CENTERIS / ProjMAN / HCist

CENTERIS – Conference on ENTERprise Information Systems
ProjMAN – International Conference on Project MANagement
HCist – International Conference on Health and Social Care Information Systems and Technologies

CENTERIS / ProjMAN / HCist 2022

Book of industry papers, poster papers and abstracts

2022
November 9-11, Lisboa
Portugal

SciKA

Book of industry papers, poster papers and abstracts of the

CENTERIS 2022 – Conference on ENTERprise Information Systems /

ProjMAN 2022 – International Conference on Project MANagement /

HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

October 9-11, Lisboa, Portugal

Editors:

Maria Manuela Cruz-Cunha, Polytechnic Institute of Cávado and Ave, Portugal

Ricardo Martinho, Polytechnic Institute of Leiria, Portugal

Rui Rijo, Polytechnic Institute of Leiria, Portugal

Dulce Domingos, University of Lisbon, Portugal

Emanuel Peres, University of Trás-os-Montes e Alto Douro, Portugal

CENTERIS/PROJMAN/HCIST 2022

Full title:

Book of industry papers, poster papers and abstracts of the CENTERIS 2022 - Conference on ENTERprise Information Systems / ProjMAN 2022 - International Conference on Project MANagement / HCist 2022 - International Conference on Health and Social Care Information Systems and Technologies

Editors:

Maria Manuela Cruz-Cunha, Polytechnic Institute of Cávado and Ave, Portugal
Ricardo Martinho, Polytechnic University of Leiria, Portugal
Rui Rijo, Polytechnic University of Leiria, Portugal
Dulce Domingos, University of Lisbon, Portugal
Emanuel Peres, University of Trás-os-Montes e Alto Douro, Portugal

Main supporting entities:

AIS - Association for Information Systems
IPCA - Polytechnic Institute of Cávado and Ave
IPLeiria - Polytechnic University of Leiria

Keynote Speakers

Robert Davison, City University of Hong Kong, Hong Kong
Nuno Mateus-Coelho, Polytechnic Institute of Cávado and Ave, Portugal

CENTERIS 2022 Organization

CENTERIS General Chair:

Maria Manuela Cruz-Cunha, Polytechnic Institute of Cávado and Ave, Portugal

CENTERIS Program Chairs:

Niels Bjørn-Andersen, Copenhagen Business School, Danmark

CENTERIS Advisory Board Chairs:

Robert Davison, City University of Hong Kong
Helmut Krcmar, Technical University of Munich, Germany
Philip Powell, Birkbeck University of London, UK
Philip Yetton, The University of South Wales, Australia

Organization Chair:

Dulce Domingos, University of Lisbon, Portugal

Publications Chair:

António Cunha, University of Trás-os-Montes e Alto Douro, Portugal

CENTERIS Organization:

António Cunha, University of Trás-os-Montes e Alto Douro, Portugal
Emanuel Peres, University of Trás-os-Montes e Alto Douro, Portugal
João Sousa, University of Trás-os-Montes e Alto Douro, Portugal
Manuela Cruz Cunha, Polytechnic Institute of Cávado and Ave, Portugal
Ricardo Martinho, Polytechnic of Leiria, Portugal

CENTERIS Scientific Committee:

Abdel-Badeeh M. Salem, Ain Shams University, Faculty of Computer and Information Sciences, Egypt
Abdul Samad (Sami) Kazi, VTT, Finland
Adamantios Koumpis, RWTH Aachen - Lehrstuhl Informatik 5, Germany
Agostino Poggi, University of Parma, Italy
Ahmed Elragal, Luleå University of Technology, Sweden
Alan Litchfield, Auckland University of Technology, New Zealand
Albert Boonstra, University of Groningen, Netherlands
Alexander Ryjov, Lomonosov Moscow State University, Russia
Alexandra Cernian, University Politehnica of Bucharest, Romania
Alvaro Figueira, CRACS, INESC TEC and University of Porto, Portugal
Amir Mohtarami, Iran
Ana I Barragan-Romero, Universidad de Sevilla, Spain
Anacleto Correia, CINAV / Escola Naval, Portugal
Anand Nayyar, Duy Tan University, Vietnam
Andrea Herrera, Universidad de Los Andes, Colombia
Andrei Vasilateanu, University Politehnica of Bucharest, Romania
Andrew Targowski, Western Michigan University, United States
Andrew Whinston, University of Texas, United States
André Carvalho, Polytechnic Institute of Cávado and Ave, Portugal
António Brandão, Metro do Porto, SA, Portugal

António Correia, INESC TEC and University of Trás-os-Montes e Alto Douro, Portugal
António Fonseca, ISTAR/ISCTE-IUL, Portugal
António Miguel Rocha, Polytechnic Institute of Cávado and Ave, Portugal
António Miguel Rosado da Cruz, Instituto Politécnico de Viana do Castelo, Portugal
António Sousa, University of Trás-os-Montes e Alto Douro, Portugal
Armando Cruz, IPV/ESTGL, Portugal
Armando Mendes, Universidade dos Açores, Portugal
Arthur Tatnall, Victoria University, Australia
Barroon Ismaeel Ahmad, Ahmadu Bello University, Zaria, Nigeria
Bassam Hussein, Norwegian University of Science and Technology, Norway
Bálint Molnár, ELTE, Eötvös Loránd, Hungary
Carlos Baeta, Portugal
Carlos Páscoa, Portuguese Armed Forces, Portugal
Carlos Rompante Cunha, UNIAG, CeDRI & Polytechnic Institute of Bragança, Portugal
Carmen De-Pablos-Heredero, Universidad Rey Juan Carlos, Spain
Carsten Kleiner, University of Applied Sciences & Arts Hannover, Germany
Christof Gellweiler, ISM - International School of Management, Germany
Cristina López, University Pablo de Olavide, Spain
David Romero, Tecnológico de Monterrey, Mexico
Dietmar Nedbal, University of Applied Sciences Upper Austria, Austria
Dimitrios Karras, National and Kapodistrian University of Athens (NKUA), Greece
Dr Mahmood Ali, Institute of Business Management,
Edward Bernroider, WU Vienna, Austria
Emanuel Peres, UTAD, Portugal
Esra Tekez, Sakarya University, Turkey
Faiez Gargouri, University of Sfax, Tunisia
Fatma Canaslan Çomut, AFAD, Turkey
Fernando Brito e Abreu, ISCTE-IUL, Portugal
Fernando Moreira, Universidade Portucalense, Portugal
Filiz Ersöz, Karabük University, Turkey
Francisco Alvarez_Rodríguez, Universidad Autónoma de Aguascalientes., Mexico
Francisco Falcone, ISC-UPNA, Spain
Francisco Ortega, Universidad de Oviedo, Spain
Frederico Cruz-Jesus, NOVA Information Management School (NOVA IMS), Portugal
Gabriela Henning, Universidad Nacional del Litoral, Argentina
Georg Hodosi, Stockholm University, Sweden
George Draghici, University Politehnica Timisoara, Romania
George Jamil, Informações em Rede C e T Ltda, Brazil

Gilbert Babin, HEC Montréal, Canada
Gilliean Lee, Lander University, United States
Giorgio Bruno, Politecnico di Torino (Polytechnic University of Turin), Italy
Giuseppe Calabrese, University of Foggia, Italy
Gonçalo Paiva Dias, University of Aveiro, Portugal
Gunnar Widforss, Mälardalen University, Sweden
Gustavo Almeida, Federal University of Minas Gerais, Brazil
Haslinda Hassan, Universiti Utara Malaysia, Malaysia
Heiko Duin, BIBA - Institut für Produktion und Logistik GmbH, Germany
Helder Ferreira, Instituto Politécnico de Bragança, Portugal
Hélio Castro, Instituto Superior de Engenharia do Porto, Portugal
Inma Hernández, University of Seville, Spain
Ionel-Bujorel Pavaloiu, University POLITEHNICA of Bucharest, Romania
Isabel Lopes, Instituto Politécnico de Bragança, Portugal
Ivan Izonin, Lviv Polytechnic National University, Ukraine
Janne Harkonen, University of Oulu, Finland
Javier M. Buldú, King Juan Carlos University & Center for Biomedical Technology, Spain
Joaquim Pinto, Universidade de Aveiro, Portugal
Jorge Duque, ISLA - Instituto Politécnico de Gestão e Tecnologia, Portugal
Jorge Marx Gómez, Oldenburg University, Germany
Jos van Hillegersberg, University of Twente, Netherlands
Jose Carlos Cavalcanti, UFPE, Brazil
José Adson Cunha, Federal University of Paraíba, Brazil
José Borbinha, INESC-ID, IST, Universidade de Lisboa, Portugal
José Borges, University of Lisbon, Portugal
José Carlos Sá, Instituto Superior de Engenharia do Porto, Portugal
José Maria David, Federal University of Juiz de Fora, Brazil
José Remo Brega, Sao Paulo State University, Brazil
José Salgado Rodrigues, ISEP, Portugal
José Silvestre Silva, LibPhysUC-Universidade de Coimbra, Portugal
José-Luís Pereira, University of Minho, Portugal
João Moutinho, BUILT CoLAB, Portugal
Karim Doumi, MOHAMMED V UNIVERSITY IN RABAT, Morocco
Laura Anna Ripamonti, Università di Milano, Italy
Lazar Rusu, Stockholm University, Sweden
Leonor Teixeira, University of Aveiro, Portugal
Lorna Uden, Staffordshire University, United Kingdom
Luay Anaya, Princess Sumaya University for Technology (PSUT), Jordan

Luciana Oliveira, CEOS.PP ISCAP Polytechnic of Porto, Portugal
Luis Carlos Ramos Nunes Pinto Ferreira, Instituto Superior de Engenharia do Porto, Portugal
Luis Enrique Sánchez Crespo, University of Castilla-la Mancha, Spain
Lukas Valek, Prague University of Economics and Business, Czechia
Luís Cachulo, Instituto Politécnico de Leiria, Portugal
Luís Cláudio Barradas, Instituto Politécnico de Santarém, Portugal
Luís Ferreira, Polytechnic Institute of Cávado and Ave, Portugal
Mahesh Raisinghani, TWU, United States
Manuel José Cabral dos Santos Reis, University of Trás-os-Montes e Alto Douro, Portugal
Manuel Mora, Autonomous University of Aguascalientes, Mexico
Manuel Pérez-Cota, University of Vigo, Spain
Manuel Ramos, Universidade de Vigo, Spain
Marcelo de Paiva Guimarães, Federal University of São Paulo, Brazil
Marco Painho, Nova Information Management School, Portugal
Maria Major, ISCTE-IUL, Portugal
Maria TORTORELLA, Department of Engineering, University of Sannio, Italy
Marian Mocan, Politehnica University of Timisoara, Romania
Marielba Zacarias, Universidade do Algarve, Portugal
Mark Stieninger, University of Applied Sciences Upper Austria, Austria
Marlene Silva, ISCAP - P.Porto, Portugal
Marta Kadłubek, Czestochowa University of Technology, Poland
Martin Šeleng, Institute of Informatics, Slovak Academy of Sciences, Slovakia
Masakazu Takahashi, Yamaguchi University, Japan
Masateru Tsunoda, Kindai University, Japan
Maya Benabdelhafid, Ecole Supérieure de Comptabilité et de Finances de Constantine, Algeria
Mayumi Hori, Chuo University, Japan
Michael Dzandu, University of Westminster, United Kingdom
Miguel Felgueiras, Polytechnic of Leiria, Portugal
Milton Santos, School of Health Sciences, University of Aveiro, Portugal
Mirjana Pejić Bach, University of Zagreb, Faculty of Economics & Business, Croatia
Moutaz Haddara, Kristiania University College, Norway
Nathalie Perrier, Polytechnique Montréal, Canada
Nelson Rocha, Universidade de Aveiro, Portugal
Norfashiha Hashim, Universiti Teknologi MARA, Malaysia
Nuno Datia, ISEL, Polytechnic of Lisbon, Portugal
Nuno Lopes, Polytechnic Institute of Cávado and Ave, Portugal
Nuno Rodrigues, Polytechnic Institute of Cávado and Ave, Portugal
Orven Llantos, MSU-IIT, Philippines

Patricia Jiménez, University of Seville, Spain
Patricio Domingues, Polytechnic of Leiria, Portugal
Paulo Mourão, University of Minho, Portugal
Paulo Ávila, Polytechnic Institute of Porto School of Engineering, Portugal
Petra Schubert, University of Koblenz, Germany
Pim van der Hoorn, Eindhoven University of Technology, Netherlands
Polona Tominc, University of Maribor, Faculty of Economics and Business, Slovenia
Prithvi Bhattacharya, HCT, United Arab Emirates
Rafael Corchuelo, University of Sevilla, Spain
Rafael Pereira, Federal University of Santa Maria, Brazil
Raquel Simões de Almeida, School of Health, Polytechnic of Porto, Portugal
Remy Cazabet, Lyon University, LIRIS Lab, France
Ricardo Martinho, Polytechnic of Leiria, Portugal
Ritesh Chugh, Central Queensland University, Australia
Robert Pellerin, Polytechnique Montreal, Canada
Roberto Vaz, Polytechnic Institute of Bragança, Portugal
Rui Dinis Sousa, University of Minho, Centre ALGORITMI, Portugal
Rui Lopes, Iscte, Portugal
Rui Rijo, Polytechnic of Leiria, Portugal
Sandra Pereira, University of Trás-os-Montes e Alto Douro, Portugal
Santiago Planet, Kapsch TrafficCom - CONSIVIA, Conservación Integral Viaria, Spain
Sara Santos, ISCA-Universidade de Aveiro, Portugal
Scott Bingley, Victoria University, Australia
Shakib Zohrehvandi, Kharazmi University, Iran
Sohail Chaudhry, Villanova University, United States
Stephen Burgess, Victoria University, Australia
Subhankar Mishra, NISER, India
Susan Williams, University of Koblenz, Germany
Telmo Adão, Center of Computer Graphics (CCG), Portugal
Tiago H. Moreira de Oliveira, NOVA IMS, Portugal
Vicente Rodríguez Montequín, University of Oviedo, Spain
Vinicius Lima, University of São Paulo, Brazil
Vitor Santos, NOVA IMS - UNL, Portugal
Volodymyr Polishchuk, Uzhhorod National University, Ukraine
Wai Ming Cheung, Northumbria University, United Kingdom
Wanda Presthus, Kristiania University College, Norway

ProjMAN 2022 Organization

ProjMAN General Chairs:

Rui Rijo, Polytechnic University of Leiria

ProjMAN Program Chair:

Emanuel Peres, University of Trás-os-Montes e Alto Douro, Portugal

ProjMAN Organization Chair:

Dulce Gonçalves, Polytechnic University of Leiria, Portugal

ProjMAN Organization

António Cunha, University of Trás-os-Montes e Alto Douro, Portugal
Dulce Domingos, University of Lisbon, Portugal
Emanuel Peres, University of Trás-os-Montes e Alto Douro, Portugal
Manuela Cruz Cunha, Polytechnic Institute of Cávado and Ave, Portugal
Sandra Pereira, University of Trás-os-Montes e Alto Douro, Portugal
Rui Rijo, Polytechnic of Leiria, Portugal

ProjMAN Scientific Committee:

Albert Boonstra, University of Groningen, Netherlands
Alcinia Zita Sampaio, Universidade de Lisboa, IST, Portugal
Aldora Gabriela Fernandes, University of Coimbra, Portugal
Alexandra Tenera, NOVA FCT, Portugal

Alexey Kizim, Volgograd State Technical University, Russia
Alfonso Bucero, Freelance, Spain
Alfredo Serpell, Universidad del Desarrollo, Chile
Angelos Liapis, Konnektable Technologies, Ireland
António Miguel Rocha, Polytechnic Institute of Cávado and Ave, Portugal
Carolina Santos, NOVA University of Lisbon, Portugal
Caroline Dominguez, UTAD, Portugal
Charles Ryder, United Kingdom
Christof Gellweiler, WHU - Otto Beisheim School of Management, Germany
Eduardo Solteiro Pires, Universidade de Trás-os-Montes e Alto Douro, Portugal
Erling S Andersen, BI Norwegian Business School, Norway
Fotios Misopoulos, University of Liverpool, United Kingdom
Francisco Ortega, Universidad de Oviedo, Spain
Frank Stumpe, KBC Group NV, Belgium
George Draghici, University Politehnica Timisoara, Romania
George Jamil, Informações em Rede C e T Ltda, Brazil
Grzegorz Grela, Maria Curie-Sklodowska University in Lublin, Poland
Hélio Castro, Instituto Superior de Engenharia do Porto, Portugal
Itzik David, Bank Hapoalim, Israel
Janne Harkonen, University of Oulu, Finland
Jim Browne, NUI Galway, Ireland
Jos van Hillegersberg, University of Twente / JADS Jheronimus, Netherlands
José Santos, Polytechnic Institute of Bragança, Portugal
José-Luís Pereira, University of Minho, Portugal
Kathryn Cormican, NUI Galway, Ireland
Maciej Nowak, University of Economics in Katowice, Poland
Maqsood Sandhu, UAE University, United Arab Emirates
Maria Magalhães, Saint Michael's College, United States
Masateru Tsunoda, Kindai University, Japan
Miguel Felgueiras, Polytechnic of Leiria, Portugal
Mirjana Pejic-Bach, University of Zagreb, Faculty of Economics & Business, Croatia
Mohammad Khalilzadeh, Peru
Mohammad Rohaninejad, Czech Institute of Informatics Robotics and Cybernetics, Czechia
Moutaz Haddara, Høyskolen Kristiania, Norway
Muhammad Ehsan Khan, ICIS LLC, United Arab Emirates
Natalie Ewin, Central Queensland University, Australia
Paulo Ávila, Polytechnic Institute of Porto School of Engineering, Portugal
Pedro Ribeiro, Universidade do Minho, Portugal

Rafael Pereira, Federal University of Santa Maria, Brazil
Ramayah T., Universiti Sains Malaysia, Malaysia
Richard Amster, United States
Ritesh Chugh, Central Queensland University, Australia
Robert Pellerin, Polytechnique Montreal, Canada
Roy Gelbard, Bar-Ilan University, Israel
Sakgasit Ramingwong, Chiang Mai University, Thailand
Sandra Pereira Cunha, UTAD, Portugal
Shakib Zohrehvandi, Science and Research Branch, Islamic Azad University, Tehran, Iran
Sohail Chaudhry, Villanova University, United States
Vicente Rodríguez Montequín, University of Oviedo, Spain
Vitor Santos, NOVA IMS - UNL, Portugal
Yan Ning, Nanjing University, China
Zakari Tsiga, University College London, United Kingdom

HCIST 2022 Organization

HCist General Chairs:

Ricardo Martinho, Polytechnic University of Leiria, Portugal

HCist Advisory Board Chairs:

Domingos Alves, Faculty of Medicine of São Paulo University, Brazil
Maria Manuela Cruz-Cunha, Polytechnic Institute of Cávado and Ave, Portugal
Ricardo Correia, Faculty of Medicine of Porto University, Portugal
Sonia Ayachi Ghannouchi, University of Sousse, Tunisia

HCist Program Chair:

Duminda Wijesekera, George Mason University, USA

HCist Organization Chair:

Emanuel Peres, University of Trás-os-Montes e Alto Douro, Portugal
António Cunha, University of Trás-os-Montes e Alto Douro, Portugal

HCist Organization

António Cunha, University of Trás-os-Montes e Alto Douro, Portugal
Dulce Domingos, University of Lisbon, Portugal
Dulce Gonçalves, Polytehnic Institute of Leiria, Portugal
Emanuel Peres, University of Trás-os-Montes e Alto Douro, Portugal
Manuela Cruz Cunha, Polytechnic Institute of Cávado and Ave, Portugal
Ricardo Martinho, Polytechnic of Leiria, Portugal

HCist Scientific Committee:

Adicineia Oliveira, Federal University of Sergipe, Brazil
Agostino Poggi, University of Parma, Italy
Alejandro Rafael Garcia Ramirez, University of Vale de Itajai, Brazil
Alessandra Mazzo, University of São Paulo, Brazil
Alexandre Santos, University of Minho, Portugal
Américo Azevedo, FEUP, Portugal
Ana Margarida Almeida, University of Aveiro, Portugal
Barbara Streimelweger, Stragere Engineering Solutions e.U, Austria
Butta Singh, Guru Nanak Dev University, India
Bálint Molnár, ELTE, Eötvös Loránd, Hungary
Carina Silva, ESTeSL-IPL, Portugal
Carla Teixeira Lopes, Faculty of Engineering of the University of Porto, Portugal
Carlos Costa, Universidade de Aveiro, Portugal
Carlos Rompante Cunha, UNIAG & CeDRI & Polytechnic Institute of Bragança, Portugal
Carolina Santos, NOVA University of Lisbon, Portugal
Catarina Reis, Polytechnic of Leiria, Portugal
David Mendes, Instituto Politécnico de Santarém, Portugal
Domingos Alves, Ribeirão Preto Medical School, University of São Paulo, Brazil
Eduardo Solteiro Pires, Universidade de Trás-os-Montes e Alto Douro, Portugal
Fabio Longo de Moura, Instituto Federal Catarinense, Brazil
Fernando Paulo Belfo, Polytechnic of Coimbra, Portugal
Filipe Portela, University of Minho, Portugal
Fátima Rodrigues, Instituto Superior de Engenharia / Politécnico do Porto, Portugal
Gang Luo, University of Washington, United States
Giovani Librelotto, Universidade Federal de Santa Maria, Brazil
Hugo Cordeiro, Instituto Superior de Engenharia de Lisboa (ISEL), Portugal
Hugo Peixoto, University of Minho, Portugal
Isaias Scalabrin Bianchi, Federal University of Santa Catarina, Brazil
Jan Havlík, Faculty of Electrical Engineering, Czech Technical University in Prague, Czechia
João Mazzoncini de Azevedo Marques, University of São Paulo, Brazil
Khawla Bouafia, Eötvös Loránd University, Hungary
Krzysztof Wolk, Polish-Japanese Academy of Information Technology, Poland
Lenka Lhotska, Czech Technical University in Prague, Czechia
Leonor Teixeira, University of Aveiro, Portugal
Luay Anaya, Princess Sumaya University for Technology, Jordan
Luciana Oliveira, CEOS.PP ISCAP Polytechnic of Porto, Portugal

Luís Gonzaga Ferreira, Instituto Politécnico do Cávado e do Ave, Portugal

Manuel José Cabral dos Santos Reis, University of Trás-os-Montes e Alto Douro/IEETA, Portugal

Maria da Conceição da Costa Marques, ISCAC Coimbra Business School, Portugal

Marisa Maximiano, Polytechnic of Leiria, Portugal

Małgorzata Pańkowska, University of Economics in Katowice, Poland

Miguel Felgueiras, Polytechnic of Leiria, Portugal

Mireia Farrús, Universitat de Barcelona, Spain

Moacyr Francischetti Corrêa, UFSCar, Brazil

Mário Antunes, Polytechnic of Leiria, Portugal

Nazaré Rego, Escola de Economia e Gestão, Universidade do Minho, Portugal

Nelson Rocha, University of Aveiro, Portugal

Ofir Ben-Assuli, Ono Academic College, Israel

Paula Pascoal-Faria, Centre for Rapid and Sustainable Product Development (CDRSP), Portugal

Paulo Mazzoncini de Azevedo Marques, University of São Paulo, Brazil

Rita M. T. Ascenso, Polytechnic of Leiria, Portugal

Rita Oliveira, University of Aveiro, Portugal

Rui Gomes, Coimbra University Hospital Centre, Portugal

Sara Dias, Politécnico de Leiria, Portugal

Srikumar Krishnamoorthy, Indian Institute of Management Ahmedabad, India

Zilma Reis, Faculdade de Medicina da Universidade Federal de Minas Gerais, Brazil

Preface

The co-located conferences CENTERIS'2022, ProjMAN'2022 and HCist'2022 provided an excellent conference environment for sharing best practices among researchers, academics and professionals from both generic Enterprise, Project Management and specific Healthcare Information Systems research areas.

CENTERIS – Conference on ENTERprise Information Systems – is an international conference addressing the largely multidisciplinary field embraced by Enterprise Information Systems (EIS), from the social, organizational and technological perspectives.

ProjMAN – International Conference on Project MANagement – addresses the application of knowledge, skills, methods, techniques and tools to the activities of a project, aiming to satisfy its requirements and achieve success at several levels. A plethora of valuable technical and business opportunities and solutions are created and developed all the time only thanks to good practices of project management.

HCist – International Conference on Health and Social Care Information Systems and Technologies – intends to gather Healthcare Information Systems and Technologies professionals and academics to share and discuss current challenges, developments, case studies, integrated and practical solutions, as well as new products, findings and approaches to leverage the use of Information Systems and Technologies in healthcare.

The three conferences implemented a hybrid and inclusive format, allowing face-to-face and remote participation, to meet the needs of those who, during the period of submission of manuscripts, were not sure about traveling and/or gathering resources to participate in person.

The physical venue for CENTERIS'2022, ProjMAN'2022 and HCist'2022 was Lisbon, Portugal, conveying both face-to-face and virtual (remote) presentations. This was the place where, during November 9-11, under the leitmotiv of Enterprise Information Systems, Project Management, and Health/Social care Information Systems, academics, scientists, information technologies/information systems professionals, managers and solution providers from all over the world had the opportunity to share experiences, bring new ideas, debate issues, introduce the latest developments, from the social, organizational and technological perspectives.

More than 400 manuscripts were submitted to CENTERIS, ProjMAN and HCist, coming from all over the world, and over 260 of them were selected for presentation and inclusion in the conference proceedings, including industry and poster papers. The selected papers represent nearly more than 700 authors from academic, research institutions and industry, from 75 countries. These proceedings are

intended for use by academics and practitioners that want to be aware of what is currently in the Information Systems agenda, from research to everyday business practice.

Finally, on behalf of the organization, we would like to express our gratitude to all the authors, for their visions and excellent contributions to the conferences, as well as to the scientific committee members, who acceded to share their insights, prompt collaboration and constructive comments in the reviewing process. We are also grateful to all who submitted valuable and high-quality contributions but unfortunately and due to several constraints, could not see their work accepted for presentation and publication.

Enjoy your reading!

November 2022,

The Editors,

Maria Manuela Cruz-Cunha
Ricardo Martinho
Rui Rijo
Dulce Domingos
Emanuel Peres

CENTERIS/PROJMAN/HCIST 2022

Acknowledgements

Organizing a conference is a very hard but compensating and enriching experience, as it involves a complex set of different activities, from the design of the conference, the establishment of the scientific commission, contacts with authors, organization of the review process, discussion and exchange of ideas and experiences, process management, organization and integration of contents, and many other, with the permanent objective of preparing an event that meets the participants' expectations. And this task cannot be accomplished without a great help and support from many sources. As conference co-chairs, we would like to acknowledge the help, support and believe of all who made possible the creation of CENTERIS/ProjMAN/HCIST.

We are grateful to all the authors who have chosen CENTERIS/ProjMAN/HCist 2022 to present their work, thank you, you made both conferences happen! Our gratitude goes also to all the authors that submitted their proposals but were not able to see their work accepted, due to several constraints.

The Scientific Committees of CENTERIS, ProjMAN and HCist integrates now more than 300 individualities, most of them who shared their knowledge and gave their constructive comments indispensable to the decision-making associated with the selection process, to whom we express our gratitude.

We are also grateful to the conference sponsors that played a very relevant role and to the scientific journals who offered the chance to publish enhanced versions of selected papers.

BSRJ - Business Systems Research Journal
IJBAN - International Journal of Business Analytics
IJESMA - International Journal of E-Services and Mobile Applications
IJHCITP - International Journal of Human Capital and Information Technology Professionals
IJISPM - International Journal of Information Systems and Project Management
IJISSC - International Journal of Information Systems and Social Change
IJISSS - International Journal of Information Systems in the Service Sector
IJITPM - International Journal of Information Technology Project Management
IJWP - International Journal of Web Portals

CENTERIS/PROJMAN/HCIST 2022

ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

Finally, a word of appreciation is due to the members of the organising committee for their prompt and friendly support.

The Conference Chairs,

Maria Manuela Cruz-Cunha
Ricardo Martinho
Rui Rijo
Dulce Domingos
Emanuel Peres

Table of contents

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

CENTERIS/PROJMAN/HCIST 2022

ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

CENTERIS/PROJMAN/HCIST 2022

ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

CENTERIS papers

"Time" Spent in Youth's "Global Information Space"

(Problems of Satisfaction of Reading or Information Need)

Parviz Firudin Oqlu Kazimi, Nigar Aliagha Gizi Guliyeva[*]

Baku State University Baku, Azerbaijan.

Abstract

The rapid penetration of the Internet into our lives has a profound effect on the reading habits of young people, and the concept of access to information is gradually becoming synonymous with the concept of reading. Until the last twenty years, young people have traditionally met their information needs through reading. It was formed as a result of long historical traditions. There has always been a significant difference between "heard information" and "read information". The percentage of "read information" by young people with higher education should have been higher than the percentage of "listened to information". This percentage determined the intelligence of the young man and expressed his social and cultural qualities. Surveys show that young people spend "time reading" on the Internet and are content with getting "episodic" information instead of classical reading. Also, reading is not one of the main activities in the organization of leisure. Here, too, the main place is occupied by the Internet. Over the past twenty years, the "time" spent on the Internet has been growing dynamically and is crowding out various traditional activities for young people. Students of the Azerbaijan State University of Culture and Arts created a working group to study the classical reading skills of young people, conducted surveys and obtained interesting results. To study the classic reading habits of young people belonging to different categories, and to compare the results obtained, it is necessary to have certain standards and norms. Unfortunately, although the results are not comparable with other regions, in a country with a population of ten million and 54 universities, the attitude of young people towards classical reading reveals a certain pattern.

Keywords: youth and the internet; reading and youth; information environment; information support; heard information; read information.

[*] *Corresponding author.*
E-mail address: gulieva_001@mail.ru

A Bibliometric Analysis of Phishing in the Big Data Era: High Focus on Algorithms and Low Focus on People

Mirjana Pejić-Bach[*], Ivan Jajić, Tanja Kamenjarska

Faculty of Economics and Business, University of Zagreb, Square of John F. Kennedy 6, 10 000 Zagreb, Croatia

Abstract

The phishing attacks, based on social engineering to persuade potential victims to provide valuable information, have significantly increased in the pandemic Covid-19 era, characterised by ubiquitous big data technologies. This paper aims to assess the theoretical and empirical research on phishing emails and big data that has been done to identify trends and recommend new areas for research. Using the VOSviewer program, the search results from the Web of Science (WoS) database were extracted. A mapping technique, using VoS Viewer, was used to examine articles on big data and phishing emails. The findings show that most of the field's research is carried out in nations in Asia and the United States of America and that the number of publications in this area is increasing exponentially. However, it is evident that researchers predominately concentrate on technical fields like computer science. Even though they are used in relatively small quantities, machine learning techniques, particularly artificial neural networks, are associated with most of the phishing publications that have been studied. Six clusters correspond to the main phishing domains: Phishing target or victim, Phishing channel, Big data analytics, Big data machine learning, Phishing attacker, and External phishing protection. The results indicate that real-time data collection and the development of effective algorithms are new approaches to combating phishing assaults. However, research outside of the technical domains is scarce.

