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## Predictors of cognitive distortions in managerial decision-making: PCD18 methodology

**Abstract.** Decision-making is one of the most important managerial activities. Effectiveness of decision-making of managers is conditioned by several subjective and objective factors. A significant place among the subjective factors is taken by the issue of cognitive distortions. In relation to conceptualisation and operationalisation of the issue of cognitive distortions, there have been discussions about various sets of issues. One of these sets is linked to the identification and specification of the predictors of cognitive distortions. The report presents the results of an analysis of the extracted factor structure of the PCD18 methodology (Prediction of Cognitive Distortions) which represents the dispositional concept of defining and studying cognitive distortions. The results of the research which was conducted from January to April 2016 on a sample of 494 respondents (121 men and 373 women, working both in the private and the public sector) enable the extraction of a factor structure of the PCD18, as well as the characterisation of the basic psychometric parameters of this methodology. The aforementioned factor structure consists of the following factors: Negative prophecies, Thought-reading, Unsubstantiated conclusions and Argumentation through emotions. The report also includes the complete version of the PCD18 methodology.

**Keywords:** Cognitive Distortions; Managerial Decision-making; PCD18 Methodology

**JEL Classification:** J29; J69; Z10

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### Фактори передбачення когнітивних відхилень у прийнятті управлінських рішень: методологія PCD18

**Анотація.** Когнітивні відхилення є визначальними серед суб'єктивних факторів прийнятих управлінськими рішеннями та відіграють значну роль у процесі прийняття управлінських рішень. У контексті концептуалізації та операціоналізації проблеми когнітивних відхилень відбувається обговорення різних груп питань. Одна така група має відношення до ідентифікації та специфікації факторів передбачень когнітивних відхилень у прийнятті управлінських рішень. У роботі представлено результати аналізу структури виявлених факторів методології PCD18, яка являє собою концепцію визначення та вивчення когнітивних відхилень. Результати проведеного в період з січня по квітень 2016 року дослідження, в основу якого було покладено вибірку з 494 респондентів (121 чоловіка та 373 жінок, працюючих як у приватному, так і в державному секторі економіки) дозволили визначити структуру факторів, що мають відношення до методології PCD18, власне як і характеристику основних психометричних параметрів цієї методології. Вищезгадана структура факторів складається з: негативних передбачень, читання думок, необгрунтованих висновків та емоційної аргументації. У роботі представлено повну версію методології PCD18.

**Ключові слова:** когнітивні відхилення; прийняття управлінських рішень; методологія PCD18.

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### Факторы предсказания когнитивных отклонений в принятии управленческих решений: методология PCD18

**Аннотация.** Принятие решений является одним из важнейших видов управленческой деятельности. Эффективность принятых управленческих решений обусловлена рядом факторов, имеющих как субъективный так и объективный характер. Когнитивные отклонения являются определяющими среди субъективных факторов и играют значительную роль в процессе принятия управленческих решений. В контексте концептуализации и операционализации проблемы когнитивных отклонений происходит обсуждение разных групп вопросов. Одна такая группа имеет отношение к идентификации и спецификации факторов предсказаний когнитивных отклонений в принятии управленческих решений. В работе представлены результаты анализа структуры выявленных факторов методологии PCD18, которая представляет собой концепцию определения и изучения когнитивных отклонений. Результаты проведенного в период с января по апрель 2016 года исследования, в основу которого была положена выборка из 494 респондентов (121 мужчины и 373 женщины, работающих как в частном, так и государственном секторе экономики), позволили определить структуру факторов, имеющих отношение к методологии PCD18, собственно, как и характеристику основных психометрических факторов этой методологии. Вышеупомянутая структура факторов состоит из: негативных предсказаний, чтения мыслей, необоснованных выводов и эмоциональной аргументации. В работе представлена полная версия методологии PCD18.

