



# InterSymp-2003

15<sup>th</sup> International Conference on Systems Research, Informatics and Cybernetics  
(July 28 - August 2, 2003, Baden-Baden, Germany)

## PRE-CONFERENCE PROCEEDINGS

of the Special Focus Symposium on CATALACTICS:  
Quantitative Modelling of Human Market Interactions

Wednesday, July 30, 2003

### Joint Symposium Chairs:

**Prof. Dr. Otto Loistl and Dr. Alexander Veverka**

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### Conference Chair:

**Prof. Dr. George E. Lasker**

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The International Institute for Advanced Studies  
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&  
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## Preface

The papers included in these pre-conference proceedings reflect the increasing focus of the Special Focus Symposium on Catallactics (Quantitative Modelling of Human Market Interactions).

Today economists' attention shifts away from any explanation of market phenomena as if they were solely equilibrium phenomena towards an understanding of economics as catallactics, the 'science of exchanges' (cf. Buchanan 2001). Rooted in the conviction that an equilibrium framework fails to offer a satisfying description of real market processes, Austrian School economists like Mises and Hayek have already stressed the fundamental property of human interaction on markets (cf. Kirzner 1997). As Buchanan (2001) convincingly shows in a generally positive appraisal, even game theory fails to meet this requirement. He therefore calls for the development of a "formal mathematics of human interaction" (Buchanan 2001, p. 31).

This Special Focus Symposium is an international forum for exploring the values of and exchanging ideas on quantitative models and numerical techniques to comprehend the complex realities of human interaction on markets as well as their application to all topic areas of market performance on the micro-level governed by human interaction. Consequently topics of this Special Focus Symposium may include, but are not limited to: interactive agent-based modelling of dynamic market processes; human learning and decision-making on markets; impact of market microstructure on emergent market outcomes; non-equilibrium asset pricing; and similar areas. Papers that address any of the above listed issues were invited. All submitted proposals (an abstract of approximately 200 words submitted for evaluation) were peer-reviewed and final papers were judged on the basis of their scholarly quality, originality and potential for further discourse.

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**Cited Literature**

Buchanan, J.M. (2001): Game theory, mathematics, and economics, *Journal of Economic Methodology* 8, pp. 27-32.

Kirzner, I.M. (1997): Entrepreneurial Discovery and the Competitive Market Process: An Austrian Approach, *Journal of Economic Literature* 35, pp. 60-85.





Wednesday, July 30, 2003 8:00–18:00 Hall C

## Special Focus Symposium on Catalactics: Quantitative Modelling of Human Market Interactions

### Joint Chairs:

Professor Dr. Otto Loistl<sup>a</sup>, Dr. Vladimir Šimović<sup>b</sup> and Dr. Alexander Veverka<sup>a</sup>  
<sup>a</sup> Vienna University of Economics and Business Administration, Vienna, Austria  
<sup>b</sup> University of Zagreb, Zaporosic, Croatia

8:00-8:15 Welcome Address

### Session I “Innovative Entrepreneurship” chaired by Alexander Veverka

- 8:15-8:45 **Mathematical Modelling in the Support of Building Entrepreneurship Management**  
by Mária Hromníková, Slovak Technical University, Bratislava, Slovakia
- 8:45-9:15 **Analysis of the Technological Innovations and Informatics Support in Small and Medium Firms**  
by Lidija Romić and Pere Tumbas, Faculty of Economic Sciences, Subotica, Serbia
- 9:15-9:45 **Upon the Development of an Instrumentarium for a Better and More Innovative Entrepreneurship**  
by Wim Smit, HAN University, Arnhem, The Netherlands  
Iva Smit, E&E Consultants Inc., Netterden, The Netherlands
- 9:45-10:15 **The Simulation of Integrated Conventional and Digital Entrepreneurship System Models with the Financial Parameters**  
by Vilko Žiljak and Klaudio Pap, University of Zagreb, Zagreb, Croatia  
Vladimir Šimović, University of Zagreb, Zaporosic, Croatia
- 10:15-10:45 Coffee Break

### Session II “Expert Training” chaired by Milan Jurina

- 10:45-11:15 **Expert Business Teaching: Towards Integrated Learning Management System on Markets**  
by Vladimir Šimović, University of Zagreb, Zaporosic, Croatia  
Šemso Tanković and Savo Vojnović, University of Zagreb, Zagreb, Croatia
- 11:15-11:45 **Comparative Analysis of the Croatian Insurance Tax System Model**  
by Miljenko Javorović and Gojko Ostojić, Libertas® Osiguranje, Zagreb, Croatia  
Vladimir Šimović, University of Zagreb, Zaporosic, Croatia