Keywords: bibliometric analysis; phishing; big data; VOSviewer; text-mining, co-occurrence.

* *Corresponding author.* Tel.: +385-1-238-3464.
E-mail address: mpejic@net.efzg.hr

A cloud-based 3D real-time inspection platform for industry:

a case-study focusing automotive cast iron parts

José Pérez[a], Javier León[b], Yusbel Castilla[a], Somayeh Shahrabadi[a], Vitor Anjos[c], Telmo Adão[a,d], Miguel Ángel Guevara López[e], Emanuel Peres[f], Luís Magalhães[d,f], Dibet Garcia Gonzalez[a,*]

[a]*CCG: Centre for Computer Graphics, Campus de Azurém, Edifício 14, 4800-058, Guimarães, Portugal.*
[b]*University of Évora, BigData@UE Laboratory, Largo dos Colegiais 2, 7004-516, Évora, Portugal.*
[c]*AAPICO Maia, S.A., Rua Jorge Ferreirinha, 679 4470-314 Maia, Portugal.*
[d]*Algoritmi Centre, University of Minho, Campus de Azurém, Av. da Universidade, 4800-058 Guimarães, Portugal.*
[e]*Technology College, Polytechnic Institute of Setúbal Setúbal, Portugal.*
[f]*CITAB, University of Trás-os-Montes e Alto Douro, 5000-801 Vila Real, Portugal.*

Abstract

A 3D real-time quality inspection platform that specifically focus on automotive cast iron parts was developed for the industry and is presented in this work. It is supported by a cloud-based platform, which combines recent software and hardware advances to deal with large amounts of information related to the acquisition process and the computational power needed to execute the computer vision platform algorithms (e.g., point cloud filtering, alignment, and comparison). This platform introduces changes in the current workflow through the inspection process' digitalization. Indeed, it promotes the reduction of human-related inspection errors, as well as ergonomic issues, while simultaneously making available a solution for the automatic gathering and storing of data in a cloud-like environment, for further access and advanced data analytics.

Keywords: 3D real-time inspection, cloud, computer vision, cast iron, automotive industry.

* *Corresponding author.* Tel.: +351 932170505.
E-mail address: dibet.gonzalez@ccg.pt

A deep learning approach for automatic counting of bedbugs and grape moth

Ana Cláudia Teixeira[a,b], Raul Morais[a,c], Joaquim J. Sousa[a,b], Emanuel Peres[a,c], António Cunha[a,b,*]

[a]*University of Trás-os-Montes and Alto Douro (UTAD), Vila Real, Portugal*
[b]*Centre for Robotics in Industry and Intelligent Systems, INESC-TEC, Porto, Portugal*
[c]*Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB), Vila Real, Portugal*

Abstract

The bedbug and the grape moth are the most significant pests affecting rice and vineyards, causing great damage. However, these pests are only two examples of the many insect pests that exist with great potential to cause significant crop damage. Insect traps are among the most appropriate solution for monitoring and counting, influencing the selection and dosage of the pesticide to be applied for pest control. However, the counting and monitoring operations are based on the frequent visit of technicians to the site and are supported by inefficient counting methods, which is a challenging and time-consuming task. This study proposes the automatic counting of bedbugs and grape moths in traps using deep learning algorithms. We use three different databases, Pest24, Bedbug and Grape moth. Pest24 is a public dataset with a great diversity of insects. The Bedbugs and the Grape moth datasets are private datasets provided by mySense, a precision agriculture platform developed and managed by researchers from the University of Trás-os-Montes e Alto Douro (UTAD). First, we trained the Pest24 dataset with YOLOv5, and we got an mAP of 69.3%. Then, using the weights obtained from the Pest24 dataset, we trained the Bedbug and Grape moth datasets. The best results for the bedbug dataset were obtained with the YOLOv5 with transfer learning with an AP of 96.5% and a counting error of 63.3%. The best result was obtained with YOLOv5 without transfer learning of Pest24 with an AP of 90.9% and a counting error of 6.7 for the Grape moth.

Keywords: Insects detection, insect counting, smart pest monitoring, deep learning, YOLOv5.

---

* *Corresponding author.* Tel.: +351-259350300
E-mail address: acunha@utad.pt

A hybrid model of risk assessment of the functioning of information modules of critical infrastructure objects

Volodymyr Polishchuk[a,*], Yurii Mlavets[a], Iryna Rozora[b], Olena Tymoshenko[c]

[a]*Uzhhorod National University, Uzhhorod, Ukraine*
[b]*Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[c]*National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Kyiv, Ukraine*

Abstract

The work carried out a theoretical study of the development of a mathematical hybrid model of risk assessment of the functioning of information modules of critical infrastructure objects in different modes, for proactive decision-making support. The model is able to assess the risks of the functioning of information modules, uses the intellectual analysis of experts' knowledge, reveals the vagueness of input estimates, increases the degree of validity of making further management decisions based on the obtained results. As a result, a vague aggregated assessment of the operation of the information module of the critical infrastructure facility was obtained; linguistic interpretation of the level of functioning of the module of the critical infrastructure object to support decision-making; the level of risk of functioning of the corresponding module. The developed model will be a useful tool for experts on the security of the operation of critical infrastructure objects in the framework of cybercrime prevention.

Keywords: Risk Assessment; Intelligent Systems; Expert Evaluation; Cybercrime; Risks; Objects of Critical Infrastructure.

* *Corresponding author.* Tel.: +38066-420-74-84.
E-mail address: volodymyr.polishchuk@uzhnu.edu.ua

A Literature Review on Digital Twins in Warehouses

Marie-Jane Bélanger[a,*], Robert Pellerin[a], Samir Lamouri[b]

[a]Polytechnique Montréal, Department of Mathematics and Industrial Engineering, Montréal (Québec) H3C 3A7, Canada
[b]LAMIH CNRS, Arts et Métiers ParisTech, Paris, France

Abstract

Due to the high cost of their warehousing operations, many manufacturing companies are looking to increase the efficiency of their warehouse. To this end, Industry 4.0 technologies offer several solutions to address this issue. One of them is the digital twin (DT) technology which is relatively new. This paper presents a literature review on DTs in warehousing. The analysis framework used to classify the papers includes the general description of the DT, the possible uses, and the required data. Our results show that several limitations remain to exploit the full potential of a DT. The limitations mainly concern the characterization of the data required.

Keywords: Review; Warehouse; Digital twin; Material Handling; Industry 4.0.

* *Corresponding author.*
E-mail address: marie-jane.belanger@polymtl.ca

A management system to personalize notifications in the TV ecosystem

João Encarnação[a], Ana Velhinho[a,*], Simão Bentes[a], Telmo Silva[a], Rita Santos[b], Roger Salgado[c], Fernado Afonso[c]

[a]*Digimedia, Department of Communication and Arts, University of Aveiro,3810-193Aveiro, Portugal.*
[b]*Digimedia, Águeda School of Technology and Management, University of Aveiro, 3754-909 Aveiro, Portugal.*
[c]*Altice Labs S.A., 3810-106 Aveiro, Portugal.*

Abstract

This article presents a prototype to generate, schedule, and monitor personalized notifications for the TV ecosystem, which encompasses the television, connected devices, and personal mobile devices. Based on the identification of guidelines and usage scenarios in the literature and the collection of empirical data through focus groups, were systematized settings for the notifications according to the type of event/content to be notified. The settings include the sending moments and triggers on the TV set-top box (STB), as well as users' responses to the notifications, like changing the channel, going to an app, or asking to repeat the reminder. The prototype, which will be tested in the laboratory with experts and field tests with users, is part of an R&D project in partnership with a Portuguese IPTV provider, to possibly integrate this feature into their service.

Keywords: iTV; notifications; prototype; management system.

* *Corresponding author.* Tel.: +351-234-370-200.
E-mail address: ana.velhinho@ua.pt

A methodology for mapping cybersecurity standards into governance guidelines for SME in Portugal

Bruno Azinheira[b,*], Mário Antunes[a,c], Marisa Maximiano[a], Ricardo Gomes[b]

[a]*Computer Science and Communication Research Centre (CIIC), School of Technology and Management, Polytechnic of Leiria; Leiria, Portugal*
[b]*School of Technology and Management, Polytechnic of Leiria; Leiria, Portugal*
[c]*INESC TEC, CRACS, Porto, Portugal*

Abstract

The digitalization of companies and the implantation of Industry 4.0 concepts are emerging and challenging for micro and Small and Medium Enterprises (SME). The benefits are evident for the companies, as their business processes become simplified, and the internationalization and global market penetration turn out to be improved.

However, information security and cybersecurity concerns have been raised on SME, as best practices and regulations compliance should be applied. The wide set of these regulations and their broad scope has put constraints on their overall direct mapping and adoption into SME.

This paper describes an original methodology to map the Roadmap for Minimum Cybersecurity Capabilities (RMCSC) delivered by the Portuguese Cybersecurity Centre, into the well-adopted international information security ISO 27001:2013 standard. The proposed mapping is oriented toward the characteristics of SME and allows these companies to assess their cybersecurity risk to further mitigate potential identified flaws.

The main deliverable of this paper is the developed methodology, which correlates the actions of the cybersecurity capabilities roadmap and the security controls enclosed in the ISO 27001:2013 standard. A questionnaire was developed to support the cybersecurity risk self-diagnosis, and the actions were justified and detailed in this paper. Further developments include the submission of the questionnaire to a case study of SME in the centre region of Portugal.

Keywords: Cybersecurity, Information Security, Auditing, ISO-27001, Small and Medium-sized Enterprises.

* *Corresponding author.*
E-mail address: 2200331@my.ipleiria.pt

A Methodology to Analyze the Development of Local Energy Communities Based on Socio-Energetic Nodes and Actor-Network Theory

Yolène Berrou[a,b,*], Eddie Soulier[a]

[a]*University of technology of Troyes, LIST3N laboratory, Troyes, France.*
[b]*ENGIE Lab CRIGEN, Computer science and artificial intelligence (CSAI) laboratory, Stains, France.*

Abstract

The shift from centralized to decentralized energy, with the development of renewable energies, is giving rise to new energy models. Some of these models aim to increase the citizens participation in the energy transition, such as the energy communities. This concept has recently emerged in Europe to encourage the development of local projects and raising citizens' awareness. Our aim is to better understand how such communities emerge to foster them, and to propose a tool for B2T (Business to Territory) Business Developers. We have developed a generic methodology to follow the formation of sociotechnical systems based on a modeling of the Actor-Network Theory. We use the concept of Socio-Energetic Node and propose a model of it to apply our generic methodology to Local Energy Communities. Preliminary results are presented at the end of this paper on a case study.

Keywords: Local Energy Communities; Socio-Energetic Nodes; Energetic companies; Assemblage; Simplicial Complexes; NLP.

* *Corresponding author.*
E-mail address: yolene.berrou@utt.fr

A morphology of digital direct-to-consumer (D2C) models

Maximilian Schacker, Katarina Stanoevska-Slabeva[*]

University of St.Gallen, Dufourstrasse 50, 9000 St. Gallen, Switzertland

Abstract

Establishing a digital direct-to-consumer (D2C) business is a complex and challenging, yet also highly attractive opportunity for many companies. To leverage this opportunity, managers need to understand what types of digital D2C models exist and how to configure them. Based on a review of the D2C literature, an analysis of 15 D2C online shops and interviews with experts from the respective firms, this paper develops a morphological box of D2C models using a design science research process. The morphological box serves as a tool that provides orientation for managers to find a suitable D2C configuration for their business.

Keywords: Direct-to-consumer; business models; morphological box.

* *Corresponding author.* Tel.: +41 71 224 22 97
E-mail address: katarina.stanoevska@unisg.ch

A Reference Model for Artificial Intelligence Techniques in Stimulating Reasoning, and Cognitive and Motor Development

Vitor Santos[a,*], Henrique Mamede[b], Clara Silveira[c], Leonilde Reis[d]

[a]NOVAIMS da Universidade Nova de Lisboa, Portugal.
[b]INESC TEC, Departamento de Ciências e Tecnologia, Universidade Aberta, Lisboa, Portugal.
[c]Escola Superior de Tecnologia e Gestão, Instituto Politécnico da Guarda, Guarda, Portugal.
[d]Escola Superior de Ciências Empresariais, Instituto Politécnico de Setúbal, Setúbal, Portugal.

Abstract

Artificial Intelligence is increasingly being discussed as something essential and pressing in all aspects and areas of society. Its potential use in education is no exception. Artificial Intelligence, in particular, and technologies, in general, are unavoidable elements to be considered in the teaching-learning process at all levels of education and training.

There are many initiatives, essentially exploratory in nature, for the application of Artificial Intelligence in this process. Therefore, it is imperative to understand how they can be used for this purpose and how they relate to pedagogical methods.

In the present study, and within this context, we address how Artificial Intelligence can be used in software to support cognitive and motor development and stimulate reasoning. We propose a reference model for techniques for this purpose. Concrete cases of existing applications are presented to better illustrate the potential of Artificial Intelligence in education.

Keywords: Artificial Intelligence, Teaching, Cognitive Development, Motor Development.

* *Corresponding author.*
E-mail address: vsantos@novaims.unl.pt

A Review of Industry 4.0 Maturity Models: Adoption of SMEs in The Manufacturing and Logistics Sectors

Hussein Magdy Elhusseiny[a,b,*], José Crispim[c]

[a]Arab Academy for Science, Technology and Maritime Transport, College of International transport & Logistics, Alexandria, Egypt.
[b]Escola de Economia e Gestão, Universidade do Minho, Campus de Gualtar, 4710-057 Braga, Portugal.
[c]NIPE, Escola de Economia e Gestão, Universidade do Minho, Campus de Gualtar, 4710-057 Braga, Portugal.

Abstract

The purpose of this paper is to critically review the current available (large/SMEs) Maturity Models (MM) for Industry 4.0 (I4.0) adoption in manufacturing and logistics sectors, as well as recognize the specific requirements of SMEs for a MM adoption. In total, 16 MM were studied with various scopes, where 5 studies applied on SMEs. To this end, this paper identified manufacturing SMEs specific requirements, conducted a review of current MM, and identified the main MM scopes for SMEs and large enterprises as well. This study found that Smart Manufacturing, Smart Supply Chain (SC), Product Development, Digitized Data collection & Analytics, Technological Infrastructure, Smart Logistics, Performance Evaluation, and Employee participation are the main scopes used for SMEs.

Keywords: Industry 4.0, Maturity Model, SMEs, Manufacturing, Logistics.

* *Corresponding author.* Tel.: +351253604550; fax: +351253604550.
E-mail address: hussein_magdy@egypt.aast.edu

A Set of Measures of Centrality by Level for Social Network Analysis

Charifa Laghridat[a,*], Mohamed Essalih[a,b]

[a]LAPSII, Graduate School of Technology, Cadi Ayyad University Marrakech, Morocco
[b]LRIT- CNRST URAC 29, Rabat IT Center FS, Mohammed V University Rabat, Morocco

Abstract

Social networks are becoming more indispensable in our lives, which leads researchers to seek to understand and analyze them. Social network analysis has become a specialty of sociology in network theory and graph theory as well. The principal role of this analysis is to focus on the entities and the structure of relationships between them in a specific context, which is going to highlight the most influential (important) person in a social network, in terms of the number of direct and indirect relationships.

Centrality indices are measures used to capture the notion of importance in a graph, by identifying the most significant person(s) in a social network. In this paper, we will propose and prove the generality of some centrality measures. In other words, the concept of these social networks analysis is part of sociological circles that study the relationships and social representations that we can analyze by levels using the $d_G^u(k)$.

Keywords: Centrality, Network, Social Network Analysis, Wiener index.

* *Corresponding author.* Tel.: +212-06-78-34-77-79.
E-mail address: charifa.laghridat@ced.uca.ma

A Technique to Integrate Service Business Models with ArchiMate

Saoriko Koyama, Yushi Tsuji, Ryuta Masuda, Hikaru Onoda, Hayate Ono, Madoka Natsuyama, Takashi Endo, Kazuki Iwasa, Shuichiro Yamamoto[*]

International Professional University of Technology in Nagoya, 4-27-1 Meieki Nakamura-ku, Nagoya 450-0002, Japan.

Abstract

With the penetration of digital transformation into enterprises, business model creation has become important issues for modern enterprises. Although business model canvas is well known, it isn't easy to use Business Model Canvas for novice service designers.
In this paper, an integrated technique is proposed to develop the service oriented Business Model Canvas step by step by combining with Customer Journey Map and Service Blueprint. Moreover, we examine the applicability of the technique by designing an emergency call service.

Keywords: Business Service Design; Business Model Canvas; Customer Journey Map; Service Blueprint; ArchiMate.

* *Corresponding author.* Tel.: +81-52-561-2001; fax: +81-52-582-0077.
E-mail address: syamamoto@acm.com

A WebApp for Reliability Detection in Social Media

Filipe David[a], Nuno Guimarães[a,b], Álvaro Figueira[a,b,*]

[a]*Faculty of Sciences University of Porto, Rua do Campo Alegre s/n, Porto, Portugal*
[b]*CRACS-INESCTEC, Rua Dr. Roberto Frias, Porto, Portugal*

Abstract

In recent years, social media disinformation had a significant impact on real-world events. Consequently, to fight disinformation, a large number of fake news detection models have been proposed. However, the theory behind these models has become increasingly sophisticated and complex. Thus, despite the high precision, most of these systems classify text without explaining why since they inherently use advanced and complex technology that is not understandable to humans. In the particular case of disinformation, users are already susceptible to their prior beliefs (i.e., preconceived bias). Consequently, without a proper aid to understand the classification of a certain text, users' trust in these models is likely to be small. Therefore, we propose a reliability detection application for Twitter messages that not only produces a classification but also attempts to explain it by providing a set of graphical cues commonly used to differentiate between reliable and unreliable content.

Keywords: Web App, Reliability Detection, Social Media, disinformation detection, machine learning, graphical interface.

* Corresponding author
E-mail address: arfiguei@fc.up.pt

Acacia dealbata classification from aerial imagery acquired using unmanned aerial vehicles

Jorge Pinto[a], António Sousa[a,b], Joaquim J. Sousa[a,b], Emanuel Peres[a,c], Luís Pádua[a,c,*]

[a]*Engineering Department, School of Science and Technology, University of Trás-os-Montes e Alto Douro (UTAD), 5000-801 Vila Real, Portugal*

[b]*Centre for Robotics in Industry and Intelligent Systems (CRIIS), INESC Technology and Science (INESC-TEC), 4200-465 Porto, Portugal*

[c]*Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB), UTAD, 5000-801 Vila Real, Portugal*

Abstract

Non-native plant species can have a negative impact in the ecosystems and in local economies when they spread uncontrollably. Monitoring tools can support their management and spread. In this paper, an exploratory approach is presented for pixelwise detection of *Acacia dealbata* from UAV-based imagery acquired from RGB and multispectral sensors. Four machine learning algorithms - k-nearest neighbors (KNN), random forest (RF), adaptive boosting (AdaBoost) and a linear kernel SVM (LSVM) - are trained using four datasets (hue, saturation and value - HSV, multispectral - MSP, RGB and a combination of all features) and their classification performance is evaluated. RF classifier obtained the overall best performance, with an accuracy above 86% in all data combinations, with LSVM showing the poorer results. Obtained results are encouraging for monitoring invasive species and can serve as a base for future improvements to detect invasive species.

Keywords: machine learning; invasive plant species; HSV; multispectral imagery; geographical information systems.

* *Corresponding author.* Tel.: +351-259-350-151 (Ext. 4151).
E-mail address: luispadua@utad.pt

AI-powered Digital Transformation: Tools, Benefits and Challenges for Marketers – Case Study of LPP

Edyta Gołąb-Andrzejak[*]

Gdańsk University of Technology, Faculty of Management and Economics, Department of Marketing, ul. Narutowicza 11/12, Gdańsk, Poland

Abstract

The article aims to show the role (benefits and challenges) of AI-powered digital marketing tools for marketers in the age of digital transformation. The considerations were related to the Polish market and a case study of LPP, a Polish clothing retailer. The starting point for this study was the analysis of the literature on the concept of artificial intelligence (AI) with reference to digital marketing. In the next steps, the results of the research on the Polish market conducted by the Digital Poland Foundation and presented in the report entitled "State of Polish AI 2021" were reviewed, and an application case study of the largest Polish clothing company – LPP – was conducted. The study is of an introductory and exploratory nature. It recognises the significant role of AI in digital transformation in the context of digital marketing in the Polish market. The implementation of solutions based on artificial intelligence algorithms, such as the Google Cloud, analytical platform and data repository, e-commerce infrastructure, chatbot, Genesys PureCloud, Google Dialogflow and the AI-based function in the PSIwms Warehouse Management System in LPP's distribution centre significantly improves the efficiency of online order processing without compromising the quality of products and order fulfilment time. By applying a case study analysis, the importance of AI-based tools in the digital transformation process, including digital marketing, in the Polish market was demonstrated. Marketers, including CMOs, were shown the benefits of applying AI-related technological solutions in the field of e-commerce optimisation and customer service.

Keywords: artificial intelligence (AI); AI tools; digital transformation; digital marketing; AI in digital marketing; LPP case study.

* *Corresponding author.* Tel.: 48 58 348 60 19; fax: +48 58 347 24 55.
E-mail address: edyandrz@pg.edu.pl

An analysis of Botswana's cybercrime legislation

Seth Sarefo[a,*,] Banyatsang Mphago[a], Maurice Dawson[b]

[a]Botswana International University of Science and Technology, Palapye, Botswana.
[b]Illinois Institute of Technology, 10 West 35th Street, Chicago IL, 60616, USA.

Abstract

Botswana has identified development of legal frameworks as one of its cybersecurity strategies. One issue that government is dealing with when it comes to cybercrime legislation is the overuse of technology related terminology. Therefore, in this study the cybercrime act of Botswana was examined alongside that of South Africa and the United Kingdom (UK), to assess its use of technology jargon. The legislation from these countries was analyzed quantitatively using frequency of terms, and feature co-occurrence. The analysis performed in this study was done through the statistical and analytical lens of R. It was discovered in this study that the UK cybercrime law uses less technology specific terms compared to the Botswana and the South African cybercrime acts. Hence it is adaptable and remains relevant to the ever-evolving technological environment.

Keywords: Cybercrime legislation, Internet Freedom, Cybersecurity, Text Analysis.

* *Corresponding author.*
E-mail address: ss18100008@studentmail.biust.ac.bw

An analysis of Open Data Scoring System towards Data Science for Sustainability in Industry 4.0

Hélio Castro[a,b,*,] Filipe Costa[a], Tânia Ferreira[c], Paulo Ávila[a,b], Manuela Cruz-Cunha[d], Luís Ferreira[d], Goran D. Putnik[e], João Bastos[a,b]

[a]School of Engineering, Polytechnic of Porto, Rua Dr. António Bernardino de Almeida, 431, 4249-015 Porto, Portugal
[b]INESC TEC, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal
[c]Data CoLAB, Av. de Cabo Verde, 1, 4900-568 Viana do Castelo, Portugal
[d]2Ai - Applied Artificial Intelligence Lab, School of Technology, IPCA, Barcelos, Portugal
[e]University of Minho, School of Engineering, Campus de Azurém, 4800-058 Guimarães, Portugal

Abstract

In a society based on data-driven, data inclusion and data access play a significant role in societal development. A called democratization of data through open access, Open Data, must be nurtured by countries to empower their citizens, entrepreneurs, companies, industries, academics, and organizations, in general. Open Data Scoring System is an evaluation system that ranks countries in 22 categories of openness in data, divided into the 3 pillars of sustainability. In this paper, we will present the importance of Industry 4.0 and its relation to sustainability and the role of Data Science in Industry 4.0 assuming an Open Design approach. Then, an analysis is made considering the Gross Domestic Product (GDP) of the most relevant countries worldwide, the USA and China, concerning the six (6) higher ranked categories of openness data of these countries, supported by the Open Data Scoring System from 2015 to 2020. Our findings reveal that in the USA and China the main categories are seven (7), five (5), and 2 (two) categories of economic, social, and environmental sustainability, respectively. Through a correlations and co-occurrences analysis of the open data scoring worldwide reveals that the most significant categories are four (4) economic, one (1) social, and two (2) environmental.

Keywords: Industry 4.0; Open Design; Sustainabilty; Data Science; Open Data Scoring System.

---

* *Corresponding author.* Tel.: +351 +351 22 83 40 500; fax: +351 22 83 21 159.
E-mail address: hcc@isep.ipp.pt

An Analysis of the Implementation of Children's Rights in the Digital World: A Case Study of Botswana

Gabaikanngwe Ethel Mambo[*], Kinyanjui Godfrey Gichuhi

BA ISAGO University, Private Bag BR94, Gaborone Botswana.

Abstract

This paper examines the effects of digital technologies on children's rights. All children's rights ought to be reinforced, respected, and protected. Majority of children devote their time on Internet using various social media platforms which have become a key means of teaching and learning. Increased internet access by children is associated with risks and escalation of children's rights violations. Institutions dealing with children continuously struggle to represent the rights of children enshrined within the Convention on the Rights of Children. The paper is mainly focuses on children's rights such as freedom of expression and information, privacy and data protection, protection and safety. Children's rights are not fully protected online in most cases particularly in countries like Botswana. The publication of sensitive information relating to children online is a violation of their rights to privacy and may affect their childhood development. The lack of relevant expert to investigate and prosecute cybercrime leads to the increase of cybercrime activities committed against children.

Keywords: child; data; online privacy; cyber-crime;investigation; prosecution.

* *Corresponding author.*
E-mail address: emambo656@gmail.com

An approach for real time management of global manufacturing enterprises based on Digital Data Stream

Hemant Jain[*]

University of Tennessee Chattanooga, 615 McCallie Avenue, Chattanooga, TN 37403, USA.

Abstract

Advances in sensor technology, IOTs, communication technologies, computing, data management and analytics is changing the way modern global manufacturing enterprises are managed. With appropriate design and architecture of these technologies it is possible to use digital data streams to manage these enterprises in real time. This paper focuses on issues related to the design of these systems. Specifically, we focus on developing approaches for the design of autonomous services that receive data from local devices (e.g. sensors) in real time, do some processing in real time, communicate with other services, and respond to stimuli received from other services in real time. This allows localization of appropriate decision making. These services pass on relevant information to other related services in a web like architecture.

Keywords: Real-time Management; Manufacturing; Global; Data Stream; Enterprises.

* *Corresponding author.* Tel.: +1-423-425-4156.
E-mail address: hemant-jain@utc.edu

An exploratory analysis of the cybersecurity threat landscape for Botswana

Seth Sarefo[a,*], Maurice Dawson[b], Mphago Banyatsang[a]

[a]*Botswana International University of Science and Technology, Palapye, Botswana.*
[b]*Illinois Institute of Technology, 10 West 35th Street, Chicago IL, 60616, USA.*

Abstract

Investigating the cybersecurity threat landscape is important as it increases situational awareness and defensive agility. Therefore, in this study the cybersecurity threat landscape for Botswana was investigated from the perspective of Information Technology (IT) and Cybersecurity professionals in Botswana. Since Botswana has no publicized empirical data on cyber threats, a cybersecurity incidences dataset from the United Kingdom (UK) was first analyzed to understand cybersecurity trends there. Insights obtained from the UK dataset were used as a baseline to design a questionnaire which was sent out to 31 participants from 20 organizations in Botswana. The findings obtained from the questionnaire were analyzed and compared to findings from the UK. This work showed that a coordinated response to cybersecurity and collection of information related to threats and mitigations can help improve situational awareness and defensive agility.

Keywords: National Cybersecurity; Cybersecurity Threats; Cybersecurity Mitigations; Cybersecurity Analytics.

* *Corresponding author.*
E-mail address: ss18100008@studentmail.biust.ac.bw

An Infrastructure of Battery Swapping and Charging Stations in Smart Cities to "Disrupt" the Current Ecosystem of Battery Usage: A Schematic Design

Victor K. Y. Chan*

Macao Polytechnic University, Rua de Luís Gonzaga Gomes, Macao, China

Abstract

This article proposes a quintessential, down-to-earth schematic design of *battery swapping and charging stations* (BSCSs) typically in smart cities together with their necessary battery standardization, supportive information systems and data communication network for the implementation of a citywide and even worldwide infrastructure of BSCSs. At such BSCSs, users of mobile information communication technology (ICT) equipment like mobile phones, tablet computers, lap-tops, etc. and electric vehicles can swap and *trade* their standardized battery modules whenever depleted for fully charged ones almost in no time virtually anytime and everywhere without ever worrying about battery depletion of the equipment and the extended time and specialized chargers for recharging. Harnessing earlier technologies of the author, this design could be a game-changer to "disrupt" the current battery usage ecosystem consisting of an excessively large number of, sometimes costly, infrastructures and chargers to recharge individuals' equipment, the cumbersome practice to recharge with specialized chargers at designated locations over extended time periods, and bulky secondary power banks being hand-carried. The key is that in this schema, disparity of battery modules' estimated remnant energy storage capacities can be offset by monetary payments.

Keywords: Battery ergonomics; Smart cities; Battery ecosystem; Battery trading; Battery swapping and charging stations; Schematic design.

---

* *Corresponding author.* Tel.: +853-8599-3322; fax: +853-2872-7653.
E-mail address: vkychan@ipm.edu.mo

Analysis of (gender-)inclusive language strategies in ecotourism corporate websites of Southern Spanish SMEs

María Jiménez-Castro[*], Mar Diáz-Millón, Irene Rivera-Trigueros

University of Granada, Granada, 18071, Spain

Abstract

Gender inclusive language (GIL) strategies are being increasingly applied by institutions and some companies to show their commitment to gender equality. In this article, a framework for the analysis of the use of inclusive language is explained. It also analyzes the use of these strategies in a sample of websites of ecotourism companies from Southern Spain, considering that these types of companies present a series of commitments to society and the environment through their CSR practices. Statistical analysis was carried out to verify whether GIL strategies were used by companies. The results show that the analyzed companies do not generally apply inclusion strategies in verbal language, although they do apply positive strategies in graphic and visual language that move away from stereotypes and objectification of women. Therefore, it is advisable for companies in this sector to seek advice so that the language they use on their websites is in line with values that are not only required by society, but can also have a positive impact on their corporate image.

Keywords: Gender-inclusive language; inclusion; tourism; website.

