased Material(s) (units)	0	0	0	0
Product(s) Offered (units)	0	0	0	0
Sold Product(s) (units)	0	0	0	0
Selling Price (per unit)	0	0	0	0
Sales	0	0	0	0
Loan	0	0	0	0
Number of Factories	2	2	2	2

Decision Making Window	
Material(s) Demanded	<input type="text"/>
Offered Price for Material (per unit)	<input type="text"/>
<input type="button" value="Skip"/> <input type="button" value="Buy"/>	
Product's Units Requested	<input type="text"/>
<input type="button" value="Skip"/> <input type="button" value="Produce"/>	
Product's Units for Sale	<input type="text"/>
Selling Price (per unit)	<input type="text"/>
<input type="button" value="Skip"/> <input type="button" value="Sell"/>	
<input type="button" value="Factory Request"/> <input type="button" value="Loan Request"/>	
<input type="button" value="Export Results"/> <input type="button" value="Exit Game"/>	

Source: FactOrEasy®, <https://vyzkum.factoreasy.cz/#!game>

In Figure 1, there is shown the FactOrEasy® simulation interface where the player can see and derive all necessary information to make his decision. At the moment, the simulation is available in Czech and English languages.

4.2 Respondents Profile

For the purpose of qualitative research, several students of the Faculty of Economics and Management were contacted. It was first established whether each of the students who showed interest meet the conditions set out in Chapter 2.2.1, i.e. does not have experiences with FactOrEasy® simulation or manager job. Suitable respondents were selected randomly.

Respondent 1, a man aged 25, is a repeating 2nd-year master's student. His current job position is in the field of real estate.

Respondent 2, a man aged 25, is a 2nd-year master's student. His current job position is a receptionist.

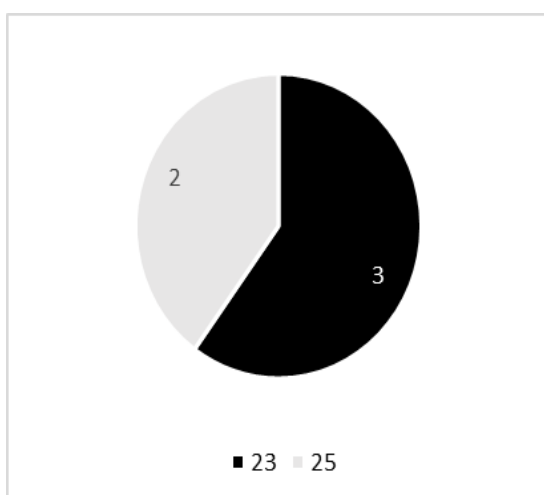
Respondent 3, a man aged 23, is a 1st-year master's student. His current job duties are design activities.

Respondent 4, a man aged 23, is a 3rd-year bachelor's student. His current job position is in the field of finance.

Respondent 5, a man aged 23, is a 3rd-year bachelor's student. His current job position is in the field of IT.

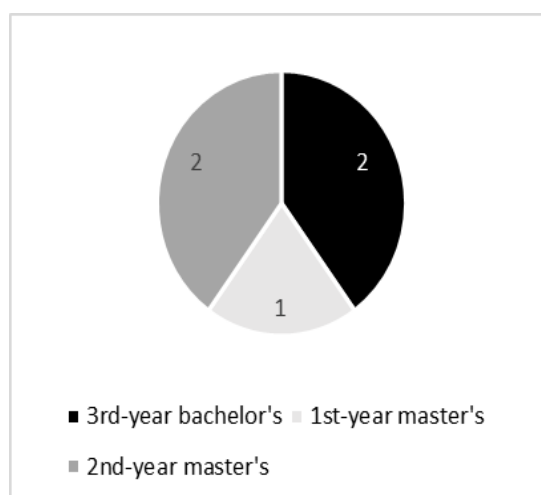
There are no female respondents in the research sample, although they were also addressed, due to their lack of interest to participate in this research.

Figure 2 Respondents by Age



Source: own processed

Figure 3 Respondents by Year of Study



Source: own processed

Research assumes that age and study year positively affects results.

4.3 Qualitative research

4.3.1 Respondent 1 Observation Notes

Respondent 1 used a theoretical approach to cognise the simulation. He tried to collect some information first and then work with it. However, he did not understand what the simulation about is and how it works. It is assumed that he does not have any experience with or knowledge about manufacturing companies in the real world.

The first function of the simulation is the purchase of material. Respondent 1 remembered correctly that the minimal possible price for material is minimal and that he can opt for a higher price. Unfortunately, he clung to this information and was opting for a higher price every round, regardless of competitors' interest in the material. When he noticed that he was overpaying the material unnecessarily when the competition did not buy, he set a lower price. Coincidentally, this happened at the moment when competitors' stocks were down, and they started buying at a higher price. He was confused and did not understand it.

Regarding production, Respondent 1 used the full capacity of two factories when he had sufficient resources to do so. When he requested another factory, it was an unfounded decision, and he did not anticipate an increase in fixed costs. He bought the factory with the help of a loan, the repayments of which he also did not realise.

Respondent 1 was always selling as many products as he had. The reason is a senselessly set price. He did not take into account other costs, i.e. production costs, fixed costs or storage costs. He was setting products price according to cost on material with profit margin, usually 100%, 200% or even 300% of the material price, which was still lower than the break-even price, so he was constantly losing money.

At first, it was not, but later, he seemed nervous and frustrated, which is understandable given the repetitive failures. Then he hurried to make the decision, which was reflected in the quality.

4.3.2 Respondent 2 Observation Notes

Respondent 2 used both approaches, mostly theoretical but also practical. He played rather passively. When he obtained information, he first tried to confirm or refute and modify it. He was developing his decision-making based on verified knowledge.

In the first function, the purchase of material, Respondent 2 quickly realised that it is possible to determine competition interest based on their warehouse state information. His passive, safe game was to buy a larger amount of material when the price was low, and when it was high, he let his competitors compete for an even higher price. Not every competitor requested the material every round, so it often happened that they bought it at a relatively low cost. In his opinion, it was a mistake in retrospect and should have been more aggressive when purchasing.

