2015

Industrial, Systems and Design Engineering, Technology & Engineering, and Foresight Abstracts

Third Annual International Conference on Industrial, Systems and Design Engineering, Second Annual International Conference on Technology & Engineering, and International Conference on Foresight

22-25 June 2015, Athens, Greece

Edited by Gregory T. Papanikos

THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

Industrial, Systems and Design Engineering, Technology & Engineering, and Foresight Abstracts

3rd Annual International Conference on Industrial, Systems and Design Engineering, 2nd Annual International Conference on Technology and Engineering, and International Conference on Foresight

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(In Alphabetical Order by Author's Family name)

Preface

This abstract book includes all the abstracts of the papers presented at the *3rd Annual International Conference on Industrial, Systems and Design Engineering, 2nd Annual International Conference on Technology and Engineering, and International Conference on Foresight*, 22-25 June 2015, organized by the Athens Institute for Education and Research. In total there were 46 papers and over 48 presenters, coming from 25 different countries (Australia, Brazil, Canada, Chile, China, Colombia, Croatia, Denmark, Finland, France, Germany, India, Israel, Jordan, Lebanon, New Zealand, Serbia, South Africa, South Korea, Spain, Taiwan, The Netherlands, Turkey, UK and USA). The conference was organized into eleven sessions that included areas of Industrial, Systems and Design Engineering, Technology and Engineering and other related fields. As it is the publication policy of the Institute, the papers presented in this conference will be considered for publication in one of the books and/or journals of ATINER.

The Institute was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet in Athens and exchange ideas on their research and consider the future developments of their fields of study. Our mission is to make ATHENS a place where academics and researchers from all over the world meet to discuss the developments of their discipline and present their work. To serve this purpose, conferences are organized along the lines of well established and well defined scientific disciplines. In addition, interdisciplinary conferences are also organized because they serve the mission statement of the Institute. Since 1995, ATINER has organized more than 150 international conferences and has published over 100 books. Academically, the Institute is organized into six research divisions and twenty-seven research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

I would like to thank all the participants, the members of the organizing and academic committee and most importantly the administration staff of ATINER for putting this conference together.

Gregory T. Papanikos
President

FINAL CONFERENCE PROGRAM
3rd Annual International Conference on Industrial, Systems and Design Engineering, 2nd Annual International Conference on Technology and Engineering, and International Conference on Foresight 22-25 June 2015, Athens, Greece

PROGRAM

Conference Venue: **Titania Hotel, 52 Panepistimiou Avenue, Athens, Greece**

Organization and Scientific Committee

1. Dr. Gregory T. Papanikos, President, ATINER & Honorary Professor, University of Stirling, UK.
2. Dr. George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.
3. Dr. Theodore Trafalis, Head, Industrial Research Unit, ATINER & Professor of Industrial and Systems Engineering, The University of Oklahoma, USA.
4. Dr. Nicholas N. Patricios, Director, Engineering & Architecture Research Division, ATINER, Professor & Dean Emeritus, School of Architecture, University of Miami, USA.
5. Dr. Thomas Attard, Deputy Head, Architecture & Engineering Research Unit, ATINER & Associate Research Professor, Arizona State University, USA.
6. Dr Lampros Pyrgiotis, Independent Researcher, President, Greek Society of Regional Scientists, Greece.
7. Dr. Anila Mesi-Dizdari, Academic Member, Atiner & Associate Professor, University of Shkodra Luigj Gurakuqi, Albania.
8. Dr. Nicholas Pappas, Vice-President of Academics, ATINER, Greece & Professor, Sam Houston University, USA.
9. Dr. Panagiotis Petratos, Vice President of ICT, ATINER, Fellow, Institution of Engineering and Technology & Professor, Department of Computer Information Systems, California State University, Stanislaus, USA.
10. Dr. Chris Sakellariou, Vice President of Financial Affairs, ATINER, Greece & Associate Professor, Nanyang Technological University, Singapore.
11. Ms. Olga Gkounta, Researcher, ATINER.

Administration

Stavroula Kyritsi, Konstantinos Manolidis, Katerina Maraki & Kostas Spiropoulos

Monday 22 June 2015

(all sessions include 10 minutes break)

08:40-09:40 Registration and Refreshments

09:40-10:00 (ROOM C) Welcome & Opening Remarks

- Dr. Gregory T. Papanikos, President, ATINER & Honorary Professor of Economics, University of Stirling, UK.
- Dr. Theodore Trafalis, Head, Industrial Research Unit, ATINER & Professor of Industrial and Systems Engineering, The University of Oklahoma, USA.

10:00-11:45 Session I (ROOM C): Engineering and Technical Education

Chair: Theodore Trafalis, Head, Industrial Research Unit, ATINER & Professor of Industrial and Systems Engineering, The University of Oklahoma, USA.

1. Rade Ciric, Professor, The Higher Technical School of Professional Studies in Novi Sad, Serbia & Matija Sokola, The Higher Technical School of Professional Studies in Novi Sad, Serbia. Syllabus Course "Distribution and Industrial Networks". (IND)
2. *Bassam Hussein, Chair, Department of Industrial Engineering, Lebanese International University, Lebanon, Lebanon, Mona Aridi, Lebanese International University, Lebanon, Hassan Khachfe, Center for Quality Assurance, Institutional Assessment & Scientific Research (QAIASR), Lebanon & Amin Haj-Ali, Lebanese International University, Lebanon. Measuring the Motivating Potential Score of Academic Staff at the Lebanese International University. (IND)
3. Don Clucas, Senior Lecturer, University of Canterbury, New Zealand & Stefanie Gutschmidt, Senior Lecturer, University of Canterbury, New Zealand. Use of Additive Manufacture and Stirling Engines as Engineering Education Tools. (IND)
4. Adam Postula, Senior Lecturer, University of Queensland, Australia, Matthew D'Souza, Konstanty Bialkowski & Mark Schulz. Embedded System Design in University Teaching Practice. (TEN)
5. *Karen Woodman, Senior Lecturer, Queensland University of Technology, Australia & Prasad KDV Yarlagadda, Professor, Queensland University of Technology, Australia. Best Practices in Supervision of International Students in Engineering and IT. (TEN)

11:45-13:45 Session II (ROOM C): Advances – Soft I	**11:45-13:30 Session III (ROOM D): Industrial Intelligence I**
Chair: *Karen Woodman, Senior Lecturer, Queensland University of Technology, Australia.	**Chair**: *Bassam Hussein, Chair, Department of Industrial Engineering, Lebanese International University, Lebanon.
1. *Peter Hess, Professor, Nuremberg Institute of Technology, Germany & Maximilian Wagner, Scientific Assistant, Nuremberg Institute of Technology, Germany. New Developments in Industrial Robot Programming. (IND) 2. Theo Van Niekerk, Professor, Nelson Mandela Metropolitan University, South Africa & Aiden Cumberlege, Weld Engineer, Nelson Mandela Metropolitan University, South Africa. Wireless Production Line Monitoring via Android. (TEN) 3. C.-Y. Wu, National Cheng-Kung University, Taiwan, Jason Sheng-Hong Tsai, Professor, National Cheng-Kung University, Taiwan, L.-C. Chen, Cheng-Kung University, Taiwan, S.-M. Guo, National Cheng Kung University, Taiwan, L.-S. Shieh, University of Houston, USA & T.-J. Tsai, Tung-Fang Institute of Technology, Taiwan. A New Input Constrained Quadratic Tracker for an Unknown Sampled-Data System with an Input to Output Direct Transmission Term. (IND) 4. Mao-Jiun Wang, Professor, National Tsing Hua University, Taiwan, Chao-Hung Wang, National Tsing Hua University, Taiwan & Wei-Jen Lo, National Tsing Hua University, Taiwan. Augmented Reality based Maintenance Instruction System. (IND) 5. Nabil Semaan, Assistant Professor, University of Balamand, Lebanon. Deterministic, Queueying and Simulation Modeling of the Production of Ready Mix Concrete Batch Plant Industry in Nahr El Maout, Lebanon. (IND)	1. *Jong-Rong Chen, Professor, National Central University, Taiwan, Chia-Hua Chung, Ph.D. Student, National Central University, Taiwan & Chih-Hai Yang, Professor, National Central University, Taiwan. Non-Practicing Entities, Patent Value, and Patent Transfer. (FOS) 2. *Konstadinos Goulias, Professor, University of California, USA. Design and Implementation of a Simulator of Activities, Greenhouse Gas Emissions, Networks, and Travel (SimAGENT) in Southern California. (FOS) 3. Sebastian Lozano, Professor, Universidad de Sevilla, Spain, Ma Teresa Moreira, Professor, Universidad de Santiago de Compostela, Spain & Gumersindo Feijoo, Professor, Universidad de Santiago de Compostela, Spain. DEA Benchmarking of Wastewater Treatment Plants Using Life Cycle Assessment. (IND) 4. Jose Maldifassi, Assistant Professor, Universidad Adolfo Ibanez, Chile & Agustin De La Cuesta, San Joaquin Campus Director, Professional Institute Duoc – Uc, Chile. A Two-Stage Process for Explaining the Relative Efficiency of Small and Medium-Size Firms in Chile. (TEN)

13:30-14:30 Lunch

14:30-16:30 Session IV (ROOM C): Industrial Intelligence II	**14:30-16:30 Session V (ROOM D): Advances – Hard I**
Chair: *Jong-Rong Chen, Professor, National Central University, Taiwan.	**Chair**: *Till Haenisch, Professor, BW State University, Germany.
1. Tae Jo Ko, Professor, Yeungnam University, Korea & Muhammad Sana Ullah Sahar, Student/Researcher, Yeungnam University, Korea. A Method to Select Optimal Solution for Machine Tools Remanufacturing Multi-Solution Decision Problem. (IND) 2. Lesley Wolk, Associate Professor, Southern Connecticut State University, USA. Increasing Public Awareness for Stuttering: Enhancing Listener Responses and Overall Communication. (FOS) 3. Guldal Guleryuz, Assistant Professor, Hacettepe University, Turkey. Asymptotic Analysis of a Reliability Model with Repair and Standby. (IND) 4. Stefan Junk, Head, Laboratory for Rapid Prototyping, University of Applied Sciences Offenburg, Germany & Steffen Schrock, Researcher, University of Applied Sciences Offenburg, Germany. A Benchmark of Service Providers in Additive Manufacturing. (IND) 5. *Tiina Kymalainen, Research Scientist, VTT Technical Research Centre of Finland Ltd, Finland. Innovative Leap into the Future - Emerging Technology Design by the Science Fiction Prototypes. (FOS)	1. Gus Calabrese, Head Engineering, Cinternational/WFTelectronics, USA & Joanne Yamaguchi, Post-Doc Researcher, Rasmussen College, USA. Moving Wearables from Toys to a Lifestyle. (FOS) 2. *Peter Boehm, Professor, University of Applied Science, Germany & Christian Lamberti, Ph.D. Student, University of Luxembourg, Luxembourg. On-Line Monitoring of the Laser Joining Process of Aluminium Alloy and Polyamid 6.6 by Acoustic Emission Analysis. (IND) 3. Jason Shih, Professor Emeritus, North Carolina State University, USA. Biogas Technology in Modern Agriculture for Energy Production, Environmental Sustainability, and New Product Development. (FOS) 4. Igor Petrovic, Lecturer, Technical College in Bjelovar, Croatia, Ante Cikic, Associate Professor, Technical College in Bjelovar, Croatia & Tomislav Pavlic, Lecturer, Technical College in Bjelovar, Croatia. The Influence of Solar Insolation and Oxygen Content in Water on the Efficiency of Intensive Hydroponic Salad Growing in Greenhouses. (TEN)

16:30-18:30 Session VI (ROOM C): Advances–Hard II

Chair: *Konstadinos Goulias, Professor, University of California, USA.