* *Corresponding author.*
E-mail address: mariajc@ugr.es

Application of AHP and ELECTRE I decision-making methods to solve a health and safety problem

António Rocha[*]

Polytechnic Institute of Cávado and Ave, 4750-810, Barcelos, Portugal

Abstract

To select a solution for a health and safety problem affecting the workers of a waste treatment facility in a cleaning operation, multicriteria decision methods have been used, namely, AHP - Analytical Hierarchical Process, and ELECTRE I - *Élimination et Choice Traduisant la Réalité*. These two methods have been used to validate and find an appropriate solution for a health and safety problem while cleaning a section separating two waste disposal tanks. Four possible solutions have been advanced and compared using a set of criteria organized into categories. The results of the assessment methods led us to the same conclusion, reinforcing the solution to be implemented to ensure the workers' health and safety. The paper provides details on how to apply the ELECTRE I method, with the perspective that its implementation and exemplification, will make it a more disseminated method to support decision-making processes, in settings where the stakeholders' participation is very important, such as, in situations where health and safety issues must be addressed.

Keywords: Multicriteria decision-making; Analytical Hierarchical Process, ELECTRE I.

* *Corresponding author.* Tel.: +351-253802190
E-mail address: arocha@ipca.pt

Applications and Perceptions of Workforce Management Systems for Warehouse Operation - Results and Findings from Expert Interviews

Marike Kellermayr-Scheucher[*], Maria Niedermeier, Patrick Brandtner

University of Applied Sciences Upper Austria, School of Business & Management, Wehrgrabengasse 1-3, 4400 Steyr, Austria

Abstract

Workforce management represents a crucial element of today's warehouse operations. Due to volatile market dynamics and uncertain customer demands, the need for flexible and adaptive warehouse practices is especially urgent in the retail sector. High fluctuation rates in workforce demand are just one side effect of these developments. The current paper analyzes the application and perception of Workforce Management Systems (WMS) in practice as one approach to counteract these issues and enable flexible warehouse operations. By means of an online survey and a detailed set of expert interviews, we analyze the current use of WMS and information items in retail. We investigate design and time horizons of workforce planning processes as well as forecasts and summarize main expectations and requirements of WMS from practitioners' point-of-view. Our results show highly diverse usage patterns of systems with a strong emphasis on spreadsheet tools like MS Excel. The integration of legislation on working hours, qualification of employees and individual working time arrangements / contract details were mentioned as exemplary key information items of WMS. The typical time horizon of workforce planning for most participants was three months. Key requirements for an ideal WMS include the depiction of qualification profiles, productivity of individual employees, forecasting features, simulation-optimization tools to find best possible solutions with given workforce, automated planning as well as bottleneck reduction and handling. The results of our paper provide practitioners with an overview of expert opinions, present opportunities for system development, and provide future research tasks in WMS for warehouse operation.

Keywords: Workforce Management; warehouse; workforce scheduling.

* *Corresponding author.* Tel.: +43 5 0804 33276; fax: +43 5 0804 33299.
E-mail address: marike.kellermayr-scheucher@fh-steyr.at

Artificial Intelligence Models: A literature review addressing Industry 4.0 approach

Hélio Castro[a,b,*,] Eduardo Câmara[a], Paulo Ávila[a,b], Manuela Cruz-Cunha[c], Luís Ferreira[c]

[a]*School of Engineering, Polytechnic of Porto, Rua Dr. António Bernardino de Almeida, 431, 4249-015 Porto, Portugal*
[b]*INESC TEC, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal*
[c]*2Ai - Applied Artificial Intelligence Lab, School of Technology, IPCA, Barcelos, Portugal*

Abstract

Industry 4.0 has brought modernization to the production system through the network integration of the constituent entities which, combined with the evolution of information technology, has enabled an increase in productivity, product quality, optimization of production costs, and product customization to customer needs.

Despite the complexity of human thought, artificial intelligence tries to replicate it in algorithms, creating models capable of processing databases with a high volume of information, and generating valuable information for decision making. Within this area, there are subfields, such as Machine Learning and Deep Learning, which, through mathematical models, define patterns to predict output data from known input data. In addition to this type of algorithm, there are metaheuristic models capable of optimizing the parameters required in Machine Learning and Deep Learning algorithms. These intelligent systems have applications in various areas such as industry, construction, health, logistics processes, and maintenance management, among others. This paper focuses on Artificial Intelligence models addressing Industry 4.0 approach.

Keywords: Industry 4.0, Artificial Intelligence, Machine Learning, Deep Learning, Metaheuristic Algorithms.

* *Corresponding author.* Tel.: +351 +351 22 83 40 500; fax: +351 22 83 21 159.
E-mail address: hcc@isep.ipp.pt

Assessing machine learning adoption at the firm level: the moderating effect of the environmental context

Pedro Filipe[*], Pedro Ruivo, Tiago Oliveira

NOVA IMS, Universidade Nova de Lisboa, Campus de Campolide, 1070-312 Lisbon, Portugal.

Abstract

Granted that Machine learning (ML) can positively impact an organization's performance, it is crucial to understand the technological, organizational, and environmental drivers upon its adoption. Using the technology-organization-environment (TOE) framework and the institutional (INT) theory, a measurement of the determinants of ML adoption and an evaluation of the moderating effects of the environmental context were made in a single framework. Partial least squares, a structural equation modeling technique, was used in a dataset of 319 firms to test the suggested hypotheses. The research empirically sustains the impact of the environment on ML adoption, both as a predictor and as a moderator of the technological context. Moreover, it suggests that external pressures may lead to a rushed adoption of ML when the firm is not yet prepared to accommodate it.

Keywords: Machine learning; Information technology (IT) adoption; Technology-organization-environment (TOE) framework; Institutional (INT) theory; Environmental context.

* *Corresponding author.* Tel.: +351913355604.
E-mail address: pfilipe@novaims.unl.pt

Benchmarking Deep Learning models and hyperparameters for Bridge Defects Classification

Somayeh Shahrabadi[a,*], Dibet Gonzalez[a], Nuno Sousa[a], Telmo Adão[a,b], Emanuel Peres[c], Luís Magalhães[b]

[a]*CCG: Centre for Computer Graphics, Campus de Azurém, Edifício 14, 4800-058, Guimarães, Portugal.*
[b]*Algoritmi Centre, University of Minho, Campus de Azurém, Av. da Universidade, 4800-058 Guimarães, Portugal.*
[c]*CITAB, University of Trás-os-Montes e Alto Douro, 5000-801 Vila Real, Portugal.*

Abstract

Deep learning (DL) is becoming increasingly popular in numerous application fields within the current Fourth Industrial Revolution (4IR) era. This is mainly due to its capability for providing accurate predictions and reliable consistency in decision-making. Bridge engineering focused on structure monitoring and inspection is a crucial activity for disaster prevention. Therefore, it is an application field wherein synergies between professional knowledge and sophisticated machine-based analytics strategies can be established and even drive time-effective interventions. This paper presents a comparison of DL models used to detect defects in bridges, resorting to the following architectures: MobileNetV2, Xception, InceptionV3, NASNetMobile, Visual Geometry Group Network-16 (VGG16), and InceptionResNetV2. Different optimizers (e.g., Nadam, Adam, RMSprop, and SGD) crossed with distinct learning rates (e.g., 1, 10^{-1}, 10^{-2}, 10^{-3}, 10^{-4}, and 10^{-5}) were employed. VGG16, Xception, and NASNetMobile showed the most stable learning curves. Moreover, Gradient-weighted Class Activation Mapping (Grad-CAM) overlapping images clarifies that InceptionResNetV2 and InceptionV3 models seek features outside the areas of interest (defects). Comparing optimizers' performance, the adaptive ones outperform SGD with decay schedulers for learning rates.

Keywords: Bridge Defects Inspection, Deep Learning, Convolutional Neural Networks, Transfer Learning, Learning Rate, Objective Function Optimization, Benchmarking.

---

* *Corresponding author.*
E-mail address: Somayeh.Shahrabadi@ccg.pt

Blockchain in the shipping industry: A proposal for the use of blockchain for SMEs in the maritime industry

Friedrich Lorenz-Meyer[*], Vitor Santos

NOVA Information Management School, Universidade Nova de Lisboa, Campus de Campolide, 1070-312 Lisbon, Portugal.

Abstract

The main objective of this study is to address one of the significant challenges maritime SMEs, as well as the whole industry, are facing concerning the general necessity to digitize the global supply chain: the lack of transparent information flows between participants and the non-existing documentation standards. This objective includes a proposal of using blockchain technology for data sharing as a solution to counter this challenge.

To understand how a blockchain-based data-sharing platform would succeed and tackle this challenge, TradeLens was selected as a case study. The literature review has addressed the shipping industry as a whole, blockchain technology, and its features and current initiatives that facilitate this technology.

The case study analysis and discussion focused on the architecture, data sharing model, and standards for documentation as well as challenges associated with the solution TradeLens is offering for maritime enterprises. From this analysis, implications for SMEs have been elaborated. Concluding these implications have been validated through interviews with industry experts and strategic decision-makers in maritime SMEs.

Keywords: Blockchain; Maritime Industry; TradeLens; SME; Case Study.

* *Corresponding author.* Tel.: +49 173 42 51856.
E-mail address: m20200526@novaims.unl.pt

Building an intelligent system for answering specialized questions about COVID-19

Bilyana Dobreva[a], Maria Nisheva-Pavlova[a,b,*]

[a]*Faculty of Mathematics and Informatics – Sofia University St. Kliment Ohridski, 5 James Bourchier Blvd., Sofia 1164, Bulgaria.*
[b]*Institute of Mathematics and Informatics – Bulgarian Academy of Sciences, 8 Acad. Georgi Bonchev Str., Sofia 1113, Bulgaria.*

Abstract

The paper discusses the design and implementation process of an intelligent system for answering specialized questions about COVID-19. The system is based on deep learning and transfer learning techniques and uses the popular CORD-19 dataset as a source of scientific knowledge about the problem domain. The experiments performed with the pilot version of the system are presented and the obtained results are analyzed. Conclusions are formulated about the applicability and the opportunities for improvement of the proposed approach.

Keywords: Natural language processing; question answering system; deep learning; transfer learning; BERT.

* *Corresponding author.* Tel.: +359-2-8161-529; fax:+359-2-8687-180.
E-mail address: marian@fmi.uni-sofia.bg

Characterisation of the first group of participants in the Capacid@de Digital initiative

Óscar Oliveira[a,*], Mariana Carvalho[a], Renata Freitas[a], Carla Pereira[b]

[a]CIICESI, Escola Superior de Tecnologia e Gestão, Politécnico do Porto, Felgueiras, Portugal
[b]INESC TEC, Porto, Portugal

Abstract

One of the pressing problems of the current time is the digital inequalities caused by the population's lack of technological knowledge and the accelerated technological transformation. These inequalities are increasing as the need for training for digital inclusion of the adult population. Concerned about the digital inequality of our region's adult population, Escola Superior de Tecnologia e Gestão do Politécnico do Porto introduced an initiative, denoted *Capacid@de Digital*. This initiative helps to capacitate the adult population with the use of technology through a series of training actions. These training actions are guaranteed by students integrated into the institution volunteer network and supervised by the academic staff. The challenge proposed to our students allows them to gain a new set of competencies that would be otherwise hard to obtain at this point in their academic paths. In this paper, presents the characterization of the digital illiteracy of one the municipalities of the Portuguese region Tâmega e Sousa, namely Baião.

Keywords: Adult Population; Training, Digital illiteracy; Higher Education Institution.

* *Corresponding author.* Tel.: +351 255 314 002.
E-mail address: oao@estg.ipp.pt

Cloud ERP systems architectural challenges on cloud adoption in large international organizations: A sociomaterial perspective

Victoria Paulsson[*], Björn Johansson

Department of Management and Engineering, Division of Information Systems and Digitalisation SE-581 83 Linköping, Sweden.

Abstract

This combined literature review and case employs a sociomaterial perspective to explore architectural challenges and countermeasures that BioOrganism, the case company, should consider in a decision to adopt a cloud enterprise resource planning (ERP) system. The case has experiences with an on-premises model, but not the cloud model per se. The study is designed with an element of case to provide a solid backdrop toward the sociomaterial perspective, which focuses on a reciprocal enactment between the cloud ERP systems architecture and the BioOrganism contextual surrounding. Six architecture challenges were identified: (1) data security, (2) data privacy, (3) network dependency, (4) system mobility, (5) vendor lock-in, and (6) scalability. Countermeasures that BioOrganism, and other large international organizations of similar nature, can take to mitigate risks from the six challenges are presented in the review.

Keywords: Cloud architecture; Cloud ERP systems; Literature review; Sociomaterial perspective.

* *Corresponding author.*
E-mail address: victoria.paulsson@liu.se

Collaborative Actions on Documents Ontology (ColActDOnt)

Martin Just[*], Petra Schubert

Center for Enterprise Information Research, University of Koblenz, Universitätsstr. 1, 56070 Koblenz, Germany.

Abstract

The analysis and interpretation of collaborative work in the Digital Workplace requires an in-depth understanding of the user actions carried out in Enterprise Collaboration Systems (ECS). The academic discipline of Process Mining (PM) provides us with methods and tools for the analysis of event logs. For PM to work successfully, we need event logs that are formatted using a standard (e.g. XES) that can be processed by existing PM tools. This is a challenge for the analysis of collaborative work because collaboration processes frequently span across multiple software products, which record user activity in their own proprietary log format. The data from different systems needs to be transformed and aggregated before it can be used by PM tools. To address this issue, we developed a novel concept for the harmonisation and aggregation of log files from collaboration systems. In this concept, events are described as *user actions on documents*. We formalised the concept in the Collaborative Actions on Documents Ontology (ColActDOnt). ColActDOnt specifies the concepts and properties of collaboration events. The ontology has been made publicly available in a machine-readable format and provides a basis for the analysis of cross-system collaboration.

* *Corresponding author.* Tel.: +49 261 287-2514
E-mail address: martinjust@uni-koblenz.de

Conception of an itinerary planning assistant for EV drivers

Rahul Roy Jannapura Shivakumar, Christian Winter[*]

Software AG, Uhlandstr. 12, 64297 Darmstadt, Germany.

Abstract

Electric vehicles (EVs) require charge stops during long trips. Appropriate digital services can ease the usage of EVs and thus could accelerate their adoption. We propose a planning system that interacts with the user's calendar for deriving upcoming journeys. The core of the system is a newly developed itinerary planning algorithm that integrates charge stop planning. The algorithm uses dynamic information distributed between different stakeholders, namely information regarding charging infrastructure and navigational information. A simulation of distinct EV scenarios validates the efficacy of the proposed work.

Keywords: Itinerary planning; route planning; Electric vehicle; Battery range; Charge stop.

* *Corresponding author.* Tel.: +49 6151 92-1438; fax: +49 6151 92-1191.
E-mail address: Christian.Winter@softwareag.com

Consumer Cyber Insurance for Risk Transfer: A coverage analysis

Florian Schütz[*], Florian Rampold, Andre Kalisch, Kristin Masuch

University of Goettingen, Platz der Goettinger Sieben 5, Goettingen 37073, Germany.

Abstract

The internet has become an integral part of most people's lives. Although this has many advantages, such as constant entertainment and easy access to resources, the internet also has its downsides. Studies indicate that people tend to be more concerned with the cyber risks that arise from their internet usage than before. While cyber insurances for businesses have been on the market for several years, the novel type of consumer cyber insurance (CCI) mitigates cyber risks to a residual level. However, we argue that both supply and demand sides do not have a shared understanding of CCIs due to the complexity and dynamics of cyber risks. Therefore, we conduct a content analysis regarding the coverage of CCI in order to (1) demonstrate the potential value of such insurance policies for private households and to (2) increase consumer awareness of the dynamically changing cyber risk situation.

Keywords: Consumer Cyber Insurance; Cyber Loss; Cyber Risk; Cyber Coverage; Insurance Innovation.

* *Corresponding author.* Tel.: +49-551-39-26072
E-mail address: florian.schuetz@uni.goettingen.de

Corrosion Analysis Through an Adaptive Preprocessing Strategy Using The K-Means Algorithm

Nelva Nely Almanza-Ortega[a,*,] Juana María Flores-Vázquez[b], Héctor Martínez-Añorve[a], Joaquín Pérez-Ortega[c], José Crispín Zavala-Díaz[d], Adriana Mexicano-Santoyo[e], Jesús Carlos Carmona-Fraustro[e]

[a]Tecnológico Nacional de México/IT de Tlalnepantla, Av. Instituto Tecnológico s/n, La Comunidad, Tlalnepantla de Baz 54070, México.
[b]Tecnológico Nacional de México/IT de Celaya, Antonio García Cubas 600, Fovissste, Celaya 38010, México.
[c]Tecnológico Nacional de México/CENIDET, Interior Internado Palmira S/N, Palmira, Cuernavaca 62490, México.
[d]UAEM/Facultad de Contaduria, Administración e Informática, Av. Universidad 1001, Col. Chamilpa, Cuernavaca 6220, México.
[e]Tecnológico Nacional de México/IT de Cd. Victoria, Blvd. Emilio Portes Gil 1301, Sin Nombre de Col 7, Cd Victoria 87010, México

Abstract

Corrosion is the process of the deterioration of metals through chemical and electrochemical reactions. The early identification of high-risk areas affected by corrosion allows time for making decisions to prevent disasters that could result from the phenomenon of corrosion. In this paper, the K-means clustering algorithm is used with various color-manipulation techniques to process and segment images of corroded metal surfaces. The goal of our research is to identify corrosion patterns in images. As an experiment, an image set of corroded surfaces demonstrating various levels of corrosion was processed. In the first phase, the images were processed with the K-means algorithm and then processed with color-manipulation techniques. The results show that this process provides relevant information regarding the surface being analyzed, successfully isolating in every test case the zone or area most affected by corrosion and highlighting the dimension of the problem. Based on our results, we recommend using the HSV technique for preprocessing images if the corroded area comprises less than 50% of the image, and an average value of $k = 4$ and $k = 8$ is recommended for obtaining significant patterns. This is important because identifying these types of patterns makes it possible for experts to make decisions without submitting these corroded metal surfaces to a second or third process or to manual analysis, and thus analytical complexity is reduced regarding time, costs, and resources.

Keywords: K-Means; Pattern Recognition; Corrosion Analysis; Hue Saturation Value; CIE L*A*B*; Gray Scale.

---

* *Corresponding author.*
E-mail address: nnaortega@outlook.com

Crowdsourcing Technologies to Promote Citizens' Participation in Smart Cities, a Scoping Review

Rute Bastardo[a], João Pavão[b], Nelson Pacheco Rocha[c],[*]

[a]UNIDCOM, Science and Technology School, University of Trás-os-Montes and Alto Dou-ro, Vila Real, Portugal.
[b]INESC-TEC, Science and Technology School, University of Trás-os-Montes and Alto Douro, Vila Real, Portugal.
[c]IEETA, Department of Medical Sciences, University of Aveiro, Aveiro, Portugal.

Abstract

The scoping review reported by this article aimed to identify (i) the purposes of the studies using crowdsourcing technologies in the context of the smart cities' implementations, (ii) the characteristics of the crowdsourcing technologies being used, and (iii) the maturity level of the solutions being proposed. An electronic search was conducted, and 29 studies were included in the review after the selection process. The results show a current interest in crowdsourcing campaigns using participatory reporting and participatory sensing to (i) support urban infrastructures' maintenance, (ii) facilitate urban mobility, (iii) monitor the environment, (iv) manage crowds, (v) aggregate geographical information, and (vi) collect citizens' perspectives about the cities. However, the results also show low maturity level of the proposed solutions and lack of consolidated evidence about their effectiveness, which difficulties their dissemination.

Keywords: Smart cities; Citizens' participation; Crowsourcing; Crowdsensing.

* *Corresponding author.* Tel.: +351234247292.
E-mail address: npr@ua.pt

Customizing ERP-systems:

A framework to support the decision-making process

Eli Hustad[a,*,] Johan Stensholt[b]

[a]*University of Agder, Kristiansand, Norway.*
[b]*Deloitte, Oslo, Norway.*

Abstract

Enterprise Resource Planning (ERP) systems are standardized software packages based on industry "best practice." Despite this off-the-shelf property, most companies that implement an ERP system choose to customize the software rather than change their business processes. Customization, however, represents a double-edged sword: on the one hand, it can provide improved functionality, increased user quality and satisfied users; on the other hand, it can bring significant risks to the company due to increased implementation costs, increased complexity, and expenses for subsequent upgrades. Interviews were conducted with ERP experts, and empirical findings contain different drivers and consequences for enterprises that choose to customize ERP systems and highlights related challenges. The purpose of the study is to develop a framework with accompanying guidelines that can help companies, in cooperation with suppliers and consultants, to better handle customization decisions in ERP projects.

Keywords: ERP systems, ERP customization, standardization, process changes, decision-making framework.

* *Corresponding author.* Tel.: +47-38-14-16-21.
E-mail address: eli.hustad@uia.no

Cyber Hygiene Practices Across Cultures: A Cross Cultural Study of the US and Saudi Arabia based Information Systems Users

Sarah Alowais[*,] Inaiya Armeen, Pratyush Sharma, Allen Johnston

The University of Alabama, 380 stadiun Dr, Tuscaloosa, 35401, United States

Abstract

Effective cyber hygiene practices have been proposed as valuable in coping with cyber risks, but these practices, to date, have assumed a Western or U.S. nomology. For persons of non-western descent, differences in cultural norms, exigencies, and constraints will most likely require them to approach cyber hygiene differently and, perhaps, redefine what it means to practice it effectively. Using a sample of home Information System users in US and Saudi Arabia, this study tests the hypothesis that national culture moderates the effect of individuals' perceived expectancy and value on their motivation towards adhering to cyber hygiene practices.

Keywords: cyber security; cyber risks; cyber hygiene.

* *Corresponding author.* Tel.: +1-202-294-6972.
E-mail address: salowais@crimson.ua.edu.

Cyber Resilience, a Survey of Case Studies

João Pavão[a], Rute Bastardo[b], Dário Carreira[c], Nelson Pacheco Rocha[d,*]

[a]*INESC-TEC, Science and Technology School, University of Trás-os-Montes and Alto Douro, Vila Real, Portugal.*
[b]*UNIDCOM, Science and Technology School, University of Trás-os-Montes and Alto Dou-ro, Vila Real, Portugal.*
[c]*Instituto Universitário da Maia, Maia, Portugal, Portugal.*
[d]*IEETA, Department of Medical Sciences, University of Aveiro, Aveiro, Portugal.*

Abstract

Considering the potential magnitude and impact of cyber-attacks, organizations must be able to understand their capabilities to prevent, respond and re-cover from these attacks as well to implement and refine adequate resilience plans. Due to the importance of cyber resilience, this survey aimed to review relevant case studies published in the scientific literature. The identified case studies followed different approaches since some of them were focused on risk assessment and risk management processes and the complexity of their implementation, while others were focused on the use of well-known frameworks to assess cyber resilience or on proposing new cyber resilience frameworks and tools.

Keywords: Cyber resilience; Risk assessment; Risk management; Survey.

* *Corresponding author.* Tel.: +351234247292.
E-mail address: npr@ua.pt

Data Mining applied to Knowledge Management

Jorge Duque*, Firmino Silva, António Godinho

ISLA - Instituto Politécnico de Gestão e Tecnologia, 4400-107 Vila Nova de Gaia, Portugal

Abstract

The digital age is responsible for the continuous growth of data volume. Everything related to Information and Communication Technologies contributes to the exponential growth of data, such as social networks, financial technology, and scientific data. Data Mining is a method of extracting data from systems such as Business Intelligence, Big Data, Data Warehouse, so that the patterns extracted during the process are considered information, knowledge, in relation to the theoretical concepts that support them. In this sense, these patterns should be presented as representations of knowledge. In the test case presented, we observed the various phases of the knowledge discovery process and analysed data using regression and classification models, to support companies in the knowledge management.

Keywords: Data Mining; Business Intelligence; Data Warehouse; Knowledge Discovery; Knowledge Management; Decision Support Systems.

* *Corresponding author.* Tel.: +351-966-304-196.
E-mail address: p40471@islagaia.pt

Data Mining for the Global Multiplex Weekly Average Income Analysis

Nicholas Dominic[a,*,] Gregorius Natanael Elwirehardja[a], Bens Pardamean[a,b]

[a]*Bioinformatics and Data Science Research Center, Bina Nusantara University, Jakarta, Indonesia 11480*
[b]*Computer Science Department, BINUS Graduate Program, Master of Computer Science Program, Bina Nusantara University, Jakarta, Indonesia, 11480*

Abstract

The box office (BO) income had significantly declined up to 80% in 2020, as the COVID-19 pandemic emerged. To minimize further financial risks, multiplex (multiple cinema complexes) owners need to analyze their potential income for each movie, each week. Therefore, we developed a proper data mining strategy that allows multiplex owners to analyze and discover insights on how successfully produced movies could be. The methodology comprises (1) data loading and exploration, (2) data cleaning, (3) data selection, integration, and transformation using Pentaho, (4) data mining in which the results were stored in the MySQL database, and (5) pattern evaluation and presentation using Qlik Sense as the Business Intelligence (BI) dashboard. Based on our data mining methodology, we revealed that drama, comedy, action, and thriller are favorite genres. We also found that DreamWorks Animation and Pixar Animation Studios are both the most popular production houses, even Apatow Productions and Escape Artists still have the biggest revenue on average.

Keywords: movie; multiplex income; data mining; Business Intelligence dashboard.

* *Corresponding author.* Tel.: +62-21-534-5830 ext. 2456; fax: +62-21-530-0244.
E-mail address: nicholas.dominic@binus.ac.id

Data Spaces Based Approach for B2B Data Exchange: A Footwear Industry Case

Pedro Pinto[a,b,]*, Cristóvão Sousa[a,b], Carlos Cardeiro[c]

[a]ESTG IPP, Rua do Curral, Porto 4610-156, Portugal
[b]INESC TEC, Rua Dr. Roberto Frias, Porto 4200-465, Portugal
[c]OFICINAWARE – Informática Lda, Rua do Sobreiral 86, 3720-287, São João da Madeira, Portugal

Abstract

This paper discusses the problem of information sharing and data interoperability in a B2B context. Therefore, this paper presents a case study on the scope of data-sharing in collaborative networks in an industrial cluster. It explores the feasibility of International Data Spaces in the context of the footwear industry cluster. This work also discusses how the adoption of digital processes might contribute to support data-based management to optimize the production planning of a footwear industry. As a result, it is defined and specified the foundations for the development and implementation of an dataspace oriented IIoT architecture, following a fully compliant Industry 4.0 solution for the footwear industry cluster.

Keywords: International Data Spaces; Industry 4.0; Footwear Industry; B2B Data Exchange.

* *Corresponding author.*
E-mail address: 8170262@estg.ipp.pt

Data-Driven Production Planning Approach Based on Suppliers and Subcontractors Analysis: The Case of the Footwear Cluster

Ricardo Ferreira[a,*], Cristóvão Sousa[a], Davide Carneiro[b], Carlos Cardeiro[c]

[a]INESC TEC, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal.
[b]CIICESI/ESTG, Polytechnic Institute of Porto, Rua do Curral, 4610-156, Felgueiras, Portugal.
[c]OFICINAWARE – Informática Lda., Rua do Sobreiral 86, 3700-287 São João da Madeira, Portugal.

Abstract

The increased competitiveness in the industry sector and the pressure for companies to be more flexible to answer to the market changes, booted the investments in technologies with the aim at increasing the flexibility, productivity, and profit. To this paradigmatic change it is called digital transformation. In this context, companies try to find new way to deal with an old problem: the product production planning. Nowadays, production planning is a collaborative process that should address all supply chain network; thus, it is critical, complicated and a time-consuming process. This article focuses on the product production planning in the context of the footwear industry from a collaborative perspective, applying suppliers' assessment methods and forecasting models to optimize the production planning process, allowing companies to satisfy delivery dates. The results showed the importance of production planning in collaborative settings, but the adoption of machine learning methods reveal the need for data restructuring at the ERP and MRP levels.

Keywords: Industry; Information Technologies; Planning; Evaluation; Classification;Prediction; Machine Learning.

* *Corresponding author.*
E-mail address: 8170279@estg.ipp.pt

Decision Theory and Risk Simulation Analysis for Optimizing Profit in PayLater Services

Nicholas Dominic[a,*], Bens Pardamean[a,b]

[a]*Bioinformatics and Data Science Research Center, Bina Nusantara University, Jakarta, Indonesia 11480*
[b]*Computer Science Department, BINUS Graduate Program, Master of Computer Science Program, Bina Nusantara University, Jakarta, Indonesia, 11480*

Abstract

The projected increase in PayLater utilization reaches up to five million people by 2025. To optimize the yearly profit from their PayLater service, fintech companies must examine all possible risks before a unanimous decision is taken. Therefore, we proposed a unified decision framework derived from decision theory and the Monte Carlo simulation technique. Two schemes were coined: (1) a decision-making scheme, and (2) a risk simulation scheme. Throughout experiments, the framework was able to estimate several alternative decisions and their impacts, analyze the causes of failure and delays in the development of the PayLater service, and execute Monte Carlo simulations in up to 10,000 trials. Outputs of this study will benefit decision-makers in the fintech initiative before launching their PayLater products.

Keywords: PayLater; decision-making; Bayesian analysis; fault tree analysis; critical path method; Monte Carlo simulation.

* *Corresponding author.* Tel.: +62-21-534-5830 ext. 2456; fax: +62-21-530-0244.
E-mail address: nicholas.dominic@binus.ac.id

Dependencies between MES features and efficient implementation

René Peinl[*], Susanne Purucker, Sabine Vogel

Institute for Information Systems Hof University, Alfons-Goppel-Platz 1, 95028 Hof, Germany.

Abstract

During the last decade, a lot of procedure models for the introduction of industry 4.0 (I40) or industrial internet of things (IIoT) solutions have been proposed, especially in the German literature. Since they target all kinds of I40 projects they necessarily must be somewhat generic and are missing important details especially for the "implementation phase". However, even in specific models for introducing manufacturing execution systems (MES) there are a lot of vague hints instead of concrete advice of how to do an effective and efficient implementation. Although it is certainly right that soft factors like finding the right partners and doing a good change management that involves end users early in the process are at least as critical as technical aspects, the latter should not be neglected. In this paper, some desirable features of MES are discussed and how they positively influence the efforts necessary for introducing such a system in a small to medium sized enterprise (SME).

Keywords: Manufacturing Execution System, MES, Industry 4.0, procedure model, human-centered design, customization.

* Contact Author. Tel.: +49-9281-409-4820; fax: +49-9281-409-554820.
E-mail address: rene.peinl@hof-university.de

Descriptive and inferential statistics of serious accidents involving considerably automated vehicles—a necessity of smart cities

Victor K. Y. Chan[*]

Macao Polytechnic University, Rua de Luís Gonzaga Gomes, Macao, China.