**11:45-12:15 Recent Real Market Price of Distance Learning Projects**

by Mario Dumančić, Vladimir Šimović and Savo Vojnović, University of Zagreb, Zagreb, Croatia

**Wednesday, July 30, 2003 8:00–18:00 Hall C  
(continued)**

**12:15-13:45 Lunch Break**

**Session III “Investment Decisions” chaired by Otto Loistl**

**13:45-14:15 The Investment Projects at Active Alternative**

by E. Bronshtein and E. Prokudina, Ufa State Aviation Technical University, Ufa, Russia

**14:15-14:45 Data Warehouse Exploring Tools**

by Dražena Tomić and Brano Markić, University of Mostar, Bosnia and Herzegovina

**14:45-15:15 Some of the Risk Models**

by Dominika Crnjac and Miljenko Crnjac, University of Osijek, Osijek, Croatia  
Martina Crnjac, Lura d.d. – Zagreb, Zagreb, Croatia

**15:15-15:45 Quantitative Simulation Modelling of Some Functional Characteristics of the Intelligent Transport System for Port System**

by Natalija Jolić, University of Zagreb, Zagreb, Croatia

**15:45-16:15 Coffee Break**

**Session IV “Market Interactions” chaired by Vladimir Šimović**

**16:15-16:45 Recent Developments in Capital Market Theory: From CAPM over Artificial Markets and Behavioural Finance back to Catallactics**

by Otto Loistl and Alexander Veverka, Vienna University of Economics and Business Administration, Vienna, Austria

**16:45-17:15 Catallactics and Human Resource Management on Croatian Market**

by Miroslav Bača, Vinko Morović and Milan Jurina, University of Zagreb, Zaprrešić, Croatia

**17:15-17:45 Virtual Time Norms**

by Romualdas Tamošaitis and Leonarda Gargasaitė, Vilnius Gediminas Technical University, Vilnius, Lithuania

**17:45-18:00 Closing Remarks**



## MATHEMATICAL MODELLING IN THE SUPPORT OF BUILDING ENTREPRENEURSHIP MANAGEMENT

**Mária Hromníková** - Slovak university of technology in Bratislava, Slovakia

**Abstract:** Mathematical methods of Operations research are appropriate implements for analytical support of market activities control at operating enterprise, all the same in building entrepreneurship management. Quantitative models optimized the solving of managerial problems, which arose in market interactions of enterprise. Applicative importance of mathematical modelling for decision making into management of building entrepreneurship, its reasoned to necessity and utility mathematical education of the civil engineer – establishment manager. Quality of study is testify to practical efficiency of mathematical support on managerial decision by preparation and realisation enterprising movements of building firms. The aim of letter be provided testimony at application meaning of mathematical methods by activity control of building enterprises and estimate the practical effectiveness the analytical support of managerial decision making by appraisal of enterpreneurial opportunities on build market, at preparation offer and to operating assurance managing of building project. The efficiency of mathematical modelling in building enterprising exemplify prove the formulation of decision algorithms for dynamic programming of starting, semi-finished, supplies and completion of construction. Utilization of mathematics at decision of establishment manager illustrate the practical applications this formalised procedures by the proposal of operating and supply politics of building enterprise.

**Keywords:** Application of mathematical methods in building entrepreneurship. Analytical support of managerial decision making.  
Dynamic programming of operating and supply politics in building enterprise.



## ANALYSIS OF THE TECHNOLOGICAL INNOVATIONS AND INFORMATICS SUPPORT IN SMALL AND MEDIUM FIRMS

Lidija Romić<sup>1</sup>, Pere Tumbas<sup>2</sup>

**Abstract:** Above all, the information's thank to the new technological possibilities, become from the biggest interest and the main instrument of strategic game, and especially when we talk about the innovations. There are two opinions about innovations, as the economic base of the firm, which is identified as the creation of radically new products, and the second, which accept that the constant innovation process could come only from constant innovations. The accepted theoretical approach from which the innovation goes is the perspective of basic resources, which represents the central theoretical base in understanding the continual innovation process. It is the approach based on donation of resources and competence of the firm and it is an ideal start point for the analysis of continual innovations. The necessity go from the perspective of based resources has received the support of the scientific public. The approach of based resources is based on the central role of resources which determine the different performances and are primary important for the competitive advantage. The turbulence of the market, technology and competitive action of the firm makes complicated the analysis of the sector dynamic and because makes useful the models based on resources, in relation the traditional models in analysis the ambient and power of the market.