1. *Till Haenisch, Professor, BW State University, Germany & Stefanie Haenisch, BW State University, Germany. Using a LED Flashlight for High Speed Photography in Industrial Settings. (TEN)
2. *Carlos Alberto Guerrero-Fajardo, Associate Professor, National University of Colombia, Colombia & Maria del Pilar Trivino-Restrepo, Professor, Universidad Pedagogica y Tecnologica de Colombia, Colombia. Mesoporous Carbon as Catalytic Support for Biodiesel Production from Oilseeds. (TEN)
3. *Jerry Davis, Associate Professor, Auburn University, USA, Richard Sesek, Associate Professor, LuAnn Sims, Ph.D. Candidate & Sean Gallagher, Associate Professor, Auburn University, USA. Developing Empirical Donning Times for Smoke Hoods. (IND)
4. Velmurugan Muthu, Ph.D. Student, Indian Institute of Technology Madras, India & Rupen Goswami, Assistant Professor, Indian Institute of Technology Madras, India. I-Beam to Square CFT Column Seismic Connection using External Diaphragm and Rib Plate for Moment Frames. (TEN)
5. Maria del Rosario Tapia Baranda, Ph.D. Candidate, Universidad de Valencia, Spain & Guillermo Gandara Fierro, Instituto Tecnologico de Estudios Superiores de Monterrey, Mexico. Towards Sustainable Development on Sugarcane Agro Industrial Sector: Scenarios to Veracruz 2030 (FOS)

18:30-20:30 Session VII (ROOM C): A Round-Table Discussion on The Future of Technology and Engineering Education

Chair: Dr Lampros Pyrgiotis, Independent Researcher; President, Greek Society of Regional Scientists, Greece.

1. Dr Jong-Rong Chen, Professor, National Central University, Taiwan.
2. Dr Don Clucas, Senior Lecturer, University of Canterbury, New Zealand.
3. Dr Patrick van der Duin, Assistant Professor, Delft University of Technology, The Netherlands.
4. Dr Konstadinos Goulias, Professor, University of California Santa Barbara, USA.
5. Dr Till Haenisch, Professor, BW State University, Germany.
6. Dr Theo van Niekerk, Professor, Nelson Mandela Metropolitan University, South Africa.
7. Dr Theodore Trafalis, Head, Industrial Research Unit, ATINER & Professor of Industrial and Systems Engineering, The University of Oklahoma, USA.
8. Dr Themistoklis Xanthopoulos, Professor Emeritus & former Rector, National Technical University of Athens (NTUA), Greece.
9. Dr Jin Zhouying, Director, Chinese Academy of Social Sciences, China.

21:00-23:00 Greek Night and Dinner (Details during registration)

Tuesday 23 June 2015

08:15-10:30 Session VIII (ROOM C): Foresight Exercise

Chair: *Peter Hess, Professor, Nuremberg Institute of Technology, Germany.

1. Ali Paya, Senior Visiting Research Fellow, University of Westminster, UK. A Critical Assessment of Foresight Methodologies.
2. *Patrick van der Duin, Assistant Professor, Delft University of Technology and Associate Professor, Fontys University of Applied Sciences, The Netherlands, Jacintha Scheerder, The Netherlands Study Centre for Technology Trends, Rene Hoogerwerf, The Netherlands Study Centre for Technology Trends, Silke de Wilde, The Netherlands Study Centre for Technology Trends & Vincent Marchau, Delft University of Technology/Radboud Unversity, The Netherlands. Challenging the Future. The Implications of the 'Horizonscan 2050' for Dutch Innovation System Policy. (FOS)
3. Zhouying Jin, Director, Center for Technology Innovation and Strategy Studies, Chinese Academy of Social Sciences, China. The Human Future Evolution - From Humanity - Social Perspectives. (FOS)
4. *Antje Bierwisch, Senior Researcher, Fraunhofer Institute for Systems and Innovation Research, Germany. Grand Challenges "Secure Society" and Integrated Foresight Approach for Technology Assessment. (FOS)
5. James Steinhoff, Ph.D. Student, The University of Western Ontario, Canada. Species Being: An Alternate Political Future for Transhumanism. (FOS)
6. Dimitrios Kyriakou, Lead Economist, Smart Specialization Platform, European Commission (JRC-IPTS), Spain. Foresight and Smart Specialization: The Twain Shall Meet. (FOS)
7. Ana Jakil, Project Manager, European Environment Agency, Denmark. Uses of Foresight Methodologies and Methods in the European Environment Agency's 'Assessment of Global Megatrends 2015': Lessons Learned and Potential Opportunities. (FOS)

10:30-12:30 Session IX (ROOM C): Industrial Intelligence III

Chair: *Patrick van der Duin, Assistant Professor, Delft University of Technology and Associate Professor, Fontys University of Applied Sciences, The Netherlands.

1. Rina Sadia, Lecturer, Shenkar College of Engineering and Design, Israel. A System Approach Linking Organizational Effectiveness, Employees Health and Quality Culture- Findings from the Literature. (IND)
2. Sermin Sahin, Industrial Engineer, Hacettepe University, Turkey, Seda Albayrak, Industrial Engineer, Hacettepe University, Turkey, Feyza Bulak, Industrial Engineer, Hacettepe University, Turkey & Zeynep Dur, Industrial Engineer, Hacettepe University, Turkey. Flexible Job Shop Scheduling for a Project Based Company. (IND)
3. Mateus Balan, Post Graduate Student, University of Sao Paulo, Brazil, Tesoro Elena Del Carpio-Huayllas, Post Graduate Student, University of Sao Paulo, Brazil & Dorel Soares Ramos, Associate Professor, University of Sao Paulo, Brazil. Operational Cost Assessment of Microgrids Containing Renewable and Non-renewable Generators. (TEN)
4. Aysegul Sarac, R&D Specialist, Arcelik Washing Machine R&D Center, Turkey, Serdar Baysan, Research Assistant, Istanbul Technical University, Turkey & Bulent Durmusoglu, Professor, Istanbul Technical University, Turkey. Integrating Lean Principles on Project Management to Reduce Project Lead Time: A Real Application in a Multi-Project R&D Center. (IND)

12:30-14:00 Session X (ROOM C): Advances–Soft II

Chair: *Antje Bierwisch, Senior Researcher, Fraunhofer Institute for Systems and Innovation Research, Germany.

1. Yahya Isik, Lecturer, Uludag University, Turkey. The Design of Internally Cooled Tools in Orthogonal Metal Cutting. (IND)
2. Ali Hussain Tarrad, General Manager, Al-Sunbula Al-Thahabiya for General Trading Company, Jordan & Al-Nadawi Ayad, Assistant Lecturer, Iraq. Modeling of Finned-Tube Evaporator using Pure and Zeotropic Blend Refrigerants. (TEN)
3. Mert Varol, Research Assistant, Turgut Ozal University, Turkey, Ecehan Kaylan, Industrial Engineer, Turkey, Okan Ay, Industrial Engineer, Turkey & Guldal Guleryuz, Assistant Professor, Hacettepe University, Turkey. Remnant Storage Area Re-design and Inventory Tracking System for a Steel Fabrication Factory. (IND)
4. Asli Atalay, Research Assistant, Marmara University, Turkey. A New Approach to Design E-Textiles by Integrating Piezoelectric PVDF in/onto Yarns. (IND)
5. Lamia Atma Djoudi, Researcher, Synchrone Technologies, France & Miguel Rome, Manager, Synchrone Technologies, France. Software Reusability for Research Tools.

14:00-15:00 Lunch

15:00-16:30 Session XI (ROOM C): Industrial Intelligence IV

Chair: Olga Gkounta, Researcher, ATINER.

1. Xin Fan, MSc Student, Beijing Institute of Technology, China, Dong-hua Zhu, Professor, Beijing Institute of Technology, China, Xue-feng Wang, Professor, Beijing Institute of Technology, China & Ying Guo, Beijing Institute of Technology, China. Enterprise Technology Forecasting Based on Patent Map and TRIZ Theory. (FOS)
2. Bogdan Epureanu, Professor, University of Michigan, USA & Kiran D'Souza, Assistant Professor, Ohio State University, USA. An Approach for Evaluating the Utility and Cost of a Fleet of Modular Vehicles. (IND)

16:30-19:00 Urban Walk (Details during registration)

20:30- 22:00 Dinner (Details during registration)

Wednesday 24 June 2015
Cruise: (Details during registration)

Thursday 25 June 2015
Delphi Visit: (Details during registration)

Asli Atalay
Research Assistant, Marmara University, Turkey

A New Approach to Design E-Textiles by Integrating Piezoelectric PVDF in/onto Yarns

Integration of micro electro-mechanical systems (MEMs), smart materials and information technology into textiles is promoting a new range of functional textile materials over traditional textiles, which are woven or knitted to produce fabric for both structural and aesthetic purposes. Also existing methods to create electronic textiles are adding wires, circuits, and bulky electronic components to traditional textiles or sewing conductive threads and sensors onto daily clothing that respond to human body and environmental stimuli. However, all these currently developed versions add bulk and weight to the clothing and give an unpleasant feeling making them uncomfortable and inconvenient for everyday use. Thus, the encapsulation of micro electro-mechanical sensors into yarns would enable the measurement of the tensile stress and pressure at yarn level and eventually textile structure level by appearing as traditional textile structure. To do so, piezoelectric PVDF films are quite suitable and have sufficient qualities for these new generation smart textiles. Therefore, this paper mainly introduces encapsulated piezoelectric PVDF film into textile yarn for electromechanical sensing and analysis of the sensor properties of the PVDF integrated yarn. Encapsulation of piezoelectric PVDF materials onto textile yarns overcome some challenges by enabling knittability, washability, low cost production and electrode attachment. This paper focuses to integrate this new dimension of functionality into fibre/yarn electronics, thus turning objects in everyday use into intelligent artefacts.

