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Algorithm of the Heuristic Model for SMART Management in a Medium-Sized Industrial Enterprise

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Abstract: The present article synthesizes and describes a 9-step algorithm of a heuristic model for SMART management in a medium-sized industrial enterprise. The need for such a model is related both to the unpredictability of an industrial entity, and to the increasing competition on the basis of innovations, speed and efficiency of manufacturing between the industrial enterprises. This requires the generation, on the basis of research and analysis, of an algorithm of a model integrating a heuristic, as well as a mathematical, management and information-and-technological toolset. The architecture of the algorithm is based on some core fundaments, which determine the activities and development of a medium-sized industrial enterprise, and goes through the following nine stages: researching a medium-sized industrial enterprise and its productiom process, content-related description, containing the dependencies and the properties of the elements of the relation «production – management» in an medium-sized industrial enterprise, decomposition of a medium-sized industrial enterprise to subsystems, and of production to subprocesess and operations, forming a mathematical model through mathematical ratios expressing the links between the parameters of the production process and the borderline and initial conditions, forming an algorithmic model of data base code, creating strict procedures, determining the relations between the parameters of the production process and the borderline and initial conditions, forming an heuristic model of empirical rules and procedures, standards, analogies, expert examinations providing information about the potential development of the correlations between the parameters of the production process and the borderline and initial conditions, forming an information-and-technological model on the basis of connected into a network devices (computers, machines, sensors, etc.), determining a relational system of data exchanged between the parameters of the production process and the borderline and initial conditions, choosing manageable parameters, which should be representative, related to the target function, and also sensitive, meaningful, measurable, related to the bottlenecks in the production process and easily described, and the last stage – specifying the model.

Keywords: Heuristic model, SMART management, Medium-sized industrial enterprise

Introduction

The present day conditions ever more insistently require the implementation of automated and smart-based management systems in the industrial enterprises. A major difficulty, however, is the integration of a SMART-model for management in a medium-sized industrial enterprise due to several reasons:

- a medium-sized industrial enterprise is not a large economic entity, and the smart-based management systems would burden its financial stability, since they are quite expensive in respect to manufacturing, introduction and maintenance;

- the processes in a medium-sized industrial enterprise are not so much in parallel in respect to their components, or similar, as it is in the large economic entities, since a medium-sized industrial enterprise does not manufactire only mass production, but quite often fulfills individual client's orders;
- in a medium-sized industrial enterprise, the production situations are often unpredictable and unique in their nature, origin, functional scope, consequences, which requires an individual approach based on previous experience when resolving certain problems.

The reasons mentioned above necessitate the integration in a medium-sized industrial enterprise of a new type of a model for SMART management, which alongside the automation of the management and engineering-and-production processes, and the financial indicators of the production process, also cumulates heuristic methods and tools for using the knowledge, practice and conclusions obtained during the activities of the economic entity.

Taking into account the stated reasons, the present research generates a new and still difficult to recognize management model, allowing for the cumulative merging of traditional and innovative socio-economic and management doctrines, of elements providing a software and digitally based management system with the heuristic approaches and methodologies typical for the human activities. The generated Heuristic model for SMART management in a medium-sized industrial enterprise integrates the well-known and traditional mathematical, software, economic and management concepts, approaches and methods, as well as the already established in the practice management-and-analytical and controlling-and-evaluation toolset with the challenges and requirements of digitalization and the high innovative technological solutions. The combination of SMART management and heuristics is in its nature a novelty in the theoretical doctrine, as well as in the practice of the industrial entities. That is exactly why the Heuristic model for SMART management in a medium-sized industrial enterprise is a specific production-and-management innovation, which has its surplus value, proven by approbation, for the activities of a medium-sized industrial unit.

