
Introduction: business simulation and knowledge management

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Philippe Geril is presently the Executive Director of ETI Ltd (The European Technology Institute), a company dedicated to promoting European research and development. In 1994, he became the Co-founder and Executive Director of SCS Europe Ltd. He left the company in 2002. In 2003 he set up ETI Bvba and was instrumental in creating EUROSIS. He was a Scientific Advisor for Ghent University from 2003 to 2006. Since 1985, he has created and run over a 100 simulation and simulation related conferences in Europe, The Middle East and North-America, each of which have become a well-known and respected brand in their own right. He has edited some 100 scientific proceedings to date and has edited several journals and newsletters (such as *Simulation News Europe* (1985–1990), *Inderscience* (2006-)) in the field of computer simulation.

This is the second part of two special issues on ‘Future Business and Technology’. The first part with focus area of *Future Technology and Engineering Management* was published in a special issue of *World Review of Science, Technology and Sustainable Development* (WRSTSD, Vol. 4, Issues 2–3, 2007). The focus of this second and continuing part is on ‘*Business Simulation and Knowledge Management*’.

As simulation and integrated knowledge management are regarded as the driving forces behind some of the world's largest and most successful organisations this special issue of WRSTSD on Future Business and Knowledge Management aims to push business technology research onto the next evolutionary step beyond the building blocks of present day business practices such as 'Operations Research' or 'Business Process Simulation'. This issue is meant to integrate them all into an even higher level enterprise wide framework with its new work roles, responsibilities, reward systems methods and tools. In other words, attaining true knowledge management is about radical and fundamentally new ways to create retain share and leverage knowledge of people and organisations in ways that were simply not possible before.

Next to the integral simulation part, this issue will try also to provide a strategic business overview of knowledge management in all its varied applications. With this aspect in mind, the focus of the issue is on the latest knowledge strategies that business leaders need in order to become a Knowledge Organisation and to withstand the forces of the financial and management markets in the present day precarious environment, which is the global society.

In summary the papers submitted for this issue fall within the following areas of research:

- simulation in operational research and knowledge management
- business cost control
- business process modelling
- statistical analysis and data mining of business processes
- e-commerce, e-management, e-trade, e-banking, etc.
- project management and intelligence
- business process: integration, workflow and process management
- representation of processes to business management
- human and agent interaction
- risk analysis and decision making
- use of hybrid systems (artificial intelligence) as decision support in political, conflict and anti-disaster problems
- emergency management and risk analysis management
- crisis management
- knowledge management and economy, multimedia in manufacturing companies.

The idea behind these issues also was to provide an opportunity for the researchers and scientists who are working in the areas of future technology, future business and knowledge management especially for the participants of *3rd Annual Future Business Technology Conference 2006 (FUBUTEC2006)*, <http://85.255.195.219/conf/fubutec/fubutec2006/index.html>) that was held in Athens, Greece from April 17–19, 2006 to publish their papers in these special issues.

In the first part the focus was on future technology and engineering knowledge. Issues such as energy, uses of emerging technology such as application of nanotechnology in medical science, energy transfer and applications of fuel cell for energy uses were presented in Part I. Titles of the ten papers reviewed in Part I in WRSTSD special issues are given as following:

- *Paper 1*: ‘Introduction to future business and technology – Part I: future technology and engineering management’, by M.R. Riazi and P. Geril (Kuwait and Belgium)
- *Paper 2*: ‘Sustainable engineering management: end-of-life vehicle models with recycling in mind’, by Rinaldo C. Michellini (Italy)
- *Paper 3*: ‘The incentive behind the adaptation process of high-technology product: an empirical research’, by Danilo Hamann and Maktoba Omar (UK)
- *Paper 4*: ‘Evaluation of the queueing network equilibrium based on clustering analysis and self-organising map’, by Dimitar Radev, Izabella Lokshina and Svetla Radeva (Bulgaria, USA)
- *Paper 5*: ‘Model of a non-isothermal tubular ammonia reformer for fuel cell applications’, by Klaus Hellgardt, David J. Richardson, Paul A. Russell, Geoffrey Mason and Bryan A. Buffham (UK)
- *Paper 6*: ‘Traffic equilibrium in a stochastic transportation network’, by H.M. Soroush (Kuwait)
- *Paper 7*: ‘A multi-criteria decision approach for choosing and ranking SO₂ emission reduction measures for a network of power stations’, by S. Al-Gharib, A. Elkamel, and C. Baker (Canada and Kuwait)
- *Paper 8*: ‘Nanotechnology in cancer prevention and treatment: bright future lies ahead’, by G.A. Mansoori, P. Mohazzabi and E. Strashnov (USA)
- *Paper 9*: ‘Natural gas transportation: NGH or LNG?’, by J. Javanmardi, Kh. Nasrifar, S.H. Najibi, M. Moshfeghian (USA and Iran)
- *Paper 10*: ‘Contribution of nuclear energy to sustainable development in Romania’, by I. Prisecaru and D. Dupleac (Politehnica University of Bucharest, Romania) T. Chirica and A. Havris (SN Nuclearelectrica, Romania).

