



FACULTY OF MANAGEMENT SCIENCE AND INFORMATICS

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The Faculty of Management at the University of Žilina was established in July 1990 as a result of a decision by the Academic Senate. In 1993 a new branch **Management and Information Systems** was created and in 1996 the name of the Faculty changed to the **Faculty of Management Science and Informatics (FMSI)**. This name more precisely reflects the importance of information technology in the profile and orientation of the Faculty.

The Faculty primarily specializes in managing activities in extensive systems. These include problems of managing and optimizing the transfer of products, passengers and information, as well as the designing of integrated interactive information systems for decision making support including economic connections and technical background.

The Faculty is interested in control and information systems with application for management, and transport systems from small-sized networks, such as a firm or company, through medium-sized, such as a region, to large-sized networks.

Mathematical knowledge is an unavoidable condition in accomplishing the Faculty's goals. That is why the Faculty pays attention to applied mathematics and to designing mathematical models as a basis for algorithmic information, decision-making processes and their optimization.



Departments of the Faculty

The FMSI has eight departments and two facilities located outside Žilina, which create its professional structure. They are:

- Department of Mathematical Methods
- Department of Informatics
- Department of Macro and Microeconomics
- Department of Technical Cybernetics
- Department of Information Networks
- Department of Transportation Networks
- Department of Management Theories
- Department of Software Technologies
- Sub-Campus in Prievidza
- Sub-Campus in Ružomberok

Educational program of the Faculty

The educational program of the Faculty is divided into the following parts:

- **Bachelor's Degree** - this is a three-year study for high school graduates. Curricula in the first year of study are common with the study in Master's Degree. The students can choose this form of study either at the beginning or during the first year of study. The graduate obtains the degree of "**Bachelor (Bc.)**". After the completion of study, s/he can continue in the Engineer Programme if s/he meets the requirements for this form of study.
- **Master's Degree** - this is a five-year study for high school graduates. The study ends with a state exam and a defense of diploma thesis. Graduates obtain the academic degree of "**Engineer (Ing.)**".
- **Postgraduate Degree** - this doctoral study is for graduates awarded the degree of Ing. who decided to achieve qualification for their scientific work. The study lasts three years. The doctoral degree requires 3 semesters of advanced study, satisfactory completion of a comprehensive examination, then after 3 semesters, submission of a written dissertation work based on independent original research that must be a significant contribution to the field of study and an oral examination that is a defense of the dissertation research. The graduate obtains the scientific academic degree of "**Doctor of Philosophy (PhD.)**".

The doctoral study at the Faculty is provided in the following scientific branches:

- **Automation and Control, Specialization Technical Cybernetics**
- **Applied Mathematics**
- **Transport and Communication Technology**
- **Applied Informatics**

Continuing Education – this study is intended to increase knowledge in one of the branches related to the Faculty's orientation. The Faculty provides education with the following opportunities for citizens of various age:

- accredited qualification and requalification courses
- regular study (evening courses, weekend courses, modular courses)
- special short-time courses
- vacation and summer courses
- special training

In the educational activities for which the Faculty has been accredited (Information and Control Systems, Applied Mathematics and Informatics), the graduates obtain a corresponding certificate.

The Branches of Study at the Faculty

The Faculty provides study for Bachelor's and Master's Degrees in these branches of study:

- **Information and Control Systems**

This form enables its students to receive university education in scientific and specialized branches related to the management of large systems. The processes in extensive systems are under the control of various physical and economic rules and technical means for managing those processes which are mostly represented by computers. Graduates can be of use in the sphere of transport and communication, also in designing, managing and securing information and management systems in banks, government, tourism and in the building of information systems of cities and regions, modeling and designing their infrastructures, prognosticating their evolution, etc. During the first two years students are without specialization and study all together. After the first two years of study they can choose their branch of specialization from the following possibilities:

- **Applied Informatics**
- **Management**
- **Information and Control Technique**

for the Master's Degree,

or after the first academic year

- **Information Technology**

for the Bachelor's Degree

In 2001 Faculty obtained the accreditation for a new branch of study **Informatics** in Bachelor's Degree, which started in the academic year 2002 –2003.

- **Applied Mathematics**

The graduates can work at economic or technical universities or scientific and research institutions, as well as in development centers of large companies and consulting services. They can also continue in economic, technical and theoretical mathematical postgraduate studies. After two years of study the students can choose from one of following specializations:

- **Economic specialization**
- **Physical-Technical specialization**

Applicants for the Bachelor's and Master's Degrees are expected to have completed secondary general education with a school-leaving certificate. They are admitted to study at the Faculty in accordance with the results of their entry examinations in mathematics and physics or informatics.

