The Logical-Mathematic Calculus in the Theory of Decision-Making: Problems and Outlook

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Abstract: This article is devoted to an extensive and rather modern scientific area – Decision-making theory. The author uses logical-mathematical bases of Decision-making theory to make an explication of the existential features of the choice, which is based on four main martingales: trend, time, men and phobia. The last four constituents "have power" above human-being and impress the situation of decision-making. The impression on such situation allow to minimize a risk, to predict results and to create a strategy with positive result.

Key words: Decision-making theory · Trends · Men · Time · World · Phobia · Situation · Strategies · Strategems

INTRODUCTIONS

Decision theory has an important place in the area of economical management and financial tradings of investments at the market in the political and social area, ethics, bioethics and jura.

Decision theory has a large theoretical bases in achievements of exact sciences: mathematical statistics, the theory of possibility, prediction and games and as well interdisciplinary sciences: neuroeconomics, economical psychology, which are popular nowadays. However in the Decision – theory is shown an imbalance between technical, statistical and psychological methods. That is why this research has a task to use technical, statistical and psychological methods [12].

Decision Theory belongs to the area of men's *ethical responsibility*, because it is based on existential factors and making a choice situation. So making a decision is a choice of a person, who is impressed by ethical features of that society, where he was born, grew up and continue to live [19; 20; 21]. In this case the ethic adds some information in the situation of a choice and the routine to create a space of the *personal responsibility*. The decision is a definite variant of an answer, it is necessary to interpret the situation of the choice. To minimize risks by the choice is possible thanks to the model of *equilibrium ethics* – managing ethical and existential structure, which connect all processes in the world and it is "internal law and principle in us", according to Kant's ethical model it is an answer to the second main philosophical question – "What should I do?". In other words: what should I do in this case to minimize my risks and achieve a success.? [1, 102].

In our case this connection tries to fix laws of men's behavior, which are typical for definite trends- pricing trends, market mechanisms and trends and so on. The idea of *ethical trends* (market, politics, technologies, culture etc) has the following purpose to create the model of equilibrium management of trends, to rule the case in any situation of decision making and to minimize risks and loses and to increase positive results [11, 199].

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In economics the last conflicts are financial crises, they show changes of the price policy in the market. Earlier the main forms of exchange were gold, jewelleries, lands or monarchs' daughters, who were exchanged for the favorable union, peace and so on. When national and international currencies appeared, people began to compare the definite weight and the price of gold. Marshal's plan about the restoration of Europe after the Second World War, made dollar as the main currency. It is worth talking about the turning point in pricing, it shows the change of valuable structure in the world. This moment modified prices and removed features of natural economics as a market. The price (dollar, euro, yuan and even gold and oil) depends on psychological component and trading of any products. This is called the circle of the exchange, when the exchange currency is used in the market as his factor and as a result of trade relations.

MATERIALS AND METHODS

The ethical possibility occurrence of an event. With development of real and semantically rich logical language for the events description in Voishvillo's theory about "possible worlds" [7, 216], appeared an opportunity to arrange the situation of choice the logical situation. The logical situation is an opportunity (not a possibility) in occurrence of an event. However the logical situation shows the technical method in solution of existential situation of the choice. The situation of choice making is an existential situation.

The idea of choice making bases on the hypothesis, a decision maker chooses more often not an absolutely minimum risky variant, but the most minimum risky variant of the society, where the human exists. Often a simple choice of human's decision in any situation relates to the choice to be a human, if it is clear and it has not got changeable features. This simple and obvious statement is often underestimated. Although the exact interpretation of human being means the exact interpretation of existential situation, where he is present. Under the interpretation of the situation we understand the interpretation of the society and main constituents, which create it: trends, time, people, phobia [25, 184]. Most of the modern theories of decision making use a human as an automated machine of decision making and consider him as a definite constituent, which has limited and final number of features. In spite of advantages there are disadvantages in this method. The main is modern management technologies are not effective enough to represent a human as the first model. We think, this disadvantage is one of reasons: why it is impossible to create a possible world, which will be maximum similar to the reality and to reach an opportunity of forecasted result. A human as the main element in the system of decision making, should stay not at the beginning of analyses. A human is a result. Such methodology of decision making changes the theory.