Respondent 2 usually did not use the full capacity of his factories. The reason is he let the competition sell products and took only his part on the market in an effort to sell at the maximum price. He did not mind sharing the market with competitors. In the case he did not attempt to buy material, he kept a certain amount of material in stock to still be able to produce. However, he did not anticipate storage costs.

When the material price remained high for a longer time, he skipped the production and eventually offered products from the store. When demand for products was higher than he could put together with competitors, he requested another factory, either from his resources or by a loan. His game plan was to be expansive but as safe as possible. The main criterion for acquiring a factory was that the increased capacity products could be sold on the market.

Respondent 2 principally focused his thinking on the sale. He was not aggressive at the purchase of material and underused production capacity. He was willing to share the market with competitors. However, his decision-making was mainly based on sales. He preferred not to buy or produce, but he always wanted to sell the products, even in small numbers, for the highest possible price.

In his successful games (3 games), Respondent 2 took 2 loans and requested 3 extra factories in total.

The observation took place in a friendly atmosphere. Respondent 2 was in no hurry, which can be just as harmful. He was hesitant.

4.3.3 Respondent 3 Observation Notes

Respondent 3 was strongly practical when cognising the simulation. He was the only one who was not afraid to take a loan to buy a factory before understanding the simulation functions. He explored his options and then put them together to draw a conclusion. He was willing to take a significant risk. After he tried to go completely all-in

strategy, he resorted to safer, more serious tactics, which is still riskier than of other respondents, at a later stage of observation.

It is not easy to describe the behaviour of Respondent 3. He tried and identified different manners for decision-making but did not establish a standardised approach. In his opinion, there is no one right decision, and some time needs to be devoted to the analysis of competitors so that one can determine the proper usage of different choices.

Respondent 3 first tended to buy all the material. This was not as effective as more material in stock led to high storage costs. He later decided to buy more material once every few rounds, which he quickly left after he failed to purchase in these rounds and had nothing to produce from. Then he started buying material on an ongoing basis.

Respondent 3 was producing at the total capacity of his factories every round. He requested the factory without further thought now and then. He intended to increase production capacity to meet product demand for the most part himself.

Subsequently, he decided how many of his products to sell. When the product price was low, he let his competitors sell and faced the storage costs in the vision of a higher price in the next round. At first, he sold every product for a lower price, just so the competition does not have any sales. But after a while, he preferred to sell along with competitors at the maximum price.

In his successful games (4 games), Respondent 3 took 8 loans and requested 8 factories in total.

Respondent 3 tried to take the higher road, which reduced his attention.

4.3.4 Respondent 4 Observation Notes

Respondent 4 used both theoretical and practical approaches to cognise the simulation. Based on the information acquired, he established a hypothesis of what he should be able to do and acted on it. He proceeded cautiously and showed risk aversion. With each verified information, he tried to find out more connections. Among all, Respondent 4 proved the thinking and decision-making closest to the real world manufacturing company. In his opinion, each piece of information has its value, and it is up to everyone to realise and use it.

Respondent 4 always tried to have the lowest possible inventory, so the lowest potential storage costs. He understood the general functioning of costs, which led him to conclude that competitors had the exact costs and that their cash flow could be analysed.

His material price setting was effective. He was able to estimate the competition's price level with some certainty, and when he failed to purchase, the difference was only a few units.

Respondent 4 used the total capacity of his factories if he had enough material. He requested the factories less than other respondents but specified that it would always be with his cash. He refused to take out a loan and did not take it once.

Regarding sales, his price-setting was also effective. He mostly shared the market with the competition. It was because he did not have the production capacity to satisfy the demand by himself. Thanks to the set prices, however, he always sold some products. He often left a few products in stock just in case there was a higher demand or price in the next round.

In his successful games (2 games), Respondent 4 took no loans and requested 2 factories in total.

He was entirely focused on the simulation.

4.3.5 Respondent 5 Observation Notes

Respondent 5 used a practical approach to the simulation. He intended to go all-in on the material right from the beginning. He then faced high storage costs, like Respondent 3. However, unlike him, Respondent 5 did not give up his tactic but modified it after finding out his possibilities and abilities. To decrease storage costs, he monitored the state of the competition's stock and bought the material in the rounds when he assumed their interest. He attached great importance to the acquisition of material. His decisions on purchase and sale were price-focused.

He did not take too many risks by purchasing factories on loan to meet demand himself. Instead, he left competitors some leftovers of material to still sell his products at the maximum possible price. By this, he gradually increased his assets and acquired extra factories on an ongoing basis during 12 rounds.

He took out the loan at most once per game. This was usually the case when competitors began to run out of inventories. That's when he started his expansion strategy.

Respondent 5 produced at full capacity and sold most of the demanded products at the maximum possible price. He was able to do that because he controlled the material market.

In his successful games (4 games), Respondent 5 took 3 loans and requested 7 factories in total.

He was devoted to the simulation.

5 Results

5.1 Respondent 1 Results

5.1.1 Cognition Process and Simulation Results

Table 1 Respondent 1 Observation Output

Respondent 1	Cognition Points	Simulation Result	Time in Simulation
1st game	0	bankruptcy	0h 3m
2nd game	50	bankruptcy	0h 10m
3rd game	50	bankruptcy	0h 15m
4th game	120	bankruptcy	0h 32m
5th game	160	bankruptcy	0h 48m

Source: own processed, www.factoreasy.cz

Respondent 1 scored 160 cognition points during five games played. It is the least of all the respondents. These points were allocated equally from all the simulation functions (general, purchase, production, sale, costs). However, Respondent 1 was the only one who did not reach the whole number of points from the 5 point section. Without realising the basic information, it is very difficult or even impossible to gain a deeper understanding. This corresponds to the fact that he went bankrupt in all five games played. Other respondents also went bankrupt, but they spent more time in the simulation and were able to play a result with increasing time and knowledge.

Respondent 1 spent 48 minutes in the simulation. It is also the least of all the respondents. It is assumed that if he spent more time analysing the simulation, he would achieve a higher number of cognition points and a better (or at least some) simulation result.