Scientific and professional orientation of the Faculty

The Faculty is oriented to the following scientific fields:

- Analysis, synthesis and design of integrated information and control systems
- Creation of integrated systems for the support of decision-making, including its economic correlations and technical equipment requirements
- Management, marketing, logistics and enterprising in the general field of transport and communication systems
- Problem solving design in transport and communication systems and relative tasks of control
- Control and optimization of transportation of products and persons
- Control and optimization of database creation, transmission and data processing
- Analysis, synthesis and design of multimedia information systems
- Analysis, synthesis and design of geographical information systems
- Design and realization of simulation components for communication networks and systems
- Design and realization of technical means for information and control systems

List of Universities and Institutions cooperating with the Faculty of Management Science and Informatics

Universities:

- Technical University Dresden, (Germany)
- Technical University Braunschweig (Germany)
- Brandenburg Technical University Cottbus (Germany)
- University of Applied Sciences and Technology, Dresden (Germany)
- University of Applied Sciences Darmstadt, (Germany)
- University of Applied Sciences Leipzig, (Germany)
- Technical University of Vienna (Austria)
- National Institute of Telecommunication, Evry, (France)
- University of Poitiers (France)
- Linköping University (Sweden)
- University of Vaasa (Finland)
- Polytechnic Jyväskylä (Finland)
- Helsinki University of Technology (Finland)
- Molde University College (Norway)

- University of Essex (UK)
- University of Leeds (UK)
- University of Valencia (Spain)
- University of Gent (Netherlands)
- University of Ostrava (Czech Republic)
- University of Pardubice (Czech Republic)
- West Czech University (Czech Republic)

Institutions:

- Siemens Österreich (Austria)
- Alcatel (Austria)
- Österreichische Bundesbahn (Austria)
- Deutsche Telecom (Germany)
- Deutsche Bundesbahn (Germany)

- Scheidt & Bachmann (Germany)
- Siemens, A.G. (Germany)
- Siemens Business Services (Germany)
- Volkswagen, A.G. (Germany)
- SOFTGATE, GmbH, Erlangen (Germany)
- Schweizerische Bundesbahn (Switzerland)
- International Telecommunication Union (Switzerland)
- France Telecom (France)
- TDJ Harbin (China)
- CNET France (France)
- ESC Bordeaux (France)
- ETSI Nice, Sophia Antipolis (France)
- Object Consulting (Czech Republic)
- Czech Railways (Czech Republic)

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THE DESIGN OF OPTIMAL TRANSPORTATION SYSTEM STRUCTURE

Department of Transportation Networks, Faculty of Management Science and Informatics

This topic of research concerns strategic decisions made by top management on the structure of a large sized system. Such a decision has great long-term impact on effectiveness of the system. The concerned systems do not include only the transportation system themselves but also many applications to one-to-many distribution system designs or many-to-many distribution systems. The set of the concerned systems may be also extended by various public administration systems, which spread over a large area. The structure of the systems is mostly determined by locations of important facilities, which is a common denotation of terminals, marshalling yards, airports or hubs, when transportation system is designed. When a distribution system is built up, then facility denotes warehouse or place where distributed goods are transhipped. Relating to a public administration system design, the facility means some office or administration center.

Strategic decisions are made under uncertainty concerning future costs, flows, demands and other parameters, which change in time and which can be only roughly estimated at the time when decisions have to be made. Furthermore, decision makers have to take into consideration conditions and impacts, which can be hardly quantified.

Our research was focused on *decision support tool development*, which should be able to find optimal decision for the system structure in the case when an objective function and associated constraints are given. The support tool should offer the solution to a decision maker and enable him to revise the constraints and

objective function. The tool has to enable a dialogue with the decision maker and perform it until a satisfactory solution is met.

A substantial part of our research consists of the implementation of a branch-and-bound method for a large-sized uncapacitated location problem and of investigation of the algorithm behavior when the algorithm is used for real-size network problem solving [9]. We compared the algorithm properties with Daganzo's continuous approximation approach and proved advantage of the branch-and-bound algorithm for one-to-many distribution system design. We extended the abilities of the algorithm by possibility to process uncertain input data, which are described using triangular fuzzy numbers [5]. The next issue was another extension of the algorithm for the p-median problem solution [3]. To be able to work out many-to-many distribution system design, we suggested an approximation of the associated quadratic objective function [7], which enabled to reformulate the quadratic problem to the uncapacitated location problem.

The above-mentioned results of the research, which was supported by the VEGA 1/4328/97 and 1/7211/20 research grants, were used for the following applications:

1. Analysis of the transport optimal forming of a region

This study was carried out when the public administration system of Slovakia was changed, to demonstrate the impact of



Fig. 1. Transport-optimal administration partition

various planned political decisions on the administration center accessibility [2], [8].

The same tool was used in another study to reduce the transportation network to a sensible size with the purpose to enable OD matrix determination [1].

2. Decision support tool for marshalling yard allocation

A transportation system, which has approximately the same number of primary sources as a number of customers, seems to be a marginal case of a distribution system. This case includes such instances as cargo railway system, which provides transport of carriages between railway stations. In these cases demands of customers form a matrix of yearly flows from sources to places of destination. The fact that the unit cost of transportation is smaller when bigger bulks of items are transported approves concentration of flows between different pairs of sources and customers to stronger flows at least on a part of their way. This flow concentration needs terminals in which transshipment of transported items is carried out and bigger bulks are formed or, on the other hand, where bulks are split into smaller groups designated to different customers.