The Logical Possibility Occurrence of an Event: On the bases of the ethical possibility [26] of the situation in choice is necessary the explication of logical meaning in the situation of decision making. The explication of its logical meaning allows to represent the decision making and to give the problem of decision making a practical meaning.

It is worth noticing the fact, that logical and ethical possibility is characterized by predictive narrative. In this meaning for forecasting possible events the presence of one real world is not enough. Such existence of other worlds is present in our consciousness, for example Husserl wrote: «correlate of the definite experience, which is called "the real world", is a special case of many possible worlds and not-worlds. All these worlds and not worlds are the correlate of possible variant ideas, "in the experience of the consciousness" with definite connection between the experience» [2, 144]. Here it is worth saying about an important notice: the logical opportunity is not based on a trend from the situation. It is not a result of thinking of attractive consciousness. It is prepared by the experience and the experience influences on modeling of possible events. The interrelation, which Husserl discusses, is the main connection with the world, which becomes a prerequisite of such situation. «The availability never means only logical possibility, it is always a possibility inside the interrelation» [1, 145].Any decision belongs to the past situation, it exists and is prepared by the experience even, if this experience is not definite and formalized enough. «Everything, what is realiter, but it is not experienced, can become the reality and it means, that such thing belongs to not definite, but forecasted real experience. Such experience is a correlate of all components of uncertainty, they depend on the situation and these components are still discussed, they are always forecasted and motivated by their kinds» [2, 146].

Husserl says, possibilities are intended in advance in our being and now in the state. Our possible experience is always limited by our present experience and it is limited by the past. That is why we can discuss the causality of situations and the past state in the world system. The past influences on the development of the presence, it makes causally, the past does not allow the development to deviate, the past becomes the absolute possibility for the present. The present follows from the past, because the past becomes the behavior assessment in the future.

The instruments of the events in natural language are the semantics of possible worlds logic, which is represented by S. Kripke [23].

The topic (theme) of this research means use of methods in three science spheres: humanity, exact and interdisciplinary sciences. In the article are used interpretive and hermeneutics methods, narrative and conceptual analysis and configuring. The author pays attention to mathematical models of social changes, mathematical statistics, games theory, probability theory, theory of social conditions and social physics and neurolinguistics.

RESULTS

The semantics of possible worlds in intuitionistic propositional logic.

The model $<W,w_0,R,I>$, in which:

$$W \neq \phi \tag{1}$$

$$w_0 \in W \tag{2}$$

R – binary relation, which is set by w ($R \leq w \times w$) and which has features of reflexivity and transitivity $\tag{3}$

$$I(y,w) \in \{1,0\}, \tag{4}$$

where γ is derivative proposition variable, $w \in W$, I has a property of constancy: if $I(y,w) = 1 \wedge R(w_1,w_2) \rightarrow I(y,w_2) = 1$

Functions of an assessment in possible worlds:

1. $|\gamma|_w = 1 \leftrightarrow I(y,w) = 1$
    $|\gamma|_w = 1 \leftrightarrow I(y,w) = 0$

2. $|\bar{A}|_w = 1 \leftrightarrow \forall w^1 (R(w,w^1)) \Rightarrow |A|_w = 0$
    $|\bar{A}|_w = 0 \leftrightarrow \exists w^1 (R(w,w^1)) \wedge |A|_{w^1} = 0$

However Kripke's logic is evolutionary logic and it is its main disadvantage. It describes stationary situation with first features, which do not change during the analyses. In reality, where $w_2 \leftarrow w_1, w_2$ can be different from w_1, because time sequence w_1 and w_2. The causal reason w_1 cannot be the reason w_2 because one situation took place earlier than the other and followed it $w_2 \leftarrow w_1$, $(w_2 \in w_1 \vee w_2 \notin w_1)$.

In the evolutionary logic there is a principle of "a pyramid", where like in a child's toy different levels of knowledge are imposed with each other. But it is not always so, the scientific history cannot be represented as "mix of knowledge". The scientific history is an elimination process. Old areas are written in a new way. The terminology and methods are changed. The technical approaches, which were popular 100 years ago, are changed by other more "optimum and pertinent". The history of the science is not an increase, but a more difficult process.

