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INTERPERSONAL COMMUNICATION IN THE INTERNAL MARKETING: BOUNDED RATIONALITY GAME THEORY APPROACH

Abstract: *Interpersonal communication or better known as communication face-to-face is an integral part of everyday life. It has meaning in the business context and the organization in which the individual acts of employer and employee is a complex form of exchange/ trade and an inexhaustible source of research from different perspectives.*

This paper considers the employer - employee relationship from the point of view of internal marketing communications, pulling an analogy from the sales conversation. Game theory communication model will explain the phases of the communication process in a job interview by identifying the factors that influence the conversation, focusing on limited rationality. Our model will offer a space of possible strategies and the equilibrium outcome for both sides of the conversation.

Game theory model will offer a causal connection between personality biases, person's productivity with the flow and precision of given information, phases, and outcome. Also, we will consider deviations from equilibrium and their consequences.

This paper offers new concepts that can directly contribute to the progress of the internal marketing and communications field, and indirectly labor market, and the human capital area.

Keywords: *interpersonal marketing communications, bounded rationality, game theory, the trade.*

JEL Classification: C7, D82, J08, M31, M51

1. Introduction

The role of the job interview or selection interview is critical. It is a moment when employer and employee choose whether to place trust in their conversationalist by committing to a business arrangement .Implications of such arrangement can be both

positive and negative, at the individual level and for a given economy. From the perspective of the individual employee, positive implications occur if they establish fruitful cooperation where his trust would be justified, and his expectations met. For the employer, the fruitful cooperation will result in benefits. The opposite, negative implications imply cost or loss, both for the employee and employer. Those losses and costs occur due expense of time, labor, additional education and training costs and catching the pace in work. Such negative implications arise from lacking an assessment, pour decision-making model and making judgment errors at the job interview. Aggregately, wrong decisions at the job interview have effect to the economy through creating expenses due to employee's unemployed period or decline of employer's business productivity.

For above stated, the theme of job interview draws the attention of numerous researchers which approach from different perspectives. The most common approach is from the point of view of management or psychology. Consequently, the contribution is largest in that area. Studies of the process of the job interview from the point of view of internal marketing are missing. Namely, internal marketing often serves as a synonym for training and motivation of employees, which is only one part of internal marketing. The internal marketing represents sets of efforts in finding, keeping and developing of the employee. The boundary between finding and keeping an employee should be a job interview. That part is usually part of the management process, but in this paper ,we will assess initial job interview as the phase in the process of internal marketing management. From the marketing perspective, once the potential employee has been found, he will be observed as a potential "buyer" of the offered job. In that situation, the employer has two basic assignments.First, to create candidate's desire for the job or to "sell" a job. Second, todiscover employee's characteristics, to decide whether to hire him. The employer will do that enforcing semi-structuredinterview[1] while using his negotiation skills forsale. The semi-structured interview starts with the invitation for the interview. Then follows opening of the conversation with one self's introduction and small talk, determining motives, connecting motives to a particular goals, and finishes with the cooperation offer. Stated order will be the base for forming a model within game theory framework[2], namely, creating a game. Single units of conversation represent a stage in the model. Given

1 There are three sorts of selection/ job interview: structured, semi – structured and not structured. Structured interview is consisted of previously defined questions, which should be asked to each interviewee without exceptions. Not structured interview is an open kind of conversation without previously defined questions. Semi – structured interview is consisted of previously defined areas or themes, which have to be asked, but the content of each question or approach adapt for each interviewee.

2 Game theory assumptions apply.

there are multiple stages, it will be a dynamic game. Dynamic games can be games of complete or incomplete information. A game of incomplete information will be considered, given that the employee yet has to discover the employee's characteristics or, in game theory terminology, the candidate's type. The behavioral indicator will specify the type of candidate.It will serve tomatch relative frequencies of personality traits based on Jung's (1921) typology[3].Hence, values of Briggs – Mayers test for determination of personality types, and personal values scale gained from the general attitudes. The data of individual personality traits are a result of a survey. The survey has been online in Croatian, and the data consists of the answers of 231 respondents. Besides that behavioral data determines candidate's type, they affect the choices in each stage of the game. Given that the behavioral elements represent a deviation from rationality in candidate's decision-making, it implies that the candidate will have bounded rationality. Employer's discovery of candidate's type also describes the detection of boundaries of candidate's rationality, which we will model within auxiliary signaling game. The signaling game and the dynamic game of incomplete information will derive simultaneously; hence, an equilibrium that is more restrictive will be necessary, perfect Bayesian equilibrium reinforced with statistical equilibrium.

The contribution of the stated model will enable detailed insight in the job interview process, and discovering of regularities and patterns in the process of a job interview. The exact contribution refers to explicit consideration of alternatives during the negotiations. Since a job interview is a form of negotiations, it deliver sequential discovering of information on the type of interpersonal communication and a new insight into the bounded rationality question. Practical implications of findings are possible within interpersonal communication and employees recruiting.

The contribution regarding alternatives during the negotiation fills in the gap in related researches, which connect game theory and marketing, which Chaterjee and Lillien (1984) found.

New studiesthat are connecting marketing and game theory focus on defining bounded rationality and the assessment of consequences of decision-making, by creating formal models. To determine the process of making purchasing decisions, Roozmand et al. (2011) used modeling of people behavior. Author considers that only "agent – based" modeling enables better understanding of micro processes and their consequences at macro levels. Within their framework, they have modeled consumer behavior using MASQ Meta – model. They found that there was a significant correlation of three of five traits from Five-factor personality model and the position of power as a sociological element with purchase choices. Nassiri – Mofakham et al.

3 Jung's paper on psychological types date from 1921, but for purpose of this paper has been used a translated republish by Princeton, New Jersey: Princeton University Press from 1971.

(2007) useMASQ Meta – model, which implicates internal agent mechanism, social variations among individuals, culture characteristics and the personality, whileNassiri – Mofakham et al. (2009) analyze bargain process given the correlation of personality traits and bargain process in e-business using OCEAN personality model. Stated researchers use same experimental data, based on the MASSQ Meta – model, and found same variables of influence with applications in the area of decision making in bargaining and buying.