In contradiction to classical distribution systems in which big bulks leave the primary source, another situation emerges in the many-to-many distribution systems. Primary sources send relative small bulks of items and it is useful to concentrate them to bigger bulks in the terminals located near the sources and then to send these bigger bulks to remote terminals and to split them there.

We restrict ourselves to the distribution system in which a customer-source is assigned to only one terminal and an exchange of consignments between the customer-source and other primary sources or customers is done via this assigned terminal.

We have designed a way of linearization using the proportional coefficient α . This problem was solvable in the time of several tens of seconds thanks to the specific structure of the system of constraints. This property enables repetition of the computational process for different values of α and obtaining a more precise result used in the decision support system completion [7].

3. Natural distribution centers identification

Frequency of the location

Tab. 1

q	2	3	4	5	6	total
Šaľa	6	0	0	0	0	6
Bratislava	10	9	10	10	10	49
Detva	1	2	4	4	5	16
Hlohovec	1	3	2	2	2	10
Humenné	4	4	0	0	0	8
Košice	0	1	3	3	3	10
Levice	1	3	2	2	0	8
Martin	0	0	1	1	1	3
Michalovce	0	0	4	4	4	12
Nitra	0	3	5	5	5	18
Nové Zámky	0	0	0	0	2	2
Poprad	3	4	6	6	6	25
Považská Bystrica	6	6	6	6	6	30
Prešov	8	6	5	5	5	29
Prievidza	5	2	2	2	2	13
Rimavská Sobota	5	4	2	2	1	14
Ružomberok	5	4	3	3	3	18

This application deals with the structure design of a general distribution system, which is considered to supply the area of the

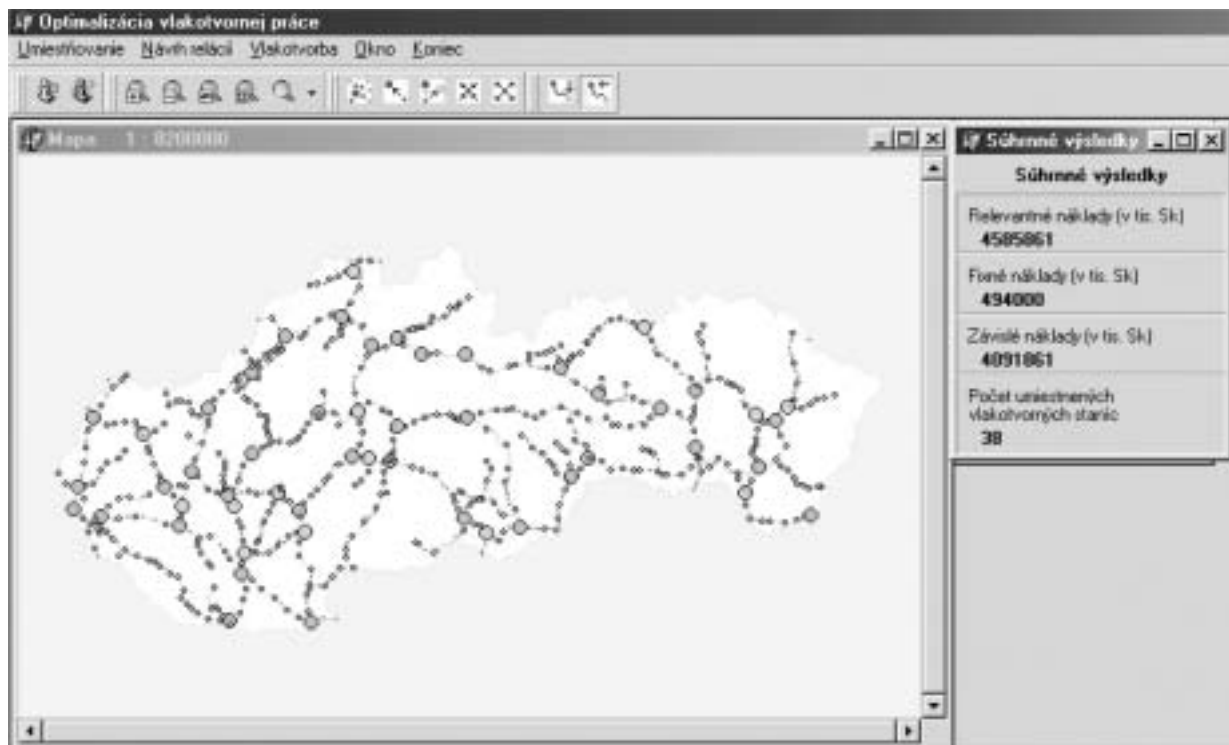


Fig. 2. A software tool for optimization of cargo services

Slovak Republic with a given sort of goods. The real density of population in the area is considered and it is assumed that the demand of goods is proportional to the number of inhabitants at the individual dwelling places. The goal of this contribution is to reveal a dependence of the distribution system structure on relative input unit costs under demographic and geographic characteristics of the Slovak Republic [3], [4].

The preliminary numerical experiments were carried out for the whole area of the Slovak Republic with 2906 dwelling places and with 70 possible sites of terminal location.