The rhizome of possible an events. The logik-ethical interrelation of events create a difficult picture, which is characterized by logical research and ethical responsibility. The logical possibility tries to represent the main law of the ontological following events. The ethical opportunity limits it, it is connected with human's features in the world (society, trends, moral). The connection between two possibilities can be represented by the *rhizome of possible events*, which is two martingales adding the meaning to each other.
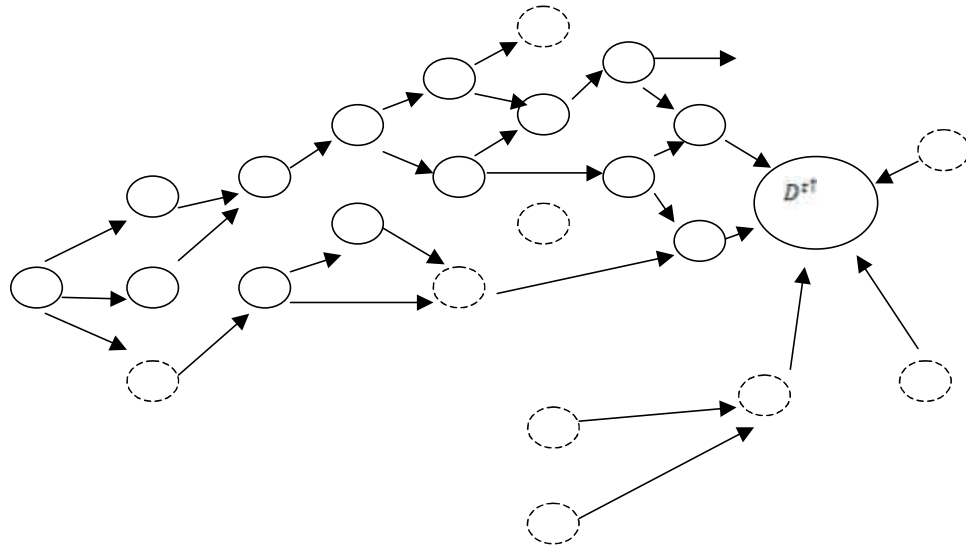

Image 1: The rhizome of possible an events

Assimilate each possible event S world – W, so, that an event $S = 1 \, S_w$, where $S_w \in W_n$, where $W_n \in \{W...\}$ to a set of worlds W. Each event corresponds to its possible world, where it has got value of truth and logical features of definite and concrete possible world influence on its truth.

Shown above the rhizome of possible events represents plenty of events (causal, difficult-causal, independent, linear and discrete), which lead to a situation - D^{t^t}. The Rhizome consists of elements, most of them are real events connected with cause-effect relations, which show a definite model in a definite period of time and factorial influence, but there are abstract hypothetical possible worlds in the model, where the situation does not develop, but they influenced the development of the situation. The human, who makes a decision, is not a physical element of the world, but an element, which create other possible systems of its existence – virtual worlds: mental, religious, family, moral, personal, cultural, aesthetic, the analyzes should pay attention to this influence on the choice. So the analyses of such influences meet difficulties and problems, it is important to change the method – to create artificial situations for decision making.

The rhizome of possible events is characterized by a *possible world*. We really live in some worlds, some of them are defined by the society, where we live, some are defined by us. There are many different worlds [15, 347]. For example in Physics we deal with the physical possible world. A bright example is the classical physical map of the world, which is represented by Cartesian coordinate system, where definite events can be described. Historical worlds of different periods exist, where event hermeneutics can be carried out. There is human's mental world, which can be interpreted thank to the theory describing it and to the definite world Freud's, Junginian's or Lakanov's therapy or patient's mental world. The worlds, which we describe, are connected with decision or choice, so the possible world is existential and have existential features. Considering its characteristics we can say about fundamental constants or special existential coordinates, which define the existential world of an event.