5.1.2 Decision-Making Process

1. Identification of a decision problem

Respondent 1 failed to identify the decision problem. He was paying attention to only individual parts of the process.

2. Analysis and formulation of a decision problem

Respondent 1 scored 160 cognition points but could not link the particular information and use it to make effective decisions. He had only a superficial overview and reached a poor understanding. He was not taking notes.

3. Determination of the evaluation criteria

Respondent 1 did not understand the simulation and did not determine any evaluation criteria.

4. Development of alternatives

Respondent 1 did not develop any alternatives.

5. Determination of possible outcomes

Respondent 1 did not determine any possible outcomes.

6. Evaluation of possible outcomes

He did not determine any possible outcomes, thus was unable to evaluate them.

7. Implementation of the chosen alternative

He did not develop any alternatives, thus was unable to implement them.

8. Monitoring the results

He did not implement any alternatives, thus was unable to monitor the results.

5.2 Respondent 2 Results

5.2.1 Cognition Process and Simulation Results

Table 2 Respondent 2 Observation Output

Respondent 2	Cognition Points	Simulation Result	Time in Simulation
1st game	60	bankruptcy	0h 15m
2nd game	90	bankruptcy	0h 23m
3rd game	150	1.328	0h 39m
4th game	200	23.511	0h 59m
5th game	220	30.954	1h 58m

Source: own processed, www.factoreasy.cz

Respondent 2 scored 220 cognition points during five games played. He reached the total number of points from the 5 point section and most of the 10 and 20 point sections. These points were allocated equally from all the simulation functions. 60

cognition points are, together with Respondent 3, the highest amount after the first game played. Respondent 2 first theoretically analysed the simulation and build hypotheses.

Respondent 2 went bankrupt in the first two games. It is not surprising that everyone goes bankrupt when the simulation is utterly unknown to them, at least in the first game. The result of the third game was 1.328 money units at 150 cognition points; this is 8,85 cash per cognition point. That result is not quite the best, but in the third game, Respondent 2 still focused on analysing and understanding the simulation and its context. The fourth game result was 23.511 at 200 cognition points; this is 117,56 cash per cognition point. The fifth game result was 30.954 at 220 cognition points; this is 140,70 cash per cognition point.

Respondent 2 spent 1 hour and 58 minutes in the simulation. It is the most of all respondents. The last fifth game alone was 59 minutes long. He took his time and justified each decision several times. Although he aspired to a thorough understanding and very effective decision-making, his attention was paid only to recurring phenomena without a broader context.

5.2.2 Decision-Making Process

1. Identification of a decision problem

Respondent 2 was paying attention to the whole process. In the simulation, he cautiously used a more theoretical approach with the help of the practical one. He focused more on sales and underestimated the purchase of material.

2. Analysis and formulation of a decision problem

Respondent 2 scored 220 cognition points. He partly tried to monitor and analyse competitors' steps but was primarily focused on his own decisions. He had a general overview of the simulation functions and elements and reached an only ordinary understanding. He did not take notes.

3. Determination of the evaluation criteria

His evaluation criteria were mainly safety and survival.

4. Development of alternatives

Respondent 2 developed 3 scenarios.

Alternative 1 – Aggressive strategy. His Aggressive strategy was described as an attempt to bankrupt competitors. This was to be achieved through loans and the acquisition

of other factories. The price per product should be lower to ensure his own sales and to prevent competition from selling.

Alternative 2 – Secure strategy. This strategy was described to be safe, defensive, passive and reactive. The point of this strategy is to let competitors compete and bankrupt each other. To achieve the objective, one needs to buy material cheaply in stock and let the competition buy for the expensive.

Alternative 3 – Imitation strategy. It consists in deciphering the patterns of artificial intelligence decision-making. This requires an in-depth, round by round analysis of its decisions.

5. Determination of possible outcomes

The outcomes of Alternative 1 are either crushing the competition or own bankruptcy. Using an aggressive strategy only leads to victory or defeat.

The outcome of Alternative 2 is a weakened position or bankruptcy of competitors, from which the player, as an impartial company, derives an advantage.

The outcome of Alternative 3 is the ultimate instruction on how to defeat that artificial intelligence.

6. Evaluation of possible outcomes

Respondent 2 decided to implement Alternative 2 based on his evaluation criteria.

7. Implementation of the chosen alternative

Respondent 2 implemented Alternative 2. With this strategy, Respondent 2 was underusing the production capacity. He produced only as much product as he was able to sell at the maximum price. He safely accomplished survival.

8. Monitoring the results

His passive style of play did not lead to the weakening or bankruptcy of competitors. On the contrary, by letting them sell their products, they even achieved a better position than he did. So it was really just survival. He later admitted that it was not the best option and would implement an aggressive strategy (certain risks).

5.3 Respondent 3 Results

5.3.1 Cognition Process and Simulation Results

Table 3 Respondent 3 Observation Output

Respondent 3	Cognition Points	Simulation Result	Time in Simulation
1st game	60	bankruptcy	0h 5m
2nd game	150	21.396	0h 25m
3rd game	190	17.688	0h 34m
4th game	190	30.458	0h 49m
5th game	210	32.753	1h 0m

Source: own processed, www.factor easy.cz

Respondent 3 scored 210 cognition points during five games played. He reached the maximum number of points from the 5 and 10 point sections and most of 20 point section. These points were allocated equally from all the simulation functions. As mentioned above, 60 cognition points in the first game are, together with Respondent 2, the highest. However, unlike Respondent 2, Respondent 3 examined the simulation practically by trial and error approach.

He went bankrupt in the first game. The result of the second game was 21.396 money units at 150 cognition points; this is 142,64 cash per cognition point. The third game result was 17.688 at 190 cognition points; this is 93,09 cash per cognition point. The fourth game result was 30.458 at 190 cognition points; this is 160,31 cash per cognition point. The fifth game result was 32.753 at 210 cognition points; this is 155,97 cash per cognition point.

Respondent 3 spent 1 hour in the simulation.

5.3.2 Decision-Making Process

1. Identification of a decision problem

Respondent 3 was paying attention equally to the whole process. He chose the practical approach and, in the simulation, made many different decisions to see what would happen.