Furthermore, Škare et al (2014)analyze the impact of the differences among the employees using game theory model in order to determine framework for defining optimal amount and category of workload given the individual differences among the employees. The model is oriented in defining the upper boundary of employee's load, hence determining the sustainable productivity of a single employee. From the internal marketing perspective, the productivity of an individual can increase due to lifelong learning and training. The model also, explains the necessity of individual approach to determining workload. Same authors (2013) connected general attitudes and derived value scales with the decision on continuing the education in the form of a micro process, but also with analysis of aggregated consequences at macro level within game theory framework. Authors suggested a model with bounded rationality by general attitudes, such that general attitudes clearly and unambiguously relate to strategic decision making.

The research of Roozmand (2011) and Nassiri – Mofakham(2007, 2009) explicitly connect behavioral psycho – social elements to decision making. Tay et al. (2006) determine the link between personality and behavioral elements of the candidate to interview success. Therefore, this area enquires further research, which will confirm the correlation of psychosocial elements with decision making in formal models. Furthermore, that arises the question of determining concrete alternatives in bargaining/ negotiation using psychosocial elements.

In this paper, psychosocial elements of personality and scales of values determinate rationality boundaries and candidate type assessment in the model of a job interview. Formal game theory model enables identification of specific alternatives in each stage, which provides an insight in the semi-structured interview.

In the rest of the paper follows literature overview, methodological model assumptions, results, and conclusions.

2. Literature review

A job interview is an inevitable part of everyday life; hence, it becomes an object of observation from economic, sociologic and psychological perspective. From the economic point of view, the goal is to spot quality, highly productive employees

that will create additional value for the company, as well as avoiding the expenses due to the employment of non-quality staff. From the sociological perspective, the goal is to identify interconnections with employees and its consequences. From the psychological viewpoint, characteristics of the individuals can affect job interview and later cooperation in various ways. The meeting spot of noted areas is decision making. Decision-making can follow a default rule, fixed strategies, random choice or adaptive strategies. For example, if it is sufficiently to provide curriculum vitae and motivational letter (without a job interview), then making a decision can be guided by a default rule, such aseducational level or years of work experience. Random choice is not commonly applied in employment. Non- structured interview can contain any form of decision-making rules. Structured interviews can follow fixed strategies whether to ask the same questions to all the interviewees or to continue the interview only while answers match the expectations. Joshi et al. (2013) offered an example of questions and answers for a structured interview with appropriate algorithms. Semi – structured interview enables use of adaptive strategies. Adaptive strategies can be defined using permanent factors, which will take over different values due to given situational effects. These strategies are represented by functions. Given that, they can become formal mathematical expression and model can be set within the game theory framework. Game theory is a mathematical discipline that creates a methodological framework for the analysis of players' interaction. There have to be at least two players. Players have strategies, which represent "guidelines" for making decisions in each situation, which could occur in the game. Given the possibility of making an agreement by changing the rules of the game, games can be cooperative and non-cooperative games. It is very hard to model cooperative games within a formal model. Hence, there is a tendency if possible, to model situations within then on-cooperative game, but with clearly stated possibility of making an agreement if necessary. The game can be simultaneously or dynamic. Simultaneously game presumes that players make a move at the same time. The dynamic game implies making moves in turns. By playing a move, a certain stage finishes, whether with the payoff or it exceeds in the next stage. The game information can be complete if all players know all the elements of the game, respectively incomplete if not all players know all information. The incomplete information entails uncertainty. To diminish uncertainty and to make the quality decision, it is advisable to gain as many information possible. In general, players are rational. That means that players will make decisions, which will maximize benefits or minimize lost. Given that such decision – making form is rare in reality, to improve theoretical models to describe reality better, the term rationality is facing numerous re-examination. Various forms of biases or influences, which influence players such that they do not make perfectly rational decisions, represent boundaries of rationality.

Camerer (1998) and Rubinstein (1998) have been modeling bounded rationality while Kahneman (2002) showed groups of possible influences. Elster and Rendall (2009) take an analytical approach to human behavior searching for regularities of reason and rationality. At the interpersonal level, boundaries of rationality are characteristics of the individual. Davis et al. (2007) define interconnection of personality traits with the lack in the decision – making. Individual's characteristics are composed of psychological, sociological and economic elements. Psychosocial elements can be defined by determination of personality traits, cognitive capacity and value scales. The implicit measure of general attitudes reveals value scales. Hanisch et al. (1998) found the scientific significance of general attitudes and value scales in repeated individual's behavior. Chen, Goodard and Casper (2004) determined the correlation between general attitudes with attitudes toward the work. Personality traits and value scales are psychometric variables. There are tests, which facilitate the determination of those values. Psychometric tests often have been using in hiring selection process. Such data enable employers detail insight in possible behavior and attitudes of the candidates. Parks and Guay (2012) connected value scales to a work performance. Kulas (2012) points out on the prevalence of making personality profiles in the job selection process. Two, the most famous models of personality, are the ones, which Furnham (1996) compared: Five-factor model[4] and Briggs – Mayers Type Indication model (MBTI)[5]. The critics of MBTI model points out Murray (1990) claiming that the model could determine subjects preferences, rather than personality traits. Exploring the critique of Briggs – Mayers model, in his research Furham (1996)determined the significant correlation of four personality traits from Five-factor model to four traits from Briggs – Mayers model. The only non-correlated trait is neuroticism, which occurs only in Five-factor model. MBTI is the most commonly used model for the non-psychiatric population. Briggs – Mayers' model can be used in career counseling according to Kennedy (2004), which confirms that personality traits are a predisposition for certain jobs.

4 Five-Factor Personality Inventory (FFPI), which was constructed in 1997, by Dutch scientists Hendriks, Hofstee and De Raad, and it is composed of five personality traits: extraversion, conscientiousness, openness to experience, agreeableness and neuroticism. Allport and Odbert (1936) have defined that five personality traits.

5 Katharine Cook Myers and Isabel Briggs Myers are creators of indicators of personality traits based on Jung's personality types. Educational Testing Service publishes their questioner for the purposes of research in 1962. After over a decade of testing the indicators, 1975. Consulting Psychologists Press, Inc. publishes MBTI as psychological auxiliary tool. Isabel Briggs Myers later publishes several editions of MBTI Manual. Personality indicator is based on four bipolar traits: extraversion – introversion, intuition – sensing, thinking – feeling, perception – judgment.

