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SCIENTIFIC, QUANTITATIVE DECISION MODELS IN ROAD TRANSPORT CORPORATIONS IN SLOVAK REPUBLIC

Запропоновано наукові основи кількісної процедури ухвалення рішення в транспортних корпораціях в Словацькій республіці. Розглянуті основні ситуації ухвалення рішення і їх виконання. Наприклад, розглянуті ситуації рішення з скалярною і векторною оцінками результату, безконфліктні і конфліктні ситуації.

Представлены научные основы количественной процедуры принятия решения в транспортных корпорациях в Словацкой республике. Рассмотрены основные ситуации принятия решения и их выполнения. Например, рассмотрены ситуации решения со скалярной и векторной оценками результата, бесконфликтные и конфликтные ситуации.

The article dealt with scientific, quantitative procedure of decision making in road transport corporations in Slovak Republic. Main decision-making situations and their execution have been examined. The examples are decision situations with scalar and vector result evaluation, non-conflict and conflict decision situations.

Introduction

We understand decision as a process to choose one from several variants.

Decision making subject is in a general way usually man alternatively unanimously descending board, which like self-regard cap alternatively some organisation interests executes variant selection. Situation in which is due to make selection from large number variant, it means to decide, is called **decision situation.**

Variant selection prevents to finite decision situation results. These results could be in term of decision making subject interest superior alternatively worse. If the decision making subject tries comparing eventuality to choose that best variant, he will be called scientific participant of the decision situation. Then selection sense: in sense the best variant, will be called **optimal** decision.

Specific team of the decision making subjects do not act scientific it means they are to the decision results indifferent. Such acting decision making subject is called **indifferent participant** of the decision situation. Indifferent participant can be man choosing variant without results valuation, as well as some casual nature factor, at relation by does not matter any results evaluation. In both cases we can indifferent participant approach like some adventitious mechanism, which chooses variant according to finite (known or unknown) probability distribution. In the decision theory is it next expected that there is at least one scientific participant in the decision situation and it is searched the answer for question: what kind of decision done by the scientific participantś could be considered as optimum decision. If the decision results regards the scientific participant's interest can be evaluated through one character (criteria) we describe this as decision situation with the scalar result evaluation, if there are more characteristics we describe this as **decision situation with the vector result evaluation**.

If the decision situation is solved by one participant and the situation is evaluated scalar we describe it as non conflict decision situation. These decision situations will be solved through the mathematical programming theory. If the decision situation is solved by more participants or is vector evaluated we describe it as conflict decision situation.

The conflict situations with more scientific participants and with scalar results evaluation are by game theory proceeded. In the case of conflict situation with more scientific participants or one scientific and one indifferent participant and with the scalar results evaluation are useful the knowledge of the theory of the decision under risk and indetermination. In the case of conflict situation with one scientific participant and vector results evaluation we can use the more criterions optimation theory.

There are many samples of conflict decision situations in diverse company activity areas, for instance decision about investment or manufacturing programme with reference to many criteria and economic indexes, discussion about trading income distribution, on the macro level activity coordination of the diverse economic system branches, legal proceeding, problem with the right choose of agricultural products growing or their collection date, or chess and military conflicts and so on.

Common mathematic model of the decision situation

$$Let\ P = (1,2,3\ldots\ldots\ldots\ldots n)$$

is set of the scientific participants of the decision situation

$$Let\ Q = (1,2,3\ldots\ldots\ldots\ldots m)$$

is set of the indifferent participants of the decision situation.

Expected, each scientific participant $p \in P$ commands set Xp decision variants. Set of the possible states that results by indifferent participant $q \in Q$ acting will be marked Yq.

Collection of the variants chosen by the scientific participants and states occurred by indifferent participants acting will be called decision situation result. We signify the result as (x, y).

Where

$$x = (x1, x2, x3, \ldots xn) \quad xp \in Xp$$

$$y = (y1, y2, y3, \ldots yn) \quad yp \in Yp\ .$$

Set of the possible results of the decision situation will be called Cartesian composition $V = X \cdot Y$ where

$$X = \prod_{p=1}^{n} Xp$$

$$Y = \prod_{q=1}^{m} Yq\ .$$

Expected, every scientific participant knows some dependency between decision situation results and effects caused by these results. Let relevant dependency p – scientific participant´s represent vector duty

$$M_p(x,y) = \begin{pmatrix} M_{p1}(x,y) \\ M_{p2}(x,y) \\ \cdot \\ \cdot \\ M_{pk}(x,y) \end{pmatrix}$$

Vector duty $M_p(x,y)$ will be called evaluative duty p – participant´s. Every scientific player tries to maximize his own evaluative duty.

Compact form of the decision situation mathematic model

$$\begin{Bmatrix} P = \{1,2,\ldots n\}, X_1, X_2, \ldots X_n, M_1, M_2, \ldots M_n \\ Q = \{1,2,\ldots m\} Y_1, Y_2, \ldots Y_m \end{Bmatrix}$$

$P = (1,2,\ldots n)$ is set of the scientific participants of the decision situation

$Q = (1,2,\ldots m)$ is set of the indifferent participants of the decision situation

n sets $X1, X2, \ldots Xn$ variants scientific participants of the decision situation

m sets $Y1, Y2, \ldots Ym$ states indifferent participants of the decision situation

N evaluative duties $M1, M2, \ldots Mn$ scientific participants of the decision situation

Mathematic model of the non conflict situation

$$\{P = \{1\}; X, M\}$$

P – set includes one scientific participant

X – set includes scientific participant´s variants

M – his scalar evaluative duty defened on the set X

Mathematic model decision under risk and indetermination

$$\begin{Bmatrix} P = \{1\}; X, M \\ Q = \{1\}; Y \end{Bmatrix}$$

P – set includes one scientific participant

Q – set includes one indifferent participant

X – set includes scientific participant´s variants

Y state set occurred by indifferent participant acting

M scientific participant´s scalar evaluative duty

Mathematic model more criterions decision

$$\{P = \{1\}; X, M\}$$

$$M(x) = \begin{pmatrix} M_1(x) \\ M_2(x) \\ : \\ : \\ M_k(x) \end{pmatrix}$$

P – set includes one scientific participant

X – set includes scientific participant´s variants

M – vector evaluative duty of the scientific participant defened on the set X.

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