Abstract

This article analyses a dataset of past serious accidents involving considerably automated vehicles despite the moderately small size of the dataset due to the currently restrictive legalization of such vehicles globally. Both descriptive and inferential statistics are presented as to the prevalence of accidents as impacted by such situational parameters as the terrain, period of the day, visibility, weather condition, automated vehicle speed, automation system status, accident type and road curvature. The key finding is that the ratio of the accident count with the automation system status being on to that with it being off (i.e. manual driving per se) is substantially smaller at a high speed (74 km per hr or above) of the vehicle than at a low speed. Current automation systems are far more technologically, legally, economically and financially valuable and helpful to human beings for travelling on vehicles at high speeds.

Keywords: Automated vehicles; Smart cities; Serious accidents; Descriptive statistics; Inferential statistics.

* *Corresponding author.* Tel.: +853-8599-3322; fax: +853-2872-7653.
E-mail address: vkychan@ipm.edu.mo

Design and Implementation of a Product Recommendation System with Association and Clustering Algorithms

Chibuzor Udokwu[*], Robert Zimmermann, Farzaneh Darbanian, Tobechi Obinwanne, Patrick Brandtner

University of Applied Science Upper Austria, Wehrgrabengasse 1-3, 4400 Steyr, Austria

Abstract

Product recommendation systems are an important aspect of retailing because of the improved shopping experience provided for customers. Due to the wide range of products offered by retailers, recommendation systems provide an optimal approach for displaying only relevant products to customers by forming associations that exist between products. Still, it is also important to understand the characteristics of customers connected to different product associations. Conventional approaches for product recommendation systems apply association algorithms and unsupervised classification of customers based on product ratings. However, it is not clear what demographic properties of customers are linked to which different product associations. This paper applies a hybrid system of machine learning (ML) association and clustering algorithms to implement a product recommendation system that shows associations that exist in products and unique customer profiles linked to these associations. The method described in this paper is evaluated with a case of a hygiene product retailer in Austria.

Keywords: Recommendation system; machine learning; product associations; customer profiles; online retailing.

* *Corresponding author.*
E-mail address: Chibuzor.udokwu@fh-steyr.at

Design Principles for Strategic Alignment in Smart City Enterprise Architectures (SCEA)

Viviana Bastidas[a,*], Iris Reychav[b], Markus Helfert[c]

[a]*Department of Engineering, University of Cambridge, Cambridge, United Kingdom*
[b]*Department of Industrial Engineering and Management, Ariel University, Ariel, Israel*
[c] *Innovation Value Institute, Maynooth University, Maynooth, Co. Kildare, Ireland*

Abstract

Smart Cities are complex systems where digital innovations are applied to design enhanced city services and enable public value creation across various domains (e.g., mobility, energy and infrastructure, environment, and so). Such complexity challenges the alignment between city strategies with city services and underlying information systems, leading to providing services that may fail to achieve city goals and meet the needs of citizens. This paper defines a set of design principles to ensure strategic alignment in Smart City Enterprise Architectures (SCEA). The design principles were derived from the literature and validated by smart city domain experts, following a design-oriented research approach. The main contribution of this paper is the formulated design principles that deepen the knowledge of Enterprise Architecture design in the smart cities field. These design principles can be used by researchers and practitioners to guide the design of innovative digital services aligned with urban strategies.

Keywords: Smart city; enterprise architecture; alignment; design principles; urban digital innovation.

* *Corresponding author. Tel.: +447485470189.*
E-mail address: vab44@cam.ac.uk

Designing an Evaluation Framework for IoT Environmental Monitoring Systems

Thomas Kozlowski[*], Ovidiu Noran, Jarrod Trevathan

Griffith University, Nathan, Queensland, Australia

Abstract

Environmental monitoring systems have been evolving dynamically to embrace modern Internet of Things (IoT) technology in the last decade. Despite this progress there are, however, continuing limitations and issues with some IoT designs. Thus, past research has identified areas of concern in areas such as communications, interoperability, reliability, and scalability. As enabling technologies evolve in an accelerated manner, there will no doubt be a plethora of environmental monitoring solutions under development. Such solutions need to be well evaluated so that potential users are knowledgeable in relation to the best solution for their specific applications. Along these lines, this paper puts forward a framework to evaluate proposed IT designs relevant to smart environmental monitoring systems. This framework is based on model standardized software engineering requirements found in ISO 25010, which it uses as an aid to develop business-driven 'smart' environmental monitoring systems.

Keywords: Environmental monitoring; Internet of Things (IoT); IT systems architecture; non-functional requirements (NFR).

* *Corresponding author.*
E-mail address: tom.kozlowski@griffithuni.edu.au

Development of a unified artificial immune system for complex objects control within the framework of the Industry 4.0 concept

Galina Samigulina[a], Zarina Samigulina[b,*]

[a]Institute of Information and Computing Technologies, Almaty city, 050010, Kazakhstan.
[b]Kazakh-British Technical University, Almaty city, 050000, Kazakhstan.

Abstract

The article is devoted to the creation of an intelligent decision-making technology for complex objects control using the bioinspired approach of artificial immune systems (AIS) and the principles of immunological homeostasis for the implementation of the Industry 4.0 program. The bases for creating a unified artificial immune system (UAIS) consisting of modified algorithms of clonal selection, negative selection and immune network have been developed in order to identify the most effective multidimensional dynamic data for processing and predicting. The unification of AIS algorithms based on systematization and classification is used to reduce the variety of modifications and to find the best solution for a specific data set. A technique for evaluating the effectiveness of modified UAIS algorithms based on the principles of immunological homeostasis has been developed. The main stages of the functioning of the proposed technology for complex objects of the oil and gas industry and the advantages of this approach are considered.

Keywords: Intelligent technology, complex objects control in the oil and gas industry, unified artificial immune system, modified algorithms, immunological homeostasis.

* Corresponding author. Tel.: +77022189773.
E-mail address: samigulinaresearch@gmail.com

Development of tools to support the production planning in a textile company

Ana Guise[a,*], Jorge Oliveira[b], Senhorinha Teixeira[c], Ângela Silva[c,d]

[a]Universidade do Minho, Campus de Azurém, Guimarães 4800-058, Portugal.
[b]Riopele – Têxteis, SA, Pousada de Saramagos, Famalicão 4770-405, Portugal.
[c]ALGORITMI, Campus de Azurém, Guimarães 4800-058, Portugal.
[d]ADiT-LAB, Instituto Politécnico de Viana do Castelo, Valença 4930-600, Portugal.

Abstract

Technologies are constantly evolving and so with advances in industry 4.0, its intelligent technologies with production planning and control (PPC) give rise to a smart PPC. Nowadays, one of the fundamental systems in a company is the ERP, since it allows the integration of various information from the different areas belonging to an organization, which allows access to data in real time, among other things. Through a work carried out in a textile company, it was noticeable the need to develop a tool to support its installed ERP system and the respective data control. Thus, it is noted that PPC systems, which include the integration of all areas of a company, must be adapted to its environment, work method and characteristics. With the application of this tool, it was possible to perceive an increase in efficiency and speed in obtaining the desired results, being that it is still under development and could evolve even more.

Keywords: Production planning and control; industry 4.0; ERP system; smart technologies; support tool; textile.

* *Corresponding author.* Tel.: +351 253 510 170; fax: +351 253 510 139.
E-mail address: ana.guise2@gmail.com

Digital Marketing: The Case of Digital Marketing Strategies on Luxurious Hotels

Belias Dimitrios[a,*], Rossidis Ioannis[b], Ntalakos Angelos[a], Trihas Nikolaos[c]

[a]Department of Business Administation, University of Thessaly, Larissa, Geopolis, 41500, Greece.
[b]Hellenic Open University, Patra, 26335, Greece.
[c]Department of Business Administration and Tourism, Hellenic Mediterranean University, Heraklion, 71410, Greece.

Abstract

Digital marketing has been on the epicentre of many researches. However, there is the need to make clear which are the current trends of the Digital Marketing Strategies regarding luxurious hotels. Unfortunately, the COVID-19 pandemic has seriously "damaged" the hospitality industry and it has affected the digital marketing strategies of hotels. The aim of this paper is the evaluation of the most recent applications of digital marketing and especially the social media used by luxurious hotels and their guests (such as Facebook, Trip-advisor). The outcome of the research indicates that social media play a key role on the marketing of luxurious hotels. More specifically, a hotel should take into serious consideration the reviews made on social media by customers. A review can leverage a hotel but also it can doom its reputation. For this reason, the practitioners must give special attention on the reviews that the guests post on social media. The methodology of the paper is literature review. Hence, it will rely on publications. The authors have collected publications from various academic databases, such as SCOPUS, by using the appropriate keywords. The publications were selected based on how relative are with the purpose of this paper. To sum up, the hotel industry has to face a major challenge due to COVID-19 crisis. This crisis, which is an ongoing phenomenon, is expected to change the way that hotels are copying with. One of the changes that the hotel should take into consideration is which strategy will use on social media. This paper has relied on existing theories and speculations that have been made by several authors and they have not been cross-checked with primary researches. Therefore, there is the need for more primary data coming from upcoming publications.

Keywords: Digital Marketing; Luxury Hotels; Strategy; Covid-19.

* *Corresponding author.* Tel.: +306972716980.
E-mail address: dbelias@uth.gr

Digital transformation under Covid-19: A Bibliometric Study and future research agenda

Samuel Fosso Wamba[a,*,] Sibukele Gumbo[b], Hossana Twinomurinzi[b], Kelvin Bwalya[b], Mercy Mpinganjira[b]

[a]*TBS Business School, 1 Place Alphonse Jourdain, 31068, Toulouse, France*
[b]*University of Johannesburg, 17 Auckland Park Bunting Road Campus, Johannesburg, South Africa*

Abstract

Digital transformation (DT) has been considered an essential enabler of operational and strategic change for any given organization across various industries. Based on the smart adoption and assimilation of cutting-edge tools and technologies, DT allows firms to develop new capabilities, including creating improved products and services, enhancing experiment and innovation abilities, becoming customers centric, and streamlining end-to-end business processes. No wonder some analysts believe that covid-19 has contributed to fostering DT trends across industries. Yet very few studies exist about the real impact of covid-19 on DT. This study aims at filling this knowledge gap using a bibliometric analysis of 441 documents collected from the Web of Science database. Two bibliometric tools, namely Bibliometrix and VOSViewer, were used for data analysis. It emerged that impact, innovation, and performance are among the top word growth and the most relevant words, while the top three relevant affiliations are based in the USA. Further insights are presented and discussed, followed by a future research agenda.

Keywords : Digital transformation; Covid-19; industry 4.0; bibliometric.

* *Corresponding author.*
E-mail address: s.fosso-wamba@tbs-education.fr

Engage Students in News Writing

Luísa Júlio[a,*], Diogo Miguel Carvalho[a], Alexandre Ulisses[b], Inês Rito Lima[b], Telmo Silva[a]

[a]*Digimedia, Universidade de Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal.*
[b]*MOG Technologies, R. Eng. Frederico Ulrich 2650, 4470-605 Maia, Portugal.*

Abstract

The technologies evolution impacts how information is produced and consumed by users. Nonetheless, with the spread of information content available on most online news platforms, the misinformation increases alongside the less credible content. In this scope, the present research aims to develop a technological ecosystem to promote students' writing ability. The system will help students, search for credible content to create school newspapers. Thus, in this article, the architecture of the solution for news writing tool for the Portuguese language is presented. This paper aims to introduce a constructive approach that presents the system architecture that will support the development of a news creation tool.

Keywords: journalism; school newspapers; fake news; contextualization; school newspapers; platforms; natural language process.

* *Corresponding author.* Tel.: +351-234-370-200.
E-mail address: luisaamj@ua.pt

Evaluating collaborative rationality-based decisions: a literature review

Nada Elgendy[a,*,] Ahmed Elragal[b], Tero Päivärinta[a]

[a]*M3S, Faculty of Information Technology and Electrical Engineering, University of Oulu, Finland.*
[b]*Department of Computer Science, Electrical and Space Engineering, Luleå University of Technology, Sweden.*

Abstract

Decision making has evolved throughout the years, nowadays harnessing massive amounts and types of data through the unprecedented capabilities of data science, analytics, machine learning, and artificial intelligence. This has potentially led to higher quality and more informed decisions based on the collaborative rationality between humans and machines, no longer bounded by the cognitive capacity and limited rationality of each on their own. However, the multiplicity of modes of collaboration and interaction between humans and machines has also increased the complexity of decision making, consequentially complicating ex-ante and ex-post decision evaluation. Nevertheless, evaluation remains crucial to enable human and machine learning, rationalization, and sensemaking. This paper addresses the need for more research on why and how to evaluate collaborative rationality-based decisions, setting the stage for future studies in developing holistic evaluation solutions. By analyzing four relevant streams of literature: 1) classical decision theory and organizational management, 2) cognitive and neuroscience, 3) AI and ML, and 4) data-driven decision making, we highlight the limitations of current literature in considering a holistic evaluation perspective. Finally, we elaborate the theoretical underpinnings from the knowledge base on how humans and machines evaluate decisions, and the considerations for evaluating collaborative rationality-based decisions.

Keywords: Collaborative rationality-based decisions; decision evaluation; human-machine collaboration; data-driven decision making; data science; literature review.

* *Corresponding author.*
E-mail address: nada.sanad@oulu.fi

Evaluation of Solvers' Performance for Solving the Flexible Job-Shop Scheduling Problem

João Carlos Silva[a], Nuno Lopes[a,*], Cátia Alves[b,c], Goran Putnik[b,c], Leonilde Varela[b,c], Luís Ferreira[a], Manuela Cruz-Cunha[a]

[a]2Ai – School of Technology, IPCA, Barcelos, Portugal
[b]Department of Production and Systems Engineering, University of Minho,
[c]Algoritmi Research Centre, University of Minho, Guimarães, Portugal

Abstract

Scheduling is essential for the efficient planning of manufacturing enterprises and ultimately for its competitiveness. Cyber-physical production systems have been using heuristics to implement scheduling algorithms. Heuristics have the advantage of being fast to reach a solution, that is usually not the optimal one but close to optimal. Recent advances in mathematical optimization solvers have improved their performance and hence make them a contender to solve scheduling problems which were traditionally out of reach in terms of computation time feasibility. In this work, the authors compare the output and performance of two mathematical solvers, Z3 and Gurobi, with a game theoretic approach to solve a Flexible Job-Shop Scheduling Problem. To formulate the scheduling problem, an integer programming approach with the Picat programming language was used. The study found that the Z3 and Gurobi solvers outperformed the game theoretic approach, finding a better solution with a fast computation time for a relatively small but realistic problem size.

Keywords: Flexible Job-Shop Scheduling, Mathematical Optimization Solver.

* *Corresponding author.* Tel.: +351 253 802260.
E-mail address: nlopes@ipca.pt

Experimental approaches to NFC-enabled packaging

for UX / CX of physical artefacts: A technology maturity study

Justina Karpavičė[a,*], Iusef Abdel Hafith[a], Torben Tambo[a], Francesco Chinello[a], Ingrida Venytė[b], Laura Gegeckienė[b]

[a]*Department of Business Development and Technology, Aarhus University, Birk Centerpark 15, Herning 7400, Denmark.*
[b]*Department of Production Engineering, Kaunas University of Technology, Studentų st. 56 - 326, Kaunas 96237, Lithuania.*

Abstract

Product's packaging with integrated electronic intelligence turns into a visual, tactile and digital encounter with consumers influencing their shopping experience and purchase behavior. The Near Field Communication (NFC) tag attached to the packaging can transform everyday objects into a direct communication channel. However, the NFC technology is still not widely accepted by the industry, thus it is necessary to analyze the influential factors related to consumer behavior, changing needs, and acceptance. As a result, this study carries out the user experiment, where a product's packaging with NFC capabilities is built and tested with selected participants to track user engagement with the smart interactive packaging. The main aim of this study is to examine the peculiarities of the user interaction with NFC-enabled packaging to find out consumer perception and technology acceptance of NFC to retrieve more comprehensive insights regarding barriers to the successful NFC application to a product's packaging. The participants were asked to interact with a set of three NFC-enabled cardboard packages with attached NFC stickers, and afterwards each participant evaluated their experience via survey designed based on Technology Acceptance Model (TAM). According to the results, all three proposed research hypotheses were tested and confirmed to some extent. This study provides a thorough elaboration regarding the technology- and consumer-related barriers that might prevent the successful acceptance of NFC technology applied to the packaging. This research contributes to a better understanding of how different variables have an impact on consumers' perception and technology acceptance of NFC. All business management practitioners, marketers and designers could employ the results of this research as a way to improve the adoption process of the NFC technology in the packaging industry.

Keywords: smart interactive packaging ; near field communication ; user experiment ; technology acceptance model.

---

* *Corresponding author.*
E-mail address: justina@tech.au.dk

Exploratory approach for automatic detection of vine rows in terrace vineyards

Nuno Figueiredo[a,b,*], Luís Pádua[b,c], António Cunha[b,c], Joaquim J. Sousa[b,c], António Sousa[b,c]

[a]*School of Management and Technology, Polytechnic Institute of Porto, Felgueiras, Portugal*
[b]*University of Trás-os-Montes e Alto Douro, Vila Real, Portugal*
[c]*INESC Technology and Science (INESC-TEC), Porto, Portugal*

Abstract

The Alto Douro Demarcated Region in Portugal is the oldest and most regulated wine-growing region in the world, formed by an ecosystem of unique value allowing the cultivation of vines on its characteristics terraces vineyards. The detection of vine rows in terrace vineyards constitutes an essential task regarding the achievement of important goals such as multi-temporal crop evaluation and production estimation. Despite the advances and research in this field, most studies are limited to flat vineyards with straight vine rows. In this study an exploratory approach in the precision agriculture for automatic detection of vine rows in terrace vineyards is presented with remote sensing techniques associated with artificial intelligence such as Machine Learning and Deep learning. At the current stage the preliminary results are encouraging for the detection of vine rows in straight and curved lines considering the complexity of the terrain.

Keywords: Artificial Intelligence; Precision agriculture; Remote sensing; Terrace vineyards.

* *Corresponding author.* Tel.: +351 255314002; fax: +351255314120.
E-mail address: nlf@estg.ipp.pt

Exploring Multi-Criteria Decision-Making Methods in ERP Selection

Kjetil Hansen, Moutaz Haddara[*], Marius Langseth

Kristiania University College, 0107 Oslo, Norway

Abstract

Enterprise resource planning (ERP) adoption literature has a consensus that selecting the right ERP system is one of the most critical success factors in the ERP adoption lifecycle. While choosing a non-fitting ERP system may lead to adoption failures, however very few papers focus solely on this selection phase. Hence, given the criticality of the ERP selection phase, this paper aims to identify and review the different ERP selection methods in extant literature. This research also presents the factors and variables included in each identified selection method in ERP literature. As a result, each method identified was reviewed, analyzed, and summarized. Our main findings suggest that ERP selection is a multi-criteria decision-making (MCDM) problem, with various methods and techniques that can be utilized for such problems. Several MCDM methods have been used in literature, but often complementing more than one method combined at a time. This is since some methods excel in considering factors in uncertain environments, and other methods are best in evaluating qualitative and quantitative factors. Finally, while there are some methods that were used for cloud-ERP selections, there is no clear consensus in extant literature if some methods could best fit specifically cloud-ERP contexts in contrast to on-premises counterparts.

Keywords: ERP selection; Literature Review; Multi-Criteria Decision-Making.

* *Corresponding author.*
E-mail address: moutaz.haddara@kristiania.no

Exploring the Impact of GDPR on Big Data Analytics Operations in the E-Commerce Industry

Moutaz Haddara[a], Salazar, A[b], Marius Langseth[a],[*]

[a]Kristiania University College, 0107 Oslo, Norway.
[b]TIAS School for Business & Society, 3511 RC Utrecht, Netherlands.

Abstract

This research explores the impact of data privacy and protection laws on e-commerce companies in the Netherlands. Specifically, this study focuses on the General Data Protection Regulation (GDPR). The purpose of this regulation is to refine privacy laws and emphasize the importance of consumer protection and consent. GDPR might challenge enterprises, especially data-driven organizations. Notably, the e-commerce industry is known for relying heavily on big data analytics, business intelligence, and other data-related technologies. Multiple semi-structured interviews with e-commerce professionals and consumers were conducted to gain a deeper understanding of the impact of GDPR based on the strategies employed by e-commerce companies and the online user experience of customers in the Netherlands. The main findings show that while GDPR compliance incurred additional costs for companies, it also improved data security and increased customer trust. Furthermore, the results also suggest that GDPR affects the e-commerce analytics operations in organizations after its adoption. Thus, many organizations have altered their practices to achieve compliance with the laws. The findings of this research contribute to the ongoing exploration of the effects of GDPR on online retail businesses that utilize (big) data analytics.

Keywords: GDPR; Data Privacy Law; E-commerce; Big Data; Data Analytics.

* Corresponding author. Tel.: +47 977 15 767.
E-mail address: marius.langseth@kristiania.no

Extending the use of the Belief Action Outcome model during COVID-19 pandemic: Technology access review on locational disparities and inequalities for knowledge workers

Walter Matli[a,*,] Mashitishi Phurutsi[b]

[a]*University of South Africa, Cnr Janadel & Alexandra Avenues, Midrand 1685, South Africa.*
[b]*Tshwane University of Technology, 2 Aubrey Matlakala St, Soshanguve - K, Preotia 0001, South Africa.*

Abstract

Remote working has played an increasingly important role in accelerating alternative workplaces. In the wake of the COVID-19 pandemic emergency demands, this paper seek to demonstrate the resilience of knowledge workers and their ability to work remotely, despite the uneven distribution of enabling infrastructure during the COVID-19 lockdown restrictions. The Belief Action Outcome (BAO) model for information systems was used to support the study as this underexplored theory was found to be worthy of further testing in real-world situations. This qualitative study used a range of sources consisting largely of search data from major online journal databases. The findings highlight that knowledge workers can successfully work from alternative workplaces and still deliver the required outputs, despite socio-economic problems such as locational disparities and inequalities in access to technology. The same technologies that empowered knowledge workers to transform their work locations during the COVID-19 crisis, however, are the same to enable certain sectors of society whilst hindering other cohorts residing in under resourced locations. Therefore, the benefits of working remotely cannot favour everyone because of the existing inequalities and disparities. Applying the BAO model in this context implies environmental issues are likely to play a growing important role in future when decisions are made around alternative workplace and adoption of IS/IT systems. Although the COVID-19 pandemic has disrupted working patterns and accelerated the trend towards working in alternative workplaces than the traditional office/factory premises, there are notable implications around this shift. The study confirmed the related behaviours, opportunities, and barriers (social systems and organisations), as well as the structures (both societal and organisational) of the BAO model. In addition, certain aspects of both the remote workers' and organisations' adoption behaviour were changed to a greater extent and more rapidly because of the COVID-19 pandemic. As a contribution, this qualitative study reveals in more detail the yet uncharted remote workers' beliefs.

Keywords: Technology inequalities, Locational disparities, Belief action outcome model, Remote knowledge workers.

---

* *Corresponding author.*
E-mail address: matliw@unisa.ac.za

Fleet management enterprise systems and traffic control synergies: a literature review and research agenda

Apostolos Kotsialos[a], Polyxeni Vassilakopoulou[b,*]

[a]*Public Power Corporation (PPC) – Hellas S.A, Athens, 10432, Greece.*
[b]*University of Agder, Kristiansand, 4630, Norway*

Abstract

Synergies between fleet management enterprise systems and traffic control systems for information sharing and collaborative planning can contribute to significant improvements to operational efficiency, safety and environmental impact. This paper provides a synthesis of the extant body of research on synergies between fleet management and traffic control systems identifying five key topics in prior research and suggesting research directions. The findings are based on a systematic literature review and topic modelling with the use of natural language processing (Latent Dirichlet Allocation). The five topics identified are related to: hazardous goods transportation, environment and emissions, position tracking and navigation technologies, traffic management and fleet operations´ optimization. The two most frequent topics link to social responsibility (minimizing accidents during hazardous goods transportation and minimizing environmental impact) indicating the relevance of this area of research to sustainability. Despite the strong potential for synergies between intelligent transportation systems and enterprise fleet management systems, the review identified a paucity of research on the coordination between real-time fleet management and traffic control measures (e.g. ramp metering, route guidance, variable speed limits and signal control).

Keywords: fleet management system; traffic control; intelligent transportation systems; topic modelling; Latent Dirichlet Allocation.

* *Corresponding author.* Tel.: +47 38 14 24 18; fax: +47 38141001.
E-mail address: polyxenv@uia.no

FLEXI - A Conceptual Model for Enterprise Cyber Resilience

Jeimy J. Cano M.*

Universidad de los Andes, Cra 1 No.18A-10, Bogotá, Colombia

Abstract

The growing increase in cyberattacks overwhelms the ability of organizations to reliably contain and maintain their operations. In this sense, current good practices and standards create a false sense of security that is usually exploited by attackers to create areas of instability that end up compromising not only their operations but also their promise of value. Therefore, the FLEXI model and its basic practices are proposed as an unconventional alternative that prepares the organization to assume the uncertainty and instability as the new normal of its operation, which is to learn, cushion and rebound in the face of a successful cyber event, where the challenge is to overcome the vision of silos in the organization to build a collective defense that generates greater uncertainty to the adversary's risk model and a better organizational posture in the face of the inevitability of failure.

Keywords: cyberattacks; failure; uncertainty; defense; cyber resilience.

* *Corresponding author.* Tel.: +57 601 3394949.
E-mail address: jcano@uniandes.edu.co

Footwear segmentation and recommendation supported by deep learning: an exploratory proposal

João Oliveira[a], Rui Gomes[b], Dibet Gonzalez[a], Nuno Sousa[a], Somayeh Shahrabadi[a], Miguel Guevara[c], Maria José Ferreira[d], Pedro Alves[e], Emanuel Peres[f], Luís Magalhães[g], Telmo Adão[a,g,]*

[a]CCG: Centre for Computer Graphics, Campus de Azurém, Edifício 14, 4800-058, Guimarães, Portugal.
[b]Martins Sarmento High School, Alameda Prof. Abel Salazar, 4810-247, Guimarães, Portugal.
[c]Technology College, Polytechnic Institute of Setúbal, Campos do IPS, Estefanilha, 2914-761 Setúbal, Portugal.
[d]Portuguese Footwear Technological Centre (CTCP), Rua de Fundões - Devesa Velha, 3700-121 S. João da Madeira, Portugal.
[e]Kyaia - Soluções Informáticas, Lda, Rua Abílio Lopes Das Neves, 593, 4805-214 - Guimarães. Portugal.
[f]CITAB, University of Trás-os-Montes e Alto Douro, 5000-801 Vila Real, Portugal.
[g]Algoritmi Centre, University of Minho, Campus de Azurém, Av. da Universidade, 4800-058 Guimarães, Portugal.

Abstract

The management of an online footwear retail store - also known as marketplace - usually involves activities that directly or indirectly end up to interface with customers, wherein communication efficiency and effectiveness is crucially relevant. Critical factors concerning entities developing remote business in these areas or similar include: (i) production of appealing catalogues and (ii) digital tools to shorten the distance between customers and marketplaces. The former requires using specific third parties - often technically complex - to arrange and prepare photographic entries acquired in studio-like environments. This can delay the diffusion of products supply that may result in financial losses. The latter prevents the retailer of reaching critical mass at a higher potential. Considering such issues, this paper proposes a couple of modules for footwear marketplaces, powered by deep learning: one to segment shoes as a fully automatic background removal tool for easing and quickening catalogue creation activities in a back-office perspective; and another to provide visual search services that allow a customer to submit photographs of footwear of interest to obtain recommendations of similar products directly retrieved from online retail databases, establishing another digital bridge with potential buyers. Preliminary implementation and pilot tests point out Mask-RCNN as a promising approach for shoes segmentation. The same applies to ResNet101 and Xception, but for shoes recommendation, based on multi-label classification.

Keywords: Footwear Marketplace; Digital Transformation; Deep Learning; Convolutional Neural Network; Segmentation; Multilabel Classification.

---

* *Corresponding author.*
E-mail address: telmo.adao@ccg.pt

Forecasting Future Product Sequences To Be Processed In Tire Production Using Deep Learning Technique

Ambre Dupuis[a,b,*,] Camélia Dadouchi[a,b], Bruno Agard[a,b], Robert Pellerin[b]

[a]*Laboratoire en intelligence des données (LID)*
[b]*Mathematics and industrial engineering department, Polytechnique Montréal, 2500, chemin de Polytechnique, Montréal (Québec), H3T 1J4*

Abstract

Production sequencing methodology using DeepLearning Seq2Seq-LSTM is applied to a tire production case study in Quebec, Canada. Production and demand data are used to predict the most likely product sequences to operate. The comparison of 4 forecasting models, differing in consideration of demand and a statistical component, leads to nearly 70% of good prediction when all machines are studied and 10 production scenarios are considered. This performance reaches 92% for a specific class of machines. The analysis of the forecasts by class of machine allows highlighting 2 factors influencing the performance of the models, namely the ratio of product/machine by class and the total number of available records. The forecasts of possible production scenarios can then be used in a digital twin to evaluate a reasonable number of options and develop a decision support system for production sequencing.

Keywords: Industry 4.0; Production sequencing; Sequence analysis; RNN; Seq2Seq.

* *Corresponding author.* Tel.: +1-438-399-2509.
E-mail address: ambre.dupuis@polymtl.ca

Fostering future engineers as transformational agents: integrating sustainability and entrepreneurship in engineering education

Antonieta Alcorta de Bronstein[a,*,] Sven Lampe[b], Jantje Halberstadt[a]

[a]University of Vechta, Driverstr. 22 Vechta 4937, Germany.
University of Oldenburg Ammerländer Heerstr. 114 Oldenburg 26129, Germany.

Abstract

Engineering plays a pivotal role in tackling the grand societal challenges humanity is facing. It is essential that engineers understand these challenges and realize the impact their solutions have. This means that higher education's task in fostering future engineers as transformation agents is key. In this paper we introduce initial arguments about why engineering programs need to include both sustainability and entrepreneurship as core elements for students to obtain a holistic approach towards humanity's grand societal challenges, along with specific skills, including for example critical thinking and reflection, systemic thinking, building partnerships, and collaborations An overview of the literature shows that independent sustainability and entrepreneurship have been recognized as important for engineering programs, even though the integration of both has yet to be achieved. Furthermore, a first analysis of a sample of engineering programs in Germany confirms what we observed in the literature. It would appear that the time for a transformation of engineering programs has arrived.

Keywords: Sustainability Education; Entrepreneurship Education; Engineering Education; Transformation Agents.

* *Corresponding author.* Tel.: +49-172 6266484
E-mail address: antonieta.alcorta-de-bronstein@uni-vechta.de

Gamers' Reaction to the Use of NFT in AAA Video Games

Rogério Tavares[a,b], João Paulo Sousa[a,c,*], Bruno Maganinho[a],
João Pedro Gomes[a]

[a]Instituto Politécnico de Bragança, Bragança, Portugal.
[b]Center for Informatics and systems of the University of Coimbra, Coimbra, Portugal.
[c]Research Centre in Digitalization and Intelligent Robotics, Bragança, Portugal.