In Robert Chaldini's book [3;4] such situations are discussed. He writes, nowadays many our activities are reflexive by the method "signal – reflexive" because of time lack, high emotional pressure, limited information – and a huge wish. To create such situations, where decision is made by the method "signal-reflexive" [6, 85], is the main task of the existential analytics in decision making or artificial model of decision making. Existential analytics of the events in decision making can facilitate and simplify this task. There is the following diagnostics of situations: in the situation there are invariable constants, which define our existence in the world. The function of the existence or presence in the world is a constructive operator in tectonics of the world. This is shown by famous proofs of Foma Aquitanus, A. Kantenbery's, D. Scott, I.Kant. It is obvious, the world and the situation are created first to take a place for something, for the own existence or for a possibility to be a human.
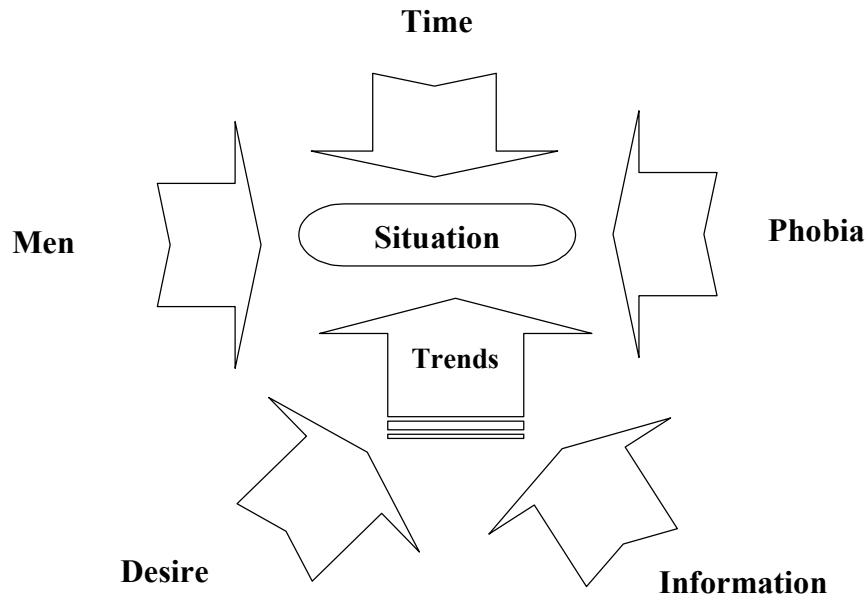

Image 2: The fundamental constituents of decision-marking in existential analytics

DISCUSSION

The Problems References of an Events: The revealed need of ethical and logical possibility and explication of rhizome of possible worlds and fundamental constituents, which influence on its formation, prepares the scientific area for technologization and automation of decision making. However methodological system meets with the fundamental problem of any theory of decision making – with the problem of the change of events, reasons, world into the technical language. That is why this theory of decision making has the aim – research of event changing into the logical language. In our case this is the language of intuitive and modal logic. However here the function of reference from the event into the statement makes doubt its feasibility. One of solution in this problem was offered in the "new theory of references" (K.Doneman, S.Kripke, H.Patnem) [4; 17], which reinterpreted critically the classical method of reference of the natural language into LLFRT, which takes place in logistsizm (Frege, Russel, Carnap) [8;9;10;14].

The central place in critics has the description of intensionals in the natural language, whose analytical character is under doubt in the "new theory of reference". Intensionals in the "natural language" are not analytical and cannot be aprioristic. They are static. For example think of three concepts: gold, lemon and tiger. According to Carnap's theory of reference the descriptions of these concepts are:

Gold = *(A)* – hart substance, precious metal.
Lemon = *(B)* – a yellow sour fruit
Tiger = *(C)* – a striped mammal animal, a predator.

Gold can be in gaseous and liquid state, it does not change its chemical content, but the definition, which we gave above, cannot meet the obvious object. A lemon, which hangs in a tree, is not yellow and a tiger can be born with gene mutation and have three paws or it can be white. Here the intensional depends on the feature of the object and the feature is that, what depends on the feeling and it can be not analytical, but descriptive. In other words intensionals, which we use, are not aprioristic, but they are the definite kind of object's description.

That is why we change three definitions:

$$\{\grave{A}\} \sim \{A^I\}$$

$$\{\hat{A}\} \sim \{B^I\}$$

$$\{\tilde{N}\} \sim \{C^I\}$$

If we give to every definition an exact description, we enrich each definition.. «{…}» - here conditional character of these definitions is discussed. We do not know at first, that $A^I \in A$ and is similar to others, that is why in operation $\{A\} \approx \{A^I\}$… we begin the description to make A- $\varnothing$. «$\approx$» - means a logical description or a definite value of an area. Before the description of the object or event it is worth noticing, that conditions of the *logical description influence on the description of the object*.