Given the stated, we will use Myers – Briggs type indicator, combined with value scales gained by general attitudes for modeling bounded rationality. The presumption is that such defined bounded rationality enables detail insight in chosen moves in stages of the communication process of a job interview. Moreover, we assume that bounded rationality game theory model can reveal the causal connection between individual's characteristics and his productivity with conversation outcome.

3. Methodology

„Because game theory is about people (and groups of people) thinking about what other people and groups will do, it is unlikely that pure logic alone will tell us what they will happen "(Camerer, Ho, Chong, 2001: 3).According to that conclusion, next logical step is to include some indicators of human behavior, i.e. implement behavioral element in the model. Models of the behavioral game theory are usually based on statistical equilibrium[6], which represent a result of experimental research or a survey on a large number of respondents. In this model, behavioral elements, which will serve as statistical generalization, will reinforce the classical concept of perfect Bayesian equilibrium. Behavioral elements will shape bounded rationality, given the probability of choices, respectively the player's type. Behavioral elements gained from personality traits and player's attitudes condition the probability of a certain choice by a certain type. Such strategies have „have numerical attractions that determine the probabilities of choosing different strategies through a logistic response function "(Camerer, Ho, Chong, 2001: 5).

For convenience, it is simplified assumed that the employer is a rational player. We assume for the candidate that he will behave rational, within the boundaries defined by his attitudes, behavior and motivation. There are several tendencies in modeling bounded rationality (A. Rubinstein, 1998, C. F. Camerer, T. H. Ho, J. K. Chong, 2001.). Those researchers tend to defineboundaries in making decisions: biological traits of decision-maker, current motivation, amount of known information and knowledge, limited memory, effect of limited perception on information absorption, limited anticipation of future events, cognitive abilities (learning abilities and thinking processes). Within this paper, we will consider the indicators of personality traits and attitudes of the decision maker, and implicitly his motivation. Regarding the influences of limited perception on information absorption, we will assume that in the considered situation can affect only on the employer. However, we

6 Quantal response equilibrium, statistical generalization of Nash equilibrium

already assumed that the employer is rational[7], so there will be no further discussion on this influence. Limited memory and limited anticipation of events relate to time. Within the game, we will model the amount of information and knowledge. We will not analyze cognitive abilities further on. First, because it is assumed that cognitive abilities of both employer and candidate are high enough to play this game[8]. Second, the difference in cognitive abilities plays crucial role in strictly non-cooperative game without possibility of making agreement (where one player wins only if another player loses), or in cooperative games where rules can be bind and creative thinking can lead to win. In this case, candidate and employer have to have at least similar interests[9], so differences in cognitive reasoning should not affect the outcome.

The players are employer and job candidate. The candidate has a private information on his type while the information is unknown to the employer. The communication between employer and candidate is derived trough two simultaneously played games. The first game is obvious – dynamic game of incomplete information and the second one is hidden - Cheap talk[10]and it reveals its self, through the sequenced choices in the first game. Let the structure of the obvious game is set as follows (see figure 1).

The job interview starts with a contact. While, employer makes the first move (employer, E) based on received applications, and at his disposal there is strategy E_1 = {contact}, i.e. movesE_{1a} and E_{1b}. Strategy of employer (at each stage) is not a single line, as it would be stated for the sake of simplicity, but the set or arguments, sales techniques and persuasiveness in order to gain candidates trust and reveal the candidate's type. We will offer the concrete alternatives of the moves and strategies keeping in mind "average type of personality in observed population". By discovering the candidate's type, employer determinates possible contribution of the candidate to the company, regarding economic, sociological and psychological elements. This isalso true for the candidate, whose answers and statements we have summarized and interpreted as the acceptance or decline. If the employer chooses the move E_{1a}, to invite the candidate for an interview, the candidate gets to make his move. If the employer chooses E_{1b}, i.e. not to invite the candidate for an interview, the game ends.

7 One of basic presumptions of game theory models is player's rationality. In this model, only one player's rationality will be modeled as bounded.

8 Cognitive abilities could represent a problem in model generalization without individual approach.

9 The employer's interest is to find out candidate's interests and it is in his interest that candidate realizes the offer, because he knows the limitation parameter.

10 Crawford and Sobel developed the communication model, and in the sequel, Gibbons' (2002) variant of the model will be used.

If the candidate chooses the moveC_{1b}: {decline}, the game goes in a loop[11]to the beginning of the stage. Then, employer reproaches to the invitation and check if the candidate move has changed (the employer will reformulate previous statement, and giving the loop it will be the move E_{a1}).Given the loopback, "a" strategy is strictly dominant to "b" strategy for the employer.

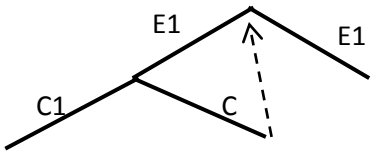

Figure 1. The loop in the decision tree of the dynamic game of job interview which occurs when candidate responds negatively for the first time.
Source: Authors

If the candidate chooses the same move again, the game ends. A similar situation will repeat whenever candidate responds negatively for the first time. The loopback asks for the confirmation of the candidate's negative response to a question in current stage and to not continuing the game.

If the candidate responds positively, game exceeds to stage two. In the second stage candidate and the employer get to know each other and the employer presents himself and job and its potential benefits. The employer can do that using the official approach (E_{2a}) or to use friendly approach (E_{2b})[12]. The employer chooses the moves, according to a few available data from the job application and previous part of the conversation. Regardless to employer's choice, the candidate can choose between acceptances or decline of the employers approach and given information. In the case of a negative response[13],the game goes in a loop to the beginning of a stage two. Given the new experience, the employer chooses another "first" approach[14]. Let the employer chosesE_{2a}, and the candidate responds with C_{2a}, which leads to the third stage of the game.

11 As shown in the Scheme 2.
12E_2 = {introduction}
13 Decline could mean direct decline of offer, but also misunderstanding of the offer or lack of establishment of trust and failure of proper assessment of candidate's type as a result.
14 By loopback, E_{2a} becomes the move of friendly approach.