Abstract

The use of non-fungible tokens (NFTs) in AAA games is a very controversial topic, which leads to negative reactions from the gamer community. The objective of this article is to relate some of these cases that presented visibility in the press and to analyze the reactions this theme generates. To achieve this, we present some cases that had more relevance in the specialized press and, in the sequence, we present a discussion about the main problems pointed out, such as the state of the art of blockchains, energy efficiency, frauds, and currency evasions. Finally, we present some hypotheses to glimpse how NFTs, and their use in games, may happen in the near future.

Keywords: Non-Fungible Token (NFT); blockchain; games; user; feedback.

* *Corresponding author.*
E-mail address: jpaulo@ipb.pt

How can FLOSS Support COBIT 2019? Coverage Analysis and a Conceptual Framework

Laura Jaime*, João Barata

University of Coimbra, CISUC, Department of Informatics Engineering, P-3030 290 Coimbra, Portugal.

Abstract

This paper assesses the supportive role of free/libre and open source software (FLOSS) in Information Technology (IT) Governance. The result is a conceptual framework emerging from design science research conducted in cooperation with a private non-profit organization in the third sector. Our selection of 35 FLOSS solutions distributed across twenty-one categories can be adopted for nearly 95% of COBIT 2019 management activities. The results are encouraging to companies interested in improving their IT Governance based on FLOSS infrastructure. For theory, we present a pioneering analysis of the FLOSS market for IT Governance using the lenses of COBIT 2019. For practice, we offer artifacts for FLOSS selection and initial recommendations to increase FLOSS adoption for IT Governance. The growing expansion of FLOSS adoption requires new tools to guide IT Governance auditors and integrate FLOSS solutions within the entire governance lifecycle from early planning, execution, and performance evaluation to more mature stages of continuous improvement.

Keywords: IT Governance, COBIT 2019, FLOSS.

* *Corresponding author.*
E-mail address: laura.jaime@student.uc.pt

Identification and Classification of Adoption Supporting Measures for Enterprise Collaboration Systems

Jens Alberts[*], Carolin Blankenberg, Susan P. Williams

Center for Enterprise Information Research, University of Koblenz, Universitätsstr. 1, 56070 Koblenz, Germany

Abstract

Recent years have seen increased levels of adoption of Enterprise Collaboration Systems (ECS) in organisations. However, to date, there are limited in-depth studies that provide empirically derived insights into Adoption Supporting Measures (ASM) in the context of ECS. The aim of the study presented in this paper is to identify, analyse and classify ASM for ECS from the organisational perspective and the company staff responsible for managing the ECS implementation. The study follows a qualitative and interpretative research design based on the analysis of company case studies. Through a process of inductive coding of six industry case studies we identified and described 41 different ASM in the context of ECS. These 41 ASM were further analysed and classified into seven categories and related subcategories. The resulting classification is visualised and discussed. The findings presented in this paper serve as an essential intermediate step for further in-depth investigations to understand contextual variations in ECS adoption and how these may vary over the life of an ECS project.

Keywords: Technology Adoption; Enterprise Social Software (ESS); Enterprise Collaboration Systems (ECS); Case Study.

* *Corresponding author.* Tel.: +49 241 287-2557; fax: +49 261 287-2521.
E-mail address: jalberts@uni-koblenz.de

Impact of cyber-attacks on the financial institutions

Olivér Gulyás[*], Gábor Kiss

Óbudai University, Budapest, Hungary

Abstract

In this paper we are presenting the impact of cyber-attacks on the financial institutions and highlighting the potential impact of these attacks on the global economy.

Given their role in the economy the financial institutions are necessary to ensure liquidity, to guarantee the money supply in the economy, provide loans, savings and deposits, but also to ensure payments and settlements are made. Financial institutions are the backbone of the economy. Due to this last the impact of cyber-attacks against the financial institutions can have very severe effects.

We will examine the increase of cyber-attack vectors financial institutions are facing, the methods of attack most used by cybercriminals. The impact of COVID-19 and large-scale attacks are huge topics; thus, we will only analyze their direct impact on the financial institutions. We will review the possible cyber security measures: strategies and DLT as a possible solution against cyber threats. Finally, we will touch the topic of cyberwarfare.

Keywords: large-scale cyber-attacks; financial institutions; distributed ledger technology; cyberwarfare.

* *Corresponding author.* Tel.: +36 30 54-56-794.
E-mail address: gulyaso@gmail.com

Increasing energy efficiency in Smart Building through Internet of Things retrofitting intervention

Roberta Vadruccio[*], Chiara Siragusa, Angela Tumino

Dipartimento di Ingegneria Gestionale (DIG), Politecnico di Milano, Via Lambruschini 4B, Milano 20156, Italy

Abstract

Buildings are responsible for 40% of energy consumption in Europe, and 75% of them are energy inefficient. In this context, the opportunities enabled by improved management and conservation of energy in buildings are huge. There is a clear need to accelerate and finance building renovation investments and leverage smart, energy-efficient technologies if the EU wants to reach climate neutrality by 2050. IoT components enable new possibilities for improving efficiency in Smart Buildings, both in commercial and residential spaces. However, the literature misses some contributions aimed at evaluating the investment in IoT technologies used for improving the energy efficiency of a building used for different purposes. Thus, the objective of the present study is to provide an assessment of the main costs and benefits stemming from IoT technologies installation through retrofitting intervention and evaluate the sustainability of the investment. Data to feed the model were retrieved from academic literature and secondary sources. The results show that the investment can be recovered in the medium-short term. In particular, buildings with high consumption rates are the ones that benefit the most from this solution. The present study contributes to the academic literature by providing a model that considers a mixed building and multiple technologies at the same time. It also provides useful insights to whoever is interested in the application of IoT technologies to make a building smart, enabling the comprehension of necessary investment and economic returns.

Keywords: Internet of Things; Smart Building; Energy management.

---

* *Corresponding author.*
E-mail address: roberta.vadruccio@polimi.it

Industry 5.0 – Past, Present, and Near Future

João Barata[a,*,] Ina Kayser[b]

[a]University of Coimbra, CISUC, Department of Informatics Engineering, P-3030 290 Coimbra, Portugal.
[b]IST University of Applied Sciences, Department of Communication & Business, Erkrather Straße 220a-c, 40233 Düsseldorf, Germany.

Abstract

The industrial transformation is sociotechnical. Industry 5.0 is one of the recent terms to describe this phenomenon, defined as a humanized vision of technological transformations in industry, balancing the current and future needs of the workers and society with the sustainable optimization of energy consumption, materials processing, and product lifecycles. This paper presents a tertiary study of thirty-two literature reviews on Industry 5.0, supported by a bibliometric analysis in the Scopus database. The results show three stages of Industry 5.0 research since 2018, starting with the Industry 4.0 separation. The latest priority is to deploy circular manufacturing strategies supported by human-friendly digitalization capable of anticipating and acting proactively on impacts. Therefore, Industry 5.0 is future-oriented and cross-sectoral, (interactively) diverging from the original configuration of Industry 4.0. For theory, we highlight the findings of recent literature reviews, clarifying the landscape of Industry 5.0 research and suggesting future developments. For practice, this paper presents examples of societal priorities that industries should consider in their digital transformation investments, as crucial as improving economic competitiveness.

Keywords: Industry 5.0; bibliometric analysis; tertiary study; research agenda.

* *Corresponding author.*
E-mail address: barata@dei.uc.pt

Information Security Challenges During Digital Transformation

Bemenet Kasahun Gebremeskel[a], Gideon Mekonnen Jonathan[b,*,] Sileshi Demesie Yalew[c]

[a]*University of Skövde, Högskolevägen 1, 541 28 Skövde, Sweden*
[b]*Stockholm University, Borgarfjordsgatan 12, 164 07 Kista, Sweden*
[c]*Addis Ababa University, King George VI St, 1000 Addis Ababa, Ethiopia*

Abstract

Since the proliferation of information technology (IT) into business processes, organisations have grown to rely on a large amount of data to improve their products and services and create added value. This development has made information the most valuable asset for any organisation, which, in turn, has made information security a primary concern for leaders. Despite the tremendous potential of digital transformation, prior empirical studies indicate that information security challenges must be overcome to realise the anticipated benefits. Analysing the data collected from 14 leaders through semi-structured interviews, this study identified six information security challenges facing organisations undertaking digital transformation—financial constraints, risk of security breaches, reduced productivity, reduced access and control over information, lack of expertise, and dynamic security management needs. Propositions, as well as the implication of the findings for research and practice, are discussed.

Keywords: Big data; Developing country; Digitalisation; Digital transformation; Information Security; Innovation.

* *Corresponding author.* Tel.: +46(0)8-161-674; fax: +46(0)8-703-9025.
E-mail address: gideon@dsv.su.se

International publication trends in Lean Agile Management research: a bibliometric analysis

Julia Yumi Ito[a], Franciane Freitas Silveira[a], Igor Polezi Munhoz[b], Alessandra Cristina Santos Akkari[a],*

[a]*Graduate Program in Engineering and Innovation Management, Federal University of ABC (UFABC), Santo Andre, Brazil.*
[b]*Federal Institute of Education, Science and Technology of Sao Paulo (IFSP), Sao Paulo, Brazil.*

Abstract

Challenged by complex problems and the speed of technological, social, and environmental change, the joint approach of Lean Management and the Agile Mindset has been explored in business as a management model. This paper aimed to carry out a bibliometric analysis of Lean Agile Management, pointing out trends in scientific research. To this end, an exploratory and descriptive study was developed, with a quantitative approach and based on secondary data from the Web of Science and Scopus, between 1994 and 2022. Bibliometric indicators pointed to 1808 different papers in 897 sources, with 18 citations per paper, and higher scientific productivity of U.S. (276), India (221), and UK (191), with production peaks in 2018 and 2021, suggesting the diffusion and contemporaneity of the research topic. The laws of bibliometrics were not met for this research subject, and dense networks of collaboration and co-citation among researchers were identified, mainly in four application domains, including supply chain, manufacturing, sustainability, and software development as corroborated by the word network.

Keywords: Lean Management; Lean Agile Management; Leagile; Agile; Bibliometrics; Publication trends; Web of Science; Scopus.

* *Corresponding author.* Tel.: +55 11 4996-0001.
E-mail address: alessandra.akkari@ufabc.edu.br

Investigating ERP System Customization: A Focus on Cloud-ERP

Hans Fredrik Hansen, Moutaz Haddara, Marius Langseth[*]

Kristiania University College, 0107 Oslo, Norway.

Abstract

This paper surveys the research on enterprise resource planning (ERP) systems' customization, focusing on Cloud-ERP. ERP system customization refers to the actual alterations of the system on a macro level to meet a specific business organizational requirement or business process. Currently, customization of ERP systems is considered by several researchers and practitioners as a double-edged sword. Hence, ERP systems' customization is often perceived negatively in the ERP literature or as a challenging issue that might affect the system's future updates and upgrades during its life cycle. While the ERP literature is rich, the number of studies focusing on ERP customization is relatively low, and literature within the cloud context is scarce. Thus, this article intends to bridge the research gap and highlight the area around cloud-ERP customization. Based on a systematic review of literature, our main findings show that, while customizations are viewed negatively in general, they are inevitable for some organizations and may provide a competitive advantage when representing a non-standard competitive business process. In addition, most of the current literature argues that the major Cloud-ERP providers do not provide system customization possibilities to most of their clients. And finally, the findings of this research are presented and organized via the five ERP business benefits dimensions introduced by Shang & Seddon.

* *Corresponding author.* Tel.: +47 977 15 767.
E-mail address: marius.langseth@kristiania.no

Investigating the factors of customer experiences using real-life text-based banking chatbot: a qualitative study in Norway

Anine Holtmoen Petersson, Sanchit Pawar[*], Asle Fagerstrøm

Kristiania University College, School of Economics, Innovation and Technology, 0152 Oslo, Norway.

Abstract

In recent times, banks have increasingly started using chatbots to offer round-the-clock customer service. However, customers experience with this type of technology is not well understood. The aim of this study was to get an in-depth understanding of factors affecting customer experience with a banking chatbot. Eight participants interacted with a real-life banking chatbot to complete a simple task (order a credit/debit card) and a complex task (apply for a housing loan). Semi-structured interviews were then conducted to examine chatbot-related factors (ease of use, miscommunication errors and human-likeness) and user-related factors (perceptions, future behaviors). The findings indicate that the human-like factors like a human personality, use of emojis, willingness to help, and polite communication style, have a positive impact of customer experience with banking chatbots. The chatbot's ability to understand questions was a critical factor. Miscommunication errors have negative impact, especially when the task is a simple one. Takeaway from this study is that banks should inform customers about the limits of the chatbot's abilities. In addition, they should communicate that the chatbot is safe to use for complex tasks. Successful development and implementation of chatbots for customer service require a customer centric approach from banks.

Keywords: Chatbot; customer experience; banking; qualitative study.

* *Corresponding author.* Tel.: +47 45529806
E-mail address: Sanchit.Pawar@kristiania.no

IoT-based Diagnostic Assistance for Energy Optimization of Air Conditioning Facilities

Benjamin Nast[*,] Achim Reiz, Kurt Sandkuhl

Rostock University, 18051 Rostock, Germany.

Abstract

The Internet of Things (IoT) is a significant trend in the field of information technology and encourages the implementation of cyber-physical systems, smart connected products, and new business models. Many enterprises struggle to create business value from IoT technology because they have difficulties defining their organizational integration. Model-driven engineering (MDE) is considered an effective technique to address the complexity of IoT application development. Existing approaches focus on requirements from a technical perspective and exhibit a lack of integration with organizational and business model aspects. The paper proposes a modeling approach and a tool to support the development and configuration of IoT solutions in the example of air conditioning and cleanroom technologies (ACT) facilities. The main contributions of this paper are (a) an architecture for the IoT application, (b) a modeling language and tool support for IoT modeling, and (c) the expected practical benefits in the industrial case.

Keywords: Internet of Things; IoT; Digital Transformation; IT Architecture; Model-Driven Engineering; Modeling Methodologies.

* *Corresponding author.* Tel.: +49 381 498 7409
E-mail address: benjamin.nast@uni-rostock.de

Is the Structure of "Regular Working Days" about to Dissolve? Changes in Employees' Time-Use Patterns Working in Enterprise Collaboration Systems During the COVID-19 Pandemic

Nathalie Scharf[a], Laura Lükemann[b], Petra Schubert[a,*], Susan Williams[a],
Anja Abendroth[b], Antje Schwarz[b]

[a]*Center for Enterprise Information Research, University of Koblenz, Universitätsstr. 1, 56070 Koblenz, Germany*
[b]*Bielefeld University, Universitätsstr. 25, 33615 Bielefeld, Germany*

Abstract

The measures taken during the COVID-19 pandemic have strengthened Work from Home and the use of digital communication technologies and digital collaboration. The resulting flexibility in terms of control over time and place of work can support workers in improving their work-life balance. In this paper, we investigate whether workers using digital communication technologies made use of this flexibility and changed the distribution of their work hours across the week and day. To answer this question, we investigate the use of an Enterprise Collaboration System in 2019-2022. Using real-world data, a MS Power BI dashboard was created following the steps suggested by the Social Collaboration Analytics Framework (SCAF). The dashboard shows that the system use increased during the COVID-19 pandemic. Furthermore, an expansion of work on weekends and outside of regular working hours can be observed. Although, timely adjustments of use-patterns were highest in the beginning of the pandemic, long-term trends could be observed as well. The results indicate that knowledge workers used digital collaboration technologies to restructure working days, according to their specific personal and business needs while working from home. The paper is a valuable starting point in the context of a long-term interdisciplinary research project on the digitalisation of the workplace.

Keywords: Work from Home (WFH), COVID-19, Working Hours, Time-Use Patterns, CSCW, Enterprise Collaboration Systems, Dashboard.

* *Corresponding author.* Tel.: +49-261-287-2525.
E-mail address: schubert@uni-koblenz.de

IT Alignment: A Path Towards Digital Transformation Success

Gideon Mekonnen Jonathan[a,*,] Sileshi Demesie Yalew[b], Bemenet Kasahun Gebremeskel[c], Lazar Rusu[a], Erik Perjons[a]

[a]Stockholm University, Borgarfjordsgatan 12, 164 07 Kista, Sweden.
[b]Addis Ababa University, King George VI St, 1000 Addis Ababa, Ethiopia.
[c]University of Skövde, Högskolevägen 1, 541 28 Skövde, Sweden.

Abstract

One of the complex tasks for leaders in organisations going through digital transformation is managing the interplay between emerging technologies and organisations' settings—organisational design, business processes and overall organisational goals (i.e., a phenomenon referred to as *IT alignment*). Despite the recognition of the link between IT alignment and digital transformation, we still know little about how IT alignment can be improved to realise successful digital transformation. Based on the analysis of 31 interviews and internal organisational documents in two public organisations, we identified five categories of determinant factors influencing IT alignment. The findings were used to formulate a model theorising a relationship between these factors and IT alignment in organisations during digital transformation. Quantitative data, collected through an online survey from 426 respondents within the public sector, was used to validate the theoretical model. The final result confirms that public organisations' attempts to improve IT alignment results in the success of their digital transformation. The result of our study has implications for research and practice as it identifies and ranks the degree of influence of various factors on IT alignment.

Keywords: Digital transformation; IT alignment; public organisations.

---

* *Corresponding author.* Tel.: +46(0)8-161-674; fax: +46(0)8-703-9025.
E-mail address: gideon@dsv.su.se

Lifecycle Support for IoT-Driven Business Rules

Yusuf Kirikkayis[*], Florian Gallik, Manfred Reichert

University Ulm, Institute of Databases and Informationsystems, Germany

Abstract

The Internet of Things (IoT) is prevalent in various areas and enables a variety of smart applications such as smart factory, smart home, and smart health. The IoT corresponds to a network of physical objects, fostering the collection and exchange of data over the Internet. Each physical object is equipped with sensors, actuators, and other technologies, and is uniquely identifiable through its embedded computing system. Business Process Management (BPM), in turn, is concerned with the modeling, execution, discovery, analysis, and monitoring of business processes. By enriching business processes with real-world IoT data and IoT-driven business rules, process automation as well as real-time process monitoring and decision making can be enhanced. Despite the increasing interest in IoT-enhanced business process support, IoT-driven business rules have not been well integrated with business process execution so far. In this context, providing integrated lifecycle support for IoT-driven business rules in BPM systems constitutes a challenge. This paper discusses how to integrate lifecycle support of IoT-driven business rules with BPM systems covering the modeling, execution, monitoring, analysis, and evolution of IoT-driven business rules. Furthermore, all lifecycle phases need to be covered by holistic approaches to IoT-driven business rules. For each lifecycle phase, we elaborate on the requirements emerging in this context and discuss existing approaches.

Keywords: BPM; Business Process Management; IoT; Internet of Things; Lifecycle; IoT-driven Business Rules; Business Rules;.

* *Corresponding author.*
E-mail address: yusuf.kirikkayis@uni-ulm.de

Listen to the noise – Demonstrating an end to end multi-platform and multilingual sentiment analysis approach

Daniel Anusic[a], Abid Hussain[a,b,*]

[a]Centre for Business Data Analytics, Dept. of Digitalization, Copenhagen Business School, Denmark.
[b]Department of Technology, Kristiania University College, Norway.

Abstract

This paper demonstrates a holistic approach for conducting multi-platform and multilingual sentiment analysis of a main stream football club in the United Arab Emirates. The paper reports first iterations of the research project which anticipates to build an automated sentiment analysis system for football clubs to detect and prevent a potential social media crisis at an early stage. The article illustrates a schematic of how state of the art machine learning algorithms, methods and techniques can be put together to provide a basis for automated data collection, classification, sentiment analysis and visual reporting. The article also presents that the time-consuming and costly process of human text labelling can be effectively replaced by lexicon-based sentiment analysis. This paper reports the complete process from data collection to visual reports to discuss challenges and opportunities associated with design and development of such artefacts.

Keywords: sports industry; multilingual sentiment analysis; social media analysis; natural language processing; and machine learning.

* *Corresponding author.*
E-mail address: ah.digi@cbs.dk

Literature review of decision models for the sustainable implementation of Robotic Process Automation

Leonel Patrício[a,*,] Paulo Ávila[b,c], Leonilde Varela[a,d], Maria Manuela Cruz-Cunha[e], Luís Pinto Ferreira[b], João Bastos[b,c], Hélio Castro[b,c], José Silva[f]

[a]*Universidade do Minho, Department of Production and Systems, 4804-533 Guimarães, Portugal.*
[b]*School of Engineering (ISEP) - Polytechnic of Porto, 4200-465, Porto, Portugal.*
[c]*INESC TEC, 4200-465, Porto, Portugal.*
[d]*ALGORITMI Research Centre, Universidade do Minho, 4804-533 Guimarães, Portugal.*
[e]*2Ai - Applied Artificial Intelligence Laboratory, Polytechnic Institute of Cávado and Ave, Portugal.*
[f]*University of Aveiro (UA) -Aveiro, Portugal.*

Abstract

Robotic Process Automation (RPA) is a rules-based system for automating business processes by software bots that mimic human interactions to relieve employees from tedious work. It was verified in the literature that there are few works related to RPA decision support models. This technology is in great growth and, therefore, it becomes important to study the evaluation of the implementation of RPA. The objective of this work is focused on a literature review for the identification and analysis of Robotic Process Automation implementation models. This work analyses some models or studies available in the literature and, in addition, analyses it from a perspective relating to the Triple Bottom Line (TBL) related to environmental, social and economic effects. Regarding the results obtained, it appears that there is still a lot of room to improve research in this field, for example, with regard to the development of an evaluation model for the implementation of the RPA, taking into account the TBL of the sustainability concept.

*Keywords:*Robotic Process Automation (RPA); Sustainability; Decision Models; Literature review; Smart systems.

* *Corresponding author.* Tel.: +351 911932085.
E-mail address: leonelfilipepatricio@gmail.com

Maintenance Forecasting Model for Geographically Distributed Home Appliances Using Spatial-Temporal Networks

Taha Falatouri, Patrick Brandtner[*], Mehran Nasseri, Farzaneh Darbanian

University of Applied Sciences Upper Austria, Wehrgabengasse 1-3, 4400 Steyr, Austria.

Abstract

The application of machine learning in predicting regular and ad-hoc maintenance demand has been widely discussed recently. Reliable forecasting of uncontrollable, ad-hoc maintenance can improve resource allocation and spare part supply planning. However, the scope of its application is still limited to manufacturing and fleet management areas. Developing predictive analytics techniques for geographically distributed household appliances has been less discussed in literature. In this research, we propose a Spatial–Temporal Network (STN) model for forecasting ad-hoc maintenance needs of private home heating appliances considering external factors such as regional situation and weather. To evaluate the results of the model, we use five years of historical maintenance order data of a heating service company as training and test data. We compare the results of our model with traditional forecasting approaches like historical average, time series analysis and multi-factor linear regression. The evaluation results show a clear improvement of forecasting accuracy and outperformed the MAPE of the best traditional model by over 6%. The developed STN model provides the basis for implementing advanced prediction of maintenance requirements for uncontrollable, ad-hoc demand and offers a reliable demand planning base.

Keywords: Deep Learning; Spatial-Temporal Network; Home appliance; ad-hoc maintenance; Maintenance Service.

* *Corresponding author.* Tel.: +43 5 0804 33450
E-mail address: patrick.brandtner@fh-steyr.at

Major concerns about Enterprise Resource Planning (ERP) systems: A systematic review of a decade of research (2011-2021)

Emanuel João Martins[a], Fernando Paulo Belfo[a,b,*]

[a]Polytechnic of Coimbra, Coimbra Business School | ISCAC, Coimbra, Portugal.
[b]Polytechnic of Coimbra, Coimbra Business School Research Centre | ISCAC, Coimbra, Portugal.

Abstract

Organizations seek to optimize their business processes and one of the best ways to achieve this objective is to implement an Enterprise Resource Planning system. ERP systems have evolved in recent decades to improve organizations' business processes and increase their performance. These systems have different and flexible characteristics and can provide growth and sustainability opportunities for large companies, but also for small and medium enterprises. This article addresses the major concerns about ERP systems and is supported by a systematic review of the literature over the last decade (2011-2021). The structure and organization of PRISMA 2020 were followed as methodological guide. Based on a systematic review of the literature, the seven scientific repositories surveyed, the number of publications per year, the editors, and authors most cited, the method categories of publications, the lifecycle stages are characterized and analyzed. Finally, the major concerns regarding ERP systems addressed in most relevant studies from the last decade are presented and discussed. The top five concerns that stood out were implementation, integration approaches, user participation, decision making, and risk management.

Keywords: enterprise resource planning; ERP concerns; ERP trends; ERP challenges; ERP evolution; business process management; critical success factors; ERP adoption; implementation; integration; user participation.

* *Corresponding author.* Tel.: +351 239 802 000; fax: +351 239445445.
E-mail address: pbelfo@iscac.pt

Migration of a stock management application in the healthcare industry to a Web/Mobile environment: a project report

Cátia Machado[a], António Cunha[a,b], António Jorge Gouveia[a,*]

[a]*School of Science and Technology, University of Trás-os-Montes and Alto Douro, Vila Real, Portugal*
[b]*INESC TEC, Campus da FEUP, Rua Dr Roberto Frias, 4200-465 Porto, Portugal*

Abstract

Hospital Institutions face many challenges. Because of this, improved management allows for better healthcare and the efficient functioning of the institution. IT comes along the field of hospital logistics to automate processes, reduce costs and time, and globally improve the functioning of the hospital. Given the evolutionary needs of Health Institutions, the advantages of having a system for hospital logistics, available to use in the latest devices, on Web and Mobile environments, were perceived. This innovation will enable Health Institutions to achieve greater mobility between services, greater efficiency, among others. To explore this need, there was developed an application that allows the management of requests for material required for hospital services in order to affect positively the management of these hospital institutions. This development was made in an entrepreneurial environment, in order to satisfy the needs of the users of the company's implemented solutions, to contribute to their technological evolution. The developed application has three modules: "Serviços", "Armazém Interno"e "Bens de Consumo". At the beginning of the development, it was performed an investigation to identify the value of hospital logistics and the influential role of IT in this area. Then, it was performed the study of technologies to choose the most suitable ones. Next, the functional and non-functional requirements that the application should satisfy were
analyzed.

Keywords: Migration; Logistic IT; Web; mobile; Application.

* *Corresponding author.* Tel.: +351-259-350-000; fax: +351-259-350-480.
E-mail address: jgouveia@utad.pt

Missing Skills Destroy Iron Triangle of IS Purchasing

Juha Närvä[a,*], Timo Kärri[b], Lasse Metso[b]

[a]Alkutaival 14, Ylöjärvi, 39160, Finland.
[b]Yliopistonkatu 34, 53850 Lappeenranta, Finland.

Abstract

The required purchasing skills have been evolving due to supply chain globalization, sustainability, and environmental requirements. Modern purchasing skills are also influenced by the expanding adaptation of complex Information Systems (IS) in enterprises. Complex technology purchasing requires the management of multiple organizations and unique competences, hence the needed IS purchasing skills required studies from a different angle. Compared to previous studies, the purpose of this study was to identify the skills required from a purchaser to manage complex IS purchases and address their risks. In-depth qualitative research reveals that the IS purchaser is required to understand SW methodologies and possess strong interorganizational skills in addition to traditional purchasing skills in order to run successful IS purchases. Based on the findings, the study proposes additional technical and project methodological training for educators and purchasing professionals to succeed in IS purchases.

Keywords: Skills; purchasing; emerging technology; information system; change management.

* *Corresponding author.*
E-mail address: juha.narva@student.lut.fi

Organizational aspects of digitalization in the context of agriculture: Exemplary results from analyzing data flows in German dairy farming

Anne-Kathrin Schwab[a], Jantje Halberstadt[a], Andrii Besieda[b], Martin Kraft[a,b], Arne Ortland[a,*]

aUniversity of Vechta, Faculty I Business and Ethics, 49377 Vechta, Germany.
bThünen Institute for Agricultural Technology, 38116 Braunschweig, Germany.

Abstract

The organizational aspects of digitalization in the context of agriculture are embedded in a complex interplay of a market-based economy, sustainability, and information security. In the medium term, digital solutions' success in increasing data transparency and security will depend on organizational adaptation due to value chain-specific data flows. A research project in Lower-Saxony, Germany, is currently applying inter-and transdisciplinary research methods to investigate data flows along agricultural value chains. In the following, the organizational aspects of digitalization of farm businesses exemplified in the value chain of dairy production will be outlined—aligned with current limitations in data processing and sharing based on quantitative and qualitative data available so far.

Keywords: Digital transformation, Agriculture, dairy farming, data security, transparency, organizational changes, impact of new technology.

* *Corresponding author.* Tel.: 0049-178-5291933.
E-mail address: arne.ortland@uni-vechta.de

Modern Build Automation for an Insurance Company Tool Selection

Moritz Lange[a], Kim Chi Tran[a], Alexander Grunewald[a], Arne Koschel[a,*], Anna Pakosch[a], Irina Astrova[b]

[a]*Hochschule Hannover, University of Applied Sciences and Arts, Hannover, Germany*
[b]*Department of Software Science, School of IT, Tallinn University of Technology, Tallinn, Estonia*

Abstract

In this paper we describe the selection of a modern build automation tool for an industry research partner of ours, namely an insurance company. Build automation has become increasingly important over the years. Today, build automation became one of the central concepts in topics such as cloud native development based on microservices and DevOps. Since more and more products for build automation have entered the market and existing tools have changed their functional scope, there is nowadays a large number of tools on the market that differ greatly in their functional scope. Based on requirements from our partner company, a build server analysis was conducted. This paper presents our analysis requirements, a detailed look at one of the examined tools and a summarized comparison of two tools.

Keywords: build automation; build server; DevOps; evaluation; CI/CD.

* *Corresponding author.* Tel.: +49-511-9296-0.
E-mail address: arne.koschel@hs-hannover.de

New Lifestyles Due to COVID-19 and Behavior of Young People Attending Universities in Japan

Nozomi Komiya[*]

Chiba University of Commerce (CUC). 1-3-1 Konodai, Ichikawa-shi, Chiba 272-8512 Japan

Abstract

The novel coronavirus infection (hereinafter, this is called COVID-19) broke out in 2019. I6 January 2020, positive cases of infection were confirmed in Japan, which forced the closure of elementary and junior high schools, voluntary restraint from going out based on a declaration of a state of emergency, and cancellation of events. After more than two years, the world is gradually beginning to move toward a new normal. This study focuses on young people aged between 18 and 20 years as of 2022. Specifically, the study highlighted students attending Japanese universities who were greatly affected by the COVID-19 pandemic in the latter half of their high school years and in the middle of university life. Moreover, it investigated and analyzed changes in their attitudes and behavior before and after the COVID-19 pandemic. The result confirmed that (1), and (2) a significant relationship existed between gender and awareness of the new lifestyle due to the COVID-19 pandemic. These results suggested that many students were willing to resume in-person activities online.