Only the fundamental and most important characteristics of SMART management in a medium-sized industrial entity are interpreted in the Heuristic model for SMART management in a medium-sized industrial enterprise. The relevance of the model in respect to the basic features of the entity – original, depends on the purpose of modeling – achieving heuristic-based SMART management in a medium-sized industrial enterprise. Since the main activity in a medium-sized industrial enterprise is the engineering-and-production one, and since it adds the highest value to it, then the study of the relationship between production and management logically determines also the closest approximation of the model to the original image (the management process in a medium-sized industrial enterprise). On this basis, in view of achieving management efficiency, the main characteristics of the theoretical and empirical research model should be cumulatively added to the Heuristic model for SMART management in a medium-sized industrial enterprise. Thus, the operational-and-process theoretical methods, such as analysis, synthesis, comparison, abstraction, induction, deduction, generalizing, specifying, formalizing, summarizing are logically preceded by the operational-and-process empirical methods of observation, measurement, expert evaluation, trialing, testing, interviewing, and the theoretical-and-cognitive methods, such as identification, resolving contradictions, setting of a problem, generating a hypothesis, analogy, modeling are complemented by intellectually based methods, such as monitoring, exploring, retrospection, forecasting, experimenting, summarizing experience.

The integration of the two core models of knowledge, of the elements of conceptual and heursitic modeling and of conventional and smart-based management with the particular characteristics of a medium-sized industrial enterprise and the uncertainty of its environment, specify in a structural and functional respect the goal of the model on the basis of searching two main types of solution – optimal or a combined compromise one. (Temelkova, 2017), (Temelkova, 2010) Thus, goal setting in the Heuristic model for SMART management in a medium-sized industrial enterprise is refracted through those specific characteristics and the goal is upgraded to the following: achieving optimal or rational (combining optimal and compromise values of some of the satisfaction indicators) heuristic-based SMART management in a medium-sized industrial enterprise. This exactly requires the accumulation in the model of mathematical, heuristic and information-and-technological models, which, complying with the goal of the model, should meet equal criteria for the efficency of SMART management in a medium-sized industrial enterprise.

The deductive approach requires the deduction from the goal of the model - achieving heuristic-based SMART management in a medium-sized industrial enterprise, of the fundamental informational, morphological and fucntional descriptions of each of its consecutive stages. Thus, formalization, as a theoretical research model, leads not only to formal objectivizing of the raod map of the model, but also to a possibility for forcasting major events, phenomena or behavioural reactions of the medium-sized industrial enterprise itself.

The setting of the task for generating a Heuristic model for SMART management in a medium-sized industrial enterprise requires the definition of a designable medium industrial enterprise - MIE, which should function within a particular temporal aspect with a finite number of designable parameters – P, and under the conditions of the heuristic-based SMART management in it, in line with:

- defined restrictive conditions - RC RC><=0;
- evaluation criteria - EC;
- design goal – Q_D;
- conceptual modeling goal – Q_A (automated goal);
- local task goal – Q_{LT}.

For the purposes of modeling, the medium-sized industrial enterprise shall be defined as a system, which is decomposed into its consituent subsytems. They are interrelated and determined by the other subsystems from the system of the medium-sized industrial enterprise, however, they are modeled independently, as an integral part of the general model. That is why, exactly, as well as on the basis of adapting various models and applying the principles of deduction, the Heuristic model for SMART management in a medium-sized industrial enterprise has a complex architecture, and its realization follows a complex algorithm, demonstrated on Figure 1. and described in the present article.

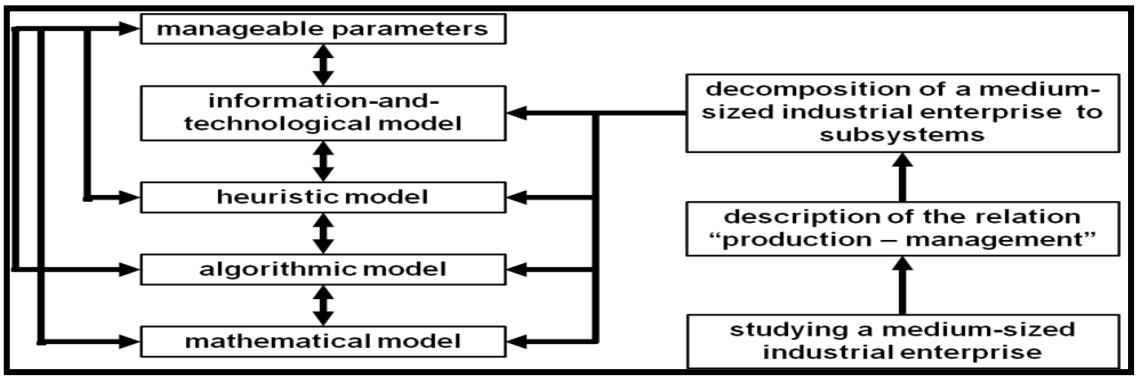

Figure 1. Algorithm of the Heuristic model for SMART management in a medium-sized industrial enterprise (author's elaboration)