Lamia Atma Djoudi
Researcher, Synchrone Technologies, France
&
Miguel Rome
Manager, Synchrone Technologies, France

Software Reusability for Research Tools

The reusability techniques have been developed and used widely on the classic software domains; the intense need for such process helped the reusability techniques to achieve more mature and reliable results. However the software reusability techniques still not applied affectively in the research fields. Many of the research fields need to develop several tools and software for the research purpose. Some of this tools and software are typically containing the same modules, functions and algorithms. It is expected that implementing the reusability for such domains will significantly enrich the research process by decreasing the redundant efforts. Moreover such platform can be employed as a collaboration knowledgebase.

In our work we chose the high performance computing and scientific computing domains. Both fields depend significantly on developing new tools for computing, simulation, visualization and parallel software.

This work aims to introduce the Tools Base system. This system works as an expert system and knowledgebase system that can provide the essential data for developing and reusing the research tools.

This work aims to introduce new dimension for the reusability, the Result Based Reusability system. This method focuses on studying the potential implementation of having a knowledgebase for the inputs and output of each the high cost algorithms. The research will provide an approximate or absolute solution (according to the tools requirements) for the scientific algorithms in the run time.

The research aims to answer the following questions.

Tools Base system:

- What are current needs of the different software domains?
- Selecting two new domains for reusability as case studies (i.e scientific computing, HPC).
- What modules can be addressed for the reusability purpose?
- What is the module classification method?

- How software can be divided into separate models to achieve higher reusability hits?
- How can we adapt the existing software modules?
- How the software can be developed to be more efficient in the reusability (reusability aware software)?
- How to maintain the software built from the usability of other modules?

Result Based Reusability system:

- Address the characteristics of the new algorithm based reusability.
- Determine the most consuming algorithms.
- How to highlight the inputs and outputs with higher hits?
- How to build the input/output data sets for the previous input/output combinations?
- How to retrieve in the results in minimal cost?
- Building the client side of the system.
- How to evaluate the approximate result techniques?

The first results are very motivating. In the final version of the paper, we present our approach, implementation and convincing results.

Mateus Balan
Post Graduate Student, University of Sao Paulo, Brazil
Tesoro Elena Del Carpio-Huayllas
Post Graduate Student, University of Sao Paulo, Brazil
&
Dorel Soares Ramos
Associate Professor, University of Sao Paulo, Brazil

Operational Cost Assessment of Microgrids Containing Renewable and Non-renewable Generators

The microgrid issue is nowadays envisaged as quite promising due to the benefits that they can offer to both the utility and the consumers. The recent technological advances show that this alternative can technically be quite feasible. However, it is also important to conduct an economical analysis on its feasibility so that future projects and current microgrid tests being conducted do not fall into a stagnant state due to economic issues, especially those related to operational costs.

In this article the authors present an economical assessment of a medium sized microgrid when it operates at both the grid-connected and in the islanded mode of operation. To this end, it will be considered that the microgrid can be simultaneously fed by a diesel generator, a wind power turbine, a solar system and a small hydropower system.

During the islanded mode of operation, the respective power balance at steady-state should be checked up at all times, ensuring that the load does not exceed the capacity of the microgrid generation. The economic evaluation presented in the article does not include the investment cost of the above listed sources, but only the operational costs. The analysis is performed using a specific program developed by the authors in the Visual Basic platform which allows assessing the operational cost of microgrids and small power systems. In its database the developed program contains a 63-year record of the wind speed behaviour, the solar radiation incidence and the level of rain precipitation, the latter useful for the operation of the small hydroelectric scheme.

It was found that for the specific type of microgrid used in the article, the operational costs involved deserve a special attention; otherwise the microgrid project would become unfeasible. This is one of the reasons why at present many microgrids operate under the form of government subsidies. This condition, though, is not applied to all types of

microgrids especially if they contain non-renewable generation sources. Hence, the importance and contribution of this article.

Antje Bierwisch
Senior Researcher, Fraunhofer Institute for Systems and Innovation Research, Germany

Grand Challenges "Secure Society" and Integrated Foresight Approach for Technology Assessment

The paper addresses one of the identified sub-themes of societal grand challenges: "Secure Society – Protecting freedom and security of Europe and its citizens". Rapid technological changes in the field of security and its associated social transformation processes result in new challenges and impacts on the innovation systems' performance level. Future security technologies (e.g. surveillance technology) have the potential to cause severe changes in social structures (e.g. new forms of public control). Given the range of ethical, legal and social aspects affected by technological dynamics in civil security, there is an increasing demand for participatory design to ensure that all relevant stakeholders' interests are sufficiently taken into account.

Previous studies are frequently dealing with single elements or sub-dimensions in a rather isolated manner. The systemic interactions and interlinkages between different actors in the innovation system and the resulting dynamics are, however, often not adequately considered. This paper explicitly addresses this research gap by providing novel insight on the participatory design of future security technology measures and the assessment of emerging technologies taking into account as much as different stakeholder perspectives.

Based on the results of three publically funded research projects on the German and European level, the paper shows how multi-method approaches, particularly of foresight methods (e.g. serious gaming, scenario technique, multi-criteria decision analysis), can help integrating a broad range of stakeholders' interests in a participative process. Starting with the discussion of the specific peculiarities of the innovation system related to civil security, the paper shows why new methodological approaches in the field of civil security are required corresponding to normative imperatives of responsible research and innovation. It is shown how such an approach can contribute to the design of effective, sustainable and widely accepted measures and policy support in the field of civil security in the future.

Peter Boehm
Professor, University of Applied Science, Germany
&
Christian Lamberti
Ph.D. Student, University of Luxembourg, Luxembourg

On-Line Monitoring of the Laser Joining Process of Aluminium Alloy and Polyamid 6.6 by Acoustic Emission Analysis

A novel laser joining process for polyamide and aluminium hybrid structures, developed at the University of Luxembourg, has proven a strong bond between these dissimilar materials. This newly developed welding technique is strongly requested by the automobile producing industry for several applications within the car structure. However, the joining quality exhibits a strong dependency to process-related variables, which highlights the need for an online inspection technique. The requirements for a chosen inspection technique are:

- showing results on-line during the joining process
- working non-destructive
- working as an integral method
- Is able to determine weld defects

In that case only the acoustic emission analysis (AEA) as a Non-destructive Technique (NDT) can be used to guarantee reasonable results. For first common tests in the welding laboratory at the University of Luxembourg, AEA sensors are conducted on the surface of the test specimen which have to be welded. Some of the most important laser process parameters have been verified and evaluated by the AEA. Using weak Laser power the break of the melting bath can occur and is often not recognizable by optical methods. The AEA however was able to detect this lack of fusion. Using high Laser power the appearance of gas bubbles, arising from the PA 6.6 could be detected afterwards in a microscopic micrograph. The AEA signals related to this effect can be correlated clearly. Throughout the high pressure of the gas bubbles the Aluminium weld is often interrupted. Also after the final shot by the laser beam some AEA signals are registered which can be traced back to the solidification of the

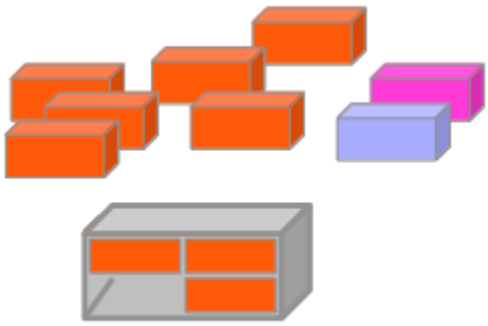
Aluminium molten mass. Due to the actual situation the AEA is a well-working NDT online monitoring method and can be used for the correlation of acoustic events and welding defects within the mentioned joining method. Future tasks will develop some algorithms to separate the different defects by pattern recognition of the AEA signals and parameters.

Gus Calabrese
Head Engineering, Cinternational/WFTelectronics, USA
&
Joanne Yamaguchi
Post-Doc Researcher, Rasmussen College, USA

Moving Wearables from Toys to a Lifestyle

Android Dreams & Electric Sheep As homo sapiens move toward full-body computing, we think of H.G. Wells' Mind at the End of its Tether (1945). Wells was considering the idea of humanity being replaced by some more advanced species of being. Phillip K. Dick's Do Androids Dream of Electric Sheep? may now be answered with a fervent YES. Here we are, android dreaming, at the end of our homo sapien tether – with multiple cyberhuman choices before us, and the ASI too. But before throwing in with the futuristic artificial superintelligence, let's take a hard look at three areas requiring attention and development.

Area #1 is energy management, which is to say battery management. As we blithely attend to our android work, or pleasurable outings, to fulfill the dream of full-body computing, behind the 'magic' there will be batteries resembling magnetically positioned sugar cubes, with different shades of color signaling 'full'(red) or 'nearly empty'(blue). These 'sugar cubes' are so simple to 'operate', they belie the intricate complexity hidden. Depending on the nature of your tasks, your batteries for the day/week may be grouped or ungrouped. They are 'universal' so it doesn't matter which way you reconnect them. Nor is there anything easier than re-charging them – just toss them into a charge-up bucket.



Energy droplets or batteries are shown as red (full), pink (halfie), blue (empty) – discharge is stopped before drain-pain or damage. Grey box is energy droplet grouper.

Area #2 is a kind of LEGO modularization that allows mixing and matching modules (of Wearables). The earlier reference to an apparently casual method of battery management is matched by interchangeability of modules as well. For example, if I am going to meet colleagues for afternoon tea, I need not be sporting full regalia for an afternoon of snow & ice-hiking. A standardization may emerge to allow matching and mixing modules. This notion is aligned with the Phonebloks concept, Project Ara from Google. The following is a list of things that might be standardized: form factor size of modules; position of connectors; types of connectors; data transfer protocols – i2c, SPI, Ethernet; power supply options.

Area #3 full-body computing security issues have unique concerns. For example, the iBod ("worn" for full-body computing) must provide highly secure compute and storage nexus. The iBod must be super resistant to hostage-threats, hacking, and be able to provide unassailable identification. The security will be customized to optimize the individual iBod android. There are roughly three areas of 'space':

- Personal space (5cm sphere around body) ("PAN")
- Local space (5cm – 100 meters) ("LAN")
- Cloud space ("WAN")

Image for 3 spaces

Black figure is person
White area is personal space 5cm (personal zone, personal network, personal area network)
Grey area is local zone 5cm – 100m, local zone, local area network

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Non-Practicing Entities, Patent Value, and Patent Transfer

This paper studies the relationship between types of assignees and patent transfer. A matter of growing concern in patent studies is non-practicing entities (NPEs), or patent trolls. Instead of producing a product or selling a service, they generate profits mainly by extracting excess licensing fees or trapping R&D intensive manufacturers in patent infringement situations so as to receive damage awards. The increase in NEP-type patent litigation is widely considered to be a serious threat to innovations. Actually, the question of whether NEPs are trolls or market-makers of technology remains debatable. Since NPEs will likely be an enduring phenomenon in the market for technology, this study pursues a different route, analyzing the role of NPEs on patent transfers and transaction price. Specifically, due to the fact that NPEs have recently emerged as sellers in the market for technology trade, we consider the role of NPEs on influencing patent value. Based on the unique transaction price information from the United States (US) patent transfer in seven live auctions hosted by Ocean Tomo over the period between 2006 and 2008, we adopt a two-step approach to implement empirical estimations by considering the sample selection problem with the endogenous treatment. Empirical results of this typical mechanism of patent transfer indicate that the age of a patent is negatively related to the probability of a successful auction and transfer price, while forward citations, patent claim and scope are positively related to it. In addition, the patent's auction price is higher if it is renewed within one year prior to auction. These findings are consistent with those in the related literature. As for the type of assignees, we find that NPEs are positively associated with the probability and the price of patent transfer, implying that patents owned by NPEs are easy to transfer and be sold at a higher price.