The ratio of unit cost of transport between a terminal and a customer and unit cost between a primary source and a terminal ranked from 2 to 6. The resulting natural distribution centers are plotted in the Table 1.

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Valent Klíma¹ – Antonín Kavická¹ – Petr Cenek¹ – Lubos Sadlon² – Norbert Adamko¹ – Milos Zatko²

SIMULATION TOOL FOR TRANSPORT NODES DESIGN AND ECONOMISATION

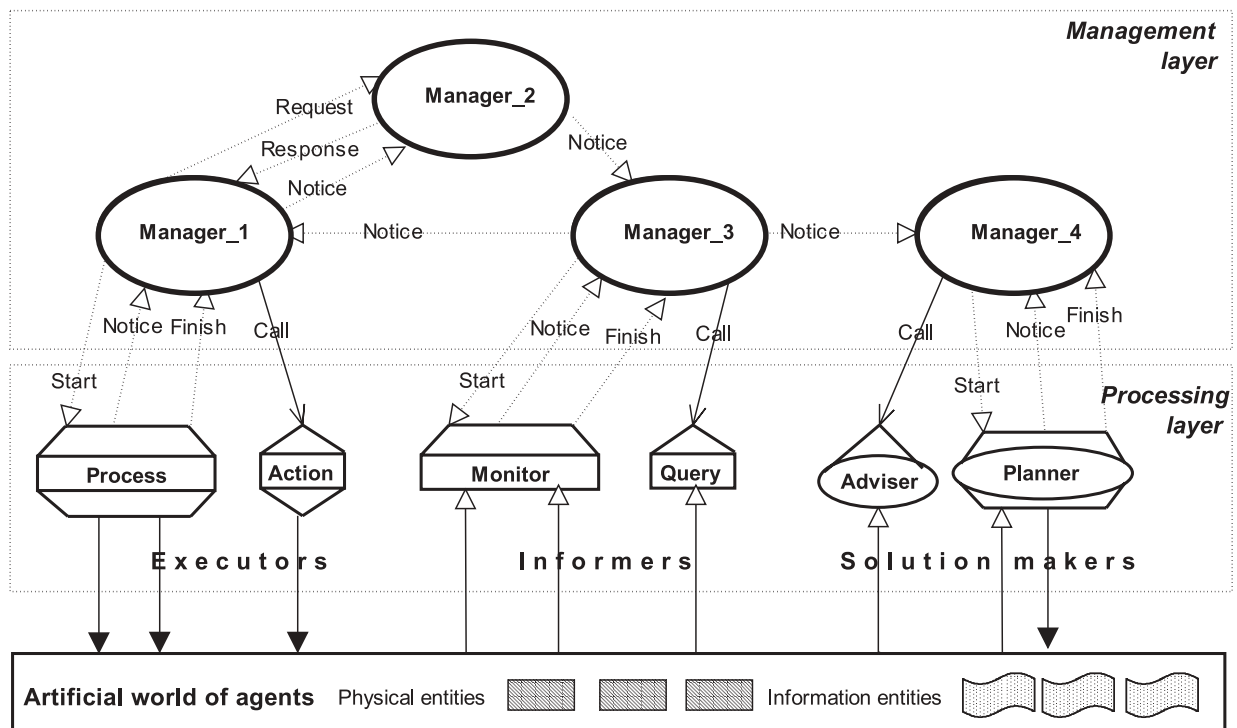
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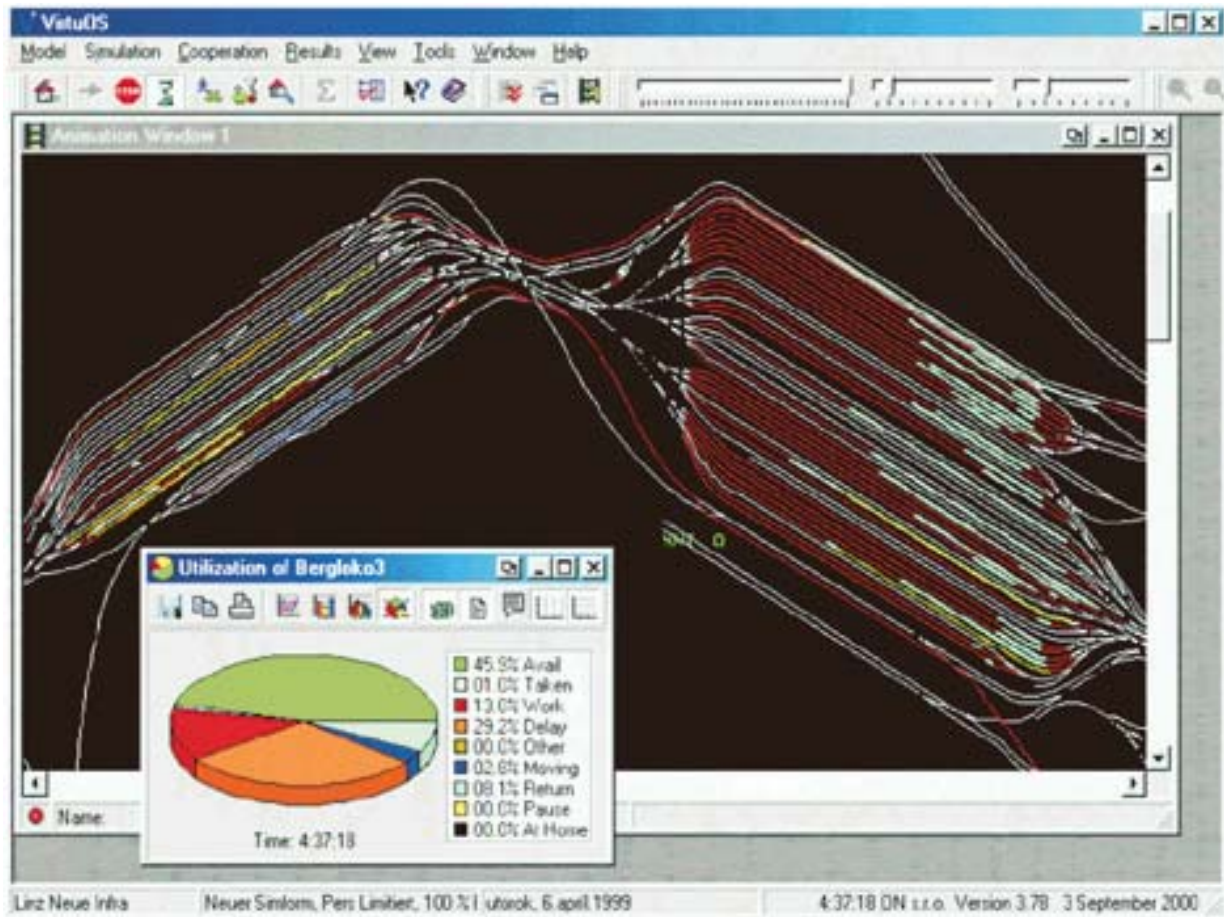
The tendency of creating and simulating ‘digital worlds’ can be observed and yields large-scale simulation models. The following features can be demanded from a large-scale simulation model: (1) the capability to reflect the behaviour of a real-world system in the required level of details, (2) the flexibility with respect to future modifications and extensions of the model, (3) an easy-to-comprehend way of presenting the results, (4) the user interaction with the simulation model, (5) the reusability of the simulation model and his components. The challenge is how to create such a simulation model in a limited amount of time and budget, especially when most of the demands are in conflict with each other.