Steps in the Algorithm of the Heuristic Model for SMART Management in a Medium-Sized Industrial Enterprise

Studying a Medium-Sized Industrial Enterprise and Its Production Process

Studying a medium-sized industrial enterprise and its production process, and on this basis, outlining the specific characteristics of the relation between production and management therein, requires, for the modeling purposes, carrying out an analysis and assessment of the external and internal environment. The dynamics and the uncertainty of the external environment are major factoirs, which largely determine the overall development of a medium-sized industrial entity. That makes necessary studying the external environment factors. The summarization of numerous literary sources (Христов, 2000), (Bovée, 1993), (Freeman, 2010), (Porter, 1979), (Shrivastava, 1994), (Subramanian, IsHak, 1998), leads to the conclusion that this study will be realized through:

- Political, Economic, Social, Technological Analysis, which reviews the main factors of the external environment determining management in the industrial enterprise and the effects of that impact on its strategic development;
- Industry Analysis, which studies, analyzes and evaluates the parameters of the sector where the medium-sized industrial enterprise operates;
- Strategic analysis of the strengths of the competition, which is realized by:
  - Competitive Analysis, determining the factors driving the competition, the strength and intensity of competitive rivalry;

  - Michael Porter's analysis, which is carried out on the basis of five forces important for competitiveness: threat of new entrants, bargaining power of suppliers, bargaining power of customers, threat of substitutes and competitive rivalry;
  - Competitor Profiling, which gathers and summarizes the complete information about the competitor, and, on this basis enables the evaluation of its strong and weak competitive qualities;

- Pressure Analysis, which classifies the communities in a medium-sized industrial enterprise and studies and analyzes their interests;
- Key Success Factors Analysis, which takes into account, analyzes and evaluates the most important factors, leading the medium-sized industrial enterprise to success in the external environment.

Forming alternative options for solution in a medium-sized industrial enterprise requires the observation and analysis of its internal environment. Studying numerous scientific sources (Котлър, 2005), (Boston Consulting Group, 1974), (David, 1989), (Hatten, Hatten, 1988), (Hurd, 1977), (Porter, 1979), (Various Authors, 2022) provides grounds to make a justified conclusion that important for the Heuristic model for SMART management in a medium-sized industrial enterprise are the evaluations made from the following analyses:

- Strategic analysis of the products, determined by:
  - Strategic Product Analysis, which analyzes the products as a prerequisite for achieving set as a goal results in a medium-sized industrial enterprise;
  - Analysis of Boston Consulting Group, which determines the strategic position of each product on the basis of its relative market share and market growth rate;
- Value - Chain Analysis, which analyzes the value created in a medium-sized industrial enterprise, and identifies the activities contributing to its increase;
- Strategic analysis of the activity - Ratio Analysis, which studies and evaluates the production activity in a medium-sized industrial enterprise;
- Strategic Position Analysis, which evaluates the positioning of a medium-sized industrial enterprise on the basis of financial indicators;
- Vulnerability Analysis, which takes into account the weaknesses of a medium-sized industrial enterprise;
- Critical Success Factors Analysis, which is focused on the specific factors preventing the achievement of the strategic goals of a medium-sized industrial enterprise.

Description of the Relation "Production – Management" in a Medium-Sized Industrial Enterprise

Some aditional analytical activities could be carried out on the basis of the analytical research of a medium-sized industrial enterprise, which would faciliate drawing the content-related and functional description of the link between management and production process therein. The toolset of some strategic and operational tools is adapted for the purpose of the Heuristic model for SMART management in a medium-sized industrial enterprise for more in-depth understanding of this relation:

- A balanced system of indicators (Темелкова, 2010), which is a strategic approach integrating financial and non-financial indicators, revealing the actual correlation between production and management in a medium-sized industrial entity on the basis of measuring the targeted satisfaction;
- Brown's framework of process assessment (Браун, 1996), (Нийли, 2001), which analyzes the processes on operational level in respect to their financial resource consumption, evaluates production organization and management down to its smallest component – the operations, and determines the importance and sustainability of the final result – the manufactured production volume.