In the third stage, the employer's goal is to identify primarily motives by determining candidate's general attitudes[15] and use it to induce the cooperation in desired direction. He still does that in friendly manner, as the candidate accepted in the previous stage. The employer tries to motivate candidate and to track his reaction, and even if the candidate responds negatively, he will be able to try again. The employer can make a moveE_{3a}, hence motivate through safety needs[16]or the moveE_{3b}, hence motivation trough the profit[17]. If the candidate responds positively to employer's motivation by safety needs, the game forwards to the fourth stage. The employer has two more information: first, the candidate responds positively to friendly approach and safety motives.

At the fourth stage, the employer will try to deepen the existing motives and to check if there is a specific goal tied to a motive[18]. Let the E_{4a}be the move where employer deepens the motive and connects it to a goal[19], and$E_{4b}$the move where the employer deepens previously knownmotives. In reality, it is more likely for employer to try with E_{4a}, so even if the candidate does not respond positively, he gets to change it by playingE_{4a}. Let the employer chooses E_{4a}, and the candidate response is C_{4a}.

In the fifth stage follows the resume of conversation so far E_5 = {resume}. Employers "a" strategy, $E_{5a}$is a complete statement, for example: if I understood correctly, you are anopen-minded young individual, and you want to test your skills in a new job and you are enjoying working with people.You are a loyal person and have a need for safety. You value tradition, structure, and organization, and economic benefit is important to you. Is all I have stated correct?", and strategy$E_{5b}$where theemployer asks for the conclusion: „How would you describe yourself given previous conversation? Do you want to improve your living standard by gaining a permanent job? ",where the employer deliberately misses out his conclusions to provoke a reaction from the candidate. The candidate can agree or disagree. If the candidate responds negatively, loopback takes the game to the beginning of the stage and employer reformulates the statement.

15E_3 = {discovering candidate's motives}

16 Group of motives contains safety, risk avoidance, health, comfort, social responsibility; lower but long-term earnings, long-term offer, etc.

17 The group of motives contains striving for acknowledgement, prestige, image, curiosity, fast profit, propensity for risk, short-term offers, etc.

18E_4 = {connecting the motives to a goal}

19 for example, does he works in order to be able to afford something specific to himself or to his family, does he have a higher purpose, is his goal to be employed in such job, where does he see himself in next 5 years etc..

In the sixth stage, employer represents eligible possibilities to thecandidate, keeping in mind previously stated preferences[20], and stage finishes by achieving the arrangement. The employer can suggest E_{6a}: taking overall workload (full-time employment) or E_{6b}: taking over only part of the workload (probationary work or part – time employment). The candidate can accept or decline. If he declines, the employer will try to bargain with the counteroffer (but within the utility boundaries). With the answer game ends.

The given structure intertwines with the game that has been simultaneously playing off and is based on Crowford and Sobel Cheap talk model (Gibbons, 1992: 210 - 218).Cheap talk model is communication signal model in which the message itself does not have a direct influence on the payoff, the message itself is just a talk – without the expenses, a statement, which is not possible to verify at the time. The only way the messages, the talk, can influence the payment is indirectly if under their influence the message receiver changes his belief on the sender's type. To consider the message informative, several terms have to be met. According to Gibbons (1992), a necessary condition in "Cheap talk" game is that different senders should have different preferences on receiver's actions. Respectively, the second necessary condition is that a receiver has different preferences on his actions given the type of the sender. The thirdnecessary condition is that the receivers and senders preferences on actions are not the complete opposite. For the sake of simplicity, we will divide the sender's type in high and low, where high and low, in this case, denote the level of qualifications[21].Presumed that the receiver will prefer lower – level – qualification action if the message comes from lower type sender, respectively high-level qualification action if it is a high type sender. If the sender also prefers low action for a low type and high action for a high type, they can establish communication. If it were any different, it would be deceptive communication; hence, we could not model it within this framework[22].

20 For example, if candidate positively responds to profit group of motives, the employer's offer should offer additional earnings through the provision system. If candidate positively responds to safety group of motives, the employer's offer should contain job with constant earning.

21 The sender's type can, but does not have to be treated as behavioral element. In the observed situation, it represents a behavioral element. If this game would have been played between two companies, then their type would have been denoted by their productivity, or know-how.

22 Accordingly, it can be presumed that honesty and sincerity is a necessary condition for the application of the multi stages cheap talk game. For example, the candidate can claim that he has high-level competences, which is unverifiable statement at that time for the employer. That message can affect employer's belief and convince him that candidate in fact has high-level

Derived from Crowford and Sobel model, it is introduced a parameter that measures the deviation candidates' from employer's goals. The parameter b measures the allowed deviation of interests, to continue communication: $n(n-1)\cdot 2b < 1$.

Respectively, adapted:

$$n^{*}(b) \le \frac{1}{2}[1+\sqrt{(1+\frac{2}{b})}] \quad (1)$$

4. Results

A certain stage has a positive outcome if the candidate answered positively, respectively if the candidate answers negatively, game finishes with the payoff 0 (the payoff that candidate and employer earn if they do not come to an agreement). If it is positive, the subgame outcome or the outcome of a certain stage represents an information input for the next stage. The space of possible outcomes for employers[23]are given as $E = \{E_1, ..., E_6\}$, and each strategy contains feasible moves

$$E_{i=1}^{6} = \{E_{ai,} E_{bi}\}. \quad (2)$$

The space of possible strategies for candidate is defined as $C = \{t, C_1, ..., C_6\}$, and each strategy has set of feasible moves

$$C_{i=1}^{6} = \{C_{ai}, C_{bi}\}. \quad (3)$$

Cheap talk constraint is true for the entire game and will be denoted with parameter b. The information set h is continuous during the whole game (in each following stage higher level of information set occurs. Hence players have access tolarger set of information for decision-making), and each decision knot h(x) of the employer follows updated belief on the candidate's type and implicitly his rationality[24].

The first stage is composed of three moves, as the scheme points out. In the first move, the candidate chooses his type by choosing from the space of the possible types

competences, but the employer can have the opposite belief. In addition, similar game could be modeled from the candidate's perspective and he would have a choice to believe that his employer wants a cooperation and mutual benefit, or he could believe that employer wants to take advantage of him.

23The employer and the candidate can use mixed strategies, which means that they do not have to stick to one strategy during the whole game.