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Syllabus Course "Distribution and Industrial Networks"

Today, in the midst of liberalization and deregulation of the energy sector, electricity distribution companies in the world are facing, all the tougher requirements for reliable electricity supply, with many investors' requirements for the connection of distributed generators into the distribution system, catastrophic disasters due to the disturbed balance in nature, limited budget for network development, an aging of professional staff, and other challenges.

It is obvious that the key role in planning, exploitation, management and maintenance of distribution systems have the engineers and technicians of different backgrounds who need new knowledge and skills. The question is how to align the curriculum in academic studies and higher education of professional studies with the increasing requirement of the industry and markets in the electricity sector. The subject *Distribution and Industrial Networks* is taught in advanced studies at the Higher Technical School of Professional Studies in Novi Sad, Serbia. The aim of the course is to train students for the planning, operation and management of the distribution networks in an open electricity market. The course is designed as a one semester in accordance with the Bologna declaration. It carries 8 ECTS points, and two hours of lectures and two hours of exercises per week are provided, in total of 56 hours. Pre duties consist of the preparation and defense of seminar work. The examination is written and consists of theoretical questions and arithmetic engineering tasks.

This paper presents a curriculum of the subject *Distribution and Industrial Networks* . The course consists of several modules covering: organization of electric power industry in the Republic of Serbia, the level of electrification, the concept of network planning, types of customer connections to the network, the measuring and billing electric energy, network protection, power sector legislation in the Republic of

Serbia, and the main techno-economic aspects of the construction of distribution networks.

Materials and examples of the comments were collected from a number of textbooks and workbooks, Technical references of the EPS Power Industry of Serbia, Serbian standards, the official documents of the Ministry of Energy of the Republic of Serbia, as well as the lectures and exercises that are performed at the Higher Technical School of Professional Studies in Novi Sad.

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&
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Use of Additive Manufacture and Stirling Engines as Engineering Education Tools

The recent proliferation of low to medium cost additive manufacturing equipment opens a doorway to using the technology for aiding the education of many engineering principles. Stirling cycle engines are highly complex thermodynamic machines that, if delved into, demonstrate many mechanical engineering disciplines. Importantly working engines, using safe hot and cold water as the energy source, can be made by polymer additive manufacture using commonly available materials and printing machines. This process somewhat negates the need for teaching institutions to invest in high cost laboratory demonstration equipment. It also allows remote and poorly funded institutions or individuals to work with live equipment. This publication will demonstrate the use of additive manufactured Stirling Engines for effective teaching in creative design, optimisation, thermodynamics, mechanics, CFD, FEA, live DAQ, material properties and additive manufacture.

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Developing Empirical Donning Times for Smoke Hoods

Personal Protective Equipment (PPE) is used in many industries and healthcare applications around the world. Establishing reliable and accurate times for putting on (donning) and taking off (doffing) PPE is important for many reasons. A number of studies have reported donning time criterion for personal escape devices (aka, 'smoke hoods') without reporting the statistical basis for such times. Examples include PPE donning times based on as few as two (2) observations. *Methods Engineering* and *Work Measurement* are two closely related sub-fields of *Industrial Engineering* that have established statistically based techniques such as *Time Study* to empirically develop standards for donning and doffing times, including those for smoke hoods. Subjects were trained on the proper method to don a smoke hood and performed multiple trials in succession with a short test period between trials. Times were checked for outliers and normalized for Time Standard development. Smoke hood donning times were normally distributed. Results support the use of classical *Time Study* techniques to establish statistically based PPE donning and doffing times, including those for smoke hoods.

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&
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An Approach for Evaluating the Utility and Cost of a Fleet of Modular Vehicles

This work presents a new method for designing fleets of ground vehicles. The focus of this presentation is a dynamic operation model which has been developed to analyze fleets used for transportation of goods, disaster relief, or military operations. Such systems are stochastic and must complete a set of predetermined functions called in a deterministic or stochastic manner. The predetermined functions vary by the application, for instance in feet operation, it might be to move a certain cargo subject to constraints such as time or survivability. These functions can be called in a deterministic manner if they are regularly scheduled such as a bus schedule, although there is still stochasticity in the load (i.e., the number of passengers) or they can be stochastic, not unlike calls to a taxi service. These functions must also be evaluated to obtain the required resources for completing them. For instance, for a military feet, the function evaluation would show which vehicles can complete each function and what the fuel consumption would be for each vehicle. The approach is applied to fleets composed of either conventional or modular vehicles. The method shows that significant operational capabilities can be obtained by a quantitative fleet design. Authors: K. D'Souza, B. I. Epureanu.

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Enterprise Technology Forecasting Based on Patent Map and TRIZ Theory

This paper devotes to exploring a practical way for enterprises to instruct them in technology forecasting. Since patents are regarded as the documents of technologies, this paper makes full use of them to forecast the technologies. Here we hold the opinion that technology forecasting should mainly consider two levels: macro and micro level. Patent map which is effective in outlining the technological framework will contribute a lot to macro level analysis. Combining the outputs of patent map with enterprises' reality, we get the core technologies that companies concern about most. And then, we make a micro analysis on the core technologies taking advantage of TRIZ theory. After both macro and micro analysis, it'll be clear and visual how core technologies change and how fast new technologies advance. Technology forecasting thus can be conducted on solid foundation and abundant information. Furthermore, TRIZ theory could also offer some suggestions for it. Finally, we make an empirical study to show the whole processes and the result proves it functional.

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Design and Implementation of a Simulator of Activities, Greenhouse Gas Emissions, Networks, and Travel (SimAGENT) in Southern California

In this paper we describe the recently developed large scale spatio-temporal simulator of activities and travel for Southern California. The simulator includes population synthesis that recreates the entire resident population of this region, provides locations for residences, workplaces, and schools for each person, estimates car ownership and type as well as main driver for each vehicle, and provides other key personal and household characteristics. Then, a synthetic schedule generator recreates for each resident in the simulated region a schedule of activities and travel that reflects intra-household activity coordination for a day. These synthetic activity and travel daily schedules are then converted to multiple Origin Destination (OD) matrices at different times in a day. These are in turn combined with other OD matrices (representing truck travel, travel from and to ports and airports, and travel generated outside the region) and assigned to the street network in multiple periods in a day. The assignment output is then used in the California Air Resources Board's EMFAC software to produce estimates of fuel consumed and pollutants emitted (including CO_2) by different classes of vehicles. The overall model system also includes provision for finer spatial and temporal resolutions that is pilot tested using TRANSIMS and a second-by-second vehicle emissions simulator. In the paper an overview of all the SimAGENT modules and numerical examples from each major module are provided, advantages and disadvantages for key modeling choices explained, and the use of these models in regional planning is described. The paper concludes with an outline of next steps.

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Mesoporous Carbon as Catalytic Support for Biodiesel Production from Oilseeds

Over recent years mesoporous materials have been rather researched due to the important and varied applications provided. One way is as catalysts support. This project is designed to obtain biodiesel from Zinc and Lantane catalysts supported on mesoporous carbons. The first step includes getting the mesoporous materials, for which, firstly were selected the mesoporous silica, SBA-15 type, for the walls of greater thickness, which were prepared under hydrothermal conditions by nanomolding using a silicon source TEOS (Tetraethoxysilane), P123 triblock copolymer (EO20 PO70 OE20) agent mesoporous router. These mesoporous silica acts as a template for synthesis of mesoporous carbons, using sucrose as a carbon precursor and subjected to calcination process in a reducing atmosphere.

Mesoporous materials of silica and carbon obtained were analyzed by various techniques such as XRD, which showed a regular arrangement of pores, resulting in reflections that were expressed in signals at low angles, a typical behavior of amorphous materials. Differential thermal analysis indicated to the mesoporous silica the condensation of the silenol groups and the graphitization for mesoporous carbons. Scanning Electron Microscopy allowed us to identify the porous topography in both materials and BET analysis confirmed the appropriate surface area.

The properties exhibited by the mesoporous structures make them suitable for use as a catalyst support in the biodiesel production.

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Asymptotic Analysis of a Reliability Model with Repair and Standby

Random processes with discrete interference of chance or random processes with discrete components can be represented in terms of Switching Processes. Switching Processes switches in points of time which may be a random functional of the previous trajectory and they are suitable for asymptotical analysis of stochastic system with fast switchings.

In this paper a system with large number of units with standby units is considered. The system consists of n units and r repairman each with large failure/ repair rate. Operational units can be working or kept as standby. Standby units are not cold, and they may also fail with some local rate. If a working or standby unit fails, it is sent to repair. If the unit comes from working units, it is replaced by a standby unit, if any available. Repaired units are returned to standby if there are at least M units already working. If there are less than M units working, repaired units are sent to the working area. A repaired unit is considered to be fully operational. An asymptotic behavior of the trajectory function for the system is investigated under different conditions regarding failure/repair rates, number of repairmen and the number of standby units in the system.

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Using a LED Flashlight for High Speed Photography in Industrial Settings

One problem in the paper industry is measuring wear of forming fabrics and other materials in the different sections of a paper machine. Today these measurements are performed during scheduled downtimes, typically every two weeks. But since the typical lifespan of these products is on the order of one to six months, a significant safety margin has to be used when measuring only during downtimes. In addition to that, these measurements are costly because they are done by the fabric manufacturers who have to travel to the customers site when the machine is down, and not, when sales personal is nearby.

An easy solution to these problems would be a way to measure wear while the machine is running. This could be done in several ways. One very promising way is by taking photographs. But at machine speeds between 400 and 2000 m/minute and fibre diameters between 0.2 and 0.5 mm very short exposure times in the order of one microsecond are needed.

Normal photographic flashlights using xenon filled flashtubes have a minimum exposure time of some 20 microseconds which is too slow. In the well known examples of high speed photography like flying bullets, air gap flash lamps are used. They can produce flashes with an exposure time well under a microsecond while achieving a high light intensity by using some 30kV and power levels of some 20 kW.

