FLAWLESS MANAGERS: MYTH OR REALITY?

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Abstract

This paper summarizes our pilot study, in which we verify the conscious rational decision making of the managers through the use of experiment. As the experiment environment, we use the business simulation FactOrEasy®. We chose the specific decision situation and defined the possibility of the error. We analysed 44 games from 10 managers. We started with the analysis of games with the focus on the occurrence of the error. Then, we focused on the fact, whether managers can be conscious of their mistakes, learn from them and not repeat them. Eye-tracking analysis has been used for this purpose. The main objective of this paper is to make summarization and description of found error behaviour. For this purpose, we define the distribution of managers into four quadrants based on two dimensions - the occurrence and the consciousness of this error. Managers are distributed into following quadrants: 'Faultless-Unconscious', 'Faulting-Unconscious', 'Faultless-Conscious' and 'Faulting-Conscious'.

Keywords

Decision-making, error, FactOrEasy®, manager, mistake, simulation

Introduction

Nowadays, managers are under the huge pressure. Their ability to make quick, effective and efficient decisions significantly affects the success of the companies (Trevis Certo, Connely and Lihanyi, 2008). Although the decision-making process and its problems are described by a number of theories, such as the theory of rational decision-making (March, 1994), bounded rationality (Simon, 1976) or natural decision-making (Klein, 2015) and by heuristic approaches (Tversky and Kahneman, 1981), there are only few studies focused on the analysis of errors in decision-making. Anyway, analysis of those errors could help to understand problems of decision-making and improve efficiency and effectivity (Trevis Certo, Connely and Lihanyi, 2008). How Bortun (2014) mentioned, mistakes are an integral part of the learning process and the way, they are managed, make the difference between good and poor manager.

Decision-making can be defined as a process of 4 phases (Simon, 1976; March, 1994), which are: (1) identifying a set of options, (2) identifying the consequences, (3) criteria setting and (4) choice. Any other decision results in a mistake (error) that is defined as 'an error in action, calculation, opinion, or judgment caused by poor reasoning, carelessness, insufficient knowledge, etc.' (Nicolaides, 2013: 18). This action or decision subsequently cause an undesirable result (Bortun, 2014; Livnat and Pippenger, 2008). The first causes of an error can be found in bounded rationality - not all alternatives are known, all preferences are not considered and also all consequences cannot be ascertained. The decision is based only on the available knowledge and choice represents a good solution, but not the best, because the best one may not be known (Simon, 1976; March, 1994). We can state, that wrong decisions, which are caused by bounded rationality, are affected by shortcomings in the first three phases (1-3) of the decision-making process. In the context of this, the wrong decision may not mean the decision maker's error,

who chooses the right and rational option - the best variant among the available ones. In reality, decision makers face poorly defined goals, unstructured tasks, uncertainty, ambiguity, missing data, dynamic conditions, time pressures, etc. Decision-making under these circumstances is defined as the natural (Klein, 2015). This is also confirmed by Wilke and Mata (2012) who claim, that people have limited resources such as time, information, and cognitive capacity to find the best solutions to all problems. Therefore, a number of decision-making take place with using heuristic methods that can be connected with cognitive biases, which lead to errors (Kahneman, 2011). Wilke and Mata (2012) points on, that cognitive biases are in itself a systematic error in judgment and decision-making that can be caused by cognitive capacity limits, motivational factors or adaptation to the environment. In other words, we can state that a decision maker can make an unconscious error, because believes, that choice is the best and right one at the moment. In our research, we focus on the decision-making of managers. We have used the FactOrEasy® simulation game that is designed to teach decision-making in management. The user makes decisions in bounded rationality; makes only a few (up to 5 in 1 round) decisions, has a limited number of variants, consequences and criteria. User proves the ability to make decisions rationally and based on data analysis (Švec et al, 2016). In the simulation, we define a specific error situation for our experiment, in which we are focused on the managers' decisions. Then, we focus on the task, where the user makes the conscious decision or where not. Conscious decision-making has been tested in the past for example by experiments, where participants had to say their thoughts aloud (Harte, Westenberg, and van Someren, 1994). But this method, also called introspection, can significantly influence the participants (Leisti and Häkkinen, 2016). Explanation of own actions makes thought processes more conscious and analytical (Baumeister, Masicampo and Vohs, 2011). The method of loud thinking can also not be suitable for testing a group of participants, because they can influence each other. In our research, for evaluating conscious decision-making, we design a methodology that combines analysis of FactOrEasy® simulation exports and the eye-tracking analysis of the game records. In this place, we accept the conclusion of Bettman, and Johnson (1988), that the right decision is the result of the conscious mental activity. We consider that activity as the slow logical thinking (Kahneman, 2011). We assume, that if one decides rationally, does some effort, hence follows the necessary data, think about them and makes (right) decision.