**Key words:** *innovations, small and medium firms, technologies, information systems.*

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## UPON THE DEVELOPMENT OF AN INSTRUMENTARIUM FOR A BETTER AND MORE INNOVATIVE ENTREPRENEURSHIP

**Wim Smit**<sup>1)</sup> and **Iva Smit**<sup>2)</sup>

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### Abstract

Several organizations in The Netherlands are operational in improving the business designs of small and medium sized enterprises (SME's). As in most developed countries, more companies have entered the 3<sup>rd</sup> wave as defined by Alvin Toffler, more and more governments have started to privatise many governmental agencies and government owned companies, and the business and economic worlds are going through a big transition process. The 3<sup>rd</sup> wave of Toffler is among others characterized by a growing service industry and a decreasing manufacturing industry, and in the coming society knowledge and the carriers of knowledge will play a far more dominant role than in former days.

Next to these developments, we see in Europe an integrating process taking place, where many countries and companies are brought together into a huge market place. Consequently this will create many unexpected possibilities and opportunities for SME's, who are enforced by the growth of the Internet and the Telecom, which provides the SME's cheap and economic ways to present their companies and their products and services to a wider public. Besides, it is slowly becoming visible in Europe that the population will grow older with all its consequences on the government finances, as well as the required and needed products and services, which have to be developed by various small and large companies.

This article reports a part of the research work that is still in progress and is directed to the issue of how to increase the labour productivity of employees by ways of increasing the effectivity and effectiveness of an organization. By accident we found that female general managers/owners of SME's in The Netherlands achieve within their companies an average labour productivity, which is about 50% higher than the average productivity of all companies. From a literature study also was found that the same holds for some other countries. If the origin(s) of such an increase could be traced back, it gives the possibility to increase the GNP of a country while maintaining the same level of the working population. In this article some first findings and results are presented. Female





entrepreneurs do business in a different way, and some ways can be generalized also to the benefit of male entrepreneurs. To quantify the different behaviour a P/L statement is derived and discussed. At the end of the article it is indicated how the research will be continued and which directions might be fruitful.

**Keywords:** Small and medium sized enterprises (SME's), business environments, Toffler's 3rd wave, and gender influence in business operations.





## THE SIMULATION OF INTEGRATED CONVENTIONAL AND DIGITAL ENTREPRENEURSHIP SYSTEM MODELS WITH THE FINANCIAL PARAMETERS

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**Abstract:** The whole modern printing industry and related entrepreneurship models are in a time of rapid and significant changing production technology in a way of integration traditional printing with digital printing. Procedures and organisations of production are tested on models which include great number of stochastic variables. Besides new technical flows they include almost completely new models of financing. Results of financing and their effects in production vary from model to model. Modelling is mainly based on measuring data from digital press production. To contribute further more researching of this theme source program modules are enclosed. In the publishing and printing entrepreneurship field have appeared conflicts around the consideration of further financial development. The simulation of integrated conventional and digital systems including the financial parameters fortified opinion about the real chance of their cohabitation. We are proving that two concurrent systems can give the better result if they assist each other inside the same projects than if let them behave as the soldiers on the market. Researching of integrated digital and conventional systems financial development in the publishing and printing field is on the beginning.

**Keywords:** financing and entrepreneurship modelling, simulation of stochastic system, digital and conventional printing



## EXPERT BUSINESS TEACHING: TOWARDS INTEGRATED LEARNING MANAGEMENT SYSTEM ON MARKETS

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**Abstract:** Objective of this work is to explain the significant quantitative evidence about relationships between Web based or eLearning Management System (eLMS) and mobile or mLearning Management System (mLMS) as relatively new technological and business possibilities for Distance Learning Management Systems (dLMS) in entrepreneurship and business on related markets (insurance, banking, etc.). Modern human dLMS are the technological and business innovation on markets, which leads entrepreneurship management to move their interest from eLMS environments to iLearning Management System (iLMS) environments on markets, where iLMS represents combination between eLMS and mLMS. This study use mainly a quantitative business evidence and results from simulation analysis of few actual exchanges in human learning on markets. Because basically the iLMS business system architecture usually makes minimally: server for preparation of learning material (preparation server), server for distance presentation of learning material (presentation server), with server for evaluation of learning (testing or correction server), this minimal configuration was used for quantitative simulation analysis of exchanges in human learning on markets.