Using and adapting the Balanced system of indicators and Brown's framework for measuring the processes for the purposes of the Heuristic Model for SMART management in a medium-sized industrial enterprise enables also to outline the components of the "management" and "production" and the location of their intersection points. (Table 1.)

Table 1. Intersection points between the «production» and «management» subsystems in a medium-sized industrial enterprise adapted by the author (Темелкова, 2010)

Medium-Sized Industrial Enterprise		
Subsystem	Elements	Intersectıon Poınts
Management	Strategıc Management	planning organizing coordinating motivating reporting control
	Work Processes	information flows processing and transfer of information communication intersection points
	Investments	return optimality profit profitability
	Productivity	production result gross income
	Marketing	customers/buyers quality price market share servicing trade and distribution network
	Innovation	research work development and implementation activities digitalization robotization
	Human Resources	physiology mentality qualities qualification needs
Production	Operating Management	planning organizing coordinating reporting control
	Production Process	functions power capacity work principles operations time
	Logistics	supplies procurement transportation stock availability forwarding
	Technologies	materials information energy productivity/time
	Human Resources	physiology mentality qualities needs

Decomposition of a Medium-Sized Industrial Enterprise to Subsystems, and of Production to Processes and Operations

The clarified relationship between the two main subsystems in a medium-sized industrial enterprise enables also its decompistion into its constituent subsystems. It can be summarized from the analysis of the literary sources that a medium-sized industrial enterprise is formed by two major subsytems – management and production one. The production process has the strongest impact on its organizational-and-management structure, and it determines the nature and tasks of management. The management process in a medium-sized industrial enterprise, in its turn, strives to achieve the strategic targets, set as goals, by applying rational methods and tools.

The analyses drawn for the purposes of the present research provide grounds to synthesize the following main factors, which originate from production but determine management in a medium-sized industrial enterprise: nature of operations, type of technological processes, level of production technological effectiveness, level of digitalization of production, level of robotization of production, production volume, production capacity, production range, structural complexity of the production process, production life cycle, type of resource flows, specific characteristics of the production process, spatial location of the production sites, permanent nature degree of the production parameters, hierarchical levels of the organizational-and-management structure, complexity and dynamics of the operational production goals.

The decomposition of production down to processes (Figure 2.) allows for coordination and control of all incoming resources and planned tasks in every business process, of the results going out from it and their compliance with the plan, and of the activities on transforming the resources into particular products or templates – at the output. When decomposing the production process down to operations, the specific organizational-and-production conditions should be observed (Темелкова, 2010), such as: way of combining the operations – consecutive, parallel or parallel-and-consecutive, time consumption for each operation, the way of movement of the details and templates, time consumption for the movement of the details and templates, time for setting the machines, type of technological routes, time for producing a product unit.

