MATHEMATICAL MODEL OF INNOVATION PROCESS

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The article is devoted to the investigation of innovation process, mathematical description of its laws and its forms.

The right organization of innovation process provides the best final results [1]. The quality of innovation process depends on effective approaches to the organization of innovation process [2, 3], in particular correct definition its forms [4]. All together taken is a necessary condition of the correct organization of innovation process.

The research is based on following assumptions that the final innovation results are depends on:

- innovation project consists of stages;
- individual features of stage management;
- the initial base stage readiness;
- the interrelation and sequence *n* presentation between stages;
- complexity of a concrete stage;
- project introduction is iterative process.

Other factors are not included in initial research approach

There is schematic illustration describing the influence of factors included in model describing the result of Innovation process.

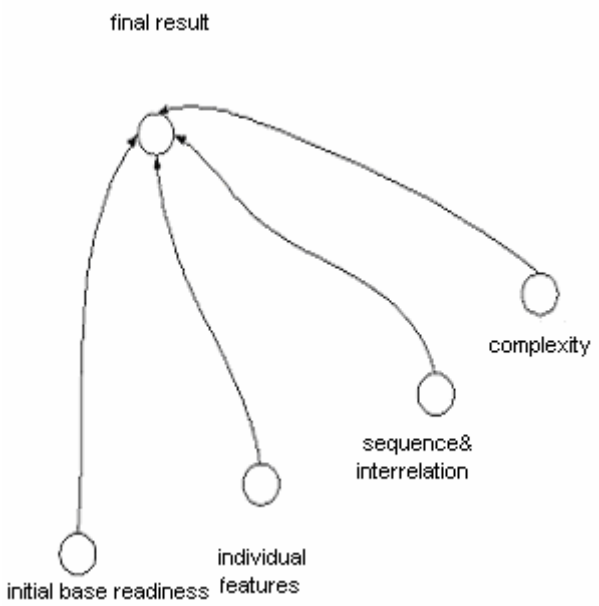

Fig.1. The illustration describing the influence of factors included in model on final result.

On the base of our prepositions we receive following mathematical model:

$$y^k = f(v_i, y_i^{k-1}, a_i, b_i, \prod_j c_j v_j),$$

where

y^{k-1} is initial base stage readiness (between 0 and 1);

v_i is stage volume between 0 and 1);

a_i is coefficient for including in model the influence of capability level of student to study of this part of discipline;

b_i is stage complexity coefficient;

$\prod_j v_j$ is member responding for interrelations between stages;

i is number of stages;

k is the project introduction iteration number

In general we have following dependencies:

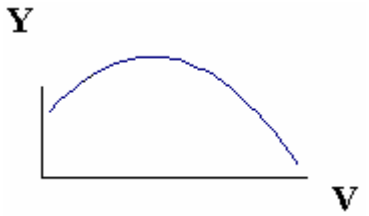

Fig.2. The dependence between final result and possible stage volume

Let us consider the simplest possible model

$$y^k = a_1 v_1 + c_{12} v_1 v_2 + a_2 v_2 - b_1 v_1^2 - b_2 v^2{}_2 + y^{k-1}$$

This model describes the project introduction in case of two stages. The volumes of these stages are $v1, v2$.

Using computer simulation we received following visual results. We used in the first case