**Ключевые слова:** когнитивные отклонения, принятие управленческих решений, методология PCD18.

## 1. Introduction

Managerial decision-making in problem solving does not always correspond with the criteria of objective rationality. It may be hued by emotions and influenced by personality traits and situational conditions. This process includes various cognitive schemas (Samuels, Stich & Faucher, 2004) [1]. Cognitive schemas within the cognitive space are created on the basis of the simplified, generalised mental representations and schemas. Although cognitive schemas can lead to distortion of information and, ultimately, to cognitive distortions, they are an important instrument of perception, understanding, learning, reasoning and decision-making, at least from the viewpoint of accelerating and simplifying these processes. It is important to be aware of the effect of these simplification schemas and their potential impact on cognition and decision-making also in the form of cognitive distortions (Frankovsky & Birknerova, 2016) [2]. The likelihood of occurrence of cognitive distortions is subject to differences between normative thinking in the intentions of logic, mathematics, and statistics and descriptive thinking considered in the context of emotions, schemas and the pressure of a situation. Actual thought process may therefore deviate to varying degrees from the norms of rationality (Samuels, Stich & Faucher, 2004) [1].

Limits of cognitive abilities, which manifest themselves mainly in solving problems, are, according to Newell and Simon (1972) [3], the source of occurrence of cognitive distortions in thinking and decision-making.

## 2. Literature review - Cognitive distortions

Conceptualisation and operationalisation of cognitive distortions relate to the theoretical definition of this construct and methodological verification of the procedures and tools of detection and measurement of cognitive distortions.

A theoretical and methodological basis of definition of the concept of cognitive distortions is an assumption that the psyche of the individual, i.e. also manager, is not a passive mirror that only reflects external influences and responds to them (Frankovsky & Birknerova, 2016) [2]. Mental picture of external reality is recognised based on the interaction between external stimuli and pre-existing mental structures, which were examined from different perspectives and in different contexts – schemas, personal constructs, irrational beliefs, contrafact thinking, risk, burnout syndrome, Dunning-Kruger effect and others (Beck, 1979 [4], 2007 [5]; Kelly, 1955 [6]; Ellis, 1962 [7]; David, Lynn & Ellis, 2010 [8]; Allais, 1953 [9]; Mandel et al., 2005 [10]; Istenik, 2011 [11]).

Beck (1967) [12] characterised cognitive schemas as freely associated main thought contents, automatic thoughts and mental images. They serve to interpret oneself and the outside world. They are relatively stable ways of organising thinking and evaluating events. Schemas represent the set of fundamental, often untold, subconscious beliefs about who I am, what is the world around me, and what I can expect from it.

An essential factor in this regard is the fact that people are not aware of their cognitive distortions (Brugger, 1994) [13]. A cognitive distortion is a fallacy in which a person registers the actual situation without knowing it (Zibrinova & Birknerova, 2012) [14].

In this context, it is important to distinguish the cognitive distortions on the unintentional basis from a dishonest argumentation that is carried out deliberately (Ruisel, 2012) [15], as well as other forms of distorted perception, such as cultural or organisational distortion (Zibrinova et al., 2014 [16]; Zibrinova & Birknerova, 2015 [17]). Also for these reasons, it is difficult to detect cognitive distortions (Ruisel, 2012) [15] and specify their predictors.

Emotions, as already mentioned, are another important factor that affects the occurrence of cognitive distortions. They may be included in the neuropsychological approach to analysing the relationship between emotions and cognitive functions (Hoschl, 2002) [18]. Emotions affect memory, attention and decision-making (Adolphs, Tranel & Damasio, 2001) [19].

In accordance with Forgas (2001) [20], emotions and cognition are not separated, individual abilities. The relationship of emotions and cognitive processes is reciprocal. On the basis of

the cognitive process, emotional reactions may be developed or suppressed. At the same time the impact of mood facilitates recollection of the emotionally coloured material. The informative quality of emotions is also important. Negative emotions guide the body to be more concerned about its environment; they produce a more externally oriented way of thinking which perceives the demands of the outside world and gives them precedence over internal thoughts (Bless, 2000) [21]. On the other hand, positive emotions lead to the release and relaxation (Zibrinova et al., 2014) [16].

One of the important concepts of examination of cognitive distortions is focusing attention to the taxonomy and typology of cognitive distortions. Typical cognitive distortions are, according to Beck (1979) [4], the following: Unsubstantiated conclusions, Distorted selection of facts, Over-generalization, Exaggeration and downplaying, Touchiness, Black-and-white thinking, Thought-reading, Negative prophecies, Disqualification of the positive, Argumentation through emotions, and Marking.

This theoretical and methodological concept formulated by Beck (1979) [4] has been applied in depressive disorders, confirmed by the results of the presented research and has wider application, for example in the context of issues of personality, e.g. in connection to the decision-making processes in managerial work.