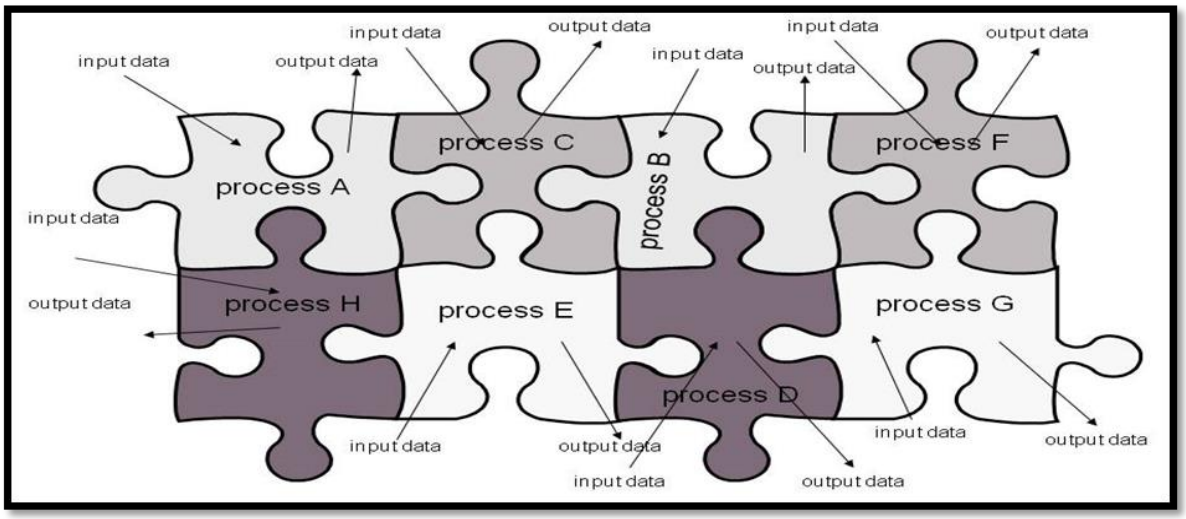

Figure 2. Decomposition of production to processes in a medium-sized industrial enterprise adapted by the author (Темелкова, М. 2010)

Mathematical Fundament of the Heuristic Model for SMART Management in a Medium-Sized Industrial Enterprise

The mathematical basis of the Heuristic Model for SMART management in a medium-sized industrial enterprise requires the goal setting in respect to the main elements of the general task for designing a medium-sized industrial enterprise, integrating heuristically based SMART management. The conditions and restrictions under which a solution should be searched in the Heuristic Model for SMART management in a medium-sized industrial enterprise, are:

- restrictions resulting from the volume of the production in kind (number of products of the j-th type)

- restrictions resulting from the determined in cash losses of technological time for each j–th product (the number of products is within the limit j=1÷n) under processes varying from 1 to d (X_{jn}=1÷d) of the n-th product of the j–th type (X_{jn})
- restrictions resulting from the cost in money for material resources (varying from 1 to g – M=1÷g), ensuring the production of each j–th product (the number of products is within the limit j=1÷n) under processes varying from 1 to d (X_{jn}=1÷d) of a product unit of the j–th type (X_{jn})
- restrictions resulting from the cost in money for energy per product unit (X_{jn}), whereby the production is reached of each j–th product (the number of products is within the limit j=1÷n) under processes varying from 1 to d (X_{jn}=1÷d)
- restrictions resulting from the cost in money for labour ensuring the production of a product of the j–th type (the number of products is within the limit j=1÷n) under processes varying from 1 to d (X_{jn}=1÷d) of the n-th product of the j–th type (X_{jn})
- restrictions resulting from the cost in money for the exploitation of the machines, and of the automated and robotized equipment, ensuring the production of a product of the j–th type (the number of products is within the limit j=1÷n) under processes varying from 1 to d (X_{jn}=1÷d) of the n-th product of the j–th type (X_{jn})

An optimal or a compromise combined solution should be searched under the conditions of the Heuristic Model for SMART management in a medium-sized industrial enterprise. This requires also setting certain criteira guaranteeing optimality or a compromise. The target criterion in the Heuristic Model for SMART management in a medium-sized industrial enterprise represents a target function and is designated with L. A target criterion in the Heuristic Model for SMART management in a medium-sized industrial enterprise should be the economic efficiency, which is a relation between the value expression of the utility achieved during the economic activity and the value of the necessary production resources, and all the other costs made for the production and realization of a certain product of the j-th type. (Мирчев, 1996)

In view of the specific characteristics of the selected target criterion (the presence of numerous integrated parameters in it), the Heuristic Model for SMART management in a medium-sized industrial enterprise is reduced to searching a multi-criteria solution. Provided that one of the searched alternatives is optimality, then the application of the Pareto method for multi-criteria optimization is a suitable strategy, which to some extent balances the optimization task through “scalarization of the multiple criteria vector” (Stoyanov, Stoyanova, 2019).

Heuristic Elements in the Heuristic Model for SMART Management in a Medium-Sized Industrial Enterprise

The heuristic elements in the Heuristic Model for SMART management in a medium-sized industrial enterprise are rules, which can save efforts, provide satisfactory solutions and do not guarantee that they are optimal. They, however, offer smart variants, selectivity and directions in the decision making process, and, therefore, lead to plausible options for final conclusions and summarization in respect to a particluar problematic situation.

The heuristics in the Heuristic Model for SMART management in a medium-sized industrial enterprise are represented in a various way in the form of maxims, proposals, principles, production and management rules, criteria, programmes, procedures, methods, strategies, option “filters”, goal transformers. Thus, the use of heuristic elements provides certainty concenring the existence of a decision making mechanism.