24 The same indicators that define candidate's type represent the boundaries of his rationality, as will be discussed further on.

$$t = \{t_1,...,t_h\} \quad (4)$$

given by the candidate's nature. For the simplicity, the candidate will choose between two types t_l andt_h. In the next move, employer chooses between E_{1a} ={offer a job interview to a candidate} and E_{1b} = {not to offer a job interview to a candidate}. Information sets denote levels of players getting familiar, and at certain levels, it will be denoted by the belief on candidates attitudes and behavior.

By reaching the higher information set[25]the employer comes closer to complete reveal the candidate type, therefore, the limitations of his rationality. In the first information set, h_1 there are two decision knots. The employer knows that the first information set has been reached. At that decision knots the employer has belief on candidate's type $\mu(t)$ which can take values 0 and 1.

At the decision knot (x_1) the employer's belief that candidates type t_v is 1, and is equal to the sum of the relative frequencies of behavior and represents the belief that the candidate is such type t_v that is worth the effort and time of the job interview. At the decision knot $h(x_1^{'})$ the belief is 0, the employer finds that the candidate does not fit a profile of a potential candidate (candidate type is t_n). Given that, players have to choose strategies their belief: if employer's belief is 1, the only move that satisfies the equilibrium condition is E_{1a} and the game follows to a next stage. If the employer's belief is 0, the only move that meets the condition of the equilibrium is E_{1b}, and the game ends (see figure 2).

25 Figure 2. shows only information sets that can occur in the game, given the limitations, i.e. feasible sets and moves. The equilibrium moves are denoted with bold line.

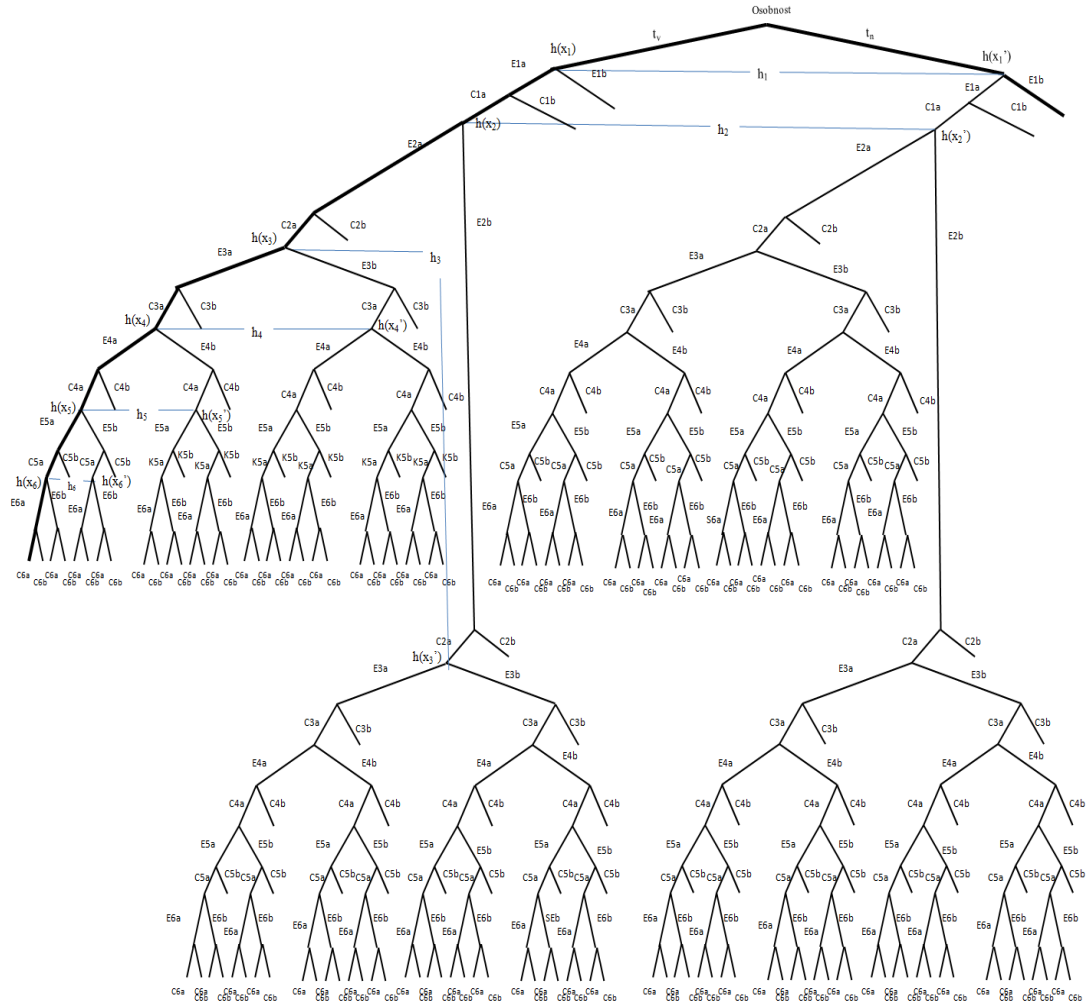

Figure 2. Dynamic game of incomplete information decision tree. *Source: Authors*

The tables present candidate's type and employer's belief on the candidate type and the shown data is the result of the survey. At the beginning of the game, the employer's belief of the candidate's type will be equal to the type of the "average person"[26] which will define starting strategies, and the beliefs will be adapted as the

26 Frequencies of the value scales of the "average" individual denoted by general attitudes are individualistic attitude: 0.221009254, theoretical attitude: 0.172787739, economic attitude:

game takes off. The candidate is randomly chosen from the survey, and it will serve as a figurative example for the demonstration of the model.

If candidate's type is t_v, and if the employer played E_{1a}, the candidate's equilibrium strategy will be E_{1a} = {acceptance} and the game exceeds to a next stage, respectively if the candidate type is t_v, his equilibrium strategy will be C_{1b} = {decline} and the game ends.