## 3. Literature review - Managerial decision-making

Decision-making can be classified as a major management activity. In managerial work are not rare the situations in which the adoption of a decision is the most important activity of a manager. On the one hand, decisions adopted by managers not only have a multiplicative effect in several areas of the organisation with an impact on the organisation as a whole, but also on each of its employees. On the other hand, managerial decision-making is influenced by several personal as well as situational factors.

In this context Grasseova (2013) [21] highlights the barriers to decision-making which can be specified according to the manager's part (subjectively) and the part of the organisation (objectively). Among the subjective decision-making barriers the author includes the limited ability to process information, formulations and solutions to complex decision-making problems by managers and repeated ineffective solutions. Among the objective decision-making barriers the above-mentioned author includes the information base that is of insufficiently high quality, as well as the inflexibility of the organisational structure.

The effect of cognitive distortions may also be another subjective barrier to the decision-making by managers. One of the requirements for people who are in managerial positions is the ability to avoid cognitive distortions in decision-making, and the ability to identify the possible effects of these errors in thinking (Frankovsky et al., 2015 [22], Zibrinova et al., 2015 [17]). The source of the cognitive distortions was identified by Newell and Simon (1972) [3] as the aforementioned limitation of human cognitive abilities to solve complex problems. Therefore, the decision-making of a manager about a certain issue is sometimes beyond the strict criteria of objective rationality; often, it does not even approach it, is emotionally underlined and uses a variety of schemas. This creates a situation where the decision-making of managers becomes vague, uncertain and lacks the precise structure (Das & Teng, 1999) [23].

Cognitive distortions can, in accordance with Schwenk (1982) [24], occur with identifying the problem, when the manager sets a wrong hypothesis. It is likely that it is followed by a faulty analysis and reasoning by analogy. It is further followed by generation of false alternatives and an automatic search for simple solutions to the problem. Accordingly, wrong alternatives serve as a starting point, whereas negative values of the preferred alternative are ignored and perceived are only those positive. Later, in hindsight of the problem and evaluation of the chosen alternative, there is again the illusion of control, certainty of proper selection effect, limitation of evaluation criteria and devaluation of the partially described alternatives. Cognitive distortions may also occur in the implementation of the decision-making process as the last stage. In examining

what causes these distortions, it has been concluded that risk aversion, excessive self-confidence, anchoring, expected benefits of the prediction and the framing effect also influence this process. Risk aversion makes the manager be not afraid of failure and thus he or she becomes careless. Excessive self-confidence and belief in one's extra value relate to the exclusion of thoughts or ideas of others because managers think they can do everything themselves best. Their alternatives are implemented quickly and without the possibility of taking a step back (Schwenk, 1982) [24].

**4. Research**

The data analysed in the paper were collected in the period from January to April 2016 within the area of Slovakia. 494 respondents participated in the presented research. Of this number, 121 respondents (24.5%) were men and 373 (75.5%) were women. The sample consisted of 1.4% of top managers, 2.4% of middle managers, 7.3% of line managers, 15.8% efficient workers and 56.1% of management students (external, part-time). 17% of the respondents failed to provide their position within the organisation. The average age of respondents was 32 (the standard deviation was 5.150 years). Their minimum age was 18 years old; the maximum age was 53 years old. 32% of the respondents work in the private sector, 43% in the public sector and 25% failed to mark the sector they work in. As for the economic area, 10% of the respondents work in the area of healthcare, 12% in education, 13% in production, 22% in trade, 16% in administration, 13% in tourism and 14% of the respondents work in other services. Data from respondents were obtained by means of the PCD18 (Prediction of Cognitive Distortions) questionnaire methodology.

**PCD 18 methodology**

The PCD18 methodology contains 18 self-evaluation items to which the respondents react by means of the 6-point scale representing the level of agreement (0 = definitely no, 1 = no, 2 = rather no than yes, 3 = rather yes than no, 4 = yes, 5 = definitely yes). PCD18 was designed on the basis of Beck's (1967 [12], 1979 [4], 2007 [5]) theory of cognitive schemas and cognitive distortions, using the experience gained by utilizing the PCD methodology (Prediction of Cognitive Distortions), which contains 16 items (Frankovsky et al., 2015) [22]. This methodology enables prediction of cognitive distortions based on two predictors: Distorted selection of facts (Cronbach's alpha - 0.728) and Over-generalization (Cronbach's alpha - 0.703).