The heuristic elements in the Heuristic Model for SMART management in a medium-sized industrial enterprise result from the specific features of the relation “production – management” in a medium-sized industrial enterprise, and from decomposing it into subsystems. At the same time, the heuristic elements should be adjusted also to the mathematical and algorithmic aparatus in the Heuristic Model for SMART management in a medium-sized industrial enterprise. The observation of those requirements and the specific frameworks of the model determine further the instrumental borderlines of the heuristics. Its toolset should ensure the analysis of the strategic alternatives in the search for the efficiency already set in the mathematical model as a target criterion, and the tree of alternative objects, where the heuristic search should take place.

The expert systems are good sources for finding effects as a result of applying heuristics. They are a set of characteristics of a particular entity – alternative, and facilitate with arguments, judgments, analogies, experience reaching a decision or outcome of a certain case study. In the Heuristic Model for SMART management in a medium-sized industrial enterprise they are a computer system, which imitates the human

ability to make decisions, and which integrates heuristic elements (tools, methods, strategies) with established hypotheses, rules, facts in view of achieving a satisfactory, interactive and reliable solution of complex assignments.

The expert systems in the Heuristic Model for SMART management in a medium-sized industrial enterprise are provided with the option to maintain reasoning. This is possible since their structure includes two subsystems – data bases – certain specific knowledge, facts, experience and algorithm for conclusion – a set of rules relevant to the data base and the specificity of one particular situation. There are not integrated by a code in conceptual modeling, but through the rule "If-Then".

Informational-and-Technological Fundaments of the Heuristic Model for SMART Management in a Medium-Sized Industrial Enterprise

For the purposes of conceptual modeling, the informational-and-technological provision of the Heuristic Model for SMART management in a medium-sized industrial enterprise is ensured on the basis of classes and objects. Thus, the digital counterpart of each cost in a medium-sized industrial enterprise in the model for SMART management based on information technology and heuristics is determined by the abstract class (Base expance). The logic for calculating the cash outlay by types is implemented in the class. All other cost types inherit Base expance – accordingly $TLTT_d$ (total losses of technological time), $TCMR_{dg}$ (total cost of material resources), $TEC_d{}^*$ (total energy costs), TLC_d (total labor costs), $TCMAR_d$ (total costs for machines, automata, robots), CP (cost price). Each of these costs uses the constructor from Base expance, where the constructor expects a name, the time when the cost was incurred, the recurrence of the cost, and its value (Figure 3.).

```
public abstract class BaseExpense implements Expense{
    private String name;
    private double time;
    private int reps;
    private double price;

    public BaseExpense(String name, double time, int reps, double price){
        setName(name);
        setTime(time);
        setReps(reps);
        setPrice(price);
    }

    private void setName(String name){
        if (name==null || name.trim().equals("")){
            throw new NullPointerException("Name cannot be empty.");
        }
        this.name = name;
    }

    private void setTime(double time){
        if(time<0){
            throw new IllegalArgumentException("Time cannot be negative number");
        }
        this.time = time;
    }

    private void setReps(int reps){
```

Figure 3. A software programme of the Heuristic Model for SMART management in a medium-sized industrial enterprise (author's elaboration)

Governing Parameters in the Heuristic Model for SMART Management in a Medium-Sized Industrial Enterprise

The governing parameters in the Heuristic Model for SMART management in a medium-sized industrial enterprise are parameters, which change independently from each other. Their variation according to a selected approach (heuristic, Pareto method, the Gauss-Seidel method, etc.), is a prerequisite for navigating and managing the qualitative characteristics of the designable new medium-sized industrial enterprise. The optimization methods require the presence of at least one governing parameter in the optimization task. There are two governing parameters in the Heuristic Model for SMART management in a medium-sized industrial enterprise – cost price (CP) and total revenue (TR).

The cost price has five constituent elements, and, in that sense, it could be claimed that they are governing vectors (parameters) in the setting of the general task of programming the Heuristic Model for SMART management in a medium-sized industrial enterprise. These are the measurable in money for the production per

product unit: total losses of technological time ($TLTT_d$), total cost of material resources - $TCMR_{dg}$, total energy costs - TEC_d, total labor costs - TLC_d, total costs for machines, automata, robots - $TCMAR_d$.