Table 1. The example of the adjustment of beliefs of relative frequencies of the value scales and personality traits at the beginning of the second stage of the dynamic game of job interview with incomplete information

	Relative frequencies of the population average (x_1)	Relative frequencies Adjusted ranking h(x_2)	Relative frequencies of the candidate	Proposed deviation in absolute value
Individualistic attitude	0.1105046	-	0.075	- 0.025
Theoretical attitude	0.0863939	-	0.05	-0.025
Economical attitude	0.0688982	+	0.1	+0.025
Social attitude	0.0756578	+	0.085	+0.025
Traditional attitude	0.071501	+	0.115	+0.025
Esthetic attitude	0.0870445	-	0.075	-0.025
Introversion – Extraversion	0.130341355	+	0.1666667	+0.025
Intuition – Sensing	0.109774067	-	0.0972223	-0.025
Feeling – Thinking	0.108300589	-	0.0694445	-0.025
Perception - Judgment	0.151583989	+	0.1666667	+0.025
Σ	1		1	Σ b = 0.25

In the second stage, employer is first on the move, and he is aware that he is in the second information set h_2. Observes and analyzes candidates move and updates his

0.137796414, social attitude: 0.151315789, traditional attitude: 0.143001735, esthetic attitude: 0.174089069. Frequencies of the behavioral components of the personality type of an "average" individual: introversion - extraversion: 0.260682711, intuition - sensing: 0.219548134, feeling – thinking: 0.216601179, perception - judgment: 0.303167976. The indicators denote how frequently a specific behavior occurs on one's behavior. For simplicity, the frequencies will be pondered to sum up to one, which will ease the calculation of the deviation.

beliefs. He will do that by arbitrary ranging value scales and personality traits[27], as shown in the table.

The employers belief at the knot $h(x_2)$ is $\mu(t|C_{1a}) = 1$. The deviation in the first stage cannot be calculated. The deviation denotes the difference between employers and candidates interests[28]. It is necessary to calculate that deviation at the end of each stage, and that serves as an input for the next stage, as shown in Table 1. So that game exceeds to the second stage, the deviation has to be less or equal to 0.25. Accordingly, the condition that communication successfully reaches the end of the stage two is $b \leq 0.25$ and has been met according to the distribution of suggested deviations from the table. Simplified, if one observed the job interview and it did not exceed to a higher stage, that means that the deviation was too big.

Table 2. The example of the adjustment of beliefs of relative frequencies of the value scales and personality traits at the beginning of the third stage of the dynamic game of job interview with incomplete information

	Relative frequencies of the population average $h(x_2)$	Relative frequencies Adjusted ranking $h(x_3)$	Relative frequencies of the candidate	Proposed deviation in absolute value
Individualistic attitude	0.0855046	-	0.075	-0.00834
Theoretical attitude	0.0613939	-	0.05	-0.00834
Economical attitude	0.0938982	+	0.1	+0.00834
Social attitude	0.1006578	-	0.085	-0.00834
Traditional attitude	0.096501	+	0.115	+0.00834
Esthetic attitude	0.0620445	+	0.075	+0.00834
Introversion – Extraversion	0.155341355	+	0.1666667	+0.00834
Intuition – Sensing	0.084774067	+	0.0972223	+0.00834
Feeling – Thinking	0.083300589	-	0.0694445	-0.00834
Perception - Judgment	0.176583989	-	0.1666667	-0.00834
Σ	1			Σ b = 0.0834

27 Let that is true that employer knows the distribution of relative frequencies of value scales and personality traits and the process of psychometric data gathering. Accordingly, he will start the game with the belief of the average individual.

28 The employer learns about the candidate's type, respectively his interests, and he adapts to what he has learned. We can see that from the employer's belief adjustment.

In the second stage, employer has at his disposal move E_{2a} = {friendly introduction} and E_{2b} = {official introduction}. If the employer's belief is a $\mu(t|C_{1a}) = 1$, his equilibrium strategy can be only E_{2a}. The candidate can choose between the moves C_{2a} ={cooperation/ positive response} and C_{2b} = {decline/ negative response}. Given the candidate has to play his move accordingly to his type, his only feasible strategy is C_{2a}.

The third stage starts with the employer's move, and he is at the decision knot at the third information set, $h(x_3)$. He observes candidates move and updates beliefs.

Table 3. The example of the adjustment of beliefs of relative frequencies of the value scales and personality traits at the beginning of the fourth stage of the dynamic game of job interview with incomplete information

	Relative frequencies of the population average $h(x_3)$	Relative frequencies Adjusted ranking $h(x_4)$	Relative frequencies of the candidate	Proposed deviation in absolute value
Individualistic attitude	0.0771646	-	0.075	-0.004167
Theoretical attitude	0.0530539	-	0.05	-0.004167
Economical attitude	0.1022382	-	0.1	-0.004167
Social attitude	0.0923178	-	0.085	-0.004167
Traditional attitude	0.104841	+	0.115	+0.004167
Esthetic attitude	0.0703845	+	0.075	+0.004167
Introversion – Extraversion	0.163681355	+	0.1666667	+0.004167
Intuition – Sensing	0.093114067	+	0.0972223	+0.004167
Feeling – Thinking	0.074960589	-	0.0694445	-0.004167
Perception - Judgment	0.168243989	+	0.1666667	+0.004167
Σ	1		1	Σ b = 0.04167

Third stage deviation has to be smaller or equal to 0.0834. Table 3 shows the distribution of the deviations, respectively, the minimum condition for reaching the end of the third stage has been met. The employer has two feasible moves, E_{3a} =

{motivation by the group of safety motives} and E_{3b} = {motivation by the group of profit motives}. The candidates possible moves are C_{3a} = {acceptance and cooperation} and C_{3b} = {decline}. The employer's updated belief is $\mu(t|C_{1a}, C_{2a}) = 1$, and congruently the equilibrium move is E_{3a}. The candidate equilibrium move is C_{3a}, because playing the other move would be contrary to candidate's type.

The employer observes candidates move and updates his beliefs at the fourth decision knot, as shown in Table 4. For the fourth stage, the deviation has to be smaller or equal to 0.04167. In the Table 4, one can read the proposed distribution of deviations, and see that the condition that communication reaches the end of the fourth stage is satisfied. The employer's moves can be E_{4a} = {connect the motives to a certain goal} and E_{4b} = {deepen the motivation without connection to goals}. Candidate can respond with C_{4a} = {acceptance/ cooperation} and C_{4b} = {rejection}. The employer's belief is $\mu(t|C_{1a}, C_{2a}, C_{3a}) = 1$, and his optimal strategy is E_{4a}. With the given employer's move and the candidate type, the candidate's answer is C_{4a}.