2. Analysis and formulation of a decision problem

Respondent 3 scored 210 cognition points. He focused primarily on his decision-making with little attention to the competition. He came up with diverse decision-making patterns under various conditions but did not devote time to its further development, which would lead to a deeper understanding. His overview was average, and his understanding was ordinary. He did not take notes, as well.

3. Determination of the evaluation criteria

His evaluation criterion was not determined but tended to take a greater risk.

4. Development of alternatives

Respondent 3 developed 2 strategies.

Alternative 1 – Own financing strategy. As the name suggests, an element of the loan is not used in this strategy until there is a bankruptcy risk. One needs to save own money for the factory.

Alternative 2 – Debt strategy. Similarly to the Aggressive strategy of Respondent 2, the Debt strategy consists of drawing a loan, acquiring several extra factories, purchasing all material, and satisfying the demand from its capacities. The product price is to be set lower, so all products are sold. This strategy is a matter of creating a monopoly.

5. Determination of possible outcomes

The outcome of Alternative 1 is that it is complicated to impossible to create a significant advantage.

The outcome of Alternative 2 is a monopoly establishment.

6. Evaluation of possible outcomes

In his opinion, own financing strategy is more suitable for the real world manufacturing company and is more long-term oriented. According to him, the debt strategy has more potential in simulation conditions, i.e. with a limited horizon of 12 rounds. He was willing to take a significant risk and decided on Alternative 2 – Debt strategy.

7. Implementation of the chosen alternative

Respondent 3 implemented Alternative 2 but, after several failed decisions, shifted to slightly less risk.

8. Monitoring the results

Respondent 3 took a great risk and was in significant debt, which he considered too unsustainable. Increasing the costs (extra factories fixed costs, material storage costs, even

higher costs for full capacity production) from the very beginning led to a gradual decrease in cash despite the leading position on the market. In that case, Respondent 3 had to wait for greater material supply, lower material price or lack of competitors' interest. He was changing the level of risk taken over time to optimise costs.

5.4 Respondent 4 Results

5.4.1 Cognition Process and Simulation Results

Table 4 Respondent 4 Observation Output

Respondent 4	Cognition Points	Simulation Result	Time in Simulation
1st game	0	bankruptcy	0h 4m
2nd game	35	bankruptcy	0h 15m
3rd game	230	37.693	0h 57m
4th game	320	37.529	1h 35m
5th game	340	bankruptcy	1h 51m

Source: own processed, www.factor easy.cz

Respondent 4 scored 340 cognition points during five games played. It is the most of all respondents, so it can be said that Respondent 4 understood the simulation best. He reached the total number of points from the 5 and 20 point sections, missed 10 points from the 10 point section, and was able to earn 100 points from the 50 point section. These points were allocated equally from all the simulation functions.

Respondent 4 went bankrupt in the first two games played. It can also be noted that in these first two games, he gained a relatively small number of cognition points. In the third game, he began to take notes, which significantly affected the number of cognition points and the result. The result of the third game was 37.693 money units at 230 cognition points; this is 163,88 cash per cognition point. The fourth game result was 37.529 at 320 cognition points; this is 117,28 cash per cognition point. He had the fifth game well played and attacked his personal record but made a mistake by double-clicking on Factory Request, which scattered him, then he accidentally skipped the sale decision and went bankrupt in the 11th round.

Respondent 4 spent 1 hour and 51 minutes in the simulation.

5.4.2 Decision-Making Process

1. Identification of a decision problem

Respondent 4 was paying attention to the whole process. He used a theoretical approach to establish a hypothesis that was to be confirmed or rejected. After verifying specific information, he used a practical approach to assume his possibilities and try them out.

2. Analysis and formulation of a decision problem

Respondent 4 scored 340 cognition points. He received 100 points for analysing the competitors' cash flow and general costs awareness.

After he assessed his decision-making patterns, he focused on the analysis of competitors. He realised that his competitors have the exact costs as he has, and knowing this, he started to analyse their cash flow. As an assisting tool, he was writing down the notes, which were mostly about costs. They were not such complicated calculations, but once written down, they helped him understand it better, adapt to it, and decide based on it. He reached a deeper understanding and had an excellent overview.

3. Determination of the evaluation criteria

Respondent 4 determined the level of risk as an evaluation criterion. As mentioned above, he showed risk aversion and inclined more toward safety.

4. Development of alternatives

Respondent 4 developed 2 strategies.

Alternative 1 – Sober strategy. He described that his sober strategy proceeds according to supply and demand. The decision should be made according to his competitors' state in terms of cash, stock, and factories. Respondent 4 reflected his risk aversion in this strategy in refusing a loan. Own resources are used to acquire another factory. It is also necessary to ensure sales by setting the right price.

Alternative 2 – Aggressive strategy. This strategy is based on the same principles as the Aggressive strategy of Respondent 2 and the Debt strategy of Respondent 3. This strategy intends to use a loan to raise funds. Through raised funds, one can request extra factories, overbid competition when buying material, and satisfy the demand. The price is to be set lower, so the competitors do not sell any products

5. Determination of possible outcomes

The outcome of Alternative 1 is a decent result. Besides, by monitoring the state of the competition, there is a better understanding of the simulation, competitors and their decisions, which results in more effective decision-making and better result in a more extended time period.

The outcome of Alternative 2 is the bankruptcy of competition due to fixed costs and no sales.

6. Evaluation of possible outcomes

Alternative 2 is much riskier, and the outcome is not guaranteed. He did not like this alternative because of his risk aversion.

He took over the actual role of the production manager and proceeded carefully and precisely. This suits more the first alternative.

7. Implementation of the chosen alternative

Respondent 4 chose Alternative 1 to implement. He would be willing to implement Alternative 2 as well if he had more experiences with the simulation.

8. Monitoring the results

By implementing the Sober strategy, he understood the vast majority of the simulation elements, which enabled him to reach consistent results without respective risk. The next step to improve the result is to include in the strategy an element of a loan to request additional factories.