The paper summarizes our pilot research where we tested managers' decision-making in a particular situation and find out, whether they decide consciously, whether they can be able to found the error, and whether the recognition of the error leads to a change in decision-making. The main objective of this paper is to make summarization and description of found error behaviour and consciousness of errors. The paper is divided into the following parts: material and methods, where the methods used and the course of the experiment are described; results of the experiment; the discussion of the achieved results with the conclusions of other authors, and the own conclusions at the end of the paper.

Materials and Methods

The research was conducted with using the FactOrEasy® software, which secured the experimental environment. It is online dynamic deterministic simulation game of decision-making in financial, operational or strategic management. It uses artificial intelligence, where competitors in the form of multi-layer neural networks compete with a human (Švec et al, 2016).

Formulation of the Observed Error

From the FactOrEasy® description is clear, that player makes a series of decisions that are related (Švec et al, 2016). For the purpose of research, we chose the specific situation, where it can be

clearly defined, that wrong decision means error. The identified error can be made by players during the sale phase. Player tries to sell products on the market (in each round of simulation). Key to success is to beat the competitors. The sale is based on a reverse auction (Bannock and Manser, 2003). The player knows the maximum market price and also knows the number of products, which can be sold by competitors. The player does not know only the price at which competitors are willing to sell. The player's goal is to evaluate the figures and set the price and number of pieces for sale. Only right evaluation of situation can lead to the sale. There exists the situation of excess demand in the simulation. It means, that the market demand is higher than the player and all competitors together have in stock. It happens quite often, the mean is 4.25 cases in our research per game (game has 12 rounds). The player should identify the excess demand, because all figures are available. If the player realizes and identifies the situation, gains opportunity (hereinafter referred to as the 'opportunity') to sell all products at the maximum price. In addition, this decision is done under certainty (of maximum profit), because the outcome of the decision is safe and known (Mařík, Štěpánková and Lažanský, 1993). Jablonský (2007) states that the goal of the decision-making process under certainty is to set the order of all variants according to their advantage. In this case, there is only one relevant criterion for order - the profit. The best variant is to set the maximum possible selling price. If the player offers less, makes the error, which is observed in this research. Opportunity to maximize profit in the round is not been used.

Research Sample

The research sample is the group of 10 managers from middle and large companies, which operates in the Czech Republic. There is the uniform representation of males (5) and females (5). All managers are university graduates and have more than 5 years of practical experience.

The Course of Research

Testing of managers took place in 2 groups in July and August of 2017 in the laboratory for the study of human behaviour (HUBRU), FEM, CULS Prague. In the beginning, managers were instructed about the simulation. After that, they started to simulate. Their task was to achieve maximum 'cash' at the end of the game. The number of simulations´ attempts was limited to 5 for each manager. Managers saved all exports from the games and marked the best one. In total 44 exports were submitted. After that, we analysed all exports and focused to find out the defined error. Exports, which were not finished (bankrupt before the 12th round) and also do not contained the opportunity, were excluded. In those cases, managers were going to bankrupt before the first opportunity. For this reason, 14 games were excluded. We also excluded 2 games, which did not contain any opportunity. These results were not relevant for further analysis. We got 28 relevant exports. In those games, we were focused on the number of occurrences of excess demand, the number of misuse of this situation (number of errors), and whether the player repeated the error in the rounds. The results were processed using a pivot table. Subsequently, the causes of the error were identified. Video records of games and eye-tracking were used to identify the errors. Eye tracking has been applied only at half of the tested managers (5) due to the limited capacity of the laboratory and time limitations of managers. Eye-tracking records usually include fixation points, lengths, maps of tracking path, heat-maps, etc. (Xiao et al, 2017). The parts of records, which contains the error has been analysed through Tobii studio software 3.4.6. Possible causes of errors have been identified using heat-maps.

Results

The results of analysis of managers' simulations' exports with focus on the occurrence of observed opportunity and error are summarized in Table 1. There were 28 errors of the total of

119 opportunities (24%). The error has been found in 11 exports (38%). There were 6 out of 10 managers (No. 2, 3, 6, 7, 8 and 9), who made the error at least once. Only 2 tagged the game with error as the best one (No. 7 and 8). Subsequently, the course of individual games was studied with the target of focus on the occurrence of opportunities and errors. Managers, who were analysed by eye-tracking, are marked in the Table 1.

