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Extended Model of New Approach Impact on Quality, Safety and Competency of Product our Enterprises

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Abstract: *The basic subject of this work is development of models for assessing the impact of the new approach directives on access to quality, safety and competitiveness products, and competency of our companies. This work represents real hypothesis on the basis of expert's experiences, in regard to that the infrastructure with using new approach directives wasn't examined until now, it isn't known which product or industry of Serbia is related to directives of the new approach and CE mark, and it is not known which are effects of the use of the CE mark. This work should indicate existing quality reserves and product's safety, the level of possible competency improvement and increasing the profit by discharging new approach directive requires.*

Keywords: *directives new approach, competitiveness, quality of product, safety and products, simulation, synergy effect*

1. INTRODUCTION

A free flow of commodity is the one the basic principles in European Union besides a free flow of services, capital and work force. This freedom significantly contributes greater supply and simultaneously induces competency. For providing free flow of commodity, European Union develops specific mechanisms. New approach directives had the most important place among these mechanisms [1].

States that are members of European Union must accept measures and arise the national infrastructure so that they would provide, at the inward market of European Union, that only products due to specific directives, which besides regular, installation, maintenance and use, do not imperil safety and health of people or some other public interests.

Reaching the certain level of international competency is also one of prerequisite for European Union acceptance because defined by Lisbon's strategy for European Union acceptance the countries must satisfy the condition of existing efficient trade economy and competitive enterprise able to stand the pressure of global markets [5, 6, 7].

According to the analysis of doing business of one hundred of the greatest Serbian exporters, we came to information that a number of companies export their products that must satisfy new approach directive requires.

The basic subject of this work is the development of models for assessing the impact of the new approach directives on access to quality, safety and competitiveness of our enterprises and the simulation of the effect. Basis in the development of this work are based on the application of systems theory, especially models and dynamic simulations of certain economic and organizational systems. The basic method to be used in the making of this work is a method of modeling dynamic complex systems.

There is no competitive national economy without discharging the most important condition and those are competitive products

that satisfy technical and safely market requires. This work should indicate existing quality reserves and product's safety, the level of possible competency improvement and increasing the profit by discharging new approach directive requires.

2. SIMULATION AND MODELING BASES

Simulation is the process of shaping models of real or imaginary system, as well as carrying out the experiment over him. The purpose of the simulation:

- Understanding behavior of
- Determining the strategy of the system.

Simulation allows the analysis of the system, and features, capacity, behavior, and all without creating or experiments with the real system. In the best case, the creation of the real system is expensive (Factory), and often undesirable (atom bomb, explosion).

The *model* is a conceptual framework that describes the system. A model is approximate description of system or process used for system's understanding, his changing or managing it [2, 3]. Models should be much simpler, though accurate and useful for the purpose they are made for. The model is usually in the form of a set of assumptions expressed: mathematical, logical, through a set of symbolic relations between the entities. In modeling there are different approaches that are referred to: time aspect, stochastic processes or determinist, discreet or continual state changes. Behavior of the system that changes over time studying the development of *simulation models.*

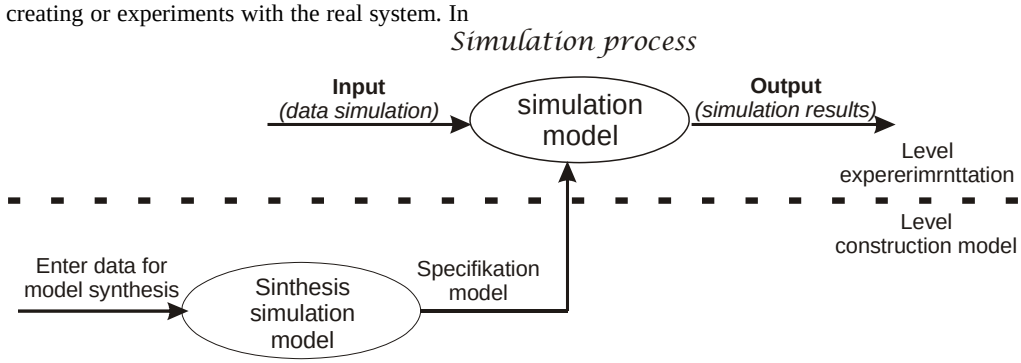

Figure 1 – The concept of simulation - activities
(Modeling, experimentation of the model, analysis of simulation results)