5.5 Respondent 5 Results

5.5.1 Cognition Process and Simulation Results

Table 5 Respondent 5 Observation Output

Respondent 5	Cognition Points	Simulation Result	Time in Simulation
1st game	25	bankruptcy	0h 9m
2nd game	135	20.789	0h 31m
3rd game	190	33.302	0h 48m
4th game	210	44.708	1h 11m
5th game	280	61.081	1h 32m

Source: own processed, www.factor easy.cz

Respondent 5 scored 280 cognition points during five games played. He reached the whole number of points from the 5 and 10 point sections, most of 20 point section, and scored 50 points from 50 point section. These points were allocated equally from all the simulation functions.

He went bankrupt in the first round as well. The result of the second game was 20.789 money units at 135 cognition points; this is 153,99 cash per cognition point. The third game result was 33.302 at 190 cognition points; the ratio is 175,27. The fourth game result was 44.708 at 210 cognition points; the ratio is 212,90. The fifth game result was 61.081 at 280 cognition points; the ratio is 218,15. 61.081 is the best result among all respondents.

Respondent 5 spent 1 hour and 32 minutes in the simulation.

5.5.2 Decision-Making Process

1. Identification of a decision problem

Respondent 5 was paying attention equally to the whole process. He focused a little more on the purchase of material, and his decisions were made according to the market prices. He approached the simulation practically. His intention was clear from the beginning, and while playing the simulation, he was improving his strategy.

2. Analysis and formulation of a decision problem

Respondent 5 scored 280 cognition points. He perceived competition as unnecessary, and his efforts were focused on eliminating it. The focus of attention on competitors distracted him from his inventories, to which he came back later in the simulation. He received 50 points for general costs awareness, which he proved after realising the amount of storage costs regarding the market price. If the product price was lower, he preferred paying storage costs for products in vision to sell for a higher price, which should also cover that extra costs.

He reached a deeper overview of the simulation functions and average understanding. He did not take notes.

3. Determination of the evaluation criteria

His objective in achieving the task was to play to win. The evaluation criterion was then absolute leadership.

4. Development of alternatives

Respondent 5 developed only 1 alternative. It was the Play to Win strategy. The main element of this strategy was to buy all material from his competitors. Unlike the Aggressive strategies and Debt strategy of other respondents, Respondent 5 used only a reasonable amount of loans, the previous strategies' main tools. He took a loan in the 3rd or 4th round when the competitors' stocks were at 0, so he could buy desired material. He did not have enough resources to meet demand on his own for lower use of loans. Depending on his production capacity and the requested products on the market, he left the number of material available to the competition to sell his products at the maximum price. In this way, he acquired assets to request additional factories over time. He set the price for the material so that it was always higher than the price of competitors. The product price was the maximum possible price.

5. Determination of possible outcomes

The outcome of this alternative was market dominance and control.

6. Evaluation of possible outcomes

The possible outcome was in line with his evaluation criterion.

7. Implementation of the chosen alternative

Respondent 5 implemented his Play to Win strategy because it was the only way to achieve the goal for him.

8. Monitoring the results

Over the course of 5 games played, he refined his approach to such a level that his result was by far the best of all the respondents. The only major problem he faced was the high storage costs when he bought all the material in each round. He tackled this problem, as mentioned in observation notes.

6 Discussion

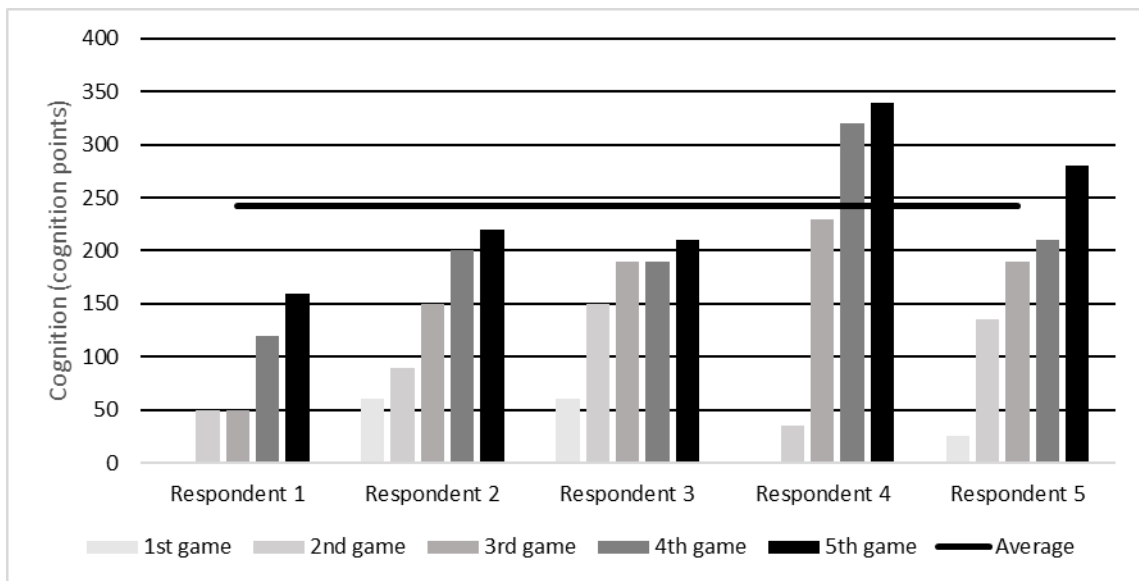
6.1 Overview of Research Results

Table 6 Overview of Respondents Cognition

Cognition	Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5
1st game	0	60	60	0	25
2nd game	50	90	150	35	135
3rd game	50	150	190	230	190
4th game	120	200	190	320	210
5th game	160	220	210	340	280