While nice in the lab, these are difficult to build and handle in an industrial setting with high humidity and temperature. With current LED and camera technology, LED flashlights can be built and used, that are able to take photographs with an exposure time of around a microsecond in normal industrial settings with a resolution of some 1/100 mm.

In the article, a low cost LED flashlight is described and evaluated. Possible applications include but are not limited to measuring wear in

the paper industry. In all but the most extreme cases, an air gap flash can be replaced with the described system.

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New Developments in Industrial Robot Programming

In former days industrial robots are successfully used in mass production. The robot programs covered all variants of production and were elaborately programmed and tested.

Today, production becomes more flexible. The number of variants is increasing and the lot sizes are changing in shorter times. With the concept of cyber-physical systems and industry 4.0, the flexibility in the production is growing fast.

With these constraints, there are two new developments in industrial robot programming. First, you can't completely program an application. On the base of CAD-models, sensor data or special inputs the robot programs are more or less automatically generated. This often is called intuitive robot programming. Second, human-robot-collaboration should be developed with multimodal inputs, especially for non-expert worker in the factory.

For the first direction, we discuss two examples.

RoboPainter is an application for lot size 1. Developed for a science show, it also can be used in the industrial environment. We take a picture of a visitor with a webcam. With image analysis a line drawing is generated, then converted to a robot program, that the robot draws. When the image is ready, the program is deleted and the next picture is taken.

The second application is gluing with two cooperating robots. On the base of a CAD-model and a sketch of the path of the glue, the programs for the cooperating robots are automatically generated.

In a short outlook, some first experiments on human-robot-collaboration are presented.

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Measuring the Motivating Potential Score of Academic Staff at the Lebanese International University

Work redesign is becoming increasingly prominent as a strategy for attempting to simultaneously improve the motivation and the quality of the work experience in modern organizations. To measure employees' perceptions of their jobs on each of the five core dimension (i.e. skill variety, task identity, task significance, autonomy, and feedback), Hackman and Oldham developed in the mid 1970's the Job Diagnostic Survey based on the Job Characteristics theory (JCT). The JCT remains one of the most suitable and widely accepted and used theories in the field of organizational behavior as it provides a model to perform work design through a set of implementing principles for enriching jobs in organizational settings. The model was tested for the first time ever in a Lebanese university by conducting the standard job diagnostic survey on 227 academic faculty members who work at the Lebanese International University (LIU), Lebanon's largest private university, throughout its 9 campuses. A standardized scale that assesses the motivating potential score of the job occupied by the employees was used and the findings supported the validity of the JCT. The scores of different academic staff occupying various jobs across several schools varied significantly on all the job characteristics. The findings of this study are presented and analyzed in this paper. Recommendations to foster individual growth as compared to the job's motivating capacity are suggested to address identified shortcomings.

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The Design of Internally Cooled Tools in Orthogonal Metal Cutting

This paper presents a new cooling method to use internally cooled cutting tool in orthogonal metal cutting. Internally cooled cutting tool in turning based in a tool holder with cooling fluid flowing inside. In this research, a series of cutting trials was carried out to investigate the practicality and the effectiveness of this internally cooled cutting tool concept. Two techniques of temperature measurement methods were used to estimate the tool temperature with K-type thermocouple and tool-chip interface temperature were measured by the IR pyrometer. Experiments were conducted on DIN 1.2379 Cold Work Die Steel. PVD coated carbide insert CNMG 190608 was used during the turning process. The results have been compared with dry cutting and internally cooled. Advantages of internally cooled cutting tools: better surface roughness and more predictable surface finish for extended tool life, enable machining at wider range of cutting speeds. It clearly indicates that internal cooling can sufficiently reduce the cutting temperature and enable the cutting tool to work away from the critical cutting temperature by controlling it in process.

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Uses of Foresight Methodologies and Methods in the European Environment Agency's 'Assessment of Global Megatrends 2015': Lessons Learned and Potential Opportunities

In 2015, the European Environment Agency (EEA) produced an update of its 'Assessment of global megatrends' as part of its five-yearly flagship report on the European environment's state and outlook (SOER 2015). The Assessment analyses 11 megatrends that are considered to be of key importance for Europe's long-term environmental outlook, drawing on objective, reliable and comparable evidence available to the EEA and its network of 39 European countries.

The paper outlines the main results of the Assessment and the lessons learned in using foresight methods to explore the impacts of global megatrends on Europe and its environment in a participatory, open, interdisciplinary and action-oriented manner. In particular, the paper focuses on the potential for using foresight methodologies and methods in tackling the key epistemological and ontological challenges of global megatrends assessment, including the deeply uncertain nature of societal and environmental change, and the discursive nature of policymaking.

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The Human Future Evolution - From Humanity - Social Perspectives

With the rapid development of science and technology, especially after a substantial progress in the hard technology intervention in human life and the deep integration of hard and soft technology, how to promote the evolution of humans according to human desire has become a hot topic for scientific and technological circles, while it has also become a social issue caused considerable ethical controversy and put forward a great challenge to the evolutionary direction of future human. At present, there are a variety of researches or predictions for the evolution of future humans, such as "Unihuman"; "Survivalistian"; "Geneman"; "Cyborg", "Spaceman" and etc. Linda Groff summarized the possible evolutionary direction of humans as nine views.

Could these be the future attribution of human beings who are known as the soul of the universe?

The author carried out the analysis on the today's “technology worship syndrome” as well as deep concerns about the direction of technology development, and then put forward the risk of the human evolution driven by technological omnipotence. The author emphasized the necessity to explore the evolution of future humans from humanity-social perspective. Namely, the space of human evolution should never confine to serve for perfection intellectually as a natural person, and we must study how to augment human abilities from the point of view of social person. It is humans who create and promote the continuous progress of civilizations at the different stages of human society, and they must continue to create more advanced civilization.

The paper also discussed several principles for exploring the future of human beings from humanity-social perspective, including the consensus in theory; some ethic bottom line needed to be kept; the hard course of constructing future "great civilization" and the path of the implementation as well as support system, etc. from a practical point of view. Finally, the author appealed that now it is time to rejuvenate the Oriental civilization paying great attention to the spiritual and ethical value as well as the Chinese traditional philosophical concepts that

pursue harmony between man and nature, becoming an important ideological foundation for the future human civilization, leading to the direction of human progress and evolution, and cultivating the consciousness of "a Community of Common Destiny", so as to meet an era of "great civilization" sublating Eastern and Western civilizations.

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A Benchmark of Service Providers in Additive Manufacturing

The number of users of Additive Manufacturing has increased significantly over the past years. For the production of 3D-models, a user can in general choose between two options: On the one hand they can master the procedure 'in house', with their own equipment, or, on the other hand, they can commission it from a service provider. As very little is known about the service industry in this field to date, this publication aims at providing a detailed overview of this market. In doing so, the focus of this contribution lays on the market for Fused Deposition Modelling FDM and also 3D-Printing 3DP, because these two additive manufacturing technologies offer a large scope of applications from product development to the creative industries.

As a first step, an extensive market analysis among the service providers active in the markets in Europe, as well as globally is conducted. This provides an overview of the available manufacturing capacities and range of feasible product sizes for 3D-models. Next, several sample components, representative of the various areas of application, were developed or selected. The analysis of the product range of a large variety of service providers yielded a comprehensive overview of cost and lead time available in the market. In addition, extensive technical testing was conducted to determine and compare the quality (e.g. surface roughness, dimensional accuracy and visual inspection) and the strength (materials hardness) of the requested components.

The results of this survey, which are presented in anonymized form, support the user in the selection and appraisal of service providers according to technical and economic criteria. Furthermore the results generated from this investigation are part of a current research project with the objective to significantly simplify the selection of processes for the industrial user.

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A Method to Select Optimal Solution for Machine Tools Remanufacturing Multi-Solution Decision Problem

Remanufacturing of machine tools is a complex and comprehensive approach to regain the original identity, accuracy and precision of faulty machine tools that are malfunctioning due to various reasons and having high salvage/scrap value. Several attributes are related with remanufacturing such as save of time, money and natural resources. Despite of its great importance, the process is not yet fully standardized and every industry has its own particular policy to carry out remanufacturing. A sound methodology to select appropriate route among best available alternatives is still not properly defined. This study is aimed to search the optimum solution for multi solution problem during remanufacturing of machine tools to deal with stochastic errors and building a mathematical model for achieving maximum benefit out of process. Our goal is to optimize the selection procedure, so that by using optimum parameters and routes, unnecessary wastage of energy, resources and man power could be saved. It also aims towards green global environment and focuses on such routes that are environmental friendly.

Quality function deployment is used to build the basic framework for recording decisions, biasness is checked by AHP. Fuzzy linear regression approach is then employed to find functional relationships between remanufacturing objectives and remanufacturing characteristics. Optimum values are recorded and difference of all available methods from optimum solution is then marked. Cost in this whole approach is considered as a fuzzy parameter and cost analysis provides an insight to choose the best method to solve a particular problem among best optimal solutions.

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Innovative Leap into the Future - Emerging Technology Design by the Science Fiction Prototypes

There has apparently always existed some kind of co-evolutionary spiral between science fiction (films and literature) and emerging technology research (Greenfield 2006; Johnson 2011; Dourish and Bell 2014). Johnson (2011) has turned this co-evolutionary spiral of science fiction and fact into method, science fiction prototyping. He describes the outcome of the method being "stories grounded in current science and engineering research that are written for the explicit purpose of acting as prototypes for people to explore a wide variety of futures". Bell et al. (2013) find this Johnson's definition laying down a rationale for the conceptual form of prototypes that "shifts markedly from the traditional prototype found in engineering that expects a tangible and solid form to be presented". They consider that the approach may well be exploited in the evolutionary futures research that aims to study complex, self-organising evolutionary systems (Mannermaa, 1991). In fact, there has already emerged a co-evolutional spiral within future studies and science fiction prototypes, as the method has been used for presenting the results of a foresight research project (Stahl, 2013) detecting weak signals of change in the environment (Schwarz and Liebl, 2013) and illustrating black swan -events (Birtchnell and Urry 2013; Johnson, 2013).

This presentation proposes science-fiction prototyping as an extension to the design methodologies that have future-oriented attitude and an aim to construct reflecting outcomes of research (Kymäläinen, 2015). The contribution focuses on considering how the method may be used explicitly as research-oriented design approach – with an objective to deliver science fiction stories that are based on extensive amount of research. The particularities of the demonstrated science fiction prototypes relate to the manner by how they engage user research findings of the emerging technology research profoundly to the prototyping processes, and how they underline the impact of the under-construction technologies in new, fictional experience environments.

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Foresight and Smart Specialization: The Twain Shall Meet

Smart specialization, a policy approach adopted by the European Commission for its new structural funds programming cycle, relies on an entrepreneurial process of discovery that can reveal domains of economic activity where a country or region excels or has the potential to excel in the future. It empowers entrepreneurs who are able to combine the necessary knowledge about science, technology and engineering with knowledge of market growth and potential in order to identify the most promising activities. In this learning process, entrepreneurial actors have to play the leading role in discovering promising areas of future specialization.