An extended Agent Based Architecture (ABAsim) was developed as a method to achieve it. By means of this architecture, a simulation model that satisfies all above requirements can be created. Moreover, a library of models can be built, and by combining them, new models can be created.

Theoretical background

In the development of architecture of a simulation model, our methodology suggests first the creation of specialized agents responsible for solving defined problems. Further, it is necessary to define the structure of the simulation model itself. One of possible ways is to group individual components of proposed agents into layers according to their function. It seems to be convenient to separate components responsible for control and managerial tasks (managers) from components responsible for performing actions (effectors). Separation of control and processing parts of a simulation model makes the architecture more transparent and enables to exchange, if need arises, individual components with the high degree of flexibility. Thus, a simulation model consists of two layers: *management layer* with control and decision making properties and *processing layer*, consisting of effectors, which can be activated only by manager.





Both these layers are operating on entities. *Entities* are modelling elements of the real world and can be divided into *physical entities* and *information entities*. Physical entities are models of individual elements of the modelled system. Information entities concentrate information which is not bound to physical entities (are not their attributes) but which is necessary for the system control.

Simulation tool

As a research activity of the Faculty of Management Science and Informatics (partially sponsored by SBB Bern) a universal and detailed simulation model of transport node and its technological processes using ABAsim architecture was developed. This model is understood as a tool which allows the user to examine all properties of an existing or just designed transport node in virtual (computer) environment instead of a real one. Transport nodes can be e.g. marshalling yards, stations for passenger transport, industrial sidings, container terminals, port terminals or ground traffic at airports.

The system is fully interactive and allows player's participation in decision-making. Running processes are animated and are shown on a precisely modelled node infrastructure. Here are some examples of problems which can be effectively examined by this

tool: designing optimal node infrastructure, development and verification of technological procedures, optimization of structure and usage of resources, examining impact of changes in surroundings on capacity and organization of transport node, training of dispatchers.

Projects

Simulation software based on ABAsim was successfully used in this simulation studies:

Linz VBf Ost

Concentration of train forming activities from Linz region into the yard Linz VBf Ost after its essential reconstruction

Wien ZVBf

Concentration of train forming activities from Vienna region into the yard Wien ZVBf

Hamburg Alte Süderelbe

Verification of the changed infrastructure connected with the planned increased rate of train flow

Hagen Vorhalle

Technical modernisation of the yard Hagen Vorhalle

Oberhausen-Osterfeld

Technical modernisation of the yards

Lausanne Triage

Concentration of train forming activities from Lausanne and Geneve region into the yard Lausanne Triage

Basel Muttentz I

Technical modernisation of the yard connected with the planned increased rate of train flows

Mudanjiang (China)

Economisation of the operation of Mudanjiang marshalling and passenger station

Harbin (China)