The aim of modeling and simulation

- The model can examine a wide range of "what - if" questions about the real system. Can simulate the potential changes to the system and to predict their impact on the system. Can be found adequate parameters of the system before implementation. A study on models instead of real system is usually much easier, faster, cheaper, and safer.
- Simulation can be used as an analytical tool for predicting the effects of changes or design tool for predicting the performance of new system.
- *It is better to do the simulation before implementation.*

Types of simulation and models

General division of simulation depending on the ways in which the variables that describe the state of change:

- Discrete event simulation state variables are changed simultaneously in the time moments
- Continuous state variables are changing continuously, usually through the function of the time variable

In practice, most simulations use both types of simulation, but is a kind of dominates. Types of models

- mathematical models (differential equations, probability theory, algebraic methods ...) give accurate results in the form of one or more numerical parameters (performance measurement system). Can have

several input parameters. Can not be used for complex systems.

- Computer Numerical simulation - imitation of behavior over time. Data is collected to be viewed as a real system.

The reasons for the application of simulation

- Simulation allows study of interactions within complex systems
- You can simulate and study changes in the structure of information, organizational changes and changes in the environment
- Simulation model supports the promotion of knowledge about the system
- Finding important input parameters change the simulation input
- Experimenting with new projects and strategies before implementation
- Simulation of different possibilities for determining the machine needs
- Simulation models for training allow learning without increasing costs
- Modern systems (plant, facilities, services, etc...) Are so complex that the interactions within the system can process only through simulation

The advantages of simulation and modeling

- New management procedures can be checked without disruption of the real system
- New project solutions, equipment, distribution, transportation systems ... can be before the test equipment
- Can vary the speed of the clock in the study of certain phenomena Acquires the insight about the impact of individual-level variables in the system Analysis of "bottleneck" shows where there is a significant delay in the movement of materials and information
- Simulation study contributes to the understanding of the system
- Get answers to "what if" questions, which is particularly useful in the design new system

Dynamics complex system modeling includes phases showed in Figure 2.

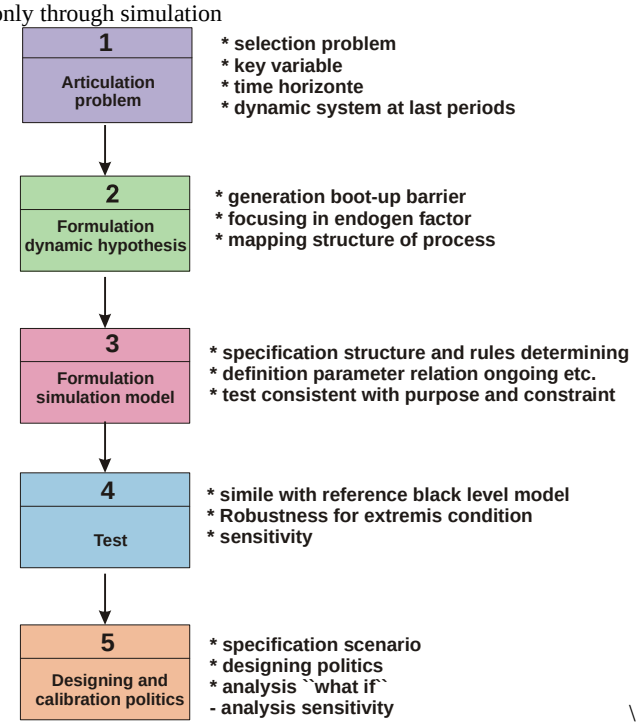

Figure 2 – Phases modeling

At modeling it starts from observing real world and along by informational feedbacks arise mental model of real world is, as well as strategy, structure and rules of making decision.

On the basis of them simulation model for making decisions in real world is formed (Figure 3).