For all the talk about the future, smart specialisation has evolved largely besides and oblivious to foresight, with one fundamental exception. The European Commission's Institute for Prospective Studies (IPTS) has been instrumental early on in the development of the smart specialisation concept and in its evolution from a top-down research-focused concept to a bottom-up approach focused on regional development and economic transformation, with the entrepreneurial process of discovery at its core.

The essence of the entrepreneurial discovery process lies in its interactive nature, and in organising a fruitful, targeted dialogue that brings the different actors together in a participatory leadership process to carve out jointly the smart specialisation fields and develop a suitable policy mix to implement it. The tall order behind it involves avoiding the Scylla of having specialists meet each other to repeat familiar notions within each area, as well as the Charybdis of huge groups producing soupy concoction of notions. Instead the goal is to allow a wide array of sources of ideas to interact, producing cross-fertilisation (the eureka moment or less ceremoniously, the "I hadn't thought of that" moment).

We will argue that the two fields/approaches, foresight and smart specialization, are natural allies that will benefit from talking to each other: the twain should meet. The link between the two is precisely the

entrepreneurial discovery process, which is in a sense democratizing foresight, widening its sources beyond the traditional Delphi groups, in tandem with high-dimension helix models, and bringing it into the 21st century, and into the new policy agenda.

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DEA Benchmarking of Wastewater Treatment Plants Using Life Cycle Assessment

Data Envelopment Analysis (DEA) is a well-known, non-parametric frontier analysis technique for assessing the relative efficiency of comparable units. Life Cycle Assessment (LCA) is an useful tool for evaluating the environmental performance of products, including not only goods, but also processes and services. In this paper, the use of DEA for the benchmarking of 13 Wastewater Treatment Plants (WWTP) located in small populations (less than 20,000 inhabitants) in Galicia (NW of Spain) is presented. Normalized LCA values for seven impact categories (namely, Abiotic Depletion, Global Warming. Acidification, Eutrophication, Ozone Layer Depletion, Terrestrial Ecotoxicity and Photochemical Oxidation) were used as input to DEA. The functional unit of LCA, common to the units being assessed, is the single (constant) DEA output considered. A number of DEA models were considered. A common feature of a majority of these models is the freedom allowed to WWTP to define their own input weights in order to appear under the best possible light, although the selected weights may be also restricted, provided the restrictions are reasonable and justified. There are, however, some DEA models which consider Common Weights. A unique vector weight is then applied, common to all WWTP evaluated. This vector is generally calculated to maximize the efficiency score of the whole group. In this study, both types of DEA approaches are considered. The results of all DEA models were very consistent, with three of the WWTP labelled as efficient and one of them especially super-efficient. The approach allowed the identification of the best practices as well as the ranking of both efficient and inefficient units. Although DEA allows them, no value judgements on the relative importance of the different impact categories were used.

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A Two-Stage Process for Explaining the Relative Efficiency of Small and Medium-Size Firms in Chile

The objectives of this study were, in the first place, to differentiate efficient from inefficient small and medium firms in Chile and second, to find the organizational characteristics that could help explain the reasons behind these relative efficiencies. The analysis utilized data of firms located in the Valparaiso Region, separated by size, economic activity, number of workers, and other qualitative as well as quantitative attributes. The data were obtained from the detailed information collected by auditors of 500 firms that applied for Chilean Government support funds to carry out investment projects. In the sample there were 417 small and 83 medium sized firms, of which in total there were 187 manufacturing and 313 service units.

In the first place the Data Envelopment Analysis (DEA) technique was used to determine the relative technical efficiency of these firms, and to identify the most and the least efficient ones in the set according to several discriminatory qualitative variables. In the second place, using contingency tables, a comparative analysis of the 10 to 20% most efficient and the 10 to 20% of the least efficient firms was carried out, in order to find the organizational characteristics that could help explain why each of the firms exhibit their respective efficiencies.

In terms of the general findings, non-statistically the most efficient firms in the sample are younger that older ones, and statistically significantly, efficient firms engaged in food processing, construction and transportation have half the age of inefficient ones. In terms of number of workers, in the case of firms that have more than 50 employees, or that belong to the segments food processing and transportation, statistically the more efficient ones have on average less employees than the least efficient ones; in the case of the textile segment the opposite holds, i.e. larger textile firms are statistically more efficient that smaller firms, exhibiting economies of scale in terms of employees.

In terms of sales, for the whole sample, economies of scale were found, where larger sales correlate statistically with higher efficiency, being this particularly true for the case of manufacturing firms of smaller size. Analyzing purchases and expenses, it was found that medium and small firms that spend smaller amounts in this item are statistically more efficient than the ones that expense more, clearly demonstrating that having reduced overall expenditures helps in reaching higher efficiencies. As well, those small and medium size firms that have the least amount of fixed assets are more efficient than the ones that have a larger fixed assets base. This clearly shows that the least efficient firms possess a larger amount of immobilized capital than what is actually needed. This finding also holds for depreciation, where in the case of medium size firms the most efficient ones exhibit statistically lower levels of depreciation than inefficient ones. In the case of transportation firms, the difference in terms of depreciation between inefficient and efficient ones is 47 to 1 in favor of efficient ones.

One of the most generalized finding relates to average salaries. For the whole sample those firms that have the largest average salaries are statistically more efficient than the ones that spend less in this item, except particularly in the case of transportation firms where the opposite holds, and in textiles where this correlation proved not statistically significant. For the whole sample, therefore, those firms that on average pay more to their employees are more efficient than the ones that pay less. The explanation for this finding relates to employees qualifications and expertise: in those firms where employees are more productive individually, therefore firms are more efficient, they are better paid; it doesn't help to have a large number of unproductive employees, that doesn´t make the firm more efficient, on the contrary, the firm is less efficient.

The profile that emerged statistically from the study of efficient small and medium firms is: large sales volume and low amounts of purchases and expenses - this implies high value added to what they sale -, low levels of fixed assets - they rent what they need instead of purchasing it -, high salaries paid to a smaller, and better qualified and productive workforce.

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I-Beam to Square CFT Column Seismic Connection using External Diaphragm and Rib Plate for Moment Frames

Tubular steel columns in moment frame buildings are sometimes filled with concrete to gain stiffness and strength, although connections between I-beams to such square columns pose difficulties in fabrication and often exhibit poor seismic performance; the common challenges in such connections being stress-concentration in welds and in the concrete, leading to premature failure. A simple connection, presented in this paper, with external diaphragm and rib plate, designed using capacity design concept, provides force flow path from beams towards box column webs relieving stresses on the welds and the concrete, and helps the connection attain 4% drift level. Performance evaluation of the proposed connection using nonlinear finite element analyses of exterior beam-column joint sub-assemblages shows that inelasticity is mobilized in the beam only, with connection elements and welds remaining elastic. Also, the connection provides higher strength and stiffness compared to two other commonly used connection schemes under reversed cyclic displacement loading.

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A Critical Assessment of Foresight Methodologies

The aim of the present paper is to provide a critical assessment of some the most popular methodologies used in Futures Studies (FS) and foresight practices. Following some introductory remarks (Sec. 1), I shall begin my discussion via a detour: by a detailed analysis of similarities and differences between theoretical knowledge/theoretical science and technology. This section lays the foundation for the discussions in the later sections of the paper. It also has direct bearing on other important issues related to FS, namely, lack of clarity with regard to the notion of 'making rational decisions', confusion over the status of FS as an academic discipline, and confused use of the two key concepts of 'method' and 'methodology'. I shall discuss these implications in sections three and four. In section five I shall critically assess a number of more popular methodological frameworks used in Humanities and Social Sciences (HSS) in general and also in FS, namely, positivism, post-positivism, constructionism, critical theory (criticalism), and action-research. I shall argue that these methodologies, notwithstanding their popularity with the practitioners in the field of FS, suffer from serious shortcomings. The defects of these methodological frameworks impact on the outcome of research informed and guided by them. In section 6, I shall introduce a philosophical perspective, known as Critical Rationalism (CR), and a methodological framework, Situational Analysis (SA), which can also (with appropriate adjustments) play the role of a meta-method. Section 7 deals with a critical comparison between CR and some popular methodological frameworks in FS and in the last section (Sec. 8) I shall try to show how CR can help to improve the efficacy of foresight practices?

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The Influence of Solar Insolation and Oxygen Content in Water on the Efficiency of Intensive Hydroponic Salad Growing in Greenhouses

Within a designed and constructed system of intensive hydroponic salad growing in shallow pools installed in greenhouses under controlled technological and microclimate conditions, trial measurements of the influence of solar insolation and oxygen content in water on growth rate and plant yield were carried out. Multiple measurements were taken in summer and winter periods in the continental area of the Republic of Croatia under various external atmospheric conditions. Results were analysed and compared with analytical and graphical representation of numerical values. Advantages and disadvantages of the interaction of tested parameters on the efficiency of salad growth and mass yield were highlighted. Possible areas of development and improvement have been suggested.

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Embedded System Design in University Teaching Practice

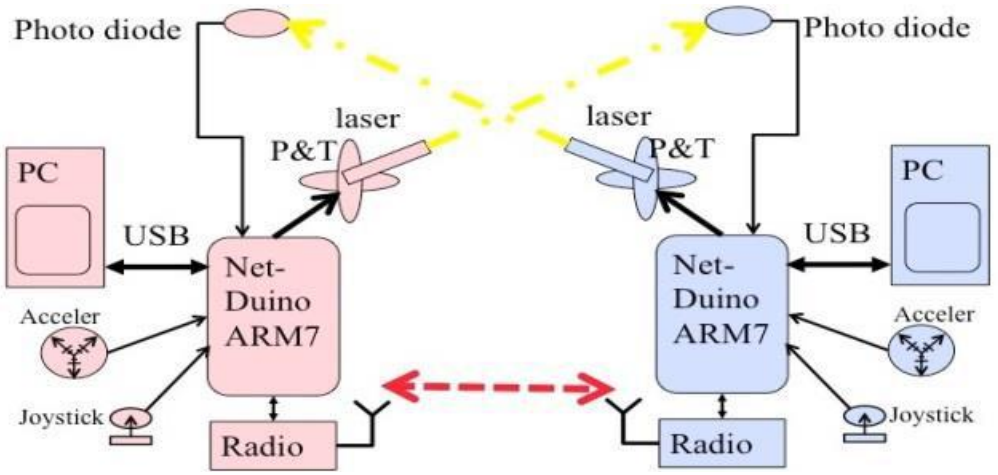
Embedded system design is an area of electronic and computer engineering that grows rapidly with the ever increasing demand for small and big devices with inbuilt sophisticated control, communication and user interface. Teaching embedded systems in university courses poses a number of challenges due to functional complexity of components, complex interaction of many modules, interfacing with the environment, and communication with other systems. In order to provide graduates with solid background in embedded systems a number of focused courses would be needed but the tight schedule of electrical engineering curriculum does not always allow that.