Revision of efficiency of service processes

Žilina-Teplička

Simulation of a new operation within the new designed yard

BASF Ludwigshafen

Simulations of factory sidings processes within BASF

Volkswagen Bratislava

Simulations of factory transportation concept

SCA Laakirchen

Verification of the changed operation connected with the planned increased rate of transportation flows

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Miroslav Hrnčiar

INTEGRATED NETWORK OF RTD ACCOMPLISHMENT

Department of Software Technologies, Faculty of Management Science and Informatics

The project IC 15-CT98-1003 IncoCopernicus - IntAccomp, was solved in the years 1998-2000 by the research workers mainly from the Faculty of Management Science and Informatics. The project was aimed at providing a uniform database structure and access methods across the interested countries (F, E, CZ, P, H, R, SK, LT, LV) which can promote exchange of information and support integration of the RTD community into the research structures of the European Union.

The second group of objectives was:

- to get evaluations of CE countries with respect to RTD as well as to socio-economic development;
- to get evaluations of relations between socio-economic conditions and RTD;
- to propose and investigate the methodology for such evaluations and its visualisation;
- to examine data analysis methods.

The research method applied by the Slovak partner involved the following activities:

- using some searching engines available on Slovak sites (Intranet of the University of Žilina);
- development and implementation of SQL interface tool for conversion of the data from national RTD databases to the IntAccomp data structure;
- co-operation in the testing process of the replication systems;
- design of a unified template for Success stories;

- development of a tool for questionnaires distribution, merging and presentation via Internet;
- co-operation in the socio-economic analysis of the RTD data from interested countries.

Methodology for socio-economic analysis

An approach based on a cluster analysis method has been used. According to the definition of distance calculation between clusters and distance calculation between objects, different methods based on the mentioned algorithm can be obtained. The distance between two objects was calculated as the square of Euclidean distance between two vectors, which correspond to these objects. A calculation came out from an average of distances between each object of the first cluster and each object of the second cluster.

In this task, z-transformation was used for the data regulation. To determine the criteria on the basis of which the clusters differ most each from other, the average values and standard deviations of the objects in individual clusters ($E_1, E_2, E_3, S_1, S_2, S_3$) were calculated. The parameter E_j is an average value of the criterion j and S_j is a standard deviation of the criterion j .

$$\frac{\sum_{j=1}^m \sum_{k=1}^m |E_j - E_k|}{\sum_{j=1}^m S_j}$$

For each parameter a "segregation coefficient" was calculated. The bigger the segregation parameter the better the clusters which are distinguishable by means of the given criterion. In this way the criterion which represents this criterion in the best way or which mostly influences the distribution of objects into clusters can be determined.

On the basis of the methodology mentioned above clustering to groups according to socio-economic criteria, criteria oriented to R&D, or the common criteria for both approaches was carried out. The weights of all the 19 criteria were considered to be equivalent. In the following step, by the means of the Statgraphics software tool, a cluster analysis was realized - distribution of objects (participating countries in the project IntAccomp) into three groups as well as identifying of relevant criteria. A Centroid method was used, distance metric - Squared Euclidean. Three different combinations of criteria were used:

- according to criteria 1-19 - all criteria, i.e., socio-economic as well as R&D ones
- according to criteria 1-6 - selected criteria oriented to general socio-economic characteristics of a country
- according to criteria 7-19 - criteria oriented to an R&D community.

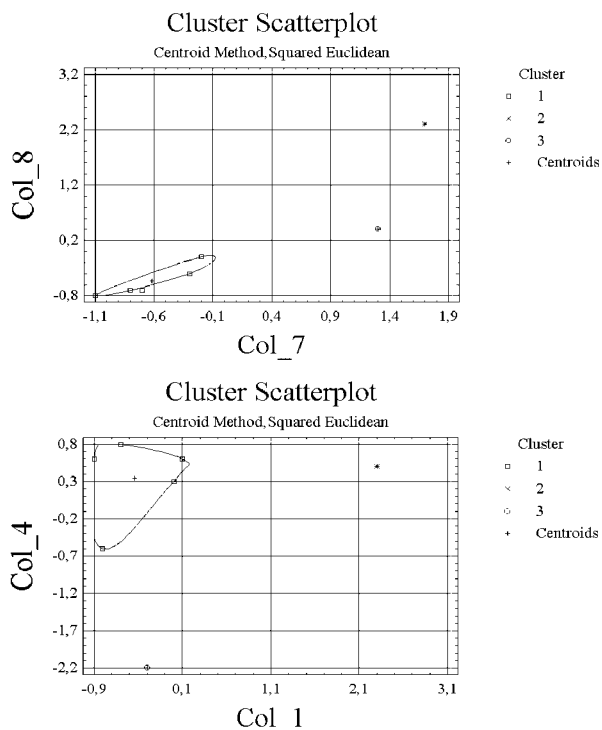
Some results and conclusions

The data accumulated during the lifetime of the project as well as from success stories of a number of national enterprises were used to obtain some general conclusions. Thanks to the multinational character of the project, some conclusions can be proved to be nation-specific while others are (possibly) universally valid.