**5. Results**

On the basis of the test results of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy - 0.766 and Bartlett's Test of Sphericity - 1956.715 (significance - 0.000), four factors were extracted by means of factor analysis (Principal Component Analysis with Varimax rotation), which may be specified as:

- **Negative prophecies:** People who score higher in this factor tend to expect the worst; they see the negative consequences, await disasters without real reasons, and do not think positively.
- **Thought-reading:** People who score higher in this factor believe that they know what other people think; based on that they can arrive at conclusions, try to read the thoughts of others, rely more on penetration into the minds of others than to what they say or do.
- **Unsubstantiated conclusions:** People who score higher in this factor can also decide on the basis of a single piece of information or fact; they do not need much information to make a decision and evaluate the phenomena based on a single event.
- **Argumentation through emotions:** People who score higher in this factor consider emotions as part of the decision-making, which they deem crucial to make the decision; sometimes they make decisions based exclusively on emotions.

The extracted factors explain 49% of variance (Table 1, Figure 1). The internal consistency of the separate factors, as an indicator of reliability of each factor of the methodology, was measured by calculating Cronbach's alpha coefficient (Table 2).

The detected values of the Cronbach's alpha coefficient indicate that the internal consistency of items saturating the specified factors is in the range of acceptability.

Tab. 1: Factor structure of the PCD18 methodology

Items	Factors			
	Negative prophecies	Thought-reading	Argumentation through emotions	Unsubstantiated conclusions
PCD1				.651
PCD2			.643	
PCD3		.585		
PCD4				.724
PCD5		.467		
PCD6		.232		-.499
PCD7	.837			
PCD8			.766	
PCD9	.805			
PCD10		.719		
PCD11	.741			
PCD12		.702		
PCD13				.571
PCD14		.666		
PCD15	.758			
PCD16			.684	
PCD17			.642	
PCD18				.507
Eigenvalue	2.719	2.216	1.960	1.936
% of total variance	15.105	12.313	10.887	10.756

Legend:

- PCD1: One piece of information is enough for me to make a decision.
- PCD2: It is impossible to exclude emotions from decision-making.
- PCD3: I do not have a problem to accept a conclusion based on penetrating the thinking of others.
- PCD4: When faced with a wide variety of facts, I make a decision based on a single fact.
- PCD5: Even on the basis of indistinct manifestations, I know what others think.
- PCD6: All information about a problem is significant.
- PCD7: I always expect the worst.
- PCD8: My feelings are decisive in assessing a situation.
- PCD9: I see negative impacts in everything.
- PCD10: When making a decision, I try to read the thoughts of others.
- PCD11: I tend to expect disasters without actual reasons.
- PCD12: Penetrating the thoughts of others is more important in decision-making than knowing the objective facts.
- PCD13: I evaluate situations on the basis of a single event.
- PCD14: When making a decision, I tend to stick more to knowing the thoughts of others than to what they say and do.
- PCD15: I have troubles to think positively.
- PCD16: Sometimes I decide only on the basis of feelings.
- PCD17: I notice mainly those facts which support my decisions.
- PCD18: When assessing something, I pay attention just to one fact of a complex phenomenon.

Source: Own calculations

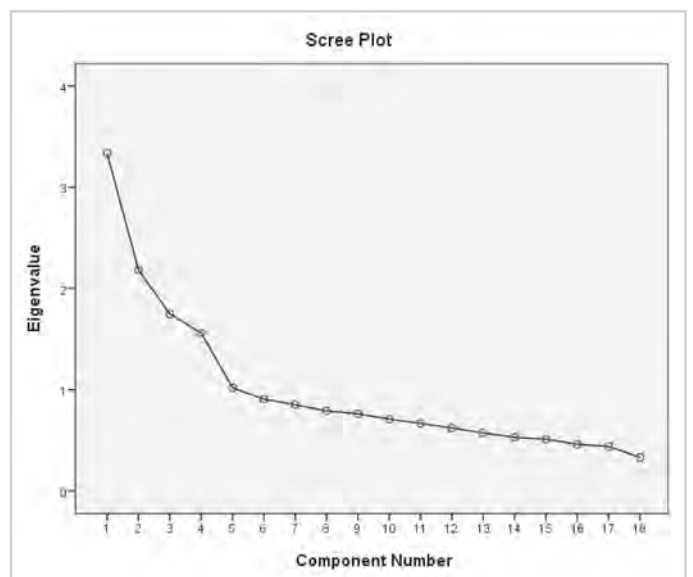


Fig. 1: Illustration of the factors by means of a Scree plot  
Source: Own calculations