Number of manager	Number of games	Number of relevant games	Number of relevant game with at least 1 error	Number of all occurrences of opportunities in relevant games	Number of errors in all games	Error in the best game	Eye tracking available
1	5	2	0	12	0	No	No
2	5	4	1	16	1	No	No
3	5	3	1	10	3	No	Yes
4	5	2	0	9	0	No	No
5	3	3	0	7	0	No	Yes
6	5	4	3	16	3	No	Yes
7	4	3	3	12	12	Yes	Yes
8	3	2	2	7	7	Yes	No
9	5	2	1	8	2	No	No
10	4	3	0	22	0	No	Yes
Total	44	28	11	119	28	2	5

Table 1: The occurrence of errors in decision-making, 2017-2018 (source: own calculation)

Analysis of Games of Managers, Who Did Not Make Any Mistake

Managers 1 and 4 – the error did not occur in any game. They found the opportunity in all occurrences. Eye tracking has not been recorded.

Managers 5 and 10 – the error did not occur in any game. They found the opportunity in all occurrences. Eye tracking was recorded and confirms, that they paid attention to all necessary figures. They used figures for identification of the opportunity and made the right decision.

Analysis of Games of Managers, Who Made Mistakes

Manager 2 – made the mistake only in the 1st game on the second occasion. He probably realized existence the possibility of opportunity before made this mistake. In all the following cases, the opportunity was found and exploited. Eye tracking has not been recorded.

Manager 3 – the error was made only in 1 out of 3 games. But the mistake was made in all 3 occurrences in the 1st game. How eye-tracking prove, the errors were caused by zero attention on the stock of competitors. Excess demand did not be identified. But whole next two games were without error, and according to eye-tracking, attention was paid on all necessary figures.

Manager 6 – was aware of the opportunity, but despite of it, made mistake in 3 out of 4 games. The 1st error in the 1st game was made during the 3rd occurrence. The existence of the opportunity was found and realized before the 1st mistake. The cause of the 1st mistake was the zero-watching of market conditions. Also, the 1st occurrence in the 2nd game was missed. Eye-tracking proves, that opportunity was found, but the decision was written into the wrong box - for the number of offered pieces. Also, the 3rd game contained an error. There was no pay attention to stock capacity, the situation could not be evaluated in right way. Manager marked the 4th game as the best one. There was no mistake in this last game.

Manager 7 - played 2 games, where the opportunities occurred (6x, 1x, 4x). Occurrences have not been identified in any case and the error has been repeated in every occasion, also in the example

of the marked best game. Eye-tracking proves, that all important figures were watched before all of the decisions. But also too much attention was paid on irrelevant figures.

Manager 8 - played 2 games, where the opportunities occurred (4x, 3x). Occurrences were not been identified in any case and the error was repeated in every occasion, also in the example of the marked best game. Eye tracking has not been recorded.

Manager 9 – played 2 games, where the opportunities occurred. Made the mistake in the 1st two occurrences out of 7 in the 1st game. After the opportunity has been found and realized, no more mistakes occurred until the end of the 1st game. Moreover no occurrence of mistakes in the 2nd game. The game without mistakes has been marked as the best one. Eye tracking has not been recorded.

DISCUSSION

According to the results, managers can be divided into four quadrants based on two dimensions. The distribution is shown in Figure 1. As the 1st dimension, we determine the occurrence of the error in decision-making; the situation where wrong decision leads to a variance from the condition of the desired maximization of profit. The 2nd dimension is the consciousness of the error. In other words, that means, whether the player was conscious of the occurrence of the opportunity to get the maximum profit; he/she used the opportunity consciously or not. We defined the state of consciousness by: 1) analysing the exports of the games - when player does not make the error in the observed situation, he/she make the right decision consciously; and by 2) eye-tracking - the player, who watch the data that are necessary for the right decision and makes right decision, does this decision consciously. Thus, we can confirm our presumption of conscious observation, thinking and decision-making (Payne, Bettman, and Johnson, 1988; Kahneman, 2011). Individual quadrants are submitted based on the percentage share of decisions on all 119 decisions. 67 decisions were subjected to eye-tracking analysis. In 49 decisions (73%), where eye-tracking was used, monitoring of the necessary figures proceed to the right decision. As one conscious and right decision, even if there was the bad result, we can mark the mistake of manager No. 6. There, the situation was correctly evaluated, but the right decision was written into the wrong column. All other errors were made unconsciously. In 5 (7%) cases, the manager did not watch the necessary data, he/she could not make the reasonable and rational decision. In the other 12 (18%) cases, manager watched necessary figures, but did not realize the opportunity, because he/she made error repeatedly. The situation, when the manager did not watch the necessary data and decided correctly, did not happen at all.