Keywords: COVID-19 pandemic; Students; University; Behavioural Science; Multivariate Analysis.

* *Corresponding author.*
E-mail address: nozokomi@cuc.ac.jp

On the use of logistics data to anticipate drugs shortages through data mining

Angie Nguyen[a,b,*], Omar Bougacha[b], Béranger Lekens[b], Samir Lamouri[a], Robert Pellerin[c], Christophe Couvreur[b]

[a]*LAMIH CNRS, Arts et Métiers Institute of Technology, 75013 Paris, France.*
[b]*CEGEDIM, 92100 Boulogne-Billancourt, France.*
[c]*CIRRELT, IVADO, Polytechnique Montréal, H3T 1J4 Montréal, Canada.*

Abstract

Drugs shortages have become a major issue affecting healthcare systems worldwide. With the growing use of electronic records, data analytics techniques have been identified as a major asset to provide support in managing pharmaceutical supply chains. However, applications addressing drugs shortages, which arise from various complex factors, are still expected. Therefore, this paper investigates whether the use of logistics data at the national level can provide insights into drugs supply disruptions issues. Basic features were defined from a dataset of 1.281.545 electronic data interchange records between French hospitals and drugs distributors in 2021. Additionally, anomaly detection and correlation analysis were performed to (i) detect supply disruptions of four products in 2021; and (ii) assess whether the features defined can be used in future time series predictive models. Findings highlight a promising opportunity to harness these data through more advanced analytics techniques to anticipate and manage drugs shortages at local, national, and European levels.

Keywords: drugs shortages; pharmaceutical supply chain; data analytics; data mining; logistics.

* *Corresponding author.*
E-mail address: angie.nguyen@ensam.eu

OSS Adoption Strategies Ranking

Lucía Méndez-Tapia[a,b,*], Juan Pablo Carvallo[a]

[a]Universidad del Azuay, Av. 24 de Mayo 7-77 y Hernán Malo, Cuenca, 010204, Ecuador
[b]Universitat Politècnica de Valencia (UPV), Camí de Vera, s/n, 46022, Valencia, Spain

Abstract

Currently, the business benefits of Open Source Software (OSS) adoption are well known among organizations, and several strategies have been identified in practice to procure that adoption process reaches successful results. Each strategy brings different benefits, demands more or less organizational commitment, and changes the management of critical issues as goals, process, risks, resources and human effort in a particular way. Hence, the decision makers need a specific support to handle the complexity that OSS adoption adds to estimation and planning business process. Our work aims to contribute to solve this need, developing a mechanism to identify and quantify the effect of each strategy. Finally, the ranking proposed was applied in a specific organization and the results were useful to better understand the business impact of OSS adoption.

Keywords: Open Source Software Adoption; Network Theory; PageRank applications.

* *Corresponding author.* Tel.: 593+ 996188535.
E-mail address: lmendez@uazuay.edu.ec

Paranoid Operating System: Wearable Trackers

Afonso Almeida[a*,] Nuno Mateus-Coelho[a,c], Nuno Lopes[a,b]

[a]*Polytechnic Institute of Cavado and Ave, 4750-810 Barcelos, Portugal*
[b]*2Ai – School of Technology, IPCA, Barcelos, Portugal*
[c]*LAPI2S – Laboratory of Privacy and Information Systems Security, 4000 Porto,, Portugal*

Abstract

The use of wearable devices in conjunction with smartphone applications is at an all-time high and still growing daily. These devices communicate between themselves as well as with remote servers, and research indicates that all these communication bridges create some security and privacy-related issues. This paper will discuss and analyze the difference between a low-end and a high-end wrist wearable device in terms of their security and privacy measures. It will focus the results on what can be obtained from analyzing the Bluetooth communication and the device's official mobile application.

Keywords: Wearables; Security; Privacy; Communication.

* *Corresponding author.*
E-mail address: a13258@alunos.ipca.pt

Predicting prices of Airbnb listings via Graph Neural Networks and Document Embeddings: The case of the island of Santorini

Nikos Kanakaris[*], Nikos Karacapilidis

Industrial Management and Information Systems Lab, MEAD, University of Patras, 26504 Rio Patras, Greece.

Abstract

We propose a new approach for predicting prices of Airbnb listings for touristic destinations such as the island of Santorini using graph neural networks and document embeddings. The already existing methods rely only on the features of each individual listing, ignoring any topological or neighborhood properties. Our approach represents the listings of a given area as a graph, where each node corresponds to a listing and each edge connects two similar neighboring listings. This enables us to not only exploit the features of each individual listing, but also to take into consideration information related to its neighborhood. Our preliminary experiments demonstrate that the proposed approach outperforms a list of classical regression models as far as the coefficient of determination (R^2) is concerned and decreases the Mean Squared Error (MSE). The data of the experimentations reported in this paper have been retrieved from the insideairbnb.com platform and describe the Airbnb listings of the island of Santorini.

Keywords: Graph Neural Networks; price prediction; Airbnb listings.

* *Corresponding author.*
E-mail address: nkanakaris@upnet.gr

Process automation using RPA – a literature review

Sílvia Moreira[a],[*,] Henrique *S.* Mamede[b], Arnaldo Santos[c]

[a]UTAD, Quinta de Prados, 5000-801 Vila Real.
[b]INESC TEC, Universidade Aberta, Rua da Escola Politécnica 147, 1269-001 Lisboa, Portugal.
[c]Universidade Aberta, Rua da Escola Politécnica 147, 1269-001 Lisboa, Portugal.

Abstract

Business process automation has been gaining more and more space in the management of organizations, since it translates into a reduction in the execution time of routine tasks in an organization, freeing up employees for other more creative and interesting tasks. However, it is important to check what types of processes are eligible, benefits, and challenges in the adoption of RPA technology. Robotic Process Automation (RPA) is a growing trend in business process restructuring, combined with digital transformation. This technology can be applied in various areas of business processes, and by organizations from any sector of activity. This work, through a literature review, aims to clarify the RPA's concept, the benefits found in this adoption, the main characteristics that the processes must have to be eligible, and the main barriers encountered for successful RPA adoption. In short, this preliminary literature review aims to contribute to the organization's clarification of RPA adoption.

Keywords: Robotic Process Automation; Business Process Automation; Process Automation; adoption; implementation; challenges.

* *Corresponding author.*
E-mail address: silviamoreira82@gmail.com

Product Customization based on Digital Twin and Cloud Manufacturing within a Decentralized Production System

Hélio Castro[a,b,*,] Fernando Câmara[a], Paulo Ávila[a,b], Luís Ferreira[c],
Manuela Cruz-Cunha[c]

[a]School of Engineering, Polytechnic of Porto, Rua Dr. António Bernardino de Almeida, 431, 4249-015 Porto, Portugal
[b]INESC TEC, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal
[c]2Ai - Applied Artificial Intelligence Lab, School of Technology, IPCA, Barcelos, Portugal

Abstract

Industry 4.0 represents a turning point in the thinking of the production model since it is based on digitalized production systems with the aim of improving productivity, product quality, and delivery time to the customer.

The digitalization and evolution of information technology allowed the emulation of production system virtual models, namely in the concept of Digital Twin (DT), with the ability to simulate different scenarios providing support for better decision making. This concept not only represents a virtual copy of the physical world that obtains information about the state of the value chain but also illustrates a system capable of changing the development of the production activity according to the fulfillment of the intended business goals. In literature, the concept of the Digital Twin is exhaustively treated as a stand-alone factory (one digital factory represents one physical factory) and underestimates the possibility of a DT oriented to a customized product (a project) that requires decentralized production systems. This paper brings to discussion the relevance of product customized applying DT to smart customization, and the inclusion of decentralized production systems supported by Cloud Manufacturing.

* *Corresponding author.* Tel.: +351 +351 22 83 40 500; fax: +351 22 83 21 159.
E-mail address: hcc@isep.ipp.pt

Production of an injection mold: analysis and improvements identification in the manufacturing process

Bruna Parente, Diana Miranda, Erika Freiras, Guilherme Silva, Lázaro Martins, António Rocha*

Polytechnic Institute of Cávado and Ave, 4750-810, Barcelos, Portugal

Abstract

Plastic injection molding industries demand high precision, accuracy, and advanced manufacturing processes, that are efficient and effective to minimize costs and comply with industrial standards and customer requirements.
This article provides a descriptive and comprehensive approach aimed at identifying process improvements in the manufacturing of two product parts of a plastic injection mold. To this end, data has been collected to assess the relation between schedule times and actual manufacturing times, and devise possible actions to improve the processes' efficiency. The data was also used to understand the performance of the current production process, to detail the times per manufacturing process, and to identify possible problems in the production process of the two product parts.
The information gathered, directed the advancement of improvement proposals to mitigate and minimize the issues leading to variations between schedule and actual manufacturing times. The approach was descriptive, based on empirical data, to characterize the operational processes, that the parts must go through, highlighting the variances between the expected and actual manufacturing times.

Keywords: Injection molding; manufacturing performance; productivity.

* *Corresponding author.* Tel.: +351-253802190
  E-mail address: arocha@ipca.pt

Proposal of a sensing model in an Adaptive Enterprise Architecture

Wissal Daoudi[a,*,] Karim Doumi[b], Laila Kjiri[a]

[a]ENSIAS, Mohamed V University, Rabat, Morocco.
[b]FSJES, Mohamed V University, Rabat, Morocco.

Abstract

Nowadays, enterprises are evolving in an interconnected ecosystem mainly characterized by turbulence. They undergo unprecedented acceleration in transformations to survive in this highly dynamic and competitive landscape. This disrupts the osmosis between the various intertwined levels of abstraction of the organisation (Strategy, Business, and Information System). Enterprise Architecture and Adaptive Enterprise Architecture, especially, are used to catalyse successive changes and to ensure scalability over time. In this context, it is compulsory for companies to sense the change proactively or reactively in early stages to respond to uncertainty. They need to build their knowledge by continuously absorbing information and data from internal and external sources. Thus, a sensing model must be devised to face enterprise needs. In this paper we propose a meta-model that formalizes the sensing capability to make smooth adaptation. We also present a model that supports adequate future enterprise architecture adoption.

Keywords: adaptation; enterprise architecture; knowledge; sensing enterprise.

* *Corresponding author.*
E-mail address: daoudi.wsl@gmail.com

Quality management practices to direct and control the accomplishment of project objectives in R&D units

António Rocha[a,*], Fernando Romero[b], Daniel Miranda[d], Marlene Amorim[c], Rui M. Lima[b]

[a]*Polytechnic Institute of Cávado and Ave, 4750-810, Barcelos, Portugal*
[b]*ALGORITMI Research Center, Dep. of Production and Systems, School of Engineering, University of Minho, 4800-058 Guimarães, Portugal*
[c]*GOVCOPP Governance Competitiveness and Public Policies, University of Aveiro, Portugal*
[d]*2Ai – School of Technology, IPCA, Barcelos, Portugal*

Abstract

Projects create value and capabilities for organizations and beneficiaries of their outcomes and must be managed by implementing quality processes to assure an execution compliant with plans, activities, and applicable standards, and to accomplish the defined requirements and objectives in an efficient and effective manner. This study analyzed the frequency of use of quality management practices by companies with R&D units and compared them with project management students' expectations of implementing quality project management practices as a professional. The data was collected using an online survey, and twenty-six quality management practices have been analyzed using descriptive and inferential statistics, following standard procedures, and using the Independent-samples T-test. For twelve out of the twenty-six practices, significant differences have been found between the two samples, five referring to quality planning practices and seven referring to quality control practices. For the twelve quality management practices, project management students had greater expectations of implementing them, in contrast to the actual frequency of use among the surveyed companies. The results can provide inputs to improve project management practices among companies, reinforcing the importance of training and recruiting project management professionals that have the required training, talent, and aligned expectations on how to successfully manage projects.

Keywords: Project management; Quality management; Quality processes; Quality practices.

---

* *Corresponding author.* Tel.: +351-253802190
E-mail address: arocha@ipca.pt

RapiTest: Continuous Black-Box Testing of RESTful Web APIs

Duarte Felício[a], José Simão[a,b], Nuno Datia[a,c,*]

[a]FIT/ISEL, Lisbon School of Engineering, Politécnico de Lisboa, Portugal
[b]INESC-ID Lisboa, Portugal
[c]NOVA LINCS, NOVA School of Science and Technology, Portugal

Abstract

When it comes to web services, RESTful web APIs have become the *de facto standard* since 2000. Those APIs expose back-end data, so it is crucial that they are robust, secure, and reliable to keep sensitive data protected. Although existing tools for automating APIs test case generation have shown significant potential, they are limited in their applicability since they focus solely on random inputs through fuzzing. Using only API specifications, it is impractical to describe personalized and specific test case workflows. This paper introduces RapiTest, an open-source continuous black-box testing application for RESTful web APIs. It takes advantage of the API specification to automatically generate tests, but also makes use of a new DSL named Test Specification Language (TSL), to create rich test cases. The RapiTest web application allows the setup of several predefined verifications, regarding security and correctness of the responses, while running the tests at regular intervals, such as every 24 hours. In this way, the API can be monitored continuously to ensure it is running correctly.

Keywords: DSL; REST; API; Web Application; Black-box Testing; Reliability; System Integration.

---

* *Corresponding author.*
E-mail address: nuno.datia@isel.pt

Reconceptualizing ERP Integration: A Module Level Perspective

Elisa Gagnon[*]

Bishops University, 2600 College Street, Sherbrooke, Canada.

Abstract

The concept of ERP integration has received significant a significant amount of attention in research because of its potential for affecting organizational outcomes. Although the importance of ERP integration has been established, the development of an instrument to measure this construct has not been reported in the literature. Based on a domain definition grounded in the literature, a reliable and valid measure of integration in an ERP context at the module level is proposed. The results show a 3-dimension construct for assessing ERP module integration, derived from a sample of 68 ERP module implementations. The evidence suggests that ERP module integration is formed by the system, business process, and user dimensions. Further, the link between ERP module integration and business process performance is assessed. Evidence of reliability and validity are presented for the hypothesized measurement models as well as implications of the results for research and practice.

Keywords: Enterprise Resource Planning (ERP); Integration; Scale Development; Scale Validation; Business Process Performance.

* *Corresponding author.* Tel.: 1-819-822-9600.
E-mail address: elisa.gagnon@ubishops.ca

Risks in Cloud Computing Relationships:

A Study of Large Public Buying Organizations in Sweden

Georg Hodosi*, Erik Linde, Lazar Rusu

Department of Computer and Systems Sciences, Stockholm University

Abstract

Cloud Computing (CC) is an increasingly alternative for IT Outsourcing (ITO). There is a consensus that a good ITO relationship between the service buyer and provider is a prerequisite for the success of an ITO. However, there is a lack of studies concerning the relationships between large companies owned by public organizations and CC-providers in Sweden. Consequently, there is a lack of knowledge about the risks that could jeopardize relationships between companies owned by public organizations and their CC providers. Thus, this study seeks to answer the research question: "What are the risk factors to consider for building and maintaining a successful relationship between CC-providers and companies owned by public organizations in Sweden from a buyer's perspective?". The study has identified seven most critical risk factors that should be considered to keep or build a well-working relationship between CC parties. These factors are contracts, the client's degree of expertise in IT operations, measurement problems, the Swedish Public Procurement Act, provider challenges, relatedness, and ex-ante imperfection. The findings of this study can be used by large public organizations in Sweden who plan to use or who are using CC in order to mitigate the risks in CC relationships.

Keywords: Cloud computing; Relationships; Risks; Large public organizations; Sweden.

* *Corresponding author.*
E-mail address: hodosi@dsv.su.se

Scaling AI-based industry 4.0 projects in the medical device industry: An exploratory analysis

David Sweeney[a], Syam Nair[a], Kathryn Cormican[b],*

[a]*Enterprise Research Centre, School of Engineering, National University of Ireland, Galway, H91 TK33, Ireland.*
[b]*Enterprise Research Centre and LERO - the Irish Software Research Centre, School of Engineering, National University of Ireland, Galway, H91 TK33, Ireland.*

Abstract

As technological advancements in artificial intelligence (AI) accelerate, the effect it has on the adoption of Industry 4.0 is significant. The adoption of AI-based Industry 4.0 projects creates a significant opportunity to generate new revenue streams and high-value customer-centric products. However, medical device manufacturing organisations are strictly scrutinised by regulatory authorities due to the critical nature of these devices and their impact on humans. This presents a challenging environment for medical device manufacturers to experiment with and implement new technologies. However, the significance and impact of AI-based projects are acknowledged by regulatory authorities such as the FDA and EMA and PMDA, allowing the incorporation of AI-based devices. This change in regulations, although limited, opens up immense opportunities for medical device manufacturers. Although extensive studies on the barriers, challenges, and failure factors of AI projects are available, very few studies explore these from a medical device manufacturing perspective. This is essential due to the significant limitations posed by the regulations governing medical device development. This study analyses the challenges and factors affecting the scaling of AI-based Industry 4.0 projects in medical device manufacturing organisations. The study found three major factors influencing the scaling of AI-based Insutry 4.0 projects. They comprise infrastructural costs, security risks and a change management migration plan. However, investing in these factors with a view to scaling may create additional revenue sources and also help in reaching a faster return on investment. Such investments can also improve the overall productivity of the industry, allowing the creation of high-value customer-centric products. The perceived security risks in the industry were found to be higher than the risks analysed in previous literature, suggesting a need to create an informed workforce. The study also found that for effective implementation of scalable AI-based industry 4.0 projects a skilled workforce with a shared long-term vision is required.

Keywords: Artificial intelligence scaling; critical success factors; medical device manufacturing; industry 4.0; AI projects.

* *Corresponding author.*
E-mail address: kathryn.cormican@nuigalway.ie

Simulation of Database Interactions for Early Validation of Digitized Enterprise Processes

Sylvia Melzer, Oliver C. Eichmann[*], Hongxu Wang, Ralf God

Hamburg University of Technology, Institute of Aircraft Cabin Systems, Hein-Saß-Weg 22, 21129 Hamburg, Germany.

Abstract

Digitized enterprise processes often encompass interaction with relational databases. Describing and simulating large-scale and complex processes on different abstraction levels lead to the use of tools and methods of Model-based Systems Engineering. In practice, current entity-relationship modeling approaches solely enable modeling relational database structure without simulation of database interactions at an early development stage. However, in general, it is known that early validation improves common understanding and communication in the development team and reduces the risk of design flaws. This paper presents an approach for model-based enterprise process digitization and a previously developed and now enhanced broker-based SysML Toolbox for integrating real relational databases into SysML simulations. The approach comprises status quo documentation concerning enterprise processes, development of digitized processes and required relational database structures as well as validation of digitized processes using the SysML Toolbox.

---

* *Corresponding author.* Tel.: +49-40-42878-8109; fax: +49-40-42878-8232.
E-mail address: oliver.eichmann@tuhh.de

Skills provisioning for the Fourth Industrial Revolution: A Bibliometric Analysis

Sibukele Gumbo[a,*], Hossana Twinomurinzi[a], Kelvin Bwalya[a], Samuel Fosso Wamba[b]

[a]*University of Johannesburg, 17 Auckland Park Bunting Road Campus, Johannesburg, South Africa.*
[b]*UBS Business School, 1 Place Alphonse Jourdain, 31068, Toulouse, France.*

Abstract

The fourth industrial revolution (4IR or Industry 4.0), fueled by cutting-edge technologies such as autonomous cars, advanced robotics, business analytics, and artificial intelligence, is expected to transform all aspects of today's workforce. Yet very few empirical studies have been conducted about the future skills needed to cope with this new industrial wave. This study is an initial attempt to fill this knowledge gap through identifying relevant literature. It aims at presenting a holistic view of the extent of existing literature on 4IR skills using a bibliometric analysis. Four hundred and ninety-one documents were extracted from the Web of Science (WoS) database and analyzed using two bibliometric tools, namely Bibliometrix and VOSViewer. The skills required for the 4IR began earnestly at the WEF in 2016. Currently, Italy emerges as the leader in 4IR skills research even though its adoption into their national plan occurred in September 2016. Thematic research gaps in skills and future clusters remain relevant even in the current era.

Keywords: Fourth Industrial Revolution; industry 4.0; skills; bibliometric.

* *Corresponding author.*
E-mail address: 222239719@student.uj.ac.za

Social Business Object Ontology (SoBOOnt):

A formal description of a novel concept for social features

Simon Meier[*], Petra Schubert

Center for Enterprise Information Research, University of Koblenz, Universitätsstr. 1, 56070 Koblenz, Germany.

Abstract

In this paper, we introduce the novel concept of "social features for process-oriented business objects" that extends existing research on the Social Network of Business Objects (SoNBO). In SoNBO, data is extracted from heterogenous source systems in the form of business objects and a user-specific knowledge graph is generated and used as a navigation structure in a web application (the so-called SoNBO Explorer). Up to now, the SoNBO Explorer has been limited to information retrieval and access, which is now enriched with interactive functionality, the so called "social features", that allow the user to add content and thus interact with the information objects. The solution builds on the idea of "social profiles" that are used to represent *people* in Enterprise Social Networks and extends this idea to *business objects*. People and objects become (equal) nodes in a knowledge graph on which the user can perform (social) functionality (e.g. following, liking, commenting, tagging, etc.). This way the idiosyncratic functionalities of human-centred collaboration software is applied to process-aware ERP systems. We present the formalisation of our concept in the Social Business Object Ontology (SoBOOnt).

Keywords: Enterprise Social Software; Enterprise Social Network; knowledge graph; ontology; ERP.

* *Corresponding author.* Tel.: +49 261 287-2567; fax: +49 261 287-2521.
E-mail address: simeier@uni-koblenz.de

Students' concerns about Online Remote Learning during COVID-19 Pandemic in the 4IR digital society

Walter Matli[a,*,] Mashitishi Phurutsi[b]

[a]University of South Africa, Cnr Janadel & Alexandra Avenues, Midrand 1685, South Africa.
[b]Tshwane University of Technology, 2 Aubrey Matlakala St, Soshanguve - K, Preotia 0001, South Africa.

Abstract

Globally, teaching and learning in contact face-to-face universities had to transition to online learning during 2020, following the disruptions caused by COVID-19 pandemic lockdowns imposed in many countries around the world. The purpose of this paper is to provide insights from preliminary results of ongoing research focusing on students' personal concerns raised about online learning during the early stages of the COVID-19 pandemic in South Africa. Data were collected using a web-based survey in 2020, sampling one group of second-year university students. Internationally, the COVID-19 pandemic has led to an acceleration in digital transformation for teaching and learning in many face-to-face contact universities. The key findings from the survey reported in this paper are twofold: firstly, it was found that COVID-19 has fundamentally changed both teaching and learning space geographies with large proportions of university students having to study from their homes during the lockdown; secondly, students recognised that access to Information and Communication Technology (ICT) infrastructure and the unaffordability of internet connections were significant concerns for most respondents who took part in the study. The study seeks to highlight that even though the COVID-19 pandemic has led to an acceleration in the digital transformation underway in tertiary education and has drawn university teaching and learning more comprehensively into the digital era, the uneven distribution of ICT infrastructure accentuates the barriers to and inequalities that exist for students and for practical home studying. The study makes initial policy suggestions for assisting this acceleration into the digital world. Future research can build on this platform by analysing the post-COVID-19 effects in the university teaching and learning environment.

Keywords: COVID-19 pandemic; Home-based learning; Teaching and learning; Digital access, Expectation-Disconfirmation Theory.

* *Corresponding author.*
E-mail address: matliw@unisa.ac.za

Sustainable Smart Waste Management Adoption Challenges in Developing Countries

Eline Fidje, Moutaz Haddara, Marius Langseth[*]

Kristiania University College, 0107 Oslo, Norway

Abstract

Internet of things (IoT) implementations are gaining increased momentum worldwide. IoT infrastructures may aid in better and more efficient resource management and attain sustainability goals. Thus, with limited resources in developing countries (DCs), IoT solutions have the potential to optimize operations and efficiently manage those resources. One of the challenges facing countries worldwide is the need for more sustainable and smart waste management (WM) solutions. Hence, IoT technologies can significantly improve the overall WM process and its logistics. It is then crucial to identify the challenges of IoT adoptions for WM in DCs, to ensure more successful adoptions. While the IoT literature is booming, very little research has been conducted focusing on WM in DCs specifically. Hence, this research summarizes and provides an overview of the existing literature on the challenges of implementing IoT technologies for WM in DCs. The primary purpose of this review is to present the findings from the reviewed articles, shed light on current research gaps, and offer recommendations for future research. Our main findings suggest that DCs can develop optimization plans for WM processes that may aid them in joining the worldwide efforts to protect public health and reach the sustainable development goals put forward by the UN. Facing the social, environmental, economic, and technical challenges when implementing IoT in WM can further increase the efforts for sustainable development in DCs.

Keywords: Smart waste management; IoT; Developing countries; Sustainability; Challenges; Opportunities.

* *Corresponding author.* Tel.: +47 977 15 767.
  E-mail address: marius.langseth@kristiania.no

The Adoption of 4Step-Rule-Set Method for Ontological Design: Application in a Real Industrial Project

Tiago F. Pereira[a,*,] Francisco Morais[a], Carlos E. Salgado[a], Ana Lima[a], António Silva[b], Manuel Pereira[b], João Oliveira[b], Ricardo J. Machado[a,c]

[a]Center for Computer Graphics, Campus de Azurém, Edifício 14, Guimarães, 4800-058, Braga, Portugal
[b]F3M, edifício F3M, R. de Linhares, 4715-435, Braga, Portugal
[c]Minho University, Campus de Azurém, Edifício 14, Guimarães, 4800-058, Braga, Portugal

Abstract

Ontology building can greatly influence the development cycle of an information system and enhance interoperability among its constituent elements. Throughout the projects we have been developing we have detected, by studying the current literature, a need to develop an agile method to conceive and mapping ontologies, which allows a quick and effective response to R&D projects. Designing a method for building an ontology, which is integrated and aligned with a systematic development approach, represents a crucial challenge in new approaches to system design and exploitation. Extant proposed methods for building an ontology, especially following agile approaches, have achieved interesting results but lack integration and alignment with a wider-view development framework. Thus, we have defined the first version of a semantic model allowing the alignment with the previously defined information model. Following the best practices for ontology building and based on our previous work on software system development, we now propose a method for designing an ontology, the 4SRS Method for Ontological Design based on the V-Model 4SRS, aligning it with a proven development method. We further demonstrate this approach by applying the proposed method in a real case, to develop an ontology for a choen restricted scope within the domain problem.

Keywords: Ontology Building, Development Method, Agile Method, Semantic Interoperability, Graph Database.

* *Corresponding author.* Tel.: +351 914 267 120.
E-mail address: fernando.pereira@ccg.pt

The Effect of Deep Learning Methods on Deepfake Audio Detection for Digital Investigation

Mvelo Mcuba[a], Avinash Singh[a,*], Richard Adeyemi Ikuesan[b], Hein Venter[a]

[a]*Department of Computer Science, University of Pretoria, Pretoria, South Africa*
[b]*Computing and Applied Technology, College of Technological Innovation, Zayed University, Abu Dhabi, United Arab Emirates*

Abstract

Voice cloning methods have been used in a range of ways, from customized speech interfaces for marketing to video games. Current voice cloning systems are smart enough to learn speech characteristics from a few samples and produce perceptually unrecognizable speech. These systems pose new protection and privacy risks to voice-driven interfaces. Fake audio has been used for malicious purposes and is difficult to classify what is real and fake during a digital forensic investigation. This paper reviews the issue of deep-fake audio classification and evaluates the current methods of deep-fake audio detection for forensic investigation. Audio file features were extracted and visually presented using MFCC, Mel-spectrum, Chromagram, and spectrogram representations to further study the differences. Harnessing the different deep learning techniques from existing literature were compared using five iterative tests to determine the mean accuracy and the effects thereof. The results showed a Custom Architecture gave better results for the Chromagram, Spectrogram, and Me-Spectrum images and the VGG-16 architecture gave the best results for the MFCC image feature. This paper contributes to further assisting forensic investigators in differentiating between synthetic and real voices.

Keywords: Deepfake audio; digital investigation; CNN, voice cloning.

---

* *Corresponding author.*
E-mail address: asingh@cs.up.ac.za

The Impact of ERP Systems in Internal Auditing: The Portuguese Case

Tiago Silva[a], Rui Pedro Marques[a,b,*,] Graça Azevedo[a,c]

[a]ISCA-UA, University of Aveiro, Portugal.
[b]ALGORITMI Research Centre, University of Minho, Portugal.
[c]Center for Research in Accounting and Taxation, Polytechnic Institute of Cávado and Ave, Portugal.

Abstract

Nowadays, internal audit procedures are increasingly supported by the use of technological tools, such as integrated ERP (Enterprise Resource Planning) systems, aiming to improve the performance of internal auditors, as well as the effectiveness and efficiency of their work. In fact, the adoption of these systems, together with a good implementation strategy, enhances the strengths of a business, while mitigating its weaknesses. This study, through a questionnaire, aims to understand the impact of ERP systems on internal audit work in Portugal. Starting by understanding which systems, modules and functionalities are most used, the study also aims to assess how these systems influence the effectiveness and efficiency of audit work and also the level of satisfaction of internal auditors in their use. The main findings show that there is a wide variety of ERP systems used by internal auditors in Portugal, the most used being SAP ERP, and the Financial Accounting, Treasury and Purchasing modules. It is also concluded that internal auditors agree that the use of ERP functionalities positively influences the effectiveness and efficiency of their work, and they are generally satisfied with the use of these functionalities in their work.

Keywords: internal auditing; enterprise resource planning; efficiency; efectiveness; satisfaction.

* *Corresponding author.*
E-mail address: ruimarques@ua.pt

The IoT to Smart Cities - A design science research approach

Jorge Duque[*]

ISLA - Instituto Politécnico de Gestão e Tecnologia, 4400-107 Vila Nova de Gaia, Portugal.

Abstract

New technologies and the use of the Internet of Things (IoT) play a remarkable role in the design, construction, and maintenance of Smart Cities. With the exponential increase of data generated in the areas of health, commerce, financial services, science, education, public administration, and society, the challenge of ensuring data security and quality is increasing. IoT and Smart Cities, are in permanent mutation and evolution, towards a new paradigm of digitalization and digital transformation. The existing literature review exposes much of the attention that is given to IoT, but a broad discussion on the characteristics, use, applications, and challenges of these technologies in Smart Cities is still needed. The main contribution of this paper is that it provides a systematic assessment and synthesis of the critical applications and challenges of IoT, in the development of Smart Cities.

Keywords: Smart Cities; IoT; Data Warehouse; Business Intelligence.