Table 4. The example of the adjustment of beliefs of relative frequencies of the value scales and personality traits at the beginning of the fifth stage of the dynamic game of job interview with incomplete information

	Relative frequencies of the population average $h(x_4)$	Relative frequencies Adjusted ranking $h(x_5)$	Relative frequencies of the candidate	Proposed deviation in absolute value
Individualistic attitude	0.0729976	+	0.075	+0.0025
Theoretical attitude	0.0488869	+	0.05	+0.0025
Economical attitude	0.0980712	+	0.1	+0.0025
Social attitude	0.0881508	-	0.085	-0.0025
Traditional attitude	0.109008	+	0.115	+0.0025
Esthetic attitude	0.0745515	+	0.075	+0.0025
Introversion – Extraversion	0.167848355	-	0.1666667	-0.0025
Intuition – Sensing	0.097281067	-	0.0972223	-0.0025
Feeling – Thinking	0.070793589	-	0.0694445	-0.0025
Perception - Judgment	0.172410989	-	0.1666667	-0.0025
Σ	1		1	Σ b = 0.025

At the beginning of the stage, employer observes the candidate action and updates his beliefs, as shown in the table 4. As the table shows, the updated distribution of the relative frequency has low enough deviation, which has to be lower or equal to 0.025. Necessary and sufficient condition is satisfied, and the game can reach the end of stage five.

Possible moves in the fifth stage for the employer are E_{5a} = {partial offer} and E_{5b} = {complete offer}. The moves can be C_{5a} = {acceptance/ cooperation} and C_{5b} = {decline}. Given the employer's belief $\mu(t|C_{1a}, C_{2a}, C_{3a}, C_{4a}) = 1$, his optimal move is E_{5a}. Given the employer's move and the candidate's type, the only option for candidate is to play C_{5a}.

Table 5. The example of the adjustment of beliefs of relative frequencies of the value scales and personality traits at the beginning of the sixth stage of the dynamic game of job interview with incomplete information

	Relative frequencies of the population average $h(x_5)$	Relative frequencies Adjusted ranking $h(x_6)$	Relative frequencies of the candidate	Proposed deviation in absolute value
Individualistic attitude	0.0754976	-	0.075	-0.00167
Theoretical attitude	0.0513869	-	0.05	-0.00167
Economical attitude	0.1005712	-	0.1	-0.00167
Social attitude	0.0856508	-	0.085	-0.00167
Traditional attitude	0.111508	+	0.115	+0.00167
Esthetic attitude	0.0770515	-	0.075	-0.00167
Introversion – Extraversion	0.165348355	+	0.1666667	+0.00167
Intuition – Sensing	0.094781067	+	0.0972223	+0.00167
Feeling – Thinking	0.068293589	+	0.0694445	+0.00167
Perception - Judgment	0.169910989	-	0.1666667	-0.00167
Σ	1		1	Σ b = 0.0167

In the last stage, employer solves the optimization problem. Given the game limitations, the employer has to place such offer such that the candidate will accept

right away. Otherwise, the game ends with payoffs 0. The employer can take E_{6a} = {q_2, work assignment set according to the group of security motives and goals} or E_{6b} = {q_1, work assignments set according to the group of motives}. Candidate moves can be C_{6a} = {acceptance} and C_{6b} = {decline}. After solving optimization problem and updated his belief, which now is $\mu(t|C_{1a}, C_{2a}, C_{3a}, C_{4a}, C_{5a}) = 1$, he chooses move E_{6a}. Given the denoted distribution of deviances, that move is within the limitation. Allowed deviation for this stage is 0.0167, as shown in the Table 5. Candidate observes employer's move and chooses consistent move, which is C_{6a}. The game ends with positive payoffs for both candidate and employer.

Although at the first sketches looks like there are 190 possible outcomes, at the equilibrium path there are only two possible outcomes (bolded at the scheme 2). This model represents a combination of the dynamic game incomplete information model and behavioral game theory model. By establishing equilibrium strategies rules of both dynamic games of incomplete information and statistical equilibrium concept. Even though the game comprises larger parameter number, there is a relatively small number of outcomes. The reason is reinforced equilibrium concept. If the employer wants to achieve the positive outcome and confirm the candidate's type, he must strive to set up cooperation. Given that the positive outcome for the employer is at the same time positive outcome for the candidate, there is a motivation for the cooperation. The employer will achieve that by following the only equilibrium strategy, hence by implementing his offer into a function of candidate's motivation, i.e. goals.

5. Conclusion

This paper examines communication relation of the employer and the candidate at the job interview. We have placed conversation within the game theory framework to gain detailed insight into the communication process, strategy and move analysis, and defining equilibrium solution. The model enables definition and explanation of the causal connection between personality test, value scales and the course of the information exchange, chosen moves by the stages and equilibrium outcome. Implementation of behavioral elements affects the conversation outcome, the choices of strategies and moves, respectively on player's rationality. By (re)defining rationality, to achieve more faithfully and precise outcome anticipation at the interpersonal level emerges bounded rationality. Such defined rationality can explain individual's strategic choices in interactions. Respectively, if we redefine rationality, game theory can offer more faithful individual interaction models. When we introduced behavioral elements in the game, the rationality does not shape the choices

of the individuals toward payoff maximization in the classic sense. The term of payment for the player and his strive to its maximization, as well as the choice of the strategy depends on attitudes, behavior and player's type, which can but does not have to concur with rational choice of the strategies and maximized payment.The enriched gamehas behavioral elements such that they form a candidate's type and enable measuring deviation of employer's beliefabout candidate's type and forming a condition that has to be met in order that game continues.Applying perfect Bayesian equilibrium in combination with statistical equilibrium, the model provides two feasible outcomes, regarding the candidate's type. Therefore, we can conclude that the model describes proposed case precise enough, and can be used in anticipation of conversation process and the outcome of the job interview. Therefore, an employer that spotted potential candidate should carefully discover candidate's type and achieve desired outcome by placing his offer in the function of candidate's goals. Also, by discovering the candidate's type, the employer learns trough the game. What he has learned has to apply immediately by adapting his belief, strategy and choose future moves, which will lead to the preferred outcome.

It is interesting and not completely expected to notice that the model does not allow positive outcome for the case of deception. The player that would try to deceive would eventually be uncovered making the damage to himself as the result. If a candidate tries to deceive, the employer will recognize that it is a low type instead of high type, the hence deviation would exceed allowed limit and the game would not follow to the next stage. Similarly, the candidate would end the communication if he discovers that the employer's offer deviates too much form his interests.