**Keywords:** human DL market; iLMS (eLMS+mLMS) information technologies



## COMPARATIVE ANALYSIS OF THE CROATIAN INSURANCE TAX SYSTEM MODEL

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**Abstract:** Objective of this work is to explain the problems of the Croatian insurance tax system modelling concept thorough the evidence acquired and accomplished during the comparative analytical evaluation of some important financial services from the fiscal year 2000 until today. This comparative analytical evaluation parallel deals with significant aspects in other countries of the world. This kind of comparative studies are appropriate for effective quantitative implementation of the analytical support of market activities control at insurance business enterprise, and in building insurance entrepreneurship management. The model gives a basic idea of movement of significant variables for quantitative insurance models that are optimized for the solving of real market problems, which arose in market interactions of insurance enterprise subject. This model is a significant part for the analytical support of market activities control at insurance business enterprise, especially at building insurance entrepreneurship management in Croatia and similar transitional countries.

**Keywords:** problems in insurance entrepreneurship related to the Croatian tax system model, support of insurance decision management



## RECENT REAL MARKET PRICE OF DISTANCE LEARNING PROJECTS

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**Abstract:** Distance learning projects have rapidly developed into a very hot topic that it has become the centre of interest and study at many business and higher education institutions. The assessment and costs evaluation is very important for understanding the full impact of the costs on recent real market price of distance learning (education) projects. On market there are various categories of distance learning project costs, like: (institutional business) infrastructure development costs, technology specific costs, support personnel costs, costs of development courses (or educational business lectures), costs of teaching, and various hidden costs. Objective of this work is to create a relevant structure of recent real market costs for some distance learning projects. There have not been many similar studies published on the costs of distance learning projects; research focus was through a relevant literature, an analysis of gathered surveys, and personal business project experience. These kinds of cost-benefit studies were significant for development of the specific Web Based education system for the various governmental projects of the Republic of Croatia. Application of this solution increases the effectiveness, efficiency, and quality of planned educational processes about specific financial knowledge (especially for the case of anti-money laundering business). This kind of study is a great opportunity for additional research and new business developments.

**Keywords:** recent real market price, distance learning project, cost-benefit study



## THE INVESTMENT PROJECTS AT ACTIVE ALTERNATIVE

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**ABSTRACT:** One of the important and rather complex problems of the investment analysis is the choice of the rate of discount, on which such characteristics of the investment projects, as Net Present Value, Payback Time, Profitability Index is necessary to calculate. It is usually supposed, that alternative to financing the project is nesting resources in bank under fixed interest rate or generally under the predicted dynamics of the interest rate. Thereby, the alternative to financing the project is supposed passive. The attempt of application to the analysis of the investments of the Markowitz-Tobin portfolio theory in a combination with the optional technique used in stochastic financial mathematics is undertaken in the paper. It means that active usage of free resources alternatively to investment project is supposed.

The offered approach is based on construction of a scenario tree, where in each node the optimal portfolio of the shares and bonds for some utility function is formed. Then it is supposed, that the free resources under the project in every node of a scenario tree are arranged according to the structure of an appropriate optimal portfolio. The construction allows to define the characteristics of the project with the help of matching outcomes under the project with the "zero" project.

**Key words.**

Investment projects efficiency, portfolio of securities



## DATA WAREHOUSE EXPLORING TOOLS

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**Abstract:** A data warehouse building has its own specific challenges (common data model, metadata catalogue and etc.), and at the end, result is a very complex environment. But, just having a data warehouse does not provide organizations with the often-heralded business benefits of data warehousing. In order to complete the whole chain from transactional system to decision makers, organizations need powerful end user tools that allow decision makers and business analysts to make strategic and tactical decisions based on the information stored in these data warehouses. Namely, the returns from a data warehouse project come when users do things they were never able to do before – make better decisions, save money, increase revenues and operate more efficiently. There are different tools that enable achieving of those goals. In the paper we gave an overview of the commonly used tools (query and reporting tools, OLAP and data mining) with their advantages and disadvantages related to the data warehouse potential.

Keywords: **data warehouse, OLAP, data mining, query and reporting tools**





## SOME OF THE RISK MODELS

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**ABSTRACT:** In this study we are constructing the relevant models for short period insurance contracts that are dependent according to number of injuries and according to ratio of individual injuries. Also, here we are developing a deriving function of momentum for sum of  $N$  independent random variables; especially when  $N$  has: Binomial, Poisson, geometric or negative Binomial distribution. After definition of complex Poisson's distribution here we show that sum of independent random variables, with complex Poisson distribution, has complex Poisson distribution, also. Next, we derive mathematical expectation, variance and coefficient of asymmetry for complex Binomial, complex Poisson's and complex negative Binomial random variable. The last task of this study was development of right equations for deriving functions of momentums and development of momentums for resulting sums of injuries throughout defined period of time, and for defined models, with a help of adequate functions that are relevant for distribution of number of injuries and of their resulting sums, with notation of all mathematical assumptions which are relevant for these equations.