We developed an embedded system course, which covers both the basic and advanced aspects of microcontroller based systems with interfacing and communication. The course has been successfully taught and improved over last four years. Our experience shows that teaching by building a realistic embedded system is most convincing for students as it shows the theory applied and engages the students much stronger than a more theoretical approach.

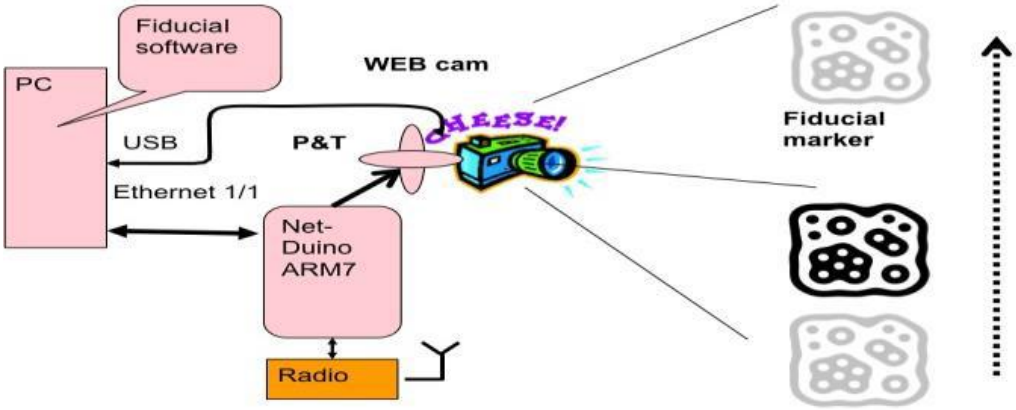
We developed a sophisticated teaching platform which consists of development software and hardware that students can use at home and at the university. The software part includes: compilers, FreeRTOS realtime embedded OS, uIP embedded networking stack, FatFS file System, and other application programs. The hardware development kit is based on off the shelf components such as ARM Cortex based Netduino2 board, pan and tilt, photo diode receiver and laser module, RF 2.4GHz digital radio, 3-axis accelerometer and magnetometer.

The practical experiments introduce various concepts and components and are arranged is sequence leading to projects which are integration of the functionality developed in the practicals. Figure below presents, as an example, conceptual view of project tasks and

hardware/software used. Project 1 is focussed on different aspects of communication and also illustrates problems of real time programming. Project 2 illustrates some control application and also using a more powerful computing platform as a support for more demanding tasks in the embedded platform.



Project1: Communication



Project2: Tracking

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A System Approach Linking Organizational Effectiveness, Employees Health and Quality Culture- Findings from the Literature

Organizations are complex social systems, and as such, they ought to be approached through a systems thinking viewpoint. System Thinking refers to the interrelationship between the parts of the organization that intend to design, produce and distribute products or services. System Thinking is actually a conceptual language that encourages professionals into using "feedback loop" thinking rather than mere linear thinking. The purpose of this literature review is to outline the complex interdependent relationship between organizational effectiveness, employees' health and quality culture. The review will open with the notion of organizations as complex social systems. Then it will describe possible applications of systems thinking in two parts: The first part will discuss quality and quality culture, and the second part will discuss employees' health in the organization. The review will include the application of system thinking and will show the important contribution of the system approach to the achievement of organizational effectiveness and to incorporate this concept within all areas of engineering education as it trains future engineers to create long-term learning processes within their organization that could bring about improved organizational effectiveness.

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Flexible Job Shop Scheduling for a Project Based Company

Scheduling job shop operations is important for manufacturing companies in the sense that a good schedule saves time and money. While capacity planning is a part of scheduling jobs, monitoring is also useful for following the plans and schedules. This paper, focuses on assigning jobs for the workbenches in a project based company at a certain given time. There are 134 jobs which must be processed on 33 machines where each job i consists of n_i operations that should be performed on the machines while satisfying precedence constraints. Workbenches have uncertain processing times and some of them are used as the alternatives for others. The problem is defined as a Flexible Job Shop Scheduling Problem (FJSP). One of the main goals is to minimize the makespan of all operations. Integer programming methods are used to obtain an optimal schedule for jobs and machines. A mathematical model is formed by considering alternative machines, precedence and priorities and the preferences of the company. The schedule that is offered allows engineers dynamically monitor the current shop floor load on per work center basis, make predictions for an advanced period and assign workers to appropriate workbenches.

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Integrating Lean Principles on Project Management to Reduce Project Lead Time: A Real Application in a Multi-Project R&D Center

The aim of this study is to analyze the impacts of integrating lean principles and project management, in particular to reduce project lead time. We analyze Arçelik Washing Machine R&D Center in which multiple projects are conducted by shared resources. In the first part of the study, we illustrate the current system by using a value stream map. We define all activities starting from the first idea of the project to the customer and measure process time and lead time of projects. In the second part of the study we estimate potential improvements and select a set of these improvements to integrate lean principles. We aim to develop a future state map and analyze the impacts of integrating lean principles on project lead time. The main contribution of this study is that we analyze and integrate lean product development principles in a real multi-project system.

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Deterministic, Queueying and Simulation Modeling of the Production of Ready Mix Concrete Batch Plant Industry in Nahr El Maout, Lebanon

Ready Mix Concrete (RMC) batch plant is an industrialized plant, where concrete is mixed from cement, coarse and fine aggregates, water and admixtures. Then, it is delivered to the construction site using transit truck mixer. Calculating the productivity of RMC batch plants in the combined operation of concrete mixing in the plant and the delivery to the site is complex task. RMC batch plants reserachers or managers try to limit the production evaluation to that of the plant mixer alone. This approach fails to look at the batch plant production as a whole system, thus fails to assess the bottle necks, queying and idleness in each part of the plant system.

This paper analyzes the production of RMC batch plant mixing and delivery to site. The productivity is evaluated using two approaches: deterministic and stochastic. The deterministic approach develops a general production model. While, the stochastic approach develops two models: a queuying model and a simulation model. The queuying model is based on both the Queuying Theory (QT) and the Markov Chain (MC) model. While the simulation model is based on the Monte Carlo Simulation (MCS) technique in the MicroCyclone web-based software. The deterministic and stochastic models are applied to the HOLCIM plant in Nahr El Maout, Lebanon.

The deterministic model found the batch plant production to be 63 m^3/hr, while the truck mixers to vary between 6 and 36 m^3/hr depending on the truck cycle time and the number of trucks. The queuying model evlauted the batch plant/truck mixer system productivity to vary between 6 and 23 m^3/hr, with varying queuying duarations. While the simulation model evlauted the productivity to be probabilistic, but around 30 m^3/hr after several cycles, stressing that the aggregates, cement and admixtures trasfer to the mixer are 95% idle. Hence faster conveyor belts must be used in order to optimize the production.

This research paper is relevant to both the academic filed and the industry.

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Biogas Technology in Modern Agriculture for Energy Production, Environmental Sustainability, and New Product Development

During the last thirty years, a series of studies have been systematically carried out and developed, first in my laboratory, then on the research and commercial farms, and, finally, a new product for a global business. In the lab, we discovered the high potential of biogas production from poultry manure by thermophilic anaerobic digestion (TAnD). The concept and technical feasibility were proven by the pilot-scale test on North Carolina State University (NCSU) poultry farm and subsequently in China. Now large anaerobic digesters on farms with millions of chickens are in operation in China. Multiple benefits in waste management, energy and fertilizer production, carbon credit (CDM) generation, sanitation, as well as financial gains have been demonstrated by this total treatment system. Furthermore, a feather degrading enzyme called keratinase was discovered in the pilot project at NCSU. This enzyme was found to be useful in the processing of feather meal, the degradation of the prion protein (the putative cause of mad cow disease), and in feeds as a protein-digestibility enhancer. As a feed supplement, keratinase is now produced on industrial scale and marketed globally by BioResource International (www.briworldwide.com). A total of ten patents were generated from this series of studies—from waste management and energy production to enzyme technology. As a result, a new agricultural ecosystem called "Holistic Farming" has been developed, with TAnD at its core. This is a cross-disciplinary and integrated system which facilitates nutrient recycling, healthy livestock growth, and energy production while at the same time maintaining a clean and sustainable environment. In the foreseeable future, new biotechnologies, such as genomics, proteomics and bioinformatics will be able to probe into the complex biological process of anaerobic digestion to better understand and improve biogas production. More new enzymes and genes will be discovered and used for more new applications. All these, combined with environmental sustainability, will make Holistic Farming the new agriculture of the 21st Century.

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Species Being: An Alternate Political Future for Transhumanism

Transhumanist philosopher Nick Bostrom (2005) has argued that "Our own current mode of being, … spans but a minute subspace of what is possible or permitted by the physical constraints of the universe … It is not farfetched to suppose that there are parts of this larger space that represent extremely valuable ways of living, relating, feeling, and thinking". This statement captures the optimistic and exploratory stance that transhumanists purport to hold towards the future. Transhumanism, in all of its myriad definitions, calls for bold exploration of the vast spaces of possible futures for all aspects of existence. Why then, I ask, have transhumanists eschewed exploration of the space of political possibilities? Transhumanists seem to be divided between only two political camps: libertarianism and liberal democracy, with more or less social democratic influences. All accept capitalism as a given. Little attention has been paid to socialist political theory. Yet this is not because transhumanism is incompatible with socialism. The two have fundamental philosophical similarities. The early work of Karl Marx, particularly as found in the *Economic and Philosophical Manuscripts of 1844,* can be read as a social transhumanism. The young Marx looks to build a technological future that differs radically from the present. This paper focuses on his concept of "species being" or the mutable and evolving, yet irreducibly social, nature of the human being. This notion is new to transhumanists only in name – they already hold such a view. What has not been recognized is how capitalist political-economic systems are inimical to the flourishing of a "species being" by constraining its free development. In this paper I elaborate on Marx's use of the concept and show that while it coincides with many transhumanist ideas, it also suggests new directions for the political future of transhumanism.

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Towards Sustainable Development on Sugarcane Agro Industrial Sector: Scenarios to Veracruz 2030

The lack of coordination between the different levels of government to create and implement public policies for agro industrial sector sugarcane in Veracruz Mexico has serious consequences on social, economic and environmental areas. The objective of this research is to analyze the current situation, to reveal and measure the key elements within the system and to propose strategies that fully activate the development of the sugarcane sector on a prospective approach.

The prospective, on words of Philippe Durance: Illuminates the present actions in light of the possible and desirable futures**.** This is a voluntaristic approach, involving systemic understanding of present reality, to implement on a proactive way the changes required to reach the desired future. This research was performed individually and with a group of experts who are kept in anonymity in accordance with the tools and methodology of prospective LIPSOR and Michel Godet.