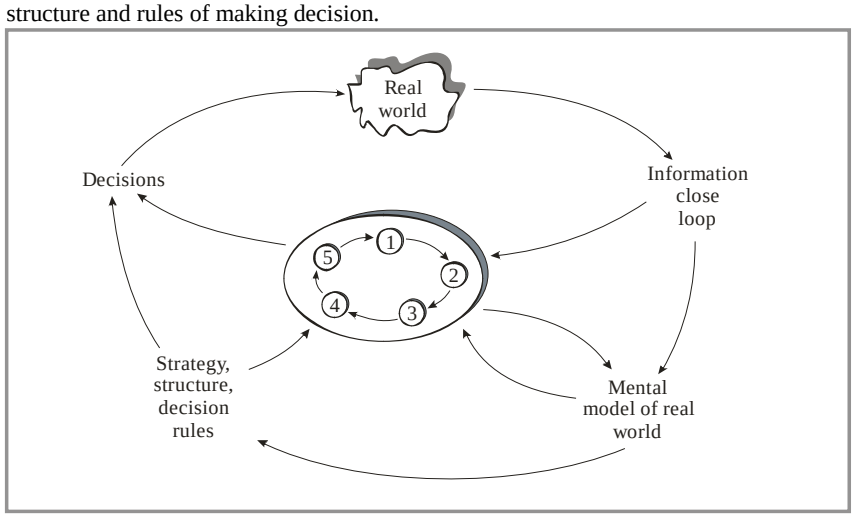

Figure 3 – The way from real world to the model

On the basis of these basic system behaviors structure and behavior of system components, relation between them (+ for positive impact and – for negative impact) or through certain diagrams that indicate to the dependence of system structure elements. The flowing phase is the development of simulation software, into which the structure's elements are built.

Previously underlined aspects of behavior are the base for the development of complex elements, from which the next are emphasized:

- Increase in form of S curve (logarithmic curve, or saturating curve) that is shamed in,
- Increase in from S curve with stabilization ,
- Great increase and collapse and others.

Other forms of behavior are:

- Equilibrium, when the system state changes very little in the second period and when negative system feedbacks are held approximately constant by the system,
- Accidentally, as result of accidental variation system elements or environmental impact,
- Chaos, that may be described through three forms of behavior: muted oscillation (local stability), increasing oscillations and limited cycles, and chaotic oscillations.

On the basis of previously underlined forms of behavior (theoretically and practically examined) model of complex dynamics system is formed and through proper tools for systematical opinion.

3. EXTENDED IMPACT WITH SIMULATION RELATION AND SYNERGY EFFECT

In consideration of the theme of research it starts from characteristics K1-K18, by what levels of characteristics (Figure 4) and forms of dependence between the same relations R1-R26 are firstly established. The sign + demonstrates that by increasing of an independent characteristics the value of dependent characteristic increases according to certain relation R*i* [4].

Precise relation defining depends on the kind of product, competency level in that area, manufacturer's characteristics and requires of directives and standards for that area, us well as costs of consultant services, examination and notification. Because of that, in this work, the authors decided to except model defining and relation form, define the degree of the new approach directive impact. Measure in the area of one middle class example requires (machines

for PVC and Al profile curving) and assesses the impact degree according to characteristic's variations for 10 percent, what is real for one year period.