[*] *Corresponding author.* Tel.: +351-966-304-196.
E-mail address: p40471@islagaia.pt

The obstacles of Internet-only bank as an alternative banking service

Avus Hou[*,] Yu Zhan Lu

Asia Eastern University of Science and Technology, No.58, Sec.2, Sichuan Rd. Banciao District 220, Taiwan

Abstract

The Internet-only bank is an emerging banking service that could shift the paradigm of the banking industry. The present study used the push-pull model as the theoretical framework to investigate the Internet-only bank as an alternative. A total of 134 respondents were yielded and assessed with component-based structural equational modelling. The results indicate low service quality and inconvenience positively influenced alternatives. The present study provides insights into Internet-only bank service design.

Keywords: Internet-only bank; alternatives; push-pull model.

* *Corresponding author.* Tel.: +886-2-77380145
E-mail address: avushou@mail.aeust.edu.tw

The perception of the management and lower-level employees of the impacts of using Robotic Process Automation: the case of a shared services company

Miguel Gomes[a,b,*,] Isabel Seruca[b,c]

[a]*Mota-Engil Global - Serviços Partilhados Administrativos e Técnicos, SA*
[b]*Univ Portucalense, Research on Economics, Management and Information Technologies - REMIT, Oporto, Portugal*
[c] *ISTTOS, Centro Algoritmi, University of Minho, Portugal*

Abstract

The increasing use of digital technologies has allowed organizations to improve their business processes, enhancing the productivity and efficiency of their operations. The implementation of Robotic Process Automation (RPA), a technology that allows replicating human actions in existing systems, given its benefits, can play an important role in achieving this goal, often referred as the digital transformation of organizations. However, the benefits of RPA implementation may not be perceived equally by managers, those responsible or that required its implementation, and lower-level employees. The work described in this paper aims not only to assess the perception that both groups have of the impacts of technology, but also to understand whether the use of robots by the employees of a shared services company positively influences their perception of the technology and whether it affects developments in additional robots in the future. A questionnaire, underpinned in a multidimensional evaluation model of the technology and given to all the company's employees, is used as the main research instrument, while results are analysed and interpreted using descriptive statistical techniques and hypothesis testing. We argue that this study may be an important contribution to the company for a better understanding of its employees' perception of RPA, allowing the tailoring of its future communication strategies to facilitate the acceptance of the technology and, thus, enhance the success and effectiveness of its implementation. Furthermore, the multidimensional evaluation model developed enhances the existing literature on the topic of RPA impacts, more specifically in terms of evaluating possible differences in perceptions between managers and other employees.

Keywords: Robotic Process Automation; Digital Transformation; RPA impact.

* *Corresponding author.*
E-mail address: Miguel.Gomes@mesp.pt

The possibilities of changes in learning experiences with Metaverse

Joana Braguez[a,*], Marta Braguez[b], Sílvia Moreira[c], Carla Filipe[d]

[a]Escola Superior de Tecnologia e Gestão de Viseu - IPV, 3504-510 Viseu, Portugal; CIAC-Research Center for Arts and Communication, Aberta University, 1269-001 Lisboa, Portugal; CEIS20, Universidade de Coimbra, 3000-186 Coimbra, Portugal.
[b]Escola Superior Agrária de Viseu - IPV, 3500-606 Viseu, Portugal.
[c]Escola Superior de Tecnologia e Gestão de Viseu - IPV, 3504-510 Viseu, Portugal.
[d]Agrupamento de Escolas de Tondela - Cândido de Figueiredo, 3460-521 Tondela, Portugal.

Abstract

This review aims to define the Metaverse, present the roles of AR, MR and VR, and also the concepts of digital twins and lifelogging. The evolution of applications for Metaverse in various sectors, especially gaming, has created the possibility of using Metaverse for education. We present the vast field of these applications and educational projects. The challenges that educators face are discussed and the potential and limitations of its educational applications are explained. It's suggested to embrace the Metaverse in classes but not in a full-time learning environment, instead, it should be used as a complement, when justified. Some of its limitations may be weaker social connections there are concerns for privacy and security. The big potential offered by Metaverse technologies is the immersive experience of content and social interactions.

Keywords: Metaverse; virtual reality; augmented reality; virtual worlds; learning experiences.

* *Corresponding author.*
E-mail address: jbraguez@estgv.ipv.pt

The relative impact of QR codes on omnichannel customer experience and purchase intention

Kimberley Kjeldsen, Margrete Nodeland, Asle Fagerstrøm[*], Sanchit Pawar

Kristiania University College, School of Economics, Innovation and Technology, 0152 Oslo, Norway.

Abstract

This study explores the relative impact of quick response (QR) codes in an omnichannel customer situation. A conjoint experiment was conducted where participants (n=53) assigned scores to stimuli cards according to experience and purchase intention in a shopping scenario. The main finding from the conjoint analysis showed that creating a positive experience does not necessarily require highly digitalized and personalized QR-code information and features. However, a balance is needed as it was discovered that the opposite was evident for purchase intention. Retailers and researchers must therefore be aware that there might be differences in what type of QR-code information and features create experiential value and what triggers purchase intention. These findings highlight the complexities of the customer experience (CX) and suggest that it is important to carefully consider the purpose for which QR codes are implemented.

Keywords: QR-codes; omnichannel; experiential value; purchase intention; conjoint study.

* *Corresponding author.* Tel.: +47 95075325.
E-mail address: asle.fagerstrom@kristiania.no

The Use of Benefits Scorecards for Identifying and Measuring Benefits from Enterprise Collaboration Systems

Söhnke Grams[*]

Center for Enterprise Information Research, University of Koblenz, Universitätsstr. 1, 56070 Koblenz, Germany.

Abstract

Commercial business software represents a large part of the IT spending of organizations. Whilst the cost of software operations and licenses is relatively easy to determine, organizations find it difficult to measure the benefits that are gained from providing the software to their employees. This is especially problematic for software that is of supportive nature and does not support key business processes as in the case of Enterprise Collaboration Systems (ECS). To address this problem, we demonstrate and evaluate Benefits Scorecards (BSC), a newly developed method for measuring and long-term monitoring of benefits gained from collaboration technology. Due to its innovative nature, the application of BSC has not been widely evaluated in practice yet. We extracted content and usage data from an operational large-scale ECS with more than 5.000 users, developed KPIs using the BSC method and visualized these KPIs in MS PowerBI dashboards. The research presented in this paper is an important step in the successful evaluation of the Benefits Scorecards method.

Keywords: Benefits Measurement, Benefits Scorecards, Benefits Management, Method, Enterprise Collaboration Systems, KPI.

* *Corresponding author.* Tel.: +49 261 287 2549.
E-mail address: grams@uni-koblenz.de

The viability of Telesurgery Service in the Autonomous Region of the Azores, supported by the 5G Network

Gualter de Medeiros Sousa*, Arnaldo Manuel Pinto Santos

Universidade Aberta, Lisboa, Portugal.

Abstract

5G network technology is considered one of the driving forces behind various societal changes. Among multiple uses, it offers Telesurgery. In situations where the patient needs specialized surgery, but there are no conditions to be transported to where the surgical intervention can be performed, Telesurgery allows access to the procedure with all the security that 5G network technology offers. The Autonomous Region of the Azores (ARA) is considered an outermost region which is an integral part of the EU (despite the thousands of kilometres that separate it from the European continent). Therefore, the EU law applies to these regions with all rights and duties associated. The Support Service to the Displaced Patient (SADD) accompanies annually and under normal conditions an average of more than 1500 patients from the Azores. They travel to the mainland for health reasons. This scenario is applied across islands, where an average of 550 patients moved annually from islands without a hospital to islands with a hospital. As a result, health costs rise in this Region.

This paper will use the survey research methodology since it is the most appropriate method when we want to obtain answers/data that express opinions, customs or characteristics of a certain target audience. Therefore, a mixed mode will be used, namely interviews and questionnaires, having as scientific target areas medicine and engineering, in the specialities of gastroenterology and telecommunications, to support the research questions. This paper aims to present research on the viability of Telesurgery in the Autonomous Region of the Azores, supported by the 5G network, as an alternative for travelling patients.

Keywords: Technology 5G Networks, Autonomous Region of the Azores, Telesurgery.

* *Corresponding author.* Tel.: +351 918 525 235.
E-mail address: 701152@estudante.uab.pt

Towards a paradigm shift in vehicle project management: From a traditional multi-project-management to an integrated process-based digital approach

Markus Rabea, Emre Kilica[*]

TU Dortmund University, Leonhard-Euler-Str. 5, 44227 Dortmund, Germany.

Abstract

The automotive industry has to deal with wide-reaching challenges and changes. A continuous gain of significant competitive advantages in a highly competitive market requires automotive manufacturers to produce new products with a large diversity of variants at ever-shorter time intervals. As a result, the frequency of series launches has increased and the need for a sophisticated vehicle project management and an efficient handling of vehicle changes and model updates along the product process have gained significant importance. However, current project management practices and frameworks utilized by automotive manufacturers do not effectively address this demand, e.g., the goals of increasing operational efficiency and productivity as well as establishing continuous improvement are not sufficiently achieved. While these goals are traditionally common-place in certain fields of the automotive manufacturing, e.g., in production, logistics, or warehousing, their dedicated consideration in the vehicle project management or one of its neighboring areas like the vehicle change management has not been examined thoroughly in the required extend. Understanding the determinants of the needed change in the vehicle project management and its related fields is a central objective of the research presented in this paper. In this context, this paper proposes a novel approach on how to manage the transition and why this is a challenge to common project management practices utilized traditionally in the automotive industry.

Keywords: Vehicle project management, vehicle change management, model update, product development, product update, digital transformation, automotive industry.

* *Corresponding author.*
E-mail address: emre2.kilic@tu-dortmund.de

Towards a technology acceptance methodology for Industry 4.0

Georgios Stergiou[a],*, Evangelia Kavakli[b], Konstantinos Kotis[b]

aRedVelvetXR, Athens, 18345, Greece.
bUniversity of the Aegean, Mytilene, 81100, Greece.

Abstract

Industry 4.0 fuses ubiquitous computing and leads to a culmination of physical, digital, and biological paradigms. Previously inanimate objects are enabled to "talk" to each other and to the users, and guide specific behaviours of speed, breadth, depth, and systems impact. Research suggests however that 70% of large-scale technological change programs don't reach their stated goals. Current theories and methodologies including Technological Transitions (TT), Digital Transformation (DT), Technology Acceptance Models (TAM, TAM2 & UTAUT), Multi-Level Perspectives (MLP), come with challenges and limitations. Management and key decision makers need new tools that will assist them to identify which factors their companies must consider to efficiently adapt to Industry 4.0. The aim of this paper is to address existing TAM, DT and MLP challenges, and propose an Industry 4.0 specific digital transformation model, involving business and management practices. Ideas, best practices and different prospective, from diverse markets and industries, will be mitigated and combined. The synergetic methodology will support management, enhance organizational problem-solving capabilities, and provide recommendations to formulate a strategic approach based on company lifecycle, corporate governance, enterprise culture, change management, company size and structure. Key lessons learned will help in forming evolutionary perspectives specific to the needs and challenges of Industry 4.0 transitions.

Keywords: Industry 4.0; Technological Transitions (TT); Technology Acceptance Model (TAM), Cyber Physical Systems (CPS); Internet of Things (IoT).

---

* *Corresponding author.*
E-mail address: gstergiou@me.com

Towards Industry 4.0: impact on production strategies

Montserrat Jiménez Partearroyo[a,*], Carmen De Pablos Heredero[a], Ana Medina López[a], Luis Miguel Arroyo Gutierrez[b]

[a]Universidad Rey Juan Carlos, P.º de los Artilleros, 38, 28032 Madrid, Spain.
[b]Grupo Flex Equipos de Descanso S.A., Río Almanzora, 2, 28906 Getafe, Madrid, Spain.

Abstract

The main purpose of this research consists of analyzing new technologies evolution impact on the manufacturing strategies, taking as a reference Hayes' matrix product-process (PPM) and its further transformation from Industry 3.0 to Industry 4.0. An empirical study on the efficiency of production processes has been done on a sample of 1426 manufacturing companies in the environment of Industry 3.0. The main contribution of this work is the proposal of a third axis on the PPM, which has been built based on the presence of advanced manufacturing technologies and flexible manufacturing systems. The appearance of the new leading technologies in Industry 4.0 represents a qualitative shift in production strategies, enabling companies to produce both, customized and personalized products. This implies an evolution of the productive strategies collected in the Hayes' PPM. Therefore, this is the first article presenting a specific PPM for Industry 3.0., supported by empirical evidence and classifying firms according to technology, products and processes. Additionally, a new model of this matrix in the context of Industry 4.0 has been depicted to represent new alternative manufacturing strategies within the framework of the digital era.

Keywords: production strategies; PPM matrix; customization; personalization; Industry 3.0; Industry 4.0.

* *Corresponding author.*
E-mail address: montserrat.jimenez@urjc.es

Towards the Development of a Blockchain System for Philippine Government Processes for Enhanced Transparency and Verifiability

Karlo Angelo F. Cabugwang, Raphael Christen K. Enriquez, Bienvenido E. Villabroza, Christian E. Pulmano[*]

Department of Information Systems and Computer Science, Ateneo de Manila University, Philippines.

Abstract

There are cases of corruption and fraud within the Philippine government that have gone under the radar, often due to a lack of transparency and verifiability. The objective of this study is to prototype a blockchain network that can run a government process as a decentralized application such that it can enhance transparency and verifiability in the public sector. This can be accomplished by identifying a government process that would be converted into a decentralized application. One of these processes would be converted into a decentralized application. Afterwards, a blockchain framework should be identified — one which can create a public permissioned blockchain network. This framework can be used to design and implement the prototype blockchain network which the decentralized application can run on. The final prototype constitutes of smart contracts deployed on an Ethereum test network with a web frontend to easily interact with it. Mechanisms of the application that are deemed necessary to transparency and verifiability of the system are also identified. Finally, the variable cost of the system and possible limitation is explored in the paper. In this regard, the prototype offers a foundation with which other decentralized applications can follow and build upon. This is to promote transparency and verifiability within and among government processes.

Keywords: Blockchain; Smart Contract; Ethereum; InterPlanetary File System (IPFS).

* *Corresponding author.* Tel.: +63-8426-6001.
E-mail address: cpulmano@ateneo.edu

Towards the Development of a Blockchain-based Decentralized Digital Credential System using Hyperledger Fabric for Participatory Governance

Christian E. Pulmano[*], Maria Regina Justina E. Estuar, Marlene M. De Leon, Hans Calvin L. Tan, Nicole Allison S. Co, Lenard Paulo V. Tamayo

Ateneo Blockchain Laboratory, Ateneo de Manila University, Quezon City 1108, Philippines

Abstract

The Philippines' ICT agenda to promote participatory e-Governance, industry and countryside development, and ICT user protection and information security can be addressed by Blockchain. This study used Hyperledger Fabric to develop a Blockchain network for a secured and validated system for issuing, distributing, and sharing digital credentials. For the initial prototype, the network was tested on two use cases: national identification system and academic credentials. Chaincodes were developed for each type of digital credential and deployed into designated Channels in the network. Initial results show that a Blockchain-based system using the Hyperledger Fabric framework is feasible for developing a secure digital credential platform. The current architecture can support the implementation of the initial use cases and can also accommodate the addition of new use cases in the future. The current iteration of our work provides the groundwork for developing a production-level ready platform. Future work for this study includes the development of the end-user web application where users can interact with the network and initiate transactions. The deployment of the Blockchain network may pave the way toward decentralized e-Participatory governance.

Keywords: Blockchain; Digital Credentials; e-Governance; Hyperledger Fabric.

* *Corresponding author.* Tel.: +63-8426-6001.
  E-mail address: cpulmano@ateneo.edu

Uncover Social Media Interactions On Cryptocurrencies Using Social Set Analysis (SSA)

Hibaq Omar, Lester Allan Lasrado[*]

Kristiania University College, School of Economics, Innovation and Technology, 0152 Oslo, Norway

Abstract

Cryptocurrencies are decentralized digital currencies that use blockchain technology to create a secure and decentralized environment. In the decade since the inception of social media, it has created revolutions and connected people with interests. Social media platforms such as Twitter allow users worldwide to share opinions, emotions, and news. Twitter is one of the most used social media platforms worldwide, where millions of users share tweets continuously every second. By leveraging 1724328 tweets, this research-in-progress paper aims to understand the dynamics of social media users' interactions on cryptocurrencies using social set analysis (SSA). The findings reveal that Twitter users are more positive about cryptocurrencies. The analysis also shows an existing relationship between events and the interaction of users, where cryptocurrency-related events shift the emotion, sentiment, and discussion topics of the users. The research-in-progress paper also contributes to demonstrating the effectiveness of the social set analysis framework to analyse and visualize a big social media data.

Keywords: Cryptocurrency, Text analytics, Social Media Analytics, Twitter, Social Set Analysis.

* *Corresponding author.* Tel.: +47 98289205.
E-mail address: lesterallan.lasrado@kristiania

Understanding Issues and Challenges of DFR Implementation in SDN Platform

Howard Munkhondya[a,*], Richard A. Ikuesan[b], Avinash Singh[a], Hein Venter[a]

[a]University of Pretoria, Lynnwood Rd, Pretoria, 0002, South Africa
[b]Zayed University, Zayed City, Abu Dhabi, United Arab Emirates

Abstract

Software-Defined Networking (SDN) is an evolutionary networking paradigm that offers simplified and agile network configuration and management capabilities. However, embracing this new and futuristic paradigm requires the understanding of Digital Forensics (DF) limitations that it presents. Studies show that the dynamism of SDN architecture impedes the preservation of Potential Digital Evidence (PDE) during a Digital Forensic Readiness (DFR) process. Therefore, the identification and acquisition of viable PDE in SDN platforms largely depends on the thorough understanding of the issues and challenges affecting the application of DFR in SDN platforms. For this reason, this study leverages a case study research methodology to empirically underline the forensic limitations and provide level of specificity with which these limitations affect the DFR process. The results of the case study combined with existing literature are used to expose the issues and challenges in a typical SDN testbed. The knowledge acquired from the state-of-the-art with respect to conducting DFR in an SDN platform addresses the knowledge gap of understanding these limitations.

Keywords: Digital Forensic, Digital Forensic Readiness, SDN, SDN Forensics, SDN Forensic Readiness.

* *Corresponding author.* Tel.: +27 12 420 3111.
E-mail address: u18359282@tuks.co.za

Understanding machine learning adoption: The moderating effects of process sophistication and mimetic pressures

Vasyl Tsykolanov[*], Pedro Ruivo, Tiago Oliveira

NOVA IMS, Universidade Nova de Lisboa, Campus de Campolide, 1070-312 Lisbon, Portugal.

Abstract

Machine learning (ML) gives organizations the power to predict the future, and this has become a core element of modern enterprises. Three contexts, grounded in the technology-organizational-environmental (TOE) framework, were scrutinized to explain ML adoption. Data collected from 319 firms are used to test conceptual model. Additionally, this study investigates the use of process sophistication and mimetic pressures as moderators. The significance of the technological, organizational, and environmental contexts for ML adoption is confirmed. Furthermore, the moderator influence of mimetic pressures and process sophistication between the technological and organizational context and ML adoption was confirmed.

Keywords: Machine learning, technology adoption, big data and analytics, technology-organization-environment, process sophistication.

* *Corresponding author.*
E-mail address: vasyl.tsykolanov@sap.com

Understanding relation between EA and smart cities using text-based analysis

Wajih Krimi, Yemna Sayeb[*], Henda Ben Ghezala

National School for Computer Science, Laboratory: RIADI, Tunis, Tunisia.

Abstract

The rapid population evolution within the city creates social problems. Furthermore, the city also has future challenges such as growing population, health, safety, poverty, pollution levels and energy needs. These problems and challenges must be solved through the use of the smart city concept in managing the city. Literature reviews shows that several technologies were used to improve the implementation of smart cities. In this paper we aim to show the relation between technological components and Smart City, specifically the relation between Enterprise architecture and smart cities using text-based analysis.

Keywords: Smart city, Enterprise Architecture.

* *Corresponding author.*
E-mail address: yemna.sayeb@ensi-uma.tn

Using deep learning for automatic detection of insects in traps

Ana Cláudia Teixeira[a,b], Raul Morais[a,c], Joaquim J. Sousa[a,b], Emanuel Peres[a,c], António Cunha[a,b,*]

[a]*University of Trás-os-Montes and Alto Douro (UTAD), Vila Real, Portugal*
[b]*Centre for Robotics in Industry and Intelligent Systems, INESC-TEC, Porto, Portugal*
[c]*Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB), Vila Real, Portugal*

Abstract

Insect pests cause significant damage to agricultural production. Smart pest monitoring enables the automatic detection and identification of pests using artificial intelligence techniques. The automatic detection of pests is an important tool to help the farmer decide on the application of pesticides. Several studies were carried out to develop deep learning methods for detecting insect pests. However, it is still an open problem, as there are a scarcity and data features that do not allow the good performance of a deep learning method. Pest24 is a public dataset with great diversity and variability of insects, but it has a low detection rate. To improve detection performance in Pest24, this work proposes a method of automatic detection of insects using deep learning. Two experiments were carried out, applying the YOLOv5 with standard hyperparameters and the hyperparameter tuning obtained by the evolution algorithm. As a result, we obtained a performance superior to that reported in state of the art, with the YOLOv5 method with standard hyperparameters, with an mAP of 72.1%.

Keywords: Insects detection, smart pest monitoring, deep learning, YOLOv5, Insect pests.

* *Corresponding author.* Tel.: +351-259350300
E-mail address: acunha@utad.pt

Using Extended Reality in Experiential Learning for Hospitality Management Education

Carlos R. Cunha[a,*,] Catarina Martins[b], Vítor Mendonça[a]

[a]Applied Management Research Unit (UNIAG), Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300-253 Bragança, Portugal.
[b]Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300-253 Bragança, Portugal, CiTUR.

Abstract

Training qualified human resources is a challenge in all areas of knowledge. In particular, in the areas where the training environment of the graduates is not easily laboratoryable and/or possible to emulate, internships are often used in the work context, where an On-the-Job Training is provided. Higher education all over the world has sought to innovate in the way it mixes education. Accordingly, the digital has populated teaching-learning strategies in an attempt to make teaching more universal, more ubiquitous and more personalized, without losing rigor or the necessary requirements. In this path of innovation, e-learning or b-learning mechanisms were and still are used. However, we believe that a more decisive step must be taken by incorporating Extended Reality tools to develop and evolve the way in which competences can be acquired and evaluated, both in the classroom and in home study - a new approach at the service of the teacher and of the student.

In this context, this work analyzes the role of Extended Reality in Human Resources training in the hospitality sector. In addition, a conceptual model is proposed to implement the use of Extended Reality in the context of higher education in the field of hospitality, in a conceptualization approach. Finally, future work is referred concerning the validation of the model and drawn technological considerations for the model implementation.

Keywords: Extended Reality; Model; Hospitality; Experiential Learning; Training; Assessement.

* *Corresponding author.* Tel.: +351 964 592 216.
E-mail address: crc@ipb.pt

Visualization of Attention Distraction Points obtained by Modelling and Analysis of an Intelligent Bicycle Assistant System

Harish Moturu[*], Johannes Schering, Jorge Marx Gómez

Department of Business Informatics Very Large Business Applications VLBA, University of Oldenburg, Oldenburg, Lower Saxony, Germany.

Abstract

Multimodal data based attention analysis, evaluation and visualization is currently predominant in various domains. The SmartHelm Project aims to present results from new kinds of data such as distraction from cargo bike riders in regular logistics processes. Because of regulatory and legal constraints there was no data collected in real traffic scenarios so far, therefore an alternative methodology is implemented in this work. 'Pseudo distractions' generated through four random numbers denoting the distraction type encoded with GPS information obtained from experiments are visualized on a map. To gain more knowledge about real distractions, the feedback gained from interviews with experts and riders in city logistics is visualized on a map to show hotspots in the city. SmartHelm test studies gathered first biophysical data based on Electroencephalography (EEG) and eye-tracking. This paper describes how this data is processed and how the related data management system will be used for the data obtained from forthcoming inner city studies. The outlook describes how we aim to publish biophysical data on an open data platform and to present the data analysis results on a dashboard.

Keywords: Distractions, Data Visualization, Heatmaps, Data Science, Bicycle logistics, Smart Cycling.

* *Corresponding author.* Tel.: +49 441/ 798-4784.
E-mail address: harish.moturu@uni-oldenburg.de

What do regular online grocery shoppers want from online grocers going forward? Suggestions for service quality improvements

Niklas Eriksson[*], Minna Stenius

Arcada University of Applied Sciences, Jan-Magnus Janssonin aukio 1, 00560 Helsinki, Finland

Abstract

Online grocery shopping has become significantly more popular amid the Covid-19 pandemic. That said, the online grocery market in many European countries is still taking shape and further service developments are needed to meet consumers' changing and increasing expectations. Based on an analysis of 412 regular online grocery shoppers' suggestions for service quality improvements, eight categories of improvements were identified. Ranked according to the frequency by which they were mentioned, the top four categories were: (1) broad and specialized assortment, (2) delivery time and flexibility, (3) lower delivery costs and more pricing options, and (4) the user interface and search efficiency. The study contributes relevantly to a better understanding of what the online grocery retailers should prioritize in their service development to meet the changing expectations of a crucially important customer segment, the regular shoppers. Implications for online grocers and limitations of the study are discussed.

Keywords: online grocery shopping; e-service quality; eCommerce; consumer expectations.

* *Corresponding author.* Tel.: +358 294 282 620.
E-mail address: eriksson@arcada.fi

What needs making Information Systems Integration successful in the case of Mergers and Acquisition

Björn Johansson[a],[*], Fredrik Waldau[b], Oskar Åhlström[c]

[a]Department of Management and Engineering, Division of Information Systems and Digitalisation SE-581 83 Linköping, Sweden.
[b]Gapgemini, Stockholm, Sweden.
[c]SEB, Stockholm, Sweden.

Abstract

Information system integration during merger and acquisition (M&A) is a critical process when organizations are joining. The integration process consisting of several crucial activities for making organizations being able to work together. Organizations need to evaluate internal and external factors in order to make the process work. In this paper we evaluated critical success factors, challenges and information systems (IS integration methods from interviews with employees in a case study to identify the most critical activities for a successful IS integration. The investigated process stretches from the introduction of the M&A to the actual integration of two organizations IT-stacks. The identified crucial activities found were top management support, organizational culture, importance of competence, internal communication, maintaining information system security, communication with end-users and managing legacy system. Evaluating these topics and creating a short and a long-term plan on how to integrate and work with these are essential to succeed with the IS integration in any M&A.

Keywords: Merger and acquisition; Information system integration; Information system due diligence; Legacy systems; Organisational culture.

* *Corresponding author.* Tel.: +46 (0)13-28 12 90
E-mail address: bjorn.se.johansson@liu.se

Why Web Accessibility Is Important for Your Institution

Francisco Filipe[a], Ivan Miguel Pires[a,b], António Jorge Gouveia[a,*]

[a]School of Science and Technology, University of Trás-os-Montes and Alto Douro, Vila Real, Portugal
[b]Instituto do Telecomunicações, Universidade da Beira Interior, Covilhã, Portugal

Abstract

Web Accessibility refers to apps, websites, and digital tools designed to be accessible by all users, including those with disabilities. The web is a source of public information, education, employment, government, commerce, health, entertainment, and many others, and every person, regardless of ability, has the right to access it. Imagine missing out on thousands of new customers because your competitor has an easier-to-use, WCAG-compliant website. This systematic literature review aims to analyze the empirical methods of evaluating accessibility to educational websites, disabilities, and errors. Some of the papers we will review here use automated tools, real users, or experts to evaluate web accessibility. After analyzing the results, we will determine if the websites comply or not with the Web Accessibility Content Guidelines (WCAG). Also, what are the differences between automated tools, real users, and experts in evaluating websites.

* *Corresponding author.* Tel.: +351-259-350-000; fax: +351-259-350-480.
E-mail address: jgouveia@utad.pt

Work practice view to digitalization – A literature review

Timo Tokkonen[a,*], Atte Kinnula[b], Marianne Kinnula[a], Kari Kuutti[a]

[a]*University of Oulu, P.O.Box 8000, 90014 University of Oulu, Finland.*
[b]*VTT Technical Research Centre of Finland, P.O.Box 1000, 02044 VTT, Finland.*

Abstract

Initially felt at the knowledge work, novel technologies are making headway beyond that, impacting employees from offices to factory floors. We review previous Information Systems research with the focus on introducing novel digital technologies in work practice. We provide an overview on the drivers for introducing the change, how the drivers transition into actual change at work practice, involved actors and role of workers in the change initiative, as well as outcomes and success factors for the initiatives. We highlight the need for the affected persons to participate in the planning and design of the technological changes as a critical component in digital transformations.

Keywords: Digital transformation; future of work; work change; work practice; digital technologies; intelligent technologies; literature review.

* *Corresponding author.*
E-mail address: timo.tokkonen@oulu.fi

CENTERIS *posters*

Public web portal for agriculture information sharing

Ana Mendes[a], Cátia Cardoso[a], Nuno Figueiredo[a,b,*], António Cunha[a,c],
Joaquim Sousa[a,c], António Sousa[a,c]

[a]University of Trás-os-Montes and Alto Douro, Vila Real, Portugal
[b]School of Technology and Management, P. Porto, Felgueiras, Portugal
[c]INESC Technology and Science (INESC-TEC), Porto, Portugal

Abstract

Web portals are already being used to support several tasks in agriculture but are still developed and used for very specific use cases. In this paper a public web portal is proposed to allow information sharing among all interested in agriculture data like farmers and researchers. Publicly available agriculture related data collection, analysis, comparison and aggregation was performed based on the most known platforms. A web portal was specified and developed based on the available information and built using a simple support database and user interfaces. Although the presented web portal is still currently in development it constitutes a solid base structure for future improvements, new features and a stimulus for farmers and researchers to share agriculture related data using the proposed web portal.

Keywords: Agriculture, web portals, platforms, satellite data, information sharing.

1. Introduction

A considerable amount of web portals is currently being used to support farmers in various tasks [1]. In low-density regions these technologies stimulate production flow, reduce the shortage of labor and abandonment of lands [2]. Advertisement and selling of agriculture products locally [3] or globally [4] are also achieved using web portals with access to statistical information and transactions registration using blockchain technology [5]. Other usages include crop diseases identification based on various types of datasets [6] or automatic irrigation systems [7]. Usability of web portals is also a topic of investigation [8] along with more specific aspects like the optimization of available information in order to increase portals usage by users [9].

Although web portals are already being used to support several tasks in agriculture they are still developed and used for very specific use cases. In order to achieve a sustainable agriculture an active collaboration should be stimulated between the different actors [10].

In this paper a public web portal is proposed to allow information sharing among all interested in agriculture data like farmers and researchers.