The proposed structure of the defined factors of the PCD18 methodology is supported by the value of the calculated inter-correlation coefficients between the individual factors (Table 3). The extracted PCD18 factors correlate with each other. These correlations, although statistically significant, take low values. This means that these factors are not identified by the same attributes of occurrence of cognitive distortions. On the contrary, it suggests that they describe different though related areas of occurrence of cognitive distortions (Table 3, Figure 2).

The comparison of assessments of individual factors of evaluation of occurrence of cognitive distortions pointed out the existence of statistically significant differences in the responses of respondents in assessing these attributes (Table 4 and Table 5). The results of this analysis indicate that the highest level of agreement was found in the assessment of the Argumentation through emotions factor.

**6. Discussion**

The occurrence of cognitive distortions in people's lives, including managers, is not rare (Rachlinski, 2000) [25]. As already mentioned, even the manager may not be aware of their cognitive distortions (Brugger, 1994) [13]. Their decisions can be made according to the best conviction that they make the right decisions and they are not willing to correct those decisions even if they get a feedback that contradicts the conclusions adopted. However, it is essential not to confuse the cognitive distortions in decision-making with the false argumentation (Ruisel, 2012) [15].

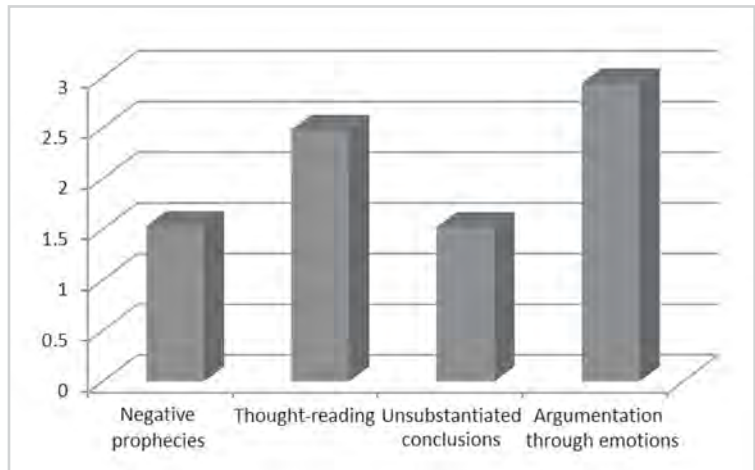


Fig. 2: Assessment of the factors of occurrence of cognitive distortions (average values)  
Source: Own calculations

In this context, it is possible to draw attention to the moral and ethical aspect of the manager's work. Cognitive distortions in managerial decision-making are linked with the manager's subjective conviction about the correctness of the decisions taken. Thus, they are not related to violation of moral and ethical principles of managerial work. When using dishonest arguments, the aspects of conscious lies, deception and concealment of information are accentuated and they may lead to the manifestations of Machiavellism (Birknerova et al., 2013) [26]. In this case, the violation of moral and ethical principles in managerial decision-making is evident.

Managerial decision-making has a multiplicative character. These decisions have an impact not only on the managers themselves, but also on their colleagues and, ultimately, the organisation as a whole. They occur in a wide range of managerial activities. An example might be a specific area of fine arts marketing (Stefko & Krajnak, 2013) [27] within which the degree of subjectivity in the decision-making is significantly high. For these reasons, the work of managers is also associated with rational, objective thinking, decision-making based on evaluation of objective factors. In the context of cognitive distortions in decision-making by managers, it is a negative phenomenon and also the obvious risk to the effective management of organisations (Kondas & Kordacova, 2000) [28].

The occurrence of cognitive distortions in managerial decision-making is associated with inadequate simplification, decision-making based on a limited amount of information, sometimes even on a single piece of information, a significant impact of emotions on decision-making, inability to be on top of things, the illusion of perfection and infallibility, distrust of the opinions of others and inability or unwillingness to analyse events in depth. In addition to other areas, in respect to the abovementioned, there is an obvious link to the issue of business intelligence (Rajnoha et al., 2016) [29].