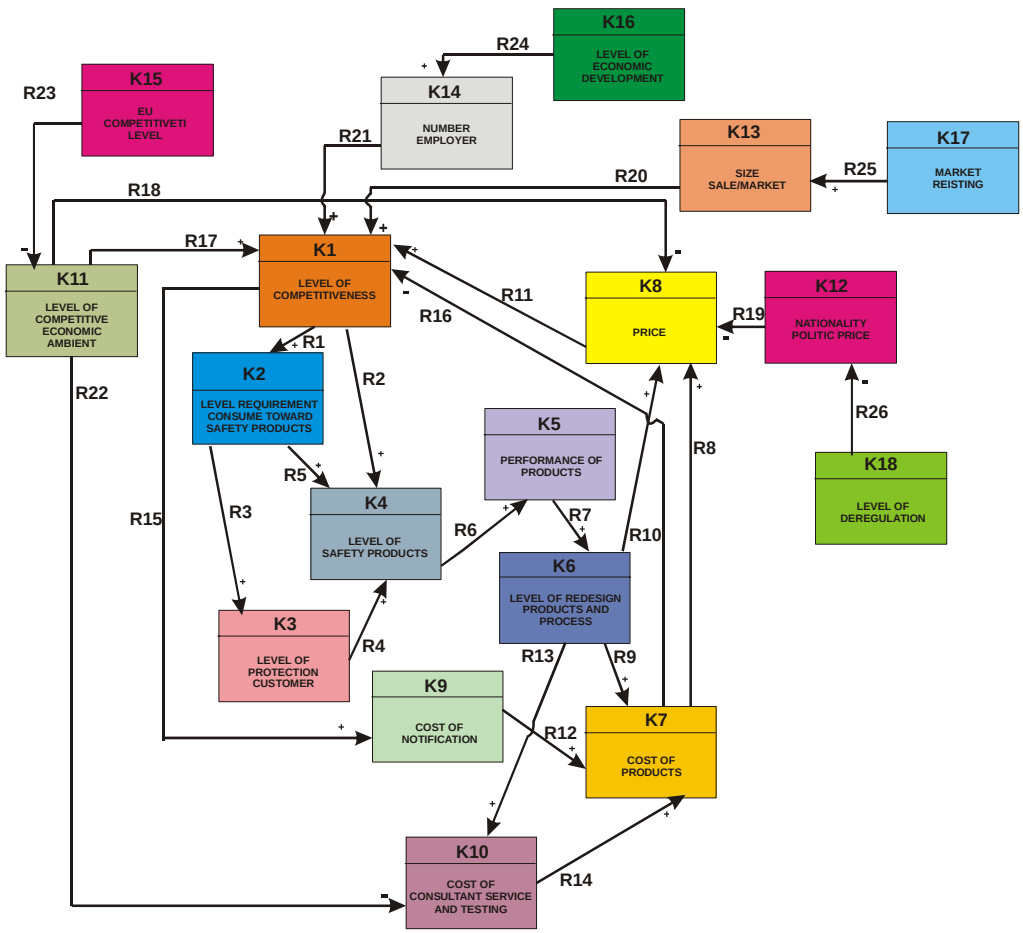

Figure 4 – Relations between characteristics

Simulation is the imitation of the real process or system over time. Simulations modify the standard scientific paradigm:

- Not an experiment (our input was not from nature) or theory (output is unknown, "measures")
- The closest definition: a new heuristic tool (heuristic = that leads to new knowledge)
- Use:
  - Solving mathematical models that can not be treated analytically
  - Numerical solutions lead to improved understanding of the studied phenomenon and to establish the legality of partial analysis ("phenomenological model")
  - New analytical relations allow refinements of the model and/or numerical algorithm, which lead to new improve the understanding of...
  - leads to uncontrolled explosive escalation of our understanding of the world.

Synergy (from the Greek *syn-ergos*, *συνεργός* meaning working together) is the term used to describe a situation where different entities cooperate advantageously for a final outcome. Simply defined, it means that the whole is greater than the sum of its parts. Synergy is created when things work in concert together to create an outcome that is in some way of more value than the total of what the

individual inputs is.

Synergy effect is an additional effect that occurs as a result of various business activities, with special material investment, as a result of better organization. It is often used as a term for the additional effects that occur because of the integration (fusion or acquisition) of two or more companies engaged in the same production or products that are inter-supplement, whose common business performance after the integration will be greater than its individual boils results. Synergy effect is expressed symbolically as follows: **2 + 2 = 5**.