The modelmay use as a theoretical framework for better understanding of the interaction between individuals. Also, it can serve as a preparation for a specific case of job interview, with the behavioral type input adjustment. The application can be expanded to similar models (given that substantial amount of data is available, and that inputs are calculated from epmirical data)of the individual cases of the negotiation of two persons. With minor adjustments, the model can be applied to theoretical and practical anticipation of processes and outcome of negotiation or bargaining of two individuals like recruiting, business partnerships, most forms of sales, mentoring and coaching of an employee, individual teaching, and even at persuasion at personal interactions.

Bounded rationality is rationality shaped with attitudes and player's behavior, so it is necessary to adjust it to each specific case, which makes this model harder for the application. Furthermore, the inputs on the "average" individual can vary regarding the country and the culture. Hence, it would be necessary to conduct research to define value scales and personality traits. So far, data on"average" individual in this paper is

applicable for Croatia only. Inductively, a framework for the modelling rationality of population can be set.

Preferably, further researches should provide additional confirmation of explicatively and predictive abilities of the model. Also, area for further researches could be the application of this model in various situations of interpersonal communication, as well as for cross-cultural assessment of the model sustainability. Furthermore, it would be interesting to check if aggregated individual decisions and interactions can explain elements of social and economic development.

REFERENCES

[1] **Allport, G. W., Odbert, H. S. (1936),*Trait-names: A Psycho-lexical Study*;**Psychological Monographs, Vol. 47(1);
[2] **Camerer, C. (1998*), Bounded Rationality in Individual Decision Making*;**Experimental Economics, 1, pp.163–183;
[3] **Camerer, C., Ho, T. H., Chong, J. K.(2001),*Behavioral Game Theory: Thinking, Learning and Teaching*,**internet edition, http://faculty.haas.berkeley.edu/hoteck/ ;
[4] **Chatterjee, K., Lilien, G. L. (1986),*Game Theory in Marketing Science. Uses and Limitation***, International Journal of Research in Marketing, Volume 3, Issue 2, pp.79–93;
[5] **Chen, G.,Goodard, T. G., Casper, W. J. (2004),*Examination of the Relationships among General and Work-Specific Self-Evaluations, Work-Related Control Beliefs, and Job Attitudes***, Applied Psychology 53 (3), pp. 349-370;
[6] **Davis, C., et al.(2007),*Personality Traits Associated with Decision-making Deficits***;Personalityand Individual Differences 42, pp.279–290;
[7] **Elster, J., Rendall, S. (2009),*Reason and Rationality***; *Princeton University Press*, New Jersey;
[8] **Furnham, A. (1996),*The Big Five versus the Big Four: The Relationship between the Myers- Briggs Type Indicator (MBTI) and NEO-PI Five Factor Model of Personality***; Personality and individual differences, 21,pp. 303 – 307;
[9] **Gibbons, R. (1992),*Game Theory for Applied Economists;*** Princeton, *New Jersey Princeton University Press*;
[10] **Hanisch, K. A., et al.(1998),*The Importance of Individuals' Repertoires of Behaviors: The Scientific Appropriateness of Studying Multiple Behaviors and General Attitudes***; Journal of organizational behavior, 19, pp. 463 – 480;
[11] **Joshi, M. S., Denson, N., Downes, A. (2013),*Quant Job Interview: Questions and Answers***; *Pilot Whale Press*;

[12] **Jung, C. G. (1971),*Psychological Types***; Princeton, New Jersey: *Princeton University Press*;
[13] **Kahneman, D., Tversky, A. (2003),** ***Maps of Bounded Rationality***; The American Economic Review, 93(5), pp. 1449-1475;
[14] **Kennedy, R. B., Kennedy, D. A. (2004),** ***Using the Myers-Briggs Type Indicator in Career Counseling***; Journal of employment counseling, p. 41: 38 – 44;
[15] **Kulas, J. T.(2012),** ***Personality – Based Profile Matching in Personnel Selection: Estimates of Method Prevalence and Criterion – Related Validity;*** Applied psychology;
[16] **Murray, J. B.(1990),** ***Review of Research on the Myers-Briggs Type Indicator*****;** Perceptual and Motor Skills, 70, pp. 1187-1202;
[17] **Myers, I. B., McCaulley M. H., Quenk, N. L., Hammer, A. L. (1998),** ***MBTI Manual (A guide to the development and use of the Myers Briggs type indicator)***; Consulting Psychologists Press; 3rd edition;
[18] **Nassiri – Mofakham, F., et al. (2009),** ***A Heuristic Personality-based Bilateral Multi-issue Bargaining Model in Electronic Commerce***; International Journal of Human-Computer Studies 67, pp. 1–35;
[19] **Nassiri – Mofakham, F., et al. (2008),** ***A Personality- based Simulation of Bargaining in E-commerce***; Simulation & gaming, 39, pp. 83 – 102;
[20] **Parks, L., Guay, R. P.(2012),** ***Can Personal Values Predict Performance? Evidence in an academic setting***; Applied psychology, *61* (1), pp. 149–173;
[21] **Roozmand, O., et al. (2011),** ***Agent-based Modeling of Consumer Decision Making Process Based on Power Distance and Personality*****;** Knowledge-Based Systems 24:1075–1095;
[22] **Rubinstein, A. (1998), M*odeling Mounded Rationality***; Cambridge, MA: *The MIT Press*;
[23] **Škare, M., Kostelić, K., Justić Jozičić, K. (2013),** ***Does Higher Education Pay off? – Micro an Macroeconomic Policy Implications***; The future of economics: Between rules and discretion; Juraj Dobrila University of Pula, pp. 93 – 120;
[24] **Škare, M., Kostelić, K., Justić Jozičić, K. (2014),** ***Sustainability of Employee Productivity as the Presumption of Sustainable Business***; Economic Research Journal;
[25] **Tay, C., Ang, S., Van Dyne, L.(2006),** ***Personality, Biographical Characteristics and Job Interview Success: A Longitudinal Study of the Mediating Effects of Interviewing Self-Efficacy and the Moderating Effects of Internal Locus of Causality,*** Journal of applied psychology, 91 (2), pp. 446–454.