The negative consequences of the adoption and use of subjective heuristics lead to cognitive distortions that will cause managers fail to make an optimally suitable decision. This creates a situation where managers' decision-making is vague, uncertain and lacks the precise structure (Das & Teng, 1999) [23].

In the context of the aforementioned, prediction of the possible occurrence of cognitive distortions in managerial decision-making is an important aspect in enhancing the efficiency of the work of managers and, last but not least, the failure of managers in practice.

Identifying predictors of cognitive distortions is, however, complicated by the fact that people do not realise their existence. One possible solution to this methodological problem is specification of the factors that may indicate, although only with a certain probability, the occurrence of cognitive distortions in decision-making.

Tab. 2: Cronbach's alpha values for the defined factors of PCD18

Cronbach's alpha	Negative prophecies	Thought-reading	Unsubstantiated conclusions	Argumentation through emotions
	.808	.629	.564	.638

Source: Own calculations

Tab. 3: Inter-correlation coefficient values between the factors of PCD18

	Thought-reading	Unsubstantiated conclusions	Argumentation through emotions
Negative prophecies	.127**	.292**	.126**
Thought-reading		.100*	.155**
Unsubstantiated conclusions			.096*

Legend:  
\* statistical significance at the 0.05 significance level  
\*\* statistical significance at the 0.01 significance level

Source: Own calculations

Tab. 4: Assessment of the factors of occurrence of cognitive distortions (Friedman's test)

Null Hypothesis	Test	Sig.	Decision
The distributions of <b>Negative_prophecies, Thought-reading, Unsubstantiated_conclusions</b> and <b>Argumentation_through_emotions</b> are the same.	Related-Samples Friedman's Two-Way Analysis of Variance by Ranks	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Source: Own calculations

Tab. 5: Assessment of the factors of occurrence of cognitive distortions (average values)

	Negative prophecies	Thought-reading	Unsubstantiated conclusions	Argumentation through emotions
Average value	1.53	2.48	1.52	2.94
Standard deviation	.926	.638	.568	.701

Source: Own calculations

The results of the present research project follow and confirm the research findings published continuously by Frankovsky and Birknerova (2016) [2].

### 7. Conclusion

The implementation of these two research projects confirms the adequacy of extracting the four significant predictors of the possible occurrence of cognitive distortions in managerial decision-making. The contents of these predictors that have been specified as Negative prophecies, Though-reading, Unsubstantiated conclusions and Argumentation through emotions, as well as the basic psychometric parameters, confirmed the legitimacy of the methodology for determining the indicators of the possible occurrence of cognitive distortions in managerial decision-making.

The PCD18 methodology is based on Beck's (1979) [4] concept of categorisation of cognitive distortions. It reduces the original number of 11 categories to 4 predictors identifying the possible occurrence of cognitive distortions in managerial decision-making. At the same time it builds on the experience of using the methodology PCD16 (Frankovsky, Birknerova & Zbihlejšova, 2015 [22], 2016 [30]). In this case, the original two predictors - Distorted selection of facts and Over-generalisation, extend the already mentioned four indicators of the possible

occurrence of cognitive distortions in managerial decision-making. The concept of the PCD18 methodology allows prediction of the occurrence of cognitive distortions at a more specific level, as opposed to the methodology PCD16.

The presented methodology PCD18 represents a dispositional approach to studying the predictors of managerial decision-making. This means that, from a methodological point of view, its construction and use are based on the assumption that it is possible to predict the behaviour on the basis of the knowledge of stable dispositional trans-situational characteristics. This approach to the construction of the methodology PCD18 should be interpreted in light of the extensive discussion of the dispositional and situational methodological concepts of general acquisition of knowledge (Terry, 1994 [31]; Carver et al., 1989 [32]; Parkes, 1986 [33]; Holahan & Moos, 1987 [34]; Stefko et al., 2010 [35]).

The PCD18 may therefore be considered as one of the possible methodological approaches to studying and detecting the prediction of cognitive distortions in managerial decision-making (Suhanyi, Suhanyi, 2014 [36]). Nevertheless, it opens the question of situational or interactional studies of the issue of cognitive distortions in managerial decision-making (Frankovsky, 2001) [37].

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