In addition to the introductory paper titles of 13 papers for Part II which are reviewed in this special issue are given as:

- *Paper 1*: ‘Introduction to future business and technology – Part II: business simulation and knowledge management’, by M.R. Riazi and P. Geril (Kuwait and Belgium)
- *Paper 2*: ‘System simulation across developmental divide: toward achieving global business advantage and consumer surplus through transfer pricing’, by Appa Rao Korukonda and Saritha Korukonda (USA)
- *Paper 3*: ‘Sustainable energy policies as a source of competitive advantage in the UK service industry’, by Mark Burrows and Maktoba Omar (UK)

- *Paper 4*: ‘Prediction markets: an information aggregation perspective to the forecasting problem’, by Georgios Tziralis and Ilias Tatsiopoulos (Greece)
- *Paper 5*: ‘Improving the use of Visual Interactive Simulation as a knowledge elicitation tool’, by Stewart Robinson, Ernie Lee, and John S. Edwards (UK)
- *Paper 6*: ‘Incorporating uncertainty in optimal investment decisions’, by Athanasios Rentizelas, Georgios Tziralis and Konstantinos Kirytopoulos (Greece)
- *Paper 7*: ‘Reverse logistics and resource recovering: modelling and simulation of car dismantling facilities’, by G.M. Accacia, R.C. Michelini, L. Penzo and N. Qualich (Italy)
- *Paper 8*: ‘Queueing networks in equilibrium and Markov chains: numerical solution method’, by Dimitar Radev, Izabella Lokshina and Vladimir Denchev (Bulgaria and USA)
- *Paper 9*: ‘Project’s duration prediction: Traditional tools or simulation?’, by Viktor K. Diamantas and Konstantinos A. Kirytopoulos (Greece)
- *Paper 10*: ‘Using Taguchi method for post optimality analysis in MCDM’, by R. Khorramshahgol and M. Tamiz (Kuwait)
- *Paper 11*: ‘An ontology oriented approach for knowledge criticality analysis’, by Charles-Emmanuel Foveau, Christophe Roche and Christophe Tricot (France)
- *Paper 12*: ‘Role of electronic commerce tools in European automobile trade’, by S. Saravanana, H. Vijayakumar and V. Sahadevan (France, Spain and India)
- *Paper 13*: ‘An enhanced approach to the ranked voting system’, by M. Tamiz and A.A. Foroughi (Kuwait)
- *Paper 14*: ‘Introduction to various dimensions of cost control’, by H.M. Soroush (Kuwait)

The focus in Part II is on business simulation, knowledge management and decision making strategy in business as well as on market predictions and forecasting problems.

Following the introductory paper, Paper 2 by Appa Rao Korukonda discusses that by the virtue of transfer pricing or value-based pricing, millions of additional needy users are able to afford the medical service. This is also one reason why multinational companies adopt price discrimination as a matter of strategic management choice. One major conclusion is that the overall effect of transfer pricing is to result in an increase in consumer surplus.

The third paper by Burrows and Omar reviews UK service industry and its ability to reduce the cost by energy efficiency operations. They consider factors such as energy prices and energy awareness as well as its benefits such as increased social perception, improved employee relations and personal integrity. Finally they look at four factors for future development of energy efficiency in the UK service industry: collaboration, deregulation, technology advancement and information. In their analysis the authors consider fuel (petroleum or natural gas) cost as the energy cost. Results from this study shows that small and medium sized businesses are less likely to become energy efficient and that any measures they do take are very minor. However, support of major companies are important in energy efficiency and cost reduction. The authors suggest that the

likelihood of becoming energy efficient is not linked to company financial strength but more about control of assets and centralised synergetic activities. Such companies have the ability that they can save more through savings on energy throughout their business.

In the fourth paper by Georgios Tziralis and Ilias Tatsiopoulos of Greece the role of forecasting in transforming strategic objectives into decisions which is crucially important has been discussed. Traditional forecasting approaches as well as modern artificial intelligence techniques have been shown to perform poorly in modelling and aggregating of experts' knowledge. In this paper an opposite and novel point of view is introduced by the use of prediction markets. Several design issues have been discussed, such as the definition of the forecast's objectives, their transformation into shares of claims, selection of employees and participation incentives, etc.

The fifth paper is presented by Stewart Robinson, Lee and John Edwards of Aston University (UK) which describes a methodology to study the ways by which Visual Interactive Simulation (VIS) could be improved as a tool to elicit hot-test operations knowledge in the Ford engine assembly plant. The authors have identified two ways of visual display and mode of engineering problems and have completed three stages of methodology. They also expect certain generic lessons such as likely effects of visual display on decision making quality.