Source: own processed, www.factor easy.cz

Chart 1 Progression of Respondents Cognition



Source: own processed, www.factor easy.cz

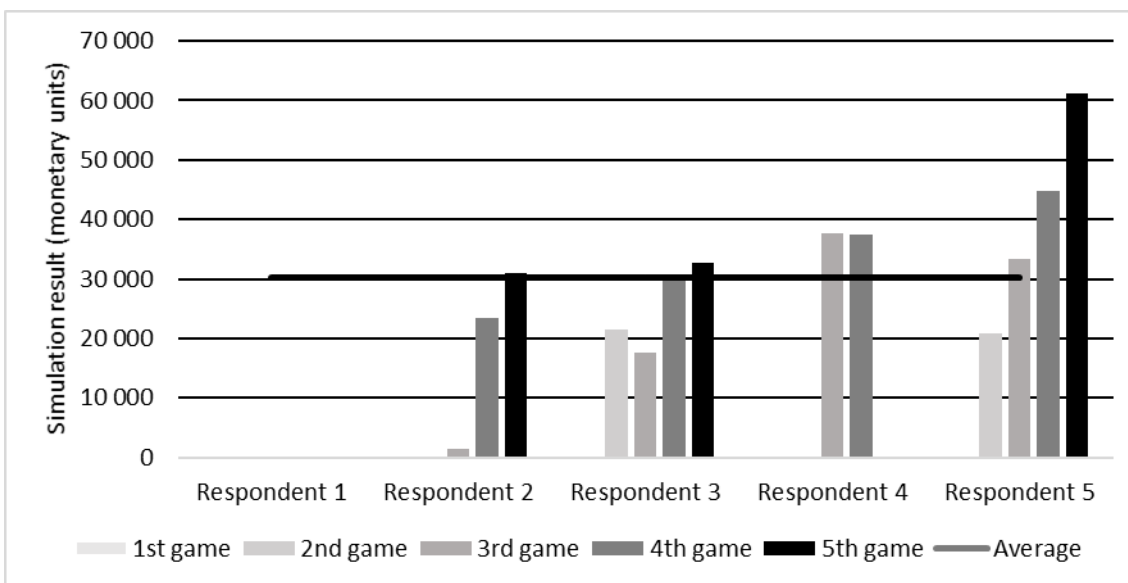
Table 6 and Chart 1 show an overview of respondents' cognition, expressed in cognition points in every game. Respondent 4 received the most cognition points, and Respondent 1 received the least. Three out of five respondents did not reach or try to gain a more profound understanding. Only Respondents 4 and 5 received 50 points for realising deeper knowledge information. The average of all respondents' total cognition points is 242, which correspond most to Respondent 2.

Table 7 Overview of Respondents Simulation Results

FactOrEasy result	Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5
1st game	bankruptcy	bankruptcy	bankruptcy	bankruptcy	bankruptcy
2nd game	bankruptcy	bankruptcy	21.396	bankruptcy	20.789
3rd game	bankruptcy	1.328	17.688	37.693	33.302
4th game	bankruptcy	23.511	30.458	37.529	44.708
5th game	bankruptcy	30.954	32.753	bankruptcy	61.081

Source: own processed, www.factoreasy.cz

Chart 2 Progression of Respondents' Simulation Results



Source: own processed, www.factoreasy.cz

Table 7 and Chart 2 show an overview of respondents' simulation results in every game played. The best result is 61.081, which achieved Respondent 5 in the 5th game. The worst outcome is bankruptcy in all Respondent 1 games. The best result of Respondent 2 is 30.954 from the 5th game. The best result of Respondent 3 is 32.753 from the 5th game. The best result of Respondent 4 is 37.693 from the 3rd game.

The average of all respondents' successful results is 30.245. The results are mainly located around the standard. The only significantly different results are 1.328 achieved by Respondent 2 in the 3rd game, which was very close to bankruptcy, and an excellent work 61.081 of Respondent 5.

Table 8 Overview of Respondents Time Spent in Simulation

	Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5
1st game	0h 3m	0h 15m	0h 5m	0h 4m	0h 9m
2nd game	0h 10m	0h 23m	0h 25m	0h 15m	0h 31m
3rd game	0h 15m	0h 39m	0h 34m	0h 57m	0h 48m
4th game	0h 32m	0h 59m	0h 49m	1h 35m	1h 11m
5th game	0h 48m	1h 58m	1h 0m	1h 51m	1h 32m

Source: own processed, www.factoreasy.cz

Chart 3 Progression of Respondents' Time Spent in Simulation

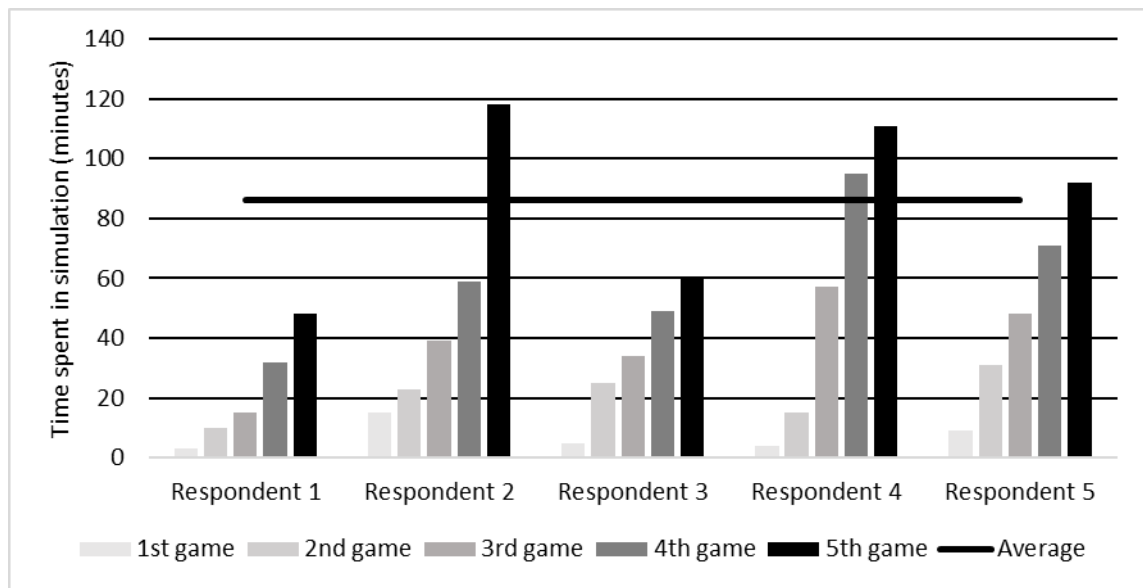


Table 8 and Chart 3 show an overview of respondents' time spent in simulation for each game played and total. The most time in the simulation spent Respondent 2, and it was 1 hour 58 minutes. The least time in the simulation was 48 minutes of Respondent 1. The average is 1 hour and 26 minutes. Respondent 1 is 36 minutes below average, which is estimated to be enough time for him to achieve some result.