$$a_1 = 0.5, c_{12} = 0.1, a_2 = 0.5, b_1 = 0.5, b_2 = 0.5, y_0 = 0.5$$

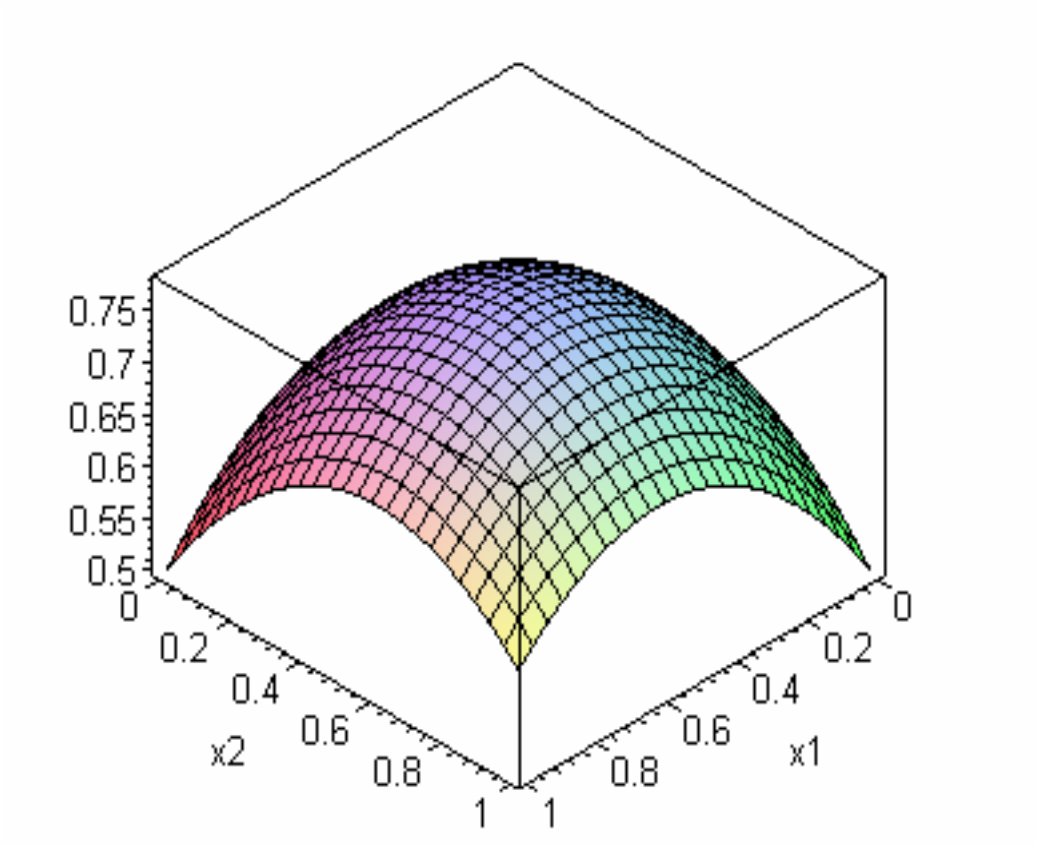

Fig.3. The dependency of final result from $v1, v2$ in first case

In the second case we used next values of parameters

$$a_1 = 0.5, c_{12} = 0.5, a_2 = 0.5, b_1 = 0.5, b_2 = 0.5, y_0 = 0.5$$

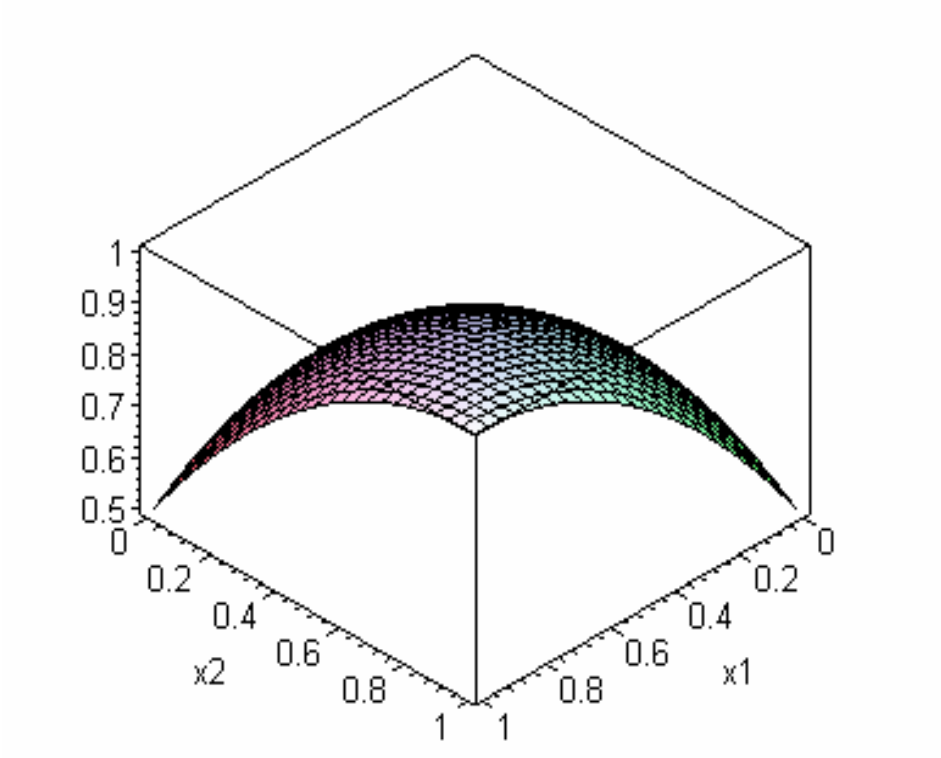

Fig. 4. The dependency of final result from $v1, v2$ in first case

We can see obviously that interrelations between the stages can improve significantly the final result of introduction (see 100% instead of 75%).

Also we see that it is not need give great stage volume, we should to give good management and provide good sequence and interrelation between stages.

Designed mathematical model may be used for detailed analysis introduction management forms and stage management.

This model may be used as a base for developing individual management trajectory in innovation process.

The results of computer modeling agreed with experimental data. Model may be used also for predicted iterative cycles in introduction. Also it is possible to take in consideration the influence of time factor.

Literature

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