**Keywords:** derivations, momentum, independent random variables, distributions, expectation, variance and coefficient of asymmetry





## QUANTITATIVE SIMULATION MODELLING OF SOME FUNCTIONAL CHARACTERISTICS OF THE INTELLIGENT TRANSPORT SYSTEM FOR PORT SYSTEM

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**Abstract:** There is very little quantitative information on functional differences (i.e. intra and extra differences) and the effectiveness of policy measures in the specific area of maritime logistics as Intelligent Transport System for Port System /ITS-PS/ is, and modern "telematics" (or information systems) facilities. A similar statement can be made about development of traditional and modern micro indicators as quantitative information on functional differences and the effectiveness of policy measures in the area of ITS-PS as specific maritime logistics. They are inadequate for the whole interrelated supply chain of maritime logistics in Ports. The fact is that most performance indicators for logistical systems in Ports comes from the traditional accounting figures, i.e. a system that has its roots in medieval times. Most of these systems have not any ITS-PS and maritime logistical transparency, which has been noted by the European Union when they introduced a new accounting system/possibility a many years ago. These statements are the basis and rationale for the work on this study report forming a frame and need for the simulation modelling analysis and simulation evaluation of indicators used for ITS-PS (in maritime logistics industry) as well as modern trends in the usage of them. Conclusion of this work is that quantitative simulation modelling of specific human market interactions correlated with activities of ITS-PS (as specific maritime logistics industry) show strong need for movement from stand alone ITS-PS solutions, through dyadic integration, to the integrated supply chains for Port System.

**Keywords:** quantitative simulation modelling, Intelligent Transport System for Port System, information systems technologies



## RECENT DEVELOPMENTS IN CAPITAL MARKET THEORY FROM CAPM OVER ARTIFICIAL MARKETS AND BEHAVIOURAL FINANCE BACK TO CATALLECTICS

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**Abstract:** Today we believe, even more than years before, that a realistic modelling of the traders' decision-making is required, obeying the restrictions of the rules and regulations prevailing at the market place under consideration. We follow the recent postulates of quantitative modelling of traders' decision-making, thereby implementing in formal terms a catallectic understanding of the market. We propose the catallectic modelling of capital markets realised by the application of discrete choice models. As in the case of stock markets the well-known objection of the independence from irrelevant alternatives (IIA) (Train, 2003) is not relevant, especially not when specifying the decision structure adequately, we implement the multinomial logit model of decision-making. The appropriateness of the IIA property is checked by referring to the relevant experimental economics and behavioural studies. With capital market synergetics, or KapSyn for short, we leave behind us the assumption of an arbitrage-free world and risk-less hedge portfolios.

**Keywords:** Capital Market Theory, Catallectics, Discrete Choice Models, Multinomial Logit Model, Capital Market Synergetics, Human Market Interactions





## CATALLACTICS AND HUMAN RESOURCE MANAGEMENT ON CROATIAN MARKET

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**Abstract:** A making of good business decisions in Human Resource Management (HRM) now became very important for many organizations, institutions and firms on Croatian market, especially in public domain. Also, quantitative information's and quantitative modelling of human market interactions on HRM market, and various models of HRM, now have significant influence on the whole Croatian Market. HRM models have influence on various organizational processes, as strong consequence of the decisions making process, which can be positive or negative. It depends of success and quality of HRM decision making models in organizations. The result of new HRM decision making process is development of relatively complex decisions that have positive influence on economical and financial organizational flows. In this work we develop relatively new aspects information's and catallactics model of HRM on Croatian market, which is now able to process and measure many kind of information's relevant for the HRM organizations, institutions and firms. These aspects of model have a different approach to HRM from the traditional model that was used on Croatian market. In traditional model of HRM we had lots of different techniques for understudying problems. In this relatively new HRM model we have basically eight steps, where every step represents only one rule for the whole HRM expert system. Now the HRM expert system is able to manage significant processes of HRM on Croatian market.

**Keywords:** Catallactics of human resource management, Expert system on Croatian market



## VIRTUAL TIME NORMS

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**Abstract.** The methodology presented in the article is based on the simulation of technological process duration, restricting on the available information about total duration of complex technological process in the conditions when there are no possibilities to determine the time norm by traditional methods. This methodology allows determining the time norm of repetitive technological processes with a defined probability without additional measurement of time for every technological process. When more information about the duration of complex technological process duration is gathered, the methodology lets to make the additional correction of separate process time norm, also increasing the reliability of the revised time norm. The methodology lets to reduce the number of technological process duration measurements, promptly evaluate the objective changes of the time norm, occurred because of the new technologies, new equipment and skills of workers.

**Keywords.** Time norm, technological process, simulation.



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