A SWOT analysis applied to the study exposes the actual positive and negative conditions in the internal and external environments; Were the strategic elements obtained are placed within a matrix of influence-dependence structural system for the sustainability of the sugar industry; and is proposed a guidance for strategic planning. It was concluded that the most important strategic variables to work and the derivate strategic issues are three: Infrastructure, Public Policy Development and Research, development and innovation. Highlighting the lobbying to achieve public policies by a body that coordinates the interests of all stakeholders and by proposing that innovation has not to be necessarily technological, suggesting administrative, financial and commercial innovation, inspiring the creation of the necessary proposals.

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Modeling of Finned-Tube Evaporator using Pure and Zeotropic Blend Refrigerants

The present research represents a mathematical model applied for a louvered finned tube evaporator. The steady state experimental data of a window type (2) ton of refrigeration air conditioning unit was used to build a tube by tube model to investigate the evaporator performance. The refrigerants selected for this object were R-22 and the zeotropic blends R-407C and R-407A refrigerants. The validation of the present model for pure and mixtures showed good agreement between experimental and those predicted values. The maximum scatter between experimental and predicted evaporator duty was within (-7 to 1) % for all of the simulated refrigerants. The predicted evaporator exit air temperature showed a higher scatter. They were within (-25 to +12) % for all of the simulated refrigerants for the ambient dry bulb temperature range of (28 – 38) ℃.

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Challenging the Future. The Implications of the 'Horizonscan 2050' for Dutch Innovation System Policy

The Netherlands Study Centre for Technology Trends (STT) started in 2012 a project called 'Horizonscan 2050'. The aim of this projects was to identify so-called 'signals for change' (SfC) impacting the existing visions on the grand societal challenges for the Dutch society. Signals were searched in various societal domains using a long time horizon.

The method is a combination of an analysis of various signals from different sources and elaborating them in a creative and interactive manner into inspiring images of the future. SfCs were identified by desk research using key words like 'breakthroughs', 'signals', and 'seeds of change'. Its results were discussed and clustered with the supervisory group of the project, resulting in a list of 150 'signals of change', which was presented in a survey to 110 experts, who assessed them using the following criteria: possibility, amount of impact, and desirability. Next to this a desk research was conducted into various 'grand (societal) challenges', resulting in six grand societal challenges: resource scarcity, climate change, demographic changes, people living longer and differently, the global balance of power, and new connectivity.

To map 'possible futures', 57 selected SfCs (with either the highest or the lowest score in terms of possibility) were combined with the six grand societal challenges by six creative workshops, using brain-writing and group discussions. In every workshop, the 57 SfCs were divided randomly in three different sets of 19 and linked to one societal

challenge by the participants. The results were extremely diverse and were elaborated by storytellers into stories about the future. The final report consists of the signals, challenges, stories, and their synthesis.

Important findings of the project were, that: technological innovation and social innovation need to be aligned to a much greater extent, the virtual world and the real world will integrate more and more, and that the erosion of trust in politics will lead to new ordering mechanisms that will be primarily bottom-up in nature.

To determine the more immediate impact of the results of the 'Horizonscan 2050', they were discussed with delegates of the sponsors of STT (consisting of industries, ministries and research institutions) and via a survey among members of the Dutch Futures Research Expert Network. The questions concerned the possible impact on the innovation policy of the Dutch government: How do the 'signals for change' of the 'Horizonscan 2050' impact the top-industry policy? What kind of new top-industries should be considered? Which present industries should become assigned a 'top-industry'? Is the notion of 'top-industries' a relevant framework for innovation policy? And: how does the 'Horizonscan 2050' impact the current Grand Societal Challenges'? The overall impression is that the choice of top industries is more a reflection of the current competencies of the Dutch economy than it is of its future potential, that the very concept of 'top industry' is debatable, since innovation often takes place between industries, and that the several grand challenges in principle present more opportunities than threats to the Dutch economy.

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Wireless Production Line Monitoring via Android

In the automotive manufacturing environment there is a constant strive for improving productivity and efficiency. Processes constantly need to be monitored to determine their effectiveness, thereby improving such processes. Due to the high demand for increased productivity and minimum product manufacturing cycle times there is an increased focus on reducing downtime of automated equipment. Those working in production and manufacturing environments know that time is money and the faster they and the machines around them can work, the better their companies can perform. As production lines become less labour intensive they are becoming more dependent on computers and automated systems. It is becoming clear that the production environment is a competitive race to produce products to the market at a rapid pace due to high public demand. Cycle times for production processes are normally accounted for during the design stage of a production line. A few seconds difference in cycle time could substantially affect the company's profit. This invention relates to production process monitoring which mainly involve robots used by manufacturing industries. The constant strive for improving the efficiency of production processes has become a worldwide challenge. In high speed production facilities the response time between man and machine is of utmost importance when financial implications are taken into account. In order to accommodate this, the timeous notification of production process-faults and proposed solutions to problems should take place effectively and efficiently.

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Remnant Storage Area Re-design and Inventory Tracking System for a Steel Fabrication Factory

In heavy industry and construction environment, steel structure, plate-works and mechanical equipment productions are carried out. Cutting off operations result in trim losses some of which are scraps and others are remnants; they can be used in other subsequent operations. Remnants can contribute to production as well as raw stock, decreasing material and ordering costs. However, if not stored appropriately, remnant inventories might increase the holding cost. Depending on the production type and planning, suitable sizes of remnants to be stored varies for companies.

In this paper, it is intended to rearrange the remnant inventory system and create a tracking system in order to increase the efficiency of remnant inventory. Remnant inventory storage area for steel remnants for a steel fabrication factory is analyzed and a new design is proposed with respect to manufacturer's requirements. Basing on the historical data and factory specifications, a volume based optimization model is developed to determine the capacity requirements. An adjusted Multi-row Layout Model with unequal areas is adopted to design the layout of remnant storage area using the obtained capacities.

In order to record flow in and out of these reusable materials, inventory tracking system is developed. The required databases are created and integrated software for the inventory tracking system is introduced.

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Augmented Reality based Maintenance Instruction System

As the trend of ICT development, the effectiveness and efficiency of maintenance operations would be improved via using new technology. In this study, an augmented reality based instruction (ARBI) system has been developed. In order to explore the differences among maintenance instruction methods, the traditional manual instruction (TMI) and computer aided instruction (CAI) methods are compared in this study. In the experimental design, three different levels of task difficulty, i.e. easy, medium, and difficult—are specified as the independent variable; and the dependent variables include task completion time and error rate. Twenty participants (10 males and 10 females) were involved, and they completed the maintenance tasks via different instruction methods in randomly ordered experimental combinations. The results showed significant effect on difficulty and maintenance instruction methods effects on task completion time, error rate, and the scores of subjective assessments (SUS and NASA-TLX). The ARBI had the highest SUS score, lowest NASA-TLX score, shorter task completion time, and minimum error rate than the other maintenance instruction methods. The implementation of augmented reality demonstrated positive effects on maintenance task performance.

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Increasing Public Awareness for Stuttering: Enhancing Listener Responses and Overall Communication

Stuttering is a disorder of speech disfluency that occurs in 1% (1 in every 100 people) of the US population. In many other parts of the world, the exact prevalence of stuttering is yet unknown. Stuttering is a developmental disorder that if left untreated, can become quite advanced in adult life. It is a highly complex disorder that may become even more complicated over time as an individual struggles to engage in functional communication. This is because communication involves a dyadic speaker-listener interaction. Thus, during a conversation, a person with stuttering (PWS) receives both subtle and more explicit listener responses. These responses create a complex interplay with an individual's ability to maintain communication. In essence, a PWS is dependent on a communication partnership. Therefore, listener responses are extremely important in the ultimate intervention plan for PWS.

Universally, education for the general population has been limited. Therefore the understanding of the complexity of this disorder and its implications for communication has not been well understood. In addition to strategies for fluency enhancement, intervention for stuttering involves modification of the PWS's entire communicative environment. This includes both the immediate speakers within the individual's environment (family and friends) as well as those within the speaker's extended environment (public at large). The rationale for this presentation is the need to extend beyond the boundaries of speech therapy for PWS; beginning to create public awareness in the general population to improve listener responses. The focus of this presentation is to enhance public awareness through education about stuttering. To this end, education should revolve around understanding its nature, its inconsistencies, its sensitivity to listener responses and overall communication strategies. This could reduce the speaker-listener's anxiety and discomfort during a communicative encounter. The ultimate goal is to educate the public in order to improve both speaker-listener responses and ease of communication.

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Best Practices in Supervision of International Students in Engineering and IT

This paper reports on the results of a series of workshops relating to 'best practices in the supervision of international graduate students in Engineering and IT' given at five different Australian universities. The workshops were an outcome of the original project *A model for research supervision of international students in engineering and information technology disciplines (PP10-1771)* which focused on identifying factors that influence successful supervision of culturally and linguistically diverse (CALD) and international higher degree research (HDR) students in Engineering and IT disciplines in three Australian universities: QUT, Curtin University and the University of Western Australia (UWA). The larger project involved a total of 229 students and 69 supervisors from the three universities took part in the student and supervisor surveys. Findings challenged a number of myths about international HDR students, including the fact international HDR students may outperform domestic students in terms of completions; language problems were not seen as a major issue by many supervisors; most students were satisfied with their supervision; and most supervisors were satisfied with their students.

However, a number of key areas were identified for further exploration. For example, while 85 percent of students perceived their supervisors to be considerate of their non-English speaking background and/or culture(s), they felt less support was provided for developing their language or communication skills, indicating that increasing supervisor awareness of these kinds of resources could be beneficial. Recommendations included dissemination of these findings, including workshops to further identify key stakeholder concerns.

Therefore, five workshops were given at key locations across the country, involving participants from a number of stakeholder groups, including students, supervisors, and support staff. Findings included differences between supervisors and students from some cultural

groups in terms of access to support services, as well as identifying key cultural factors influencing the perceptions of both supervisors and students.

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A New Input Constrained Quadratic Tracker for an Unknown Sampled-Data System with an Input to Output Direct Transmission Term

A new quadratic digital tracker for efficient tracking control of an unknown sampled-data system with a direct transmission term from input to output and subject to input constraints is proposed in this paper. First, the observer/Kalman filter identification (OKID) method is utilized to identify an appropriate (low-) order state-space innovation model with a feed-through term, equivalent to the unknown linear system; this identified model is used for the design of the controller and observer. The input-constrained quadratic digital tracker is newly proposed, which also comprises a new systematic mechanism for tuning the weighting matrix in the cost function of interest. Further, the realizable current output-based digital observer with a direct transmission term is developed for the system whose states are immeasurable. An illustrative example is given to demonstrate the effectiveness of the proposed approach.