In the Figure 1, we also describe the internal dynamics among quadrants. It is represented by arrows. Thereby we take into consideration the influence of time factor on the possible moving of managers between quadrants.

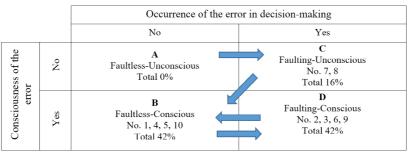|		Occurrence of the error in decision-making	
		No	Yes
Consciousness of the error	No	**A** Faultless-Unconscious Total 0%	**C** Faulting-Unconscious No. 7, 8 Total 16%
	Yes	**B** Faultless-Conscious No. 1, 4, 5, 10 Total 42%	**D** Faulting-Conscious No. 2, 3, 6, 9 Total 42%

Figure 1: Distribution of managers into quadrants, 2018 (source: own compilation)

Quadrant (A) Faultless-Unconscious includes managers who did not make any error in all games without realizing the opportunity (did not watch the necessary data before decision). In our research, we cannot include any manager into this quadrant, because this situation did not occur. Nevertheless, this quadrant can be hypothetically defined based on our findings. Such a right and moreover repetitive decision would be the result of intuition, or rather, of lucky chance. This option is very improbable in the FactOrEasy®. In our sample, the opportunity was detected 4.25 times in average per game. Each manager played 2-4 games. The probability of repeating the right and unconscious decision in all occurrences is very low.

Faultless-Conscious (B) are managers (No. 1, 4, 5 and 10), who did not make any error in all occurrences of the opportunity. The eye-tracking records of manager's No. 5 and 10 confirm that they always watched the all necessary figures, what means, that the decisions were conscious. We can state that their decisions were fully rational, because they have fulfilled all phases according to March (1994): they identified the variants, the consequences, and the criteria and then they made the right decision.

Faulting-Unconscious (C) are two managers (No. 7 and 8) who made the error in every occurrence of the opportunity; they never realized opportunities, which they faced, even though they were watching the necessary data. In these cases, this may be the systematic error, which is caused by the wrong processing of available information, but not by a lack of information (Livnat and Pippenger, 2008). This fact is confirmed by the eye-tracking records of games of manager No. 7, who was watching all necessary information, but wrong decision was still repeated. The causes of a systematic error can be found in the cognitive biases (Wilke and Mata 2012). These biases lead to variances in the decision-making from what we normally consider to be rational and therefore right (Tversky and Kahneman, 1981; Kahneman, 2011).

Faulting-Conscious (D) include managers who have been aware of the opportunities in the game from the first moment, but despite it, they made some mistakes. That behaviour was found in games of manager No. 2 and 6. As soon as they faced their 1st opportunity, they identified it and did not make the mistake. However, during the several of next rounds and games, wrong decision has been made. There are not the systematic errors in this cases (Livnat and Pippenger, 2008). Those are only random occurrences of mistakes. Their causes can be found in the eye-tracking records of manager No. 6. This manager did not pay attention to some figures in some cases, what prevent to define available variants for a rational decision (March 1994). Or the right solution was found but the decision was written into the wrong column. This unique fail can be caused by bias in fast thinking (Kahneman, 2011), what has completely betrayed the manager in the simple task. Manager No. 3 and 9 can be also included in this category. The run of their games did not contain the error in the 1st few occurrences (3x and 2x). Manager No. 3, as eye-tracking prove, did not pay attention to the necessary figures in those 1st occurrences and could not make a rational decision. But as soon as he/she began to watch the necessary figures, consciousness took a place and right decision was used in all next occurrences. We can divide this run into two shorter time periods. He/she was faulting-unconscious during the 1st game (C), but in the 2nd he/she has already become the faultless-conscious (B).

This means that the distribution of managers into quadrants is not static in terms of the time factor. Managers can move between quadrants in time. We have mentioned the low probability of inclusion in the category of faultless-unconscious (A), but we cannot completely exclude this option. In a very short time period, it can be assumed that random right decisions can be made without consciousness. However, the probability of right decision in the state of unconsciousness is decreasing with every other occurrence of opportunity. In that case, it can be assumed that the number of occurrences increases the probability of moving decision-maker into the quadrant of faulting-unconscious (C).