The change in the elements of the governing parameters (v in number) leads to generating various options of the object to be optimized. That is a prerequisite for an effcient choice of the best possible option under the evaluation criterion. The variations of the governing parameters in the Heuristic Model for SMART management in a medium-sized industrial enterprise determine the level of freedom of the task therein, where generaing numerous changes will increase substantially the options for reaching a higher quality solution.

Results and Discussion

The Heuristic Model for SMART management in a medium-sized industrial enterprise, generated in the present article, is based on:

- modeling, implementing the principles of conceptual modeling and of business modeling, which is outlined as a major architectural element of the Concept for application of the heuristic models for SMART management in a medium-sized industrial enterprise;
- the description, research and analysis of the content-related, functional, quantitative, qualitative and structural characteristics of the constituent elements of the conceptual and business modeling in a medium-sized industrial enterprise;
- the synthesis of the algorithm of the Heuristic Model for SMART management in a medium-sized industrial enterprise;
- the definition of the general task of designing the Heuristic Model for SMART management in a medium-sized industrial enterprise and the specification of its structural algorithm;
- the research and analysis of the elements from the structure of the Heuristic Model for SMART management in a medium-sized industrial enterprise, such as:

    - studying the relation “production – management” in a medium-sized industrial enterprise;
    - decomposing the architectural unity of a medium-sized industrial enterprise down to subsystems, processes and operations following the deduction method;
    - synthesis of the mathematical justification of the Heuristic Model for SMART management in a medium-sized industrial enterprise;
    - description of the heuristic system integrated in the Heuristic Model for SMART management in a medium-sized industrial enterprise;
    - summarizing the main characteristics of the informational-and-technological fundament of the Heuristic Model for SMART management in a medium-sized industrial enterprise;
    - bringing forward the governing parameters in the model together with their correlations with other parameters.

Conclusion

The Heuristic Model for SMART management in a medium-sized industrial enterprise is generated via the methods of the systematic analysis, dialectics, induction and deduction, and it should lead to efficiency in the object of designing (a medium-sized industrial unit). It comprises not only scientific, heuristic and informational-and-technological flows, but also the essential specific features of a medium-sized industrial enterprise as an economic entity. On this background, it leads to synthesizing the following main conclusions:

- the specific characteristics of the Heuristic Model for SMART management in a medium-sized industrial enterprise are related to the implemented in it essential, process-related and functional specific features of conceptual modeling and of business modeling, suggesting in architectural aspect the interrelation of algorithms and heuristics in a single system;
- in the course of the observation of the practical application of the algorithms and heuristics in management, as well as while studying and analyzing their specific features, a hypothesis is reached concerning the outcome (solution) of the task for designing the Heuristic Model for SMART management in a medium-sized industrial enterprise – optimization or achieving a combined compromise solution;
- the specificity of a medium-sized industrial enterprise as an economic entity in the commercial turnover is integrated in the Heuristic Model for SMART management in a medium-sized industrial

enterprise by outlining in its structure the relation "production – management", whereby a justified conclusion could be drawn not only about the main subject of activity of the industrial unit (production), but also about the point adding the highest value to it (the production process), as well as about the size and complexity of the structural development of the production process itself;

- the conducted informational study provides substantial research basis for synthesizing the mathematical model in the Heuristic Model for SMART management in a medium-sized industrial enterprise with specific evaluation criteria (efficiency), restrictive conditions (the expenses forming the cost price and the volume of the manufactured production), as well as indicators for achieved effect (cost price and revenue);
- the relationship "restrictive conditions – evaluation criterion" requires the introduction into the Heuristic Model for SMART management in a medium-sized industrial enterprise of cost price and productivity as governing parameters;
- observation, monitoring, research, interpretation, specification, experimentation with synthesizing the essential specific features of heuristics suggest carrying out a deliberated, structured process of intellectual reasoning of the various consequences in respect to the actually manifested factors and realized development scenarios, which is fundamental for the implicit integration of the heuristic toolset in the Heuristic Model for SMART management in a medium-sized industrial enterprise;
- the organizational principles in a medium-sized industrial enterprise, and the nature of the relationship between production and management adjust the toolset of the informational-and-technological programming to the specificity of a medium-sized industrial entity and the creation of a smart-based software program managing from efficiency perspective the entire production process.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPSTEM journal belongs to the authors.

Acknowledgements or Notes

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