Table 9 Cognition Points per Minute Ratio

Ratio	Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5
1st game	0,00	4,00	12,00	0,00	2,78
2nd game	5,00	3,91	6,00	2,33	4,35
3rd game	3,33	3,85	5,59	4,04	3,96
4th game	3,75	3,39	3,88	3,37	2,96
5th game	3,33	1,86	3,50	3,06	3,04
Average	3,08	3,40	6,19	2,56	3,42

Source: own processed, www.factor easy.cz

In Table 9, there is calculated the ratio between cognition points and time spent in the simulation in minutes. It expresses how many cognition points the respondent received per minute. This ratio represents how quickly each of the respondents cognised the simulation. On average, Respondent 3 recognised the simulation the fastest.

One of the interesting findings is that Respondent 4 was slower in cognising than Respondent 1. The reason for this might be the fact that Respondent 4 scored only 35 cognition points during the first two games. He began to understand the simulation later, but thanks to the notes all the faster (which is apparent from Chart 1). Meanwhile, Respondent 1 was recognising the simulation from the beginning but did not use the acquired information to identify others, and his cognition slowed down.

Another interesting finding is the even ratio distribution of Respondent 5. This might be the result of sticking to one strategy. He found out more and more information over games, which helped him improve his strategy design and, therefore, achieve a better result from game to game.

Table 10 Simulation Result per Cognition Point Ratio

Ratio	Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5
1st game	-	-	-	-	-
2nd game	-	-	142,64	-	246,68
3rd game	-	8,85	93,09	163,88	109,42
4th game	-	117,56	160,31	117,28	212,90
5th game	-	140,70	155,97	-	218,15
Average	-	89,04	138,00	140,58	196,78

Source: own processed, www.factor easy.cz

In Table 10, there is calculated the ratio between the simulation result and cognition points. It expresses how many monetary units the respondent earned per cognition point in one game. In other words, it is an indicator of the quality of application of the information obtained.

Despite the excellent understanding, the ratio of simulation result per cognition point of Respondent 4 is very close to the respondents average. It would mean that he did not fulfil his potential. According to the monitoring of the result from his decision-making process, his implemented strategy was not that risky. It is assumed he cannot significantly improve the outcome with his Sober approach.

Table 11 Respondents' Decision-Making Benchmarking

Decision-making Benchmarking	Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5
Identification	no	partly	partly	yes	yes
Analysis	no	no	partly	yes	partly
Taking notes	no	no	no	yes	no
Style	easy	easy	easy	fact	fact/easy
Evaluation criteria	none	safety	none	safety	play to win
Alternatives	0	3	2	2	1
Implemented strategies	0	1	1	1	1
Implementation success	0%	40%	65%	95%	95%
Risk	extreme	mild	severe	mild	elevated
Total requested loans/factories	0/0	2/3	8/8	0/2	3/7
Cognitive processes used	attention language thought	attention language perception thought	attention language learning thought	attention language learning memory perception thought	attention language learning memory perception thought

Source: own processed, www.factoreasy.cz

Note: this benchmarking follows the decision-making processes and other vital factors. Implementation success estimates the extent to which the respondent's behaviour coincides with the intended strategy and how the final outcome coincides with the predicted outcome. The level of risk is defined from the lowest to the highest as follows: mild, moderate, elevated, severe, extreme. Total requested loans and factories are only from

successful games. Cognitive processes used refers to the description of Cherry (2020) in Chapter 3.5.

In Table 11, there is a cross-sectional overview of respondents behaviour. There is an apparent correlation between identifying the decision problem, its analysis, taking notes, and style of playing. Without proper identification, one cannot analyse the problem. Taking notes is an identification and analysis tool that affects the style of playing. Style refers to identification and analysis.

The number of implemented strategies unfolds from alternatives developed. The number of options designed comes out from the combination of knowledge and creative thinking. Implementation success then depends back on the knowledge gained, quality of strategy and estimated outcome, and ability to bear the risk.

An interesting finding which the benchmarking shows is the very high implementation success of Respondents 4 and 5. It is assumed to be a consequence of genuine identification and analysis. The relatively low implementation success of Respondent 3 results from the fact that he did not devote much time to identification and analysis, despite his strategy being more or less the same as Respondent 5. The low implementation success of Respondent 2 results primarily from the above notified incorrectly estimated outcome.

Respondent 5's style is determined to be fact/easy. It looked more like an easy style, but he showed signs of fact style. He did not take notes but was able to prove advanced thoughts off the top of his head. It is not easy to estimate it for sure as he suffered from expression difficulties, but it is supposed the result speaks for itself.

Respondent 1's risk is estimated as extreme because he was not aware of his basic costs and extensively used the function of loan and factory request.

6.2 Evaluating Respondent 1

It is not so surprising that Respondent 1 went bankrupt in all games, given relatively low cognition and fast gameplay. His style of play was „*easy*“. His performance in terms of comprehension and decision-making could be described as effortless, which could be attributed to his reluctance or perhaps boycott. Or conceivably, another factor has entered, such as stress or frustration. It is also possible, after all, that his failure was the result of conscientious effort. He did not reveal his true feelings.

He tried to understand the simulation and was able to score some cognition points. However, he failed to use this information and make some connections. He did not take notes, which might be the main factor in his failure. If he cannot organize thoughts in his mind, he needs to make clear notes to orient himself in the information.

His most significant stumbling block was the product price setting. He was always selling all his products, but he was unable to generate profit. When setting the price, he did not consider all his costs, but only the material price. Although he realised his costs and received points for it, he did not prove general awareness. He should pay more attention to the element of costs and focus more on putting it in context, helping him find individual connections. He could also analyse the competitors and imitate their decisions, with exaggeration to say, learn from them. It is not a shame to mimic the ones who are better. It is also recommended for Respondent 1 to stay calm in a stressful situation.