The state of faultless-conscious (B) may also not be definitively permanent. In the long term, there may be a shift to faulting-conscious (D). This illustrates the behaviour of manager No. 6, who according to eye-tracking, found the 1st occurrence, but subsequently did make mistake in some following decisions. If we divide his/her decisions into shorter time periods, we can state that once occasion has been identified, it was realized and the manager became conscious. The causes of his/her other mistakes can be found elsewhere than in consciousness. According to Mintzberg (2013), management is a craft based on learning from experience. For simulation of FactOrEasy®, this is confirmed also by Pavlíček et al (2015); simulation is designed to verify knowledge and gain experience. Therefore, in our research, we can regard this experience as conscious and the state of consciousness can be considered to be relatively persistent. In other words, it is not possible to shift those, who have already realized at least one opportunity, from the two quadrants of the conscious (B and D) back to the two quadrants of the unconscious (A and C). However, in the long term, conscious ones can change the state of faultless (B) to the state of faulting (D). The manager can forget to apply experience.

On the other hand, it is possible to change the states of the unconsciousness (A and C) to the consciousness (B and D). In cases of managers No.7 and No.8 can be supposed, that the state of unconsciousness and systematic error will not last forever. State of consciousness can come with the increasing number of confrontations with opportunities during a time. The FactOrEasy® simulation is, according to Švec et al (2016), a learning tool where users can learn from their mistakes. Players are repeatedly exposed to opportunities, make decisions and gain experience (Pavlíček et al, 2015). Users, sooner or later, should start with slow logical thinking (Kahneman, 2011) in the process of the game, and therefore the rational decision-making process (March, 1994) should be involved. It results in consciousness and gaining experience. At least in short period after such consciousness, the state of faultless-conscious should occur (B). As Bortun (2014) writes, mistakes are owns for people, but we should learn from mistakes and not repeat them.

All time factor effects are symbolized by the arrows in the Figure 1 and can be summarized as follows: 1) Managers in the quadrant of the faultless-unconscious (A) are exist only in a short time period till they moving to the faulting-unconscious (B). 2) Faulting-unconscious (C) can shift over time to the flawless-conscious (B). 3) And finally, managers can shift in different time periods from flawless-conscious (B) to faulting-conscious (D) and vice versa.

Conclusions

In our pilot research, we tried to find out if managers make errors in a particular decision-making situation. We were focused on facts, whether they are able to realize mistakes and whether they are able to learn from these mistakes and do not repeat the error. For this purpose, we used the methodology combining the analysis of FactOrEasy® simulation export and the eye-tracking. Here we have confirmed our assumption that to watch and evaluate all necessary figures is essential to make the rational and right decision. The result of the research is the distribution of managers into four quadrants based on two dimensions - the occurrence of the error and the consciousness of this error. Based on these quadrants, we distribute the managers into 'Faultless-Unconscious', 'Faulting-Unconscious', 'Faultless-Conscious' and 'Faulting-Conscious'. Based on the analysis of managers' decisions, we also determine the internal dynamics that takes into account the time factor. It is mainly based on the analysis of managers' decision-making in the 'Faultless-Conscious' quadrant and their behaviour in shorter time intervals. Two managers (No. 3 and 7) did not use the opportunity in the first few occurrences. After consciousness, they stopped making mistakes. Based on the experience gained, they changed their follow decisions - they have learned to not do mistakes. On the other hand, two managers (No. 2 and 6) identified the

opportunity at the first occurrence, but despite their experience, they did not avoid mistakes. That means, that managers can move between quadrants over time. This time dynamics can be the subject of further research. For states of unconsciousness, it is possible to examine how long a manager can make the right decision without consciousness, or whether it is necessary first to make mistake, and how long the error will repeat before realizes it and begins to make the right decisions. The state of consciousness is considered to be permanent, but it does not mean permanent faultlessness. We estimate that despite the consciousness, the decision maker may make a mistake in the same decision situations. In future research, therefore, we will also focus the causes and circumstances of the errors, which are made despite the proven gained knowledge and experience.

The results are limited by a small research sample of the pilot study and the methodology used. In the future, therefore, verification of a larger research sample will be necessary. Or a validation of results will be added by adding another method, for example by expanding research on structured interviews with participants.

Acknowledgement

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