The sixth paper by Rentizelas, Tziralis and Kirytopoulos of National Technical University of Athens (Greece) is devoted to investment decisions as now they are more crucial than ever before for any kind of production companies. This paper proposes an innovative approach that merges optimisation and risk analysis in one single method. The two-step investment appraisal approach reaches an optimum through a Genetic Algorithm optimisation and then assesses the environment's risk through a Monte Carlo simulation. The approach was demonstrated through a case study of an investment regarding a tri-generation power plant.

The seventh paper is given by Professor Michelini and his group at the University of Genova (Italy) and gives a survey of the existing EU legal frame to lower pollution and suggests the modelling and simulation path to assess the car dismantling process performance. Recovery and recycling, directly, address requirements along material supply chains, to lower the impact in pollution and consumption.

The eighth paper is presented by Radev and his co-workers from Bulgaria and USA. In this paper a new approach to the steady-state numerical solutions for the queueing networks is recommended. Queueing networks, which consist of several service stations, are usually used in modelling to represent the structures of various systems with large number of resources, for instance, computer and communication systems. The authors show computational precision and convergence of the algorithms used through numerical examples.

The ninth paper is presented by Diamantas, Konstantinos and Kirytopoulos also from Greece and is related to the prediction of duration of a project a very important factor in project cost estimation. In this paper the authors examine various methods for modelling project duration. The authors indicate that the widely acknowledged Critical Path Method (CPM) can not handle uncertainty, therefore Program Evaluation and Review Technique (PERT) and Monte Carlo (MC) Simulation are the most frequently used methods from best-in-class companies. In this paper the results of the standard MCS with those of PERT are compared from the estimation of project duration point of view. In addition, the incorporation of project risk management into the two approaches is addressed. Advantages and disadvantages of each method are compared. The authors conclude that

the modelling of risk is more robust when the MCS is used. In addition the theoretical findings have been validated and illustrated through a case study coming from the construction industry. The case study revealed that on the one hand MCS produces more conservative results than PERT and on the other hand that it can better handle risk inclusion in project's scheduling.

In the tenth paper, R. Khorramshahgol and M. Tamiz from College of Business Administration at Kuwait University use a loss function originally derived based on the idea of social loss to assess the loss associated with a solution provided by a particular Multi-Criteria Decision Making (MCDM) method. To illustrate the practicality of the proposed model, its application to goal programming has been illustrated.

Managers and decision-makers must be able to identify as quickly as possible what knowledge are critical or could be critical in a close future in order to plan the enterprise's strategy in particular human resources management. This is what is presented by Foveau, Roche and Tricot of Université de Savoie of France in Paper 11. In this paper a methodology is provided with tools for knowledge criticality analysis which is based on the enterprise ontology and cartography. According to the authors definition ontology represents knowledge about competencies, jobs and projects while knowledge cartography allows to visualise the critical information mapped on the ontology. In conclusion the authors argue that knowledge criticality analysis is a central issue for a company. Finally in this paper the maps of critical knowledge are presented that can be used for simulation in order to identify the knowledge which could be critical in a close future.

The 12th paper by Saravanana et al. (Spain, France and India) discusses the role of electronic commerce tools in European automobile trade. In this paper an overview of E-Commerce tools in European automobile trade is presented in detail using existing utilities considering leading European automobile players and their E-Commerce utilities. The authors conclude that functionality of E-Commerce tools strongly rely on its integration with other segments of suppliers business, availability of skilled labour and Information and Communication Technologies (ICT) infrastructures.

Paper 13 is written by M. Tamiz and A. Foroughi (Kuwait) who present an improved approach toward the ranked voting system. A voting system is a means of choosing between a number of options, based on the input of a number of voters. Voting is perhaps best known for its use in elections, where political candidates are selected for public office. This paper proposes enhancements to a ranked voting system model by using a linear transformation. Not only this transformation makes the model more effective by decreasing the number of assurance region constraints, but it also reduces a number of the other constraints. The advantages of the proposed enhancements are illustrated by an example that only two constraints are needed instead of 21 constraints in the original model. The proposed approaches can also reduce the role of inefficient candidates in determining the efficiency scores of efficient candidates.

Finally the last paper by H.M. Soroush from Operational Research Department of Kuwait University reviews an overview and introduction to various dimensions of cost control from both macro and micro perspectives. Global competition and the recession of 1990s and the early years of the 21st century have made the issue of cost control ever more important for the sake of survival and competitiveness. The roles of average citizens, employees and corporations as well as governments in cost control through appropriate legislations and reduction in bureaucracy have been discussed in this paper.

We hope this collection of papers will be useful to those who are interested in scientific approaches toward future business activities and knowledge management. We would like to express our appreciation to the authors for their contributions to this special issue, while we also would like to express our sincere thanks to the following people from academia and research centers from various countries:

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