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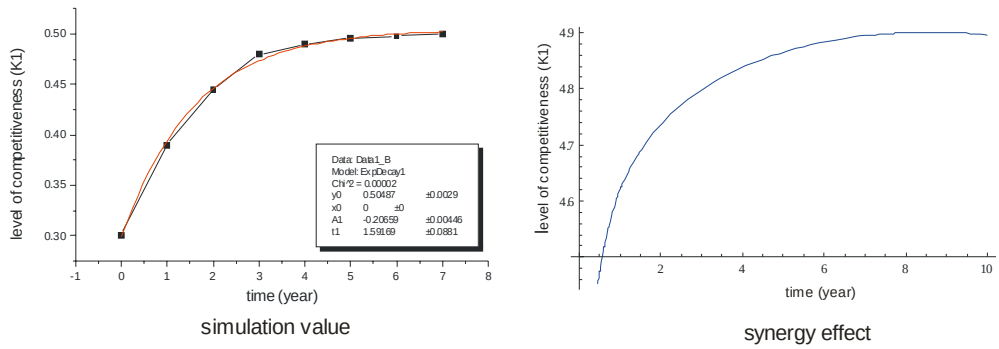

Figure 5 – Comparing the simulation value and synergy effect the level of competitiveness

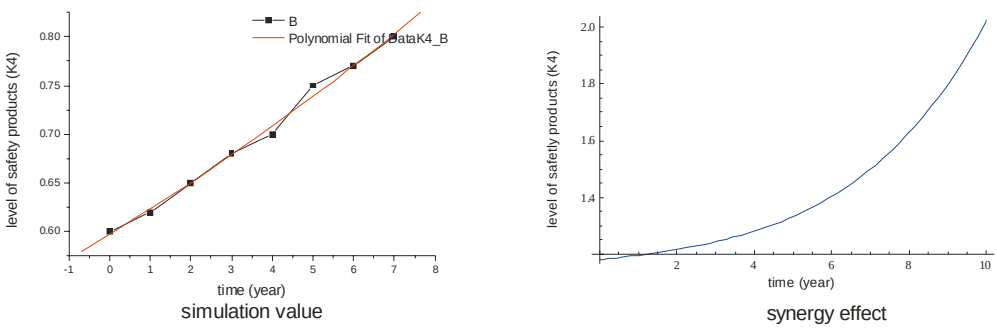

Figure 6 – Comparing the simulation value and synergy effect the level of safety products

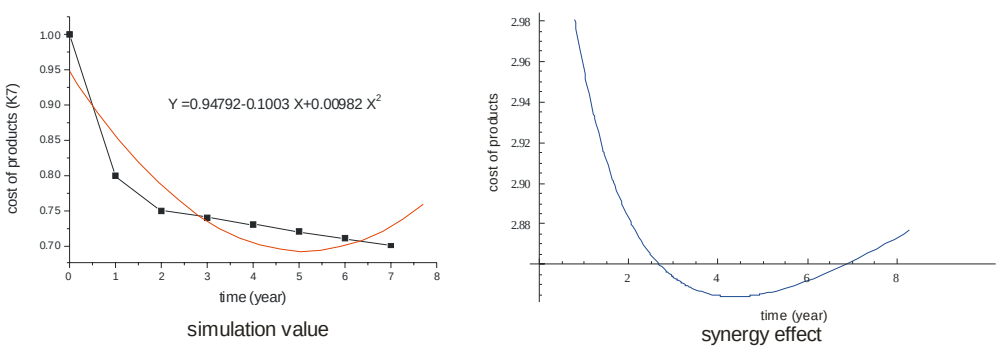

Figure 7 – Comparing the simulation value and synergy effect cost of products

When comparing the simulation value and synergy effect the level of competitiveness can be concluded that it is the same form of curves depending on the time (Figure 5).

To the same conclusion can be reached and when it comes to level of safety products (Figure 6) and cost of products (Figure 7)

For the simulation values are synergy effect used mathematic programs ORIGIN and Wolfram Mathematic

4. CONDUSION

This work represents real hypothesis on the basis of expert's experiences, in regard to that the infrastructure with using new approach directives wasn't examined until now, it isn't known which product or industry of Serbia succumb to directives of the new approach and CE mark, and it is not known which are effects of the use of the CE mark.

The model for assessing the impact of the new approach directives on access to quality, safety and competitiveness products and competitiveness our enterprises is stabilized, it has feedbacks. Model includes the most relevant factors. According to the given results we can conclude that new approach directives have dominant impact on product competency, level of safety products and cost of products, there by on competitive enterprise.

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