Having used a cluster analysis, the following results were obtained (see Tab. N°1).

An impact of criteria on distribution into clusters can be scored according to a value of a segregation coefficient. Values of this coefficient for individual criteria are in Tab. N°2.

According to this table, the criteria which have a crucial impact on the distribution to clusters can be named in the following order: 8, 7, 1 and 4. The Figures N°1 a N°2 present the results of mutual dependence on the most relevant criteria 7 - 8 and criteria 1-4.



Figs. 1, 2: Distribution to clusters according to the criteria

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Tab. No1 - Results of Cluster analysis

Clustering according to the criteria	Clusters			The most relevant criteria
	1	2	3	
1 - 6 Socio-economic	CZ, HU, LV, LT, SK	PL	RO	Number of researchers,
7 - 19 RTD	CZ, HU, LT, SK	LV, RO	PL	Total number of employees,
1 - 19 General criteria	CZ, HU, LV, LT, SK	PL	RO	Gross domestic product in industry and services, Gross domestic product at current prices

Tab. No2 - Values of segregation coefficient

Criteria	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Segregation coefficient	13.0	5.2	7.0	11.2	4.5	7.4	14.2	22.0	8.2	6.7	1.5	1.8	2.1	3.3	6.2	5.8	2.1	2.8	6.4

Ondrej Bartl

MODELLING OF DECISION PROCESSES UNDER RISK

Department of Software Technologies, Faculty of Management Science and Informatics

This part of scientific research activities of the faculty is represented by models building in the area of sequential decision making in an environment of risk for cost-effective operations management in manufacturing and services. The set of Markov and semi-Markov decision models built for inventory control problems together with optimization techniques from the theory of Markov decision processes provides efficient tools to determine cost-optimal policies for taking control actions in replenishment orders placement properly. Such an approach allows finding out control rules in single-item periodic-review inventory systems, where demand between consecutive reviews is a discrete random variable with either a finite or an infinite set of possible values. Review intervals between successive decisions on replenishment orders made at decision epochs when the current inventory position is reviewed specified a fixed duration. Discrete-time Markov decision models with finite state and action spaces were built for an optimal policy determination in periodic-review inventory systems with finite demand to handle alternatives with zero delivery lag both with [1, 2] and without [2] backlogging of demand as well as with positive (one review-interval) delivery lag with demand backlog [2]. If demand is represented by a Poisson process, then the set of possible values for demand size during a review interval in a periodic-review inventory system is infinite. This case was treated by a discrete-time Markov decision model with finite state and action spaces, when the cost structure reflects ordering, holding, shortage and rejection costs associated with the inventory system operation [3, 4, 5].

An inventory system where demand is represented by a Poisson process and delivery lag is a random variable depending on the quantity ordered, belongs to the class of stochastic discrete event dynamic systems. Decisions on replenishment orders are made at time points of discrete event occurrences. The corresponding semi-Markov decision model with finite state and action spaces were built [6, 7] for the optimal policy determination in stationary demand, delivery and financial conditions of the single-item inventory system operation. Some inventory systems require placing joint orders for two items. To find an optimal inventory control policy for such situations, the semi-Markov decision model with vector state and action spaces and finite sets of possible values of state and action variables were built [8]. Mutually independent Poisson process was considered to represent demand for particular items. The lead-time between the joint order placement and the corresponding joint delivery receipt was given by a longer time period of both individual random delivery lags dependent on the order size.

The problem when to dispatch a service car on a round trip to serve customers in the attraction area of a service centre is a problem

of sequential decisions made in an environment of risk if requirements for service form a Poisson arrival stream. A cost-effective control policy can be found using the semi-Markov decision model [9], where state and action variables range within finite sets of possible values.

Traffic control in the road lane closure case can be represented by sequential decisions on the number of vehicles released to move through the closure sector. Decisions are made by turns for one and the other direction with respect to the current situation in the queues of vehicles waiting on the road at both ends of the closure sector. To reveal an optimal traffic control policy, the semi-Markov decision model was built [10], where the sets of possible values for state and action variables are finite and vehicles are supposed to arrive in front of the closure sector in accordance with mutually independent Poisson processes.

The aforementioned decision models for dynamic operations management under risk were designed in the framework of the stochastic part of research projects "A Design and Operating Optimization of Logistical Chains" (in years 1997-1999) and "Models and Economic Optimization of Logistical Systems" (in years 2000-2002). The projects were supported by the Scientific Grant Agency of the Ministry of Education of the Slovak Republic and the Slovak Academy of Sciences under grants no. 1/4328/97 and 1/7211/20.

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Štefan Hittmár – Jozef Strišš

SUPPORT AND DEVELOPMENT OF TRANSPORT MANAGEMENT

Department of Management Theories, Faculty of Management Science and Informatics

1. Methodology of Transport Strategy

The aim is to describe the methodology for creation and support of function strategy and business development in transport for 3 to 5 years period.

An objective scope of these activities is the development and purpose of transport business in conditions of the Slovak Republic in long-term horizon. Solution is mainly oriented on development of management, marketing, providing of transport services and related activities.