6.3 Evaluating Respondent 2

Respondent 2 decided to implement a very passive strategy. He quite often happened to fail to purchase material in his games, so he had to skip even a couple of rounds consecutively, and he did not mind it. The passive style of playing the simulation is assumed to be the reason why he did not score more cognition points.

Respondent 2 expected his strategy to weaken or bankrupt competitors as a result of their competition. But it did not happen because artificial intelligence is programmed to make reasonable decisions and to avert bankruptcy if possible. It is also not directly programmed to target another business in the market to weaken or bankrupt it. This is still just the domain of human beings.

As he took a passive approach and instead waited for the situation to develop, he did not need to make such important decisions. Therefore, this did not require a focus on acquiring much information and a more profound understanding of the simulation.

Respondent 2 is recommended to be more initiative. He should understand the challenges as a test of his knowledge and skills, which might improve them. Staying passive and playing safe is not understood as a wrong approach, but it is when doing it the whole time. He should also learn to decide effectively.

6.4 Evaluating Respondent 3

In the modelled decision-making process of Respondent 3, it is written that he came up with diverse decision-making patterns under various conditions. It might be seen as an advantage. But he did not devote time to its further development and understanding. These conditions mean a combination of external factors (material market, product market, and competitors inventories) and internal factors (cash, material, production capacity, and the possibility of factory or loan). Every now and then, he changed the focus of his mind to another idea. It is necessary to find the opportunities and limits, but one also needs to define a suitable situation for the application to make the result as effective as possible.

The sudden changes of attention to another subject are assumed to be why he scored the least cognition points of successful respondents. Respondent 3 also spent the least time in the simulation of successful respondents, making him the fastest recognising respondent because others spent almost twice as much time in the simulation. Devoting more time and effort to understand the simulation's functions and elements leads to consistent decision patterns. Each decision pattern should be used in a particular situation, and the appropriate assignment will help achieve a better understanding and result.

Respondent 3 took a disproportionate risk since he did not know the conditions and his limiting possibilities perfectly. In his case, it was gamble rather than risk. He is recommended to find the possibilities and limits first and formulate his decision patterns later. He should focus on one thing at a time.

6.5 Evaluating Respondent 4

It was mentioned several times that Respondent 4 was entirely lost in the simulation in the first two games. And then, he started to take notes. It would be the subject of speculation whether he would end up as Respondent 1 without notes. Nevertheless, it demonstrates that notes are a powerful tool for sorting out thoughts and finding clear connections. With his mindset and natural curiosity, it can be assumed that he would master the simulation after some time.

His weakness was not cognition as previous respondents but a lack of courage to take risks. As Respondent 3 was recommended to find the limit possibilities first, Respondent 4 should already focus on developing a more advanced strategy with the knowledge he gained. He did not become too competitive, and with this approach, he

would be more prey than a predator in the real business world. However, he is assumed to have great potential and all capabilities to win once he focuses on something.

Addressing the risk can provide opportunities. Better knowledge of the simulation brings more options, with which there is a risk naturally. Risking is rewarded by profit as there is a positive correlation between the level of risk and the return potential, demonstrated by Respondent 5. Respondent 4 is recommended to consider taking on some risk he should handle with his capabilities. Effective risk management might help.

6.6 Evaluating Respondent 5

Respondent 5 developed only one strategy, which he stuck to, and gained more information to its refinement. He earned by far the most. It can be said he came, he saw, he won. After all, his evaluation criterion was play to win. He was the best in terms of simulation result and the second-best in terms of cognition compared to other respondents. Given that, he does not seem to complain much.

In the games, Respondent 5 did not try to adapt but rather to set the pace. In his observation notes is written, he used a practical approach when recognising the simulation. He could score more cognition points if he paid more attention to the simulation elements. From the evaluation of Respondent 2, it is evident that one strategy leads to understanding only the information necessary for this strategy. Respondent 5 is recommended to use his creative thinking to develop more systems. Even if not implemented, then mere creative thinking can help discern another context. It could mean further improvement of his strategy. Also, one cannot rely only on one method. When the conditions or competitors behaviour change, it is better to have other reserve approaches that would be more appropriate to respond to these changes, which are very common in the real world.

7 Conclusion

This diploma thesis's main aim was to evaluate respondents' cognitive knowledge-based decision-making using the managerial simulation FactOrEasy®. Partial goals were to assess respondents' cognitive abilities, consider the ability to implement strategy, identify failures when implementing strategy, and provide a recommendation.

The research sampling goal was to find at least five causal relationships between the cognition process and decision-making. This has been achieved after observing the first five respondents. Respondent 1 did not understand the simulation, so his decision-making had significant shortcomings. Respondent 2 was satisfied with understanding little information to take a passive, defensive approach to decision-making. Respondent 3 had big plans, but his procedure was not entirely clear and comprehensive, reflected in a relatively low understanding and then in decision-making. Respondent 4 achieved excellent knowledge but did not use the potential of the information obtained, and his decision-making remained at the level of safe decision-making. Respondent 5 first made a decision and thus learned. He used the learned knowledge to optimize decisions.

Qualitative research confirmed that greater cognition leads to better decision-making. It can be said that it also positively influences the simulation result to a certain extent. Nonetheless, the result depends on other factors as well. However, the research did not confirm the positive effect of age and study year. Paradoxically, the two best performing respondents were the only students who have not yet completed a bachelor's degree. On the other hand, the worst performing respondent is the student who studies the longest. It follows that the age and level of education of economics students do not matter so much. The topic is suitable for further investigation of students from distinct fields.

Each of the respondents processed the simulation differently. None process was the same, although the strategies used had many similar elements. It is impossible to say which of the procedures is right and which is wrong. It always depends on the individual, and each of them was able to create a unique decision-making process in their way. For this reason, the results cannot be generalized. However, the topic is suitable for further research, focusing on a long-term investigation of the cognitive process's development and its impact on strategy and decision-making changes.

The decision-making process, as well as cognition process and implementation, were analysed and qualitatively evaluated. Each of the respondents had some shortcoming

in their cognition or decision-making process. The individual respondents' deficiencies were defined, and each of the respondents was recommended which area to focus more on.

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