Frege's idea: every person has a meaning of a concept, is incorrect. It is incorrect, if a "mental content" is recognized as a meaning, which we have about an object before seeing the object. Frege used Platon's ideas about eternal ideas, which always exist and never disappear. Ideas exist in every person. That is why an object description of Platon and Frege is déjà vu. But it is not always so. A child, who has been just born, can't know the definitions of "mother", "father" or favourite toys. The child meets the objects of this world at first. This meeting does not mean a direct contact with the object, it means, the meeting with the object takes place, when the child can learn the object. These definitions are conditional and descriptive. The meaning of the object is defined not as memory, but as "an optimum situation". Kripke and Patnem write the same, speaking about definite theoretical and pragmatical kontitution of objects [7, 201].

In life we often use "fragments" or "flash" meanings, meaning are simplified to simple mechanisms and schemes, which are multi-purpose (not simple for learning, but to fundamental and multi-purpose forms of our relation to the world). Some of them can be used separately and together. Flash meanings are the main constituents of our situation in the world - "an optimum situation" [13, 45]. Every person finds a definite bases, a set of universal mechanisms, which he uses for living. He lives in the existential world, in the world of regular choice. The meaning does not always tell something or give information. Sometimes it appeals and attracts and sometimes it pushes away without details on the intuitive level.

In Eremeev's articles [17; 18] is discussed the questions about logical interpretation of decision making, however this interpretation suggests the only way for modeling in decision making, which would be logical true, but the logical truth of a decision is not always effective. And this theory has many features like others. It is too ideal and it shows changes of the situation into the logical language.

In Smirnov's researches [19] are analyzed different methods to temporal statements, which are statements about the future. By on method the statements about the future are considered similar to the statements about the past or the present as ascertaining of the situations. In this case The statement "whenever will be p" is correct by the a period of time t, if in a time t, which follows after t, p is correct. If the future state is determined by the present, the statements about the future will be correct or false. However the situation is similar to the reality, when the future is not determined by the present

and different variants of event development are possible. By the second method the statements about the future are concerned as modal statements [16]. In this case the statements "there is always p", "there will be p whenever", "through n of time there will be p", which are correct in the first method, are incorrect.

The statements, which are built correct:

G□p – «necessary (by any event development) there will be always p»;
G◇p – «possible (by a definite development of an event) there will be always p»;
F□p – «necessary whenever there will be p»;
F◇p – «possible whenever there will be p»;
Fn□p – «through *n* of time p is necessary»;
Fn◇p – «through *n* of time p is possible».

For each operator given the development of events represented in the form of a tree, branching into the future (Image 3).
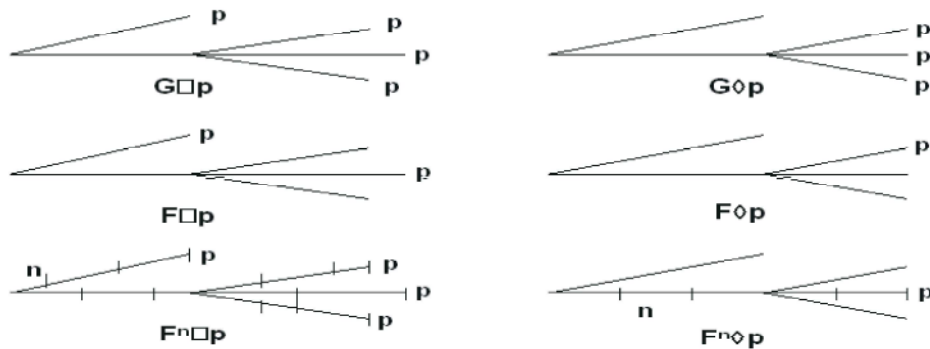

Image 3: The graphical representation of temporary operators

Introduces operators are common, modal temporary operators, not a combination of modal and temporary operators. This method is perspective in the meaning of the expressiveness in the conception, but is not enough developed in its practical realization.

ACKNOWLEDGEMENTS

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