2. Training of Railway Management

In terms of the Conception of Railways of the Slovak Republic Management Education, we prepared training projects for low and middle management. The projects meet the need of scientific, functional and career growth of organisation employees.

The projects are divided into the following scientific modules: Management, Marketing, Finances, Controlling, Law, Quality Management. In term of specification the modules are created for employees of scientific units: Economics, Human Resources, Trade and Marketing and Operation.

The first year of training was held in the year 2001 and 314 attendants graduated, in the year 2002 there were 226 attendants.

3. Projects for Transport Management

Transport Process Management, co-operation with the University of Pardubice

The solution of the project is oriented on analysis and design of transportation processes rationalisation in the transport management. The aim of the solution is development of process management principles in transportation activities as the basis for a reengineering conception. Transportation processes will be radically renovated and reconstructed in the way that will lead to the so-called step improvement of transportation processes in terms of costs, service quality and speed.

Content – the general solution scope is the identification of transportation processes in logistic chains with the focus on transport subsystem. The process choice will be oriented on right processes, it means the processes oriented on benefit of customers, contributing with added value.

Development strategy in railway transport

At present there is no suitable methodological material available for the processing of business activities development for quality transportation services. There are no theoretical and methodological procedures for this activity. It is necessary for the railway transport to continue in the general and formal development and to create conditions for successful operation on the transportation market.

The solution of the project is the long-term development of the business in railway transport in the conditions of the Slovak Republic. The solution is oriented on main potentials of business activities: human resources, economics, commercial activities and marketing, information resources, management system and organisational structure etc.

Solution results – methodical and methodological material can be used especially for preparation and formation of basic strategic documents for business in the field of services providing on competition-oriented transportation market.

Management in communication systems (KOM-MAN) – grant project VEGA

For management in the field of communications (information, communication and transport systems), there are not any management bases elaborated. Apart from practical experience and references, it is necessary to deal with theoretical management base in the market economy.

The scientific project deals with an important and topical problem of information, communication and transport processes management from the point of view of economic science. The project analyses present management methods in those systems home and abroad, reviews internal and external conditions and formulate scopes for scientific base creation, the so-called *communication management* (subject, basic explanations, conceptions and definitions of research). On the basis of these analyses, the project defines and develops management methods, models and techniques used in complex conditions of communication systems and designs chosen algorithms of solution for structured and non-structured communication management tasks.

The project contributes to development of management knowledge base in communication systems (communication management).

Project: Networks of Excellence: “Railway Wheel Sets, Safety, New Materials and Technologies, Ecology, Law, Economy”, Silesian University of Technology in Katowice (Proposal for our participation in the Network of Excellence activities within the Sixth Framework Programme of the European Community for research, technological development and demonstration activities.)

We are planning the following activities aimed at disseminating of knowledge of the project:

Conferences and seminars:

- International seminars: Management in the railway transport – 2003
- International seminars: Management in the railway transport – 2004
- International conference on railway administrations agents from CEEC

Education:

- Educational project for the Slovak railway management – during 2003 and 2004

Projects:

- Decision Support Tool for Marshalling Yard Location
- Spatial Decision Oriented Intelligent System for Transport and Distribution Service Design

- Methodology of business activities development strategy in railway transport
- Motivation accent of human resources management processes
- Quality in process of customer relationship management

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Books issued by the Faculty within the period 1998-2002

- Martin Fronc: KVANTITATÍVNE METÓDY (TEÓRIA HIER A TEÓRIA GRAFOV) - Quantitative Methods (Game Theory and Theory of Graphs)
- Miroslav Benedikovič et al.: PRÁCA V INTERNETE A INTRANETE - Work in Internet and Intranet
- Štefan Hittmár: PLÁNOVANIE V MALOM A STREDNOM PODNIKANÍ - Planning in Small and Middle Business
- Jaroslav Janáček: MATEMATICKÉ PROGRAMOVÁNÍ - Mathematical Programming
- Martin Klíma et al.: ŠIROKOPÁSMOVÉ SIETE - Broadwidth Networks
- Jaroslav Král: LOGISTIKA, RIADENIE DODÁVATEĽSKÝCH REŤAZCOV - Logistics, Supply Chain Management
- Štefan Hittmár: MANAŽMENT V DOPRAVE - Management in Transport
- Ludmila Jánošíková: PROGRAMOVANIE V JAZYKU SYMBOLICKÝCH ADRIES PRE 32-BITOVÉ PROCESORY INTEL - Assembly Language Programming for 32-bit Intel Processors
- Valent Klíma: ÚDAJOVÉ ŠTRUKTÚRY - Data Structures
- Dušan Marček: ANALÝZA, MODELOVANIE A PROGNOZOVANIE ČASOVÝCH RADOV - Analysis, Modelling and Prognosis of Time Sequences
- Karol Matiaško: DATABÁZOVÉ SYSTÉMY - Database Systems
- Jaroslav Janáček: OPTIMALIZACE NA DOPRAVNÍCH SÍTÍCH - Optimization in Transportation Networks
- Martina Blašková: RIADENIE LUDSKÝCH ZDROJOV - Management of Human Resources.