2. Data collection

In order to define the structure of the proposed web portal an initial survey of platforms with publicly available agriculture related data was performed. Among the surveyed platforms were included the SentinelHub (Fig. 1), CropMonitoring or Spectator just to mention a few. The data collection was performed considering factors such as: a) Whether or not the available data was public; b) The data resolution (spatial, temporal); c) Availability/downloadable information; d) Possibility of data filtering.

3. Data analysis

A comparative study of surveyed platforms was then performed. The comparison was based on the type of data made available: satellite images, temperature data, humidity, etc., in order to collect the maximum available information and avoid redundance. Since the most common data available in the surveyed platforms was satellite information the focus of this research has been given to this type of information with a more detailed analysis presented next.

One of the advantages of the high availability of satellite information in the surveyed platforms is the possibility to filter information by spatial resolution, temporal resolution, etc. in the proposed web portal.

In order to systematize satellite information comparison from each platform several comparative tables were generated. The platform comparison, shown as an example in Table 1, allows to determine the resources that each platform provide.

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

Table 1. Platform comparison

Platforms	Image Download	Timelapse	GIF'S	Topographic Map	Apply Filters
Sentinelhub	X	X	X		X
World Imagery Wayback			X		
Crop Monitoring	X			X	X
Land Viewer	X	X	X		X
Spectator	X				
Google Earth Pro	X			X	

In platforms where satellite images were available a comparison analysis was performed in order to determine the ones with available filtering. Also, a comparison of available/best spatial resolution of satellite images in the different platforms was performed.

4. Web portal development

Once the data has been collected and analyzed a specification of the main features of the web portal was performed. The development phase included a first approach to create a simple database structure to support the web portal and its visual interface (mockup).

5. Conclusions

In this paper an ongoing development of a public web portal was presented which is intended to allow information sharing among all interested in agriculture data, like farmers and researchers. The data collection, analysis, compilation and aggregation made available publicly by the most known platforms is already finished. A first approach to the visual interface of the web portal was already performed but it is still under development. As the available data in the web portal increases a more complex database structure will be created to support it. Also, as future work it is intended to include a module in the web portal that allows users to register and publish newly available agriculture related data.

References

[1] Thanopoulos, Ch, Protonotarios, V., Stoitsis, G., 2012. "Online Web portal of competence-based training opportunities for Organic Agriculture", AGRIS on-line Papers in Economics and Informatics. 4.

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

[2] Pinto, D., Alves, R., Matos, P., Pousa, D., 2020. "e-SmallFarmer - A solution for small farming", 2020 IEEE International Workshop on Metrology for Agriculture and Forestry (MetroAgriFor), pp. 104-108, doi: 10.1109/MetroAgriFor50201.2020.9277558.

[3] Sneha Iyer, R., Shruthi, R., Shruthhi, K., Madhumathi, R., 2021. "Spry Farm: A Portal for Connecting Farmers and End Users", 2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS), 2021, pp. 429-433, doi: 10.1109/ICACCS51430.2021.9441815.

[4] Kundu, J., Debi, S., Ahmed, S., Halder, S., 2017. "Smart e-agriculture monitoring system: Case study of Bangladesh", 2017 4th International Conference on Advances in Electrical Engineering (ICAEE), 2017, pp. 641-646, doi: 10.1109/ICAEE.2017.8255435.

[5] Talreja, R., Chouksey, R., Verma, S., 2020. "A Study of Blockchain Technology in Farmer's Portal", 2020 Second International Conference on Inventive Research in Computing Applications (ICIRCA), 2020, pp. 828-833, doi: 10.1109/ICIRCA48905.2020.9182969.

[6] Salehin, I., Talha, I., Saifuzzaman, M., Nessa, N., Nur, F., 2020. "An Advanced Method of Treating Agricultural Crops Using Image Processing Algorithms and Image Data Processing Systems", 10.1109/ICCCA49541.2020.9250839.

[7] Rani, M., Sethuramalingam, K., 2014. "Web based service to monitor automatic irrigation system for the agriculture field using sensors", 1-5. 10.1109/ICAEE.2014.6838569.

[8] Benda, P., Šmejkalová, M., Šimek, P., 2016. "Usability Analysis of Agricultural Portal eAGRI in Terms of the General Public", AGRIS on-line Papers in Economics and Informatics, Czech University of Life Sciences Prague, Faculty of Economics and Management, vol. 8(4), pages 1-9, December.

[9] Ahmad, F., Zakaria, N. H., Osman, W. R. S., 2008. "Transforming Information-Based Agricultural Portal to Knowledge-Based Agricultural Hub", 2008 3rd International Conference on Information and Communication Technologies: From Theory to Applications, 2008, pp. 1-4, doi: 10.1109/ICTTA.2008.4529914.

[10] Ramanauskas, J., Vienažindienė, M., Rauluškevičienė, J., Žukovskis, J., 2021. "Collaboration Perspectives Developing Sustainable Agriculture: The Case of Lithuanian Farmers", European Countryside, Sciendo, vol. 13(4), pages 697-714, December.

Open strategy in higher education: a case study in a public university

Andrey Anderson dos Santos*, Eliana Maria dos Santos Bahia Jacintho, Isaías Scalabrin Bianchi, Rosalia Lavarda

Federal University of Santa Catarina, Eng. Agronômico Andrei Cristian Ferreira St., Florianópolis, 88040-900, Brazil

Abstract

IT enables higher education institutions to open their processes in a strategic way. Open Strategy and Open Government are both phenomena that claim for transparency in order to involve the internal and external participants in shared decision making. The use of IT mechanisms should allow transparency and positively impact public universities reputation. This study aims to understand how the relationship between open strategy and open government takes place considering a crisis episode. We carried out a case study in a public university. Data collection was based on evidentiary sources namely: documentation, archival records and direct observations. The findings indicate that the most important feature of the open strategy phenomenon is transparency and IT is very important in this process, configuring itself as a signal for organizations of its relevance to the governance flow. To continue this research, it is recommended to evaluate the dimensions of participation and inclusion in the strategic scope of universities.

Keywords: open strategy; open government; transparency; case study

1. Introduction

Open strategy is a concept that embraces a set of practices that can be mixed in different contexts with a view to involve internal and external stakeholders in the strategy formation. Its main principles are: transparency, inclusion and participation ([1], [2]). Transparency refers to the internal or external visibility of information about an organization's strategy [3]. Inclusion is the extent to which the organization involves internal and external stakeholders in the strategy formation process [4]. While inclusion is oriented towards making connections between people and issues over time, participation is oriented towards increasing contribution to decisions [1]. To facilitate transparency, inclusion and

---

* Corresponding author. Tel.: +55 48 996-046-051.

E-mail address: anndreys@gmail.com.

CENTERIS/PROJMAN/HCIST 2022

ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

participation, IT-enablement is essential because allows connections with a much broader group of stakeholders than ever before [5].

Examples of open strategy have happened in private sector [6] and even governmental organization, which allows us to state that in a bureaucratic context, effective strategy implementation can result through various open-strategizing practices [5]. Literature has sought to find the relationship between open strategy and other phenomena [7]. In this sense, the open strategy is similar to the open government movement when we see that both seek transparency in favor of conscious decision-making by stakeholders and citizens. This common principle tends to address the problem of corruption when we bring the analysis into the public sector [8].

Knowing a government's position on a scale of openness as well as obtaining measurement results can help a government's development path [9]. Therefore, this article intends to answer the research question: How does the open strategy phenomenon in public administration occur? The objective of this work is to understand the process of strategic opening in public organizations. A brief theoretical background will be presented and through the applied methodology, the findings and discussions of a case study in a public organization that has prioritized the development of a culture of transparency due to an external event.

2. Theoretical background

This section addresses three themes: (i) open strategy; (ii) public management; and (iii) open government.

2.1. Open Strategy

Although there is often a deliberate top-down focus on the strategic process, researchers have recently started claiming to open it to groups outside the Top Management Team (TMT) [10], [11]. From the strategic opening, more information is available, so that more people are motivated to engage in strategic conversations [3]. The opening dimensions are: i) inclusion: translates as the range of people involved in developing the strategy, the extent to which the organization involves internal or external stakeholders in the strategy formation process; ii) transparency: the visibility of information about the organization's strategy, both during the formulation process and in relation to the strategy finally produced; iii) shared decision-making: a clearer understanding of openness needs to treat shared decision rights as an indispensable element of openness [10].

2.2. Public Management

Policies and programs that structure and guide social and political life today are the result of the interaction of many different groups and organizations, the mixture of many different opinions and interests, in which the government is indeed a substantial actor, but not in charge [12]. Cooperation is

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

described as the preferred concept of public governance [13], where the central importance of recent changes is based on information technology (IT), management systems and methods of interaction with citizens and other service users in civil society. The new constellation of ideas and changes is called: "digital-era governance" (DEG) or e-governance [14], [15]. Digital governance promises to improve government processes through citizen co-production, but governments are slow to adopt new governance technologies [15]. Good governance implies practices of transparency, accountability and responsiveness [8], these issues are essential for the next topic.

2.3. Open Government

One of the ways to measure transparency in government relations with citizens is through the availability of public records. The potential for dissemination of these records has changed substantially with the advent of the Internet. So, public transparency came to be reflected on the websites of government agencies [16]. The use of technology is an important way to tackle corruption [17] and, in this context, collaborative innovation should support the anti-corruption solutions [18].

We find a straight relationship between the phenomenon of open strategy and open government. Governments have dedicated themselves to the digitization of their processes and the transparency of their actions in order to create greater opportunities for citizens to discuss solutions and propose clear actions, based on open data [9]. As seen in the topic about Open Strategy, there is a claim for making strategy beyond the Top Management Team (TMT). The same phenomena is seen in Open Government, where citizens are called to be part of the solution and the upper echelon of government, such as the TMT, begins to open to a policy of transparency and participation.

3. Methodology

This is a research with a qualitative approach, which starts with assumptions and the use of interpretive/theoretical structures that inform the study of research problems, addressing the meanings that individuals or groups attribute to a social or human problem [19].

In order to contextualize the research to the Brazilian reality, we present a case study in a public university, located in Southern Brazil, that suffered a strong external control action, leading it to modify its practices of transparency and disclosure of data. The case study investigates a contemporary phenomenon in a real world context, especially when the boundaries between the phenomenon and the context cannot be clearly evident [20].

To explain the selection of the case, a contextualization is needed. Public institutions of higher education are part of the public context. They are innovative and capable of transforming the economic and social scenario [21]. Also, in Brazil, we find some barriers to the expansion of transparency in public administration, which is an important principle for strategic and also governmental opening. Closed government is still considered the standard and the right way to do things in government [22].

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

From February 2018 to November 2020, they were applied data collection instruments based on evidentiary sources [20], namely: documentation, archival records and direct observations. They are described in the following: i) documentation: includes internal and external rules and regulations for the functioning of the sector; ii) archival records: the sector's website was selected because it is the main means of communication to society about its activities and the news published in the online media about the case studied were also analyzed; and iii) direct observation: the materiality context was observed in the field.

For the analysis of the case, data triangulation was used, which involves the use of these different data sources to analyze a research question from different perspectives [23], considering the theoretical background and data from the field.

4. Findings and discussions

The selected Brazilian university was founded over 60 years ago and offers for free: 120 undergraduate courses, 87 master's degrees, and 56 doctorates. This university is among the 10 best in the country, the 8th in Latin America [24] and has a consolidated structure in five campuses. One of university's sectors covers online undergraduate and professional development courses. These courses are part of a national public program that aims to form teachers and workers of basic education, in addition to expanding access to public higher education. It was created in 2006 and since then the program has formed more than 800 thousand students. Therefore, this research analyzes in particular these online undergraduate courses inside the university.

In the specific higher education institution, there have been almost 60 projects between undergraduate and professional development courses. Each of these courses has its own coordination and they are managed by a general coordination, where the focus of the study is established. The general coordination is responsible for allocating federal resources according to the needs of each course offered by the university.

A serious (strategic) episode occurred when the sector was the subject of a federal investigation, in 2017, that sought to find irregularities in payments to employees of these courses financed as projects by public funds. In 2019, some results were documented in some control bodies, the external control agency responsible for the supervision of federal resources and the university's internal control body, even by the action of the federal police. Among the findings in the audits are: payment to some persons not linked to the execution of the contract and duplicate payments for the same object.

The case gained a lot of media repercussion, generating speculation that extrapolated the university's ability to be accountable to society. The sector in the case was prevented from offering new courses and had to offer those that were in progress with limited resources. In order to make the university's actions more transparent within the scope of the courses that were investigated, the general coordination opted for the disclosure of each payment received by the employees. The tool that made it possible was the sector's website. A link was created so that the public could view the values and functions through which employees were being paid.

As the courses are financed by public resources, there is a legal understanding that selecting a collaborator requires a competition, which must be widely publicized. Thus, in addition to the payment information, the selection process in which the contracted personnel participated was informed. The call for candidates, their scores and placements are also made public.

The sequence of activities that are contemplated in the payment process is also available to the public through Business Process Management (BPM). Internal and external control of contracts executed by the sector is allowed from process mapping.

Answers to Frequently Asked Questions (FAQ) is also one of several attempts to provide highly focused access to textual information and this task has received a lot of attention in recent years [25]. The sector of the university implemented a FAQ along with Open Source Ticket Request System (OTRS), a Perl based trouble ticket (or issue management) system [26].

The courses that are the subject of our case are governed by university regulations regarding the progress of pedagogical projects, as well as national regulations and public policies. The administrative and operational structure complies with the federal administration's financing parameters. So that the public is aware of the legislation involving the courses, these regulations are published in the sector's website.

Although these actions seem basic, a search was carried out on different websites in sectors similar to our case. It was noticed that these actions occur in few universities. We found the websites of 43 public federal universities that participate in the same program. The search on their websites took place between March 2 and 11, 2020.

An access button or a link to a space named "transparency" was not found in 79% of the analyzed universities. As for the disclosure of amounts paid, 88% do not meet this analysis criterion. Almost all (95%) disclose the selection processes of their employees on their websites. Among those universities, 92% do not publish their mapped processes on their institutional websites. Regarding the presentation of answers to frequently asked questions, 55% do not adopt this procedure. More than half (56%) do not publish their regulations, either at the federal or institutional level.

After three years since the operation started (in 2017), the studied university was authorized by the federal government to offer new courses, for having intensified its data opening policy as shown in Figure 1.
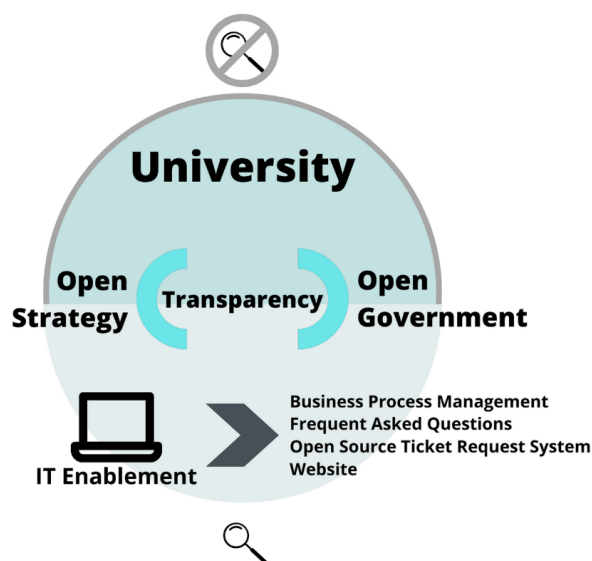
Fig. 1 Scheme of Open Strategy and Open Government supported by Information Technology at University

Universities spend numerous resources to build their reputations and suddenly find their reputations undermined due to the negligence or indiscretion of some [27]. Opening the university in order to deliver greater accountability (according to the episode in the case studied) requires governance as strategic driving force [28]. The movements to open government and strategy equally value transparency. Our case study sought to illustrate the process of strategic opening [29] in public organizations and how the lack of transparency could result in a serious damage.

Trust in e-government addresses citizens' perceived judgment about the transparency and accountability of e-government delivery [30]. Digital files and records become essential for citizens to reach public administration information, as well as favoring citizens' participation in strategic issues for society. Considering the goal established, we understand that the process of strategic opening in public organizations requires IT support.

5. Conclusion, limitations and future research

The main contribution of this study considering the phenomenon of open strategy and open government is to shed light in this relationship that is demanding for more studies. By adopting portals and tools as an open strategy resource, internal governance flows are favored. The most important feature of the open strategy phenomenon is transparency, which was the focus of the actions reported in our case. As a limitation, there was no attempt to verify the transparency in the academic monitoring of the courses, such as student numbers, scope of curriculum plans and of the pedagogical project. It would allow more citizens to know the actions of public administration in a matter of extreme social importance, which is education. Besides, to deepen concerning topics as compliance with regulation and legitimacy are part of the transparency needed to strategy openness [31], to which further studies are required.

Acknowledgements

References

[1] K. S. Quick and M. S. Feldman, "Distinguishing participation and inclusion," *J. Plan. Educ. Res.*, vol. 31, no. 3, pp. 272–290, 2011, doi: 10.1177/0739456X11410979.

[2] R. Whittington, L. Cailluet, and B. Yakis-Douglas, "Opening strategy: Evolution of a precarious profession," *Br. J. Manag.*, vol. 22, no. 3, pp. 531–544, 2011.

[3] J. Hautz, D. Seidl, and R. Whittington, "Open Strategy: Dimensions, Dilemmas, Dynamics," *Long Range Plann.*, vol. 50, no. 3, pp. 298–309, 2017, doi: 10.1016/j.lrp.2016.12.001.

[4] J. Baptista, A. D. Wilson, R. D. Galliers, and S. Bynghall, "Social Media and the Emergence of Reflexiveness as a New Capability for Open Strategy," *Long Range Plann.*, vol. 50, no. 3, pp. 322–336, 2017, doi: 10.1016/j.lrp.2016.07.005.

[5] H. J. Doeleman, D. H. van Dun, and C. P. M. Wilderom, "Leading open strategizing practices for effective strategy implementation," *J. Strateg. Manag.*, 2021.

[6] Y. Benkler and H. Nissenbaum, "Commons-based peer production and virtue," *J. Polit. Philos.*, vol. 14, no. 4, pp. 394–419, 2006, doi: 10.1111/j.1467-9760.2006.00235.x.

[7] L. Dobusch, G. von Krogh, and R. Whittington, "Sub-theme 50: Open Strategy: Practices, Perspectives and Problems."

[8] T. D. Beshi and R. Kaur, "Public Trust in Local Government: Explaining the Role of Good Governance Practices," *Public Organ. Rev.*, vol. 20, no. 2, pp. 337–350, 2020, doi: 10.1007/s11115-019-00444-6.

[9] N. Veljković, S. Bogdanović-Dinić, and L. Stoimenov, "Benchmarking open government: An open data perspective," *Gov. Inf. Q.*, vol. 31, no. 2, pp. 278–290, 2014.

[10] H. Adobor, "Open strategy: role of organizational democracy," *J. Strateg. Manag.*, 2020.

[11] P. Jarzabkowski, J. Balogun, and D. Seidl, "Strategizing: The challenges of a practice perspective," *Hum. Relations*, vol. 60, no. 1, pp. 5–27, 2007, doi: 10.1177/0018726707075703.

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

[12] R. B. Denhardt and J. V. Denhardt, "The new public service: Serving rather than steering," *Public Adm. Rev.*, vol. 60, no. 6, pp. 549–559, 2000, doi: 10.1111/0033-3352.00117.

[13] R. Reiter and T. Klenk, "The manifold meanings of 'post-New Public Management' – a systematic literature review," *Int. Rev. Adm. Sci.*, vol. 85, no. 1, pp. 11–27, 2019, doi: 10.1177/0020852318759736.

[14] P. Dunleavy, H. Margetts, S. Bastow, and J. Tinkler, "New public management is dead - Long live digital-era governance," *J. Public Adm. Res. Theory*, vol. 16, no. 3, pp. 467–494, 2006, doi: 10.1093/jopart/mui057.

[15] A. Meijer, "E-governance innovation: Barriers and strategies," *Gov. Inf. Q.*, vol. 32, no. 2, pp. 198–206, 2015, doi: 10.1016/j.giq.2015.01.001.

[16] C. L. Armstrong, "Providing a clearer view: An examination of transparency on local government websites," *Gov. Inf. Q.*, vol. 28, no. 1, pp. 11–16, 2011, doi: 10.1016/j.giq.2010.07.006.

[17] A. Prasad and S. Shivarajan, "Understanding the role of technology in reducing corruption: A transaction cost approach," *J. Public Aff.*, vol. 15, no. 1, pp. 19–36, 2015, doi: 10.1002/pa.1484.

[18] W. M. Abreu and R. C. Gomes, "Shackling the Leviathan: balancing state and society powers against corruption," *Public Manag. Rev.*, vol. 00, no. 00, pp. 1–26, 2021, doi: 10.1080/14719037.2021.1893802.

[19] J. D. Creswell, *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications, 2017.

[20] R. K. Yin, *Case study research: Design and methods*, vol. 5. sage, 2009.

[21] C. Kerr, *The uses of the university*, vol. 29. Harvard University Press, 2001.

[22] E. M. Luciano, G. C. Wiedenhöft, and F. P. dos Santos, "Promoting social participation through digital governance: Identifying barriers in the brazilian public administration," in *Proceedings of the 19th Annual International Conference on Digital Government Research: Governance in the Data Age*, 2018, pp. 1–9.

[23] L. A. Guion, D. C. Diehl, and D. McDonald, "Triangulation: Establishing the validity of qualitative studies," *Edis*, vol. 2011, no. 8, p. 3, 2011.

[24] "Ranking Web of Universities." .

[25] V. Jijkoun and M. de Rijke, "Retrieving answers from frequently asked questions pages on the web," in *Proceedings of the 14th ACM international conference on Information and knowledge management*, 2005, pp. 76–83.

[26] P. Kácha, "OTRS: streamlining CSIRT incident management workflow," in *WSEAS International Conference. Proceedings. Recent Advances in Computer Engineering*, 2009, no. 13.

[27] M. Downes, "University scandal, reputation and governance," *Int. J. Educ. Integr.*, vol. 13, no. 1, p. 8, 2017.

[28] C. Bratianu and F. Pinzaru, "University governance as a strategic driving force," in *European Conference on Management, Leadership & Governance*, 2015, p. 28.

[29] H. W. Volberda, S. Khanagha, C. Baden-Fuller, O. R. Mihalache, and J. Birkinshaw, "Strategizing in a digital world: Overcoming cognitive barriers, reconfiguring routines and introducing new organizational forms," *Long Range Plann.*, vol. 54, no. 5, p. 102110, Oct. 2021, doi: 10.1016/j.lrp.2021.102110.

[30] S. Malodia, A. Dhir, M. Mishra, and Z. A. Bhatti, "Future of e-Government: An integrated conceptual framework," *Technol. Forecast. Soc. Change*, vol. 173, p. 121102, 2021.

[31] C. Stadler, J. Hautz, K. Matzler, and S. F. von den Eichen, *Open Strategy: Mastering Disruption from Outside the C-Suite*. MIT Press, 2021.

Databasing on demand for research data repositories explained with a large epidoc dataset

Sylvia Melzer[a,*], Simon Schiff[b], Franziska Weise[a], Kaja Harter[a], Ralf Möller[b]

[a]Universität Hamburg, Centre for the Study of Manuscript Cultures, Warburgstraße 26, 20354 Hamburg, Germany
[b]University of Lübeck, Institute of Information Systems, Ratzeburger Allee 160, 23562 Lübeck, Germany

Abstract

In this article, we explain how databasing on demand (DBoD) can be used to automatically transfer large amounts of datasets to a database and to build information systems on top of the database with a domain-specific website for searching and representing research data considering the scholars' requirements.

Keywords: Enterprise resource planning; humanities; research data repository; EpiDoc; databasing on demand; information system

1. Introduction

Inscriptions on stone, metal, and other durable materials are often the only means of obtaining contemporary information on cultures of the past. Hundreds of thousands have survived and are made accessible to scholars, usually via printed media. Still, the demands of large document collections led in the last decades to the search for ways to encode a wide range of information, such as inscriptions, as electronic texts.

The EpiDoc Guidelines [1] have been published and are used by scholars in a wide variety of epigraphic disciplines to exchange research data. Recently in the field of epigraphy, thousands of EpiDoc files have been created to document epigraphic data and are usually stored in research data repositories such as the Research Data Repository (RDR) [2] at the Universität Hamburg. However, the EpiDoc format is a machine-readable format. To search for specific information in the EpiDoc files therefore requires a user-friendly interface with a search function. In addition, to enable the

CENTERIS/PROJMAN/HCIST 2022

ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

interpretation of information retrieval results in a domain-specific and user-friendly way, the research data from the EpiDoc files requires a transfer to a human-readable data representation format. In general, humanities scholars determine how research data must be presented. A variety of tools and approaches exist for building information systems, nevertheless, the biggest challenge is to empower scholars to use available tools and approaches without the help of an IT expert. Then the scholars can build their information systems themselves based on their project-specific requirements using the archived data from research data repositories. Thus, an approach is required to enable scholars to build information systems by themselves. Therefore, we have developed the databasing on demand (DBoD) approach so that scholars can build project-specific information systems on demand in a few hours and with few resources. In this paper, the DBoD is explained using a large EpiDoc dataset. DBoD can also be applied to other data formats making the approach universally applicable in the humanities as well as in other fields. Our approach shows that the implementation and usage of enterprise resource planning systems is increasing in the humanities as well.

2. Related Work

The tool EpiDoc Front-End Services (EFES) was developed to convert EpiDoc files from a machine-readable to a human-readable data representation, considering the epigraphers' data representation requirements. However, EFES must be installed locally before a dataset can be displayed, and extending it to display additional data is not possible without programming.

3. EpiDoc Edition of Inscriptions

Ancient inscriptions passed on to modern times only on durable materials such as stones - not seldom fractured and fragmented. But even the tiniest bit of information on an old stone can be important for an ancient historian to reconstruct the past. Yet the information an inscription provides goes far beyond the content of its text. In addition to the content, date and type of the text, also the object on which the text is written, its origin and fabrication are in the scholar´s interest. Like the well-established and universalized Leiden Conventions as standard for symbols and brackets to edit an epigraphic or papyrological text, the idea of EpiDoc is to use a common set of rules based on XML to encode ancient texts and their research data to share them among scholarly and educational projects – unified and machine-readable. Thus, the general qualitative analysis of the inscription texts can be subjoined now by a quantitative analysis of these texts as well as the history and materiality of the objects on which the texts appear.

4. Transforming Documents into EpiDoc for Databasing on Demand

We have observed that the documentation of data is often done in a well-structured way by humanities scholars, even if they are not encoded with a markup language such as EpiDoc but rather

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

documented with a WYSIWYG (What You See Is What You Get) editor. This editor is structured by a controlled language used by the author depending on the use case, as well as by the Leiden Conventions, and paragraphs highlighted as, for instance, as chapters, table headers, or footnotes. The former is a specific language, indirectly specified by the author of the document. Our new web application enables humanities scholars to upload and transform Word DOCX file into another format such as EpiDoc. Information is extracted from the uploaded Word DOCX file, by the API of an automatically created Python program from an Antlr4 [4] grammar. Antlr4 is a framework for explicitly specifying a controlled language, such as XML, programming languages, word indices, or editions. In our experiments, it has been shown that humanities scholars save weeks of work by using our web application, while they still use their preferred tools and data representation formats.

To build project-specific information systems with few resources and in a short time, we have developed the DBoD framework that users can access to configure and create customized project-specific information systems on demand, based on, e.g. EpiDoc. Heurist [3] is an open-source database management system with a web-front end. Heurist allows researchers without prior IT knowledge to develop data models, store search, and publish data on a website. Considering the ease of use and the features offered by Heurist, this system was chosen to create a Heurist database instance from 6750 EpiDoc files on demand. The DBoD process consists of the following three steps: (1) We have written a JAVA program that transforms all EpiDoc files into one CSV file. (2) A PHP script was written to automatically import all the data from the CSV file in a Heurist database instance. After 5 ½ hours the CSV data was imported into the Heurist database instance. (3) The web page was created with the Heurist web editor, which displays the data based on the scholars' requirements and thus represents an information system.

5. Application and Results

During the project EDAK (Epigraphische Datenbank zum antiken Kleinasien) the Department for Ancient History at the Universität Hamburg collected Greek and Latin inscriptions from modern-day Turkey and represented them in EpiDoc files. The information system for this project was built in 5 ½ hours. Now it is possible to search specifically for epigraphic phenomena, such as erasures or the reuse of inscription supports. This task was difficult and time-consuming in the days of print editions and was often left aside. In this way, connections between inscriptions and the authorities behind them can be easily discovered by providing easy and most important well-structured access to thousands of editions.

Other information systems have been built according to this principle. The data formats and the representation of the research data varied. Text Encoding Initiative (TEI) and JSON files were available as input, which could also be successfully used with the DBoD approach to build information systems on demand in hours. Without using the EpiDoc Stylesheets, the information systems could even be created in minutes with more than 22,000 entries.

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

6. Conclusion

In this paper we have shown that large amounts of data encoded in EpiDoc, DOCX or even other formats can be transferred to a Heurist database instance using our novel DBoD method for the humanities. Furthermore, we have presented that project-specific information systems can be built on top of the database instance with a domain-specific website. We have successfully tested the DBoD approach in several humanities projects. The result we have achieved is a significant reduction in the implementation time of building domain-specific information systems for scholars without the help of an IT expert.

Acknowledgements

References

[1] Elliott, T., Bodard, G., Cayless, H. et al. (2006-2021), "EpiDoc: Epigraphic Documents in TEI XML." Online material, available: http://epidoc.stoa.org/

[2] Universität Hamburg (2020), "Research data repository (RDR)," https://www.fdr.uni-hamburg.de/

[3] Heurist (2022) "A unique solution to the data management needs of Humanities researchers." Software available: https://heuristnetwork.org/

[4] Parr, T. (2013) "The Definitive ANTLR 4 Reference". Pragmatic Bookshelf

The empirical investigation for Internet-only bank switching resistance

Avus Hou*, Yu Zhan Lu

Asia Eastern University of Science and Technology, No.58, Sec.2, Sihchuan Rd. Banciao District 220, Taiwan

Abstract

The Internet-only bank is an emerging banking service that could shift the banking industry paradigm. The present study applies the push-pull model as the theoretical framework to investigate Internet-only bank resistance. A total of 179 respondents were yielded and assessed with component-based structural equational modeling. The results indicate low service quality and convenience were negative influences on resistance. Our study provides insights into Internet-only bank service marketing strategy.

1. Introduction

With the popularity and high utilization rate in smartphone as the major Internet surf platform, the Internet-only bank is an emerging service that could shift the paradigm of banking industry. According to the statistic report, the users of online banking in Taiwan reached 6.463 million in 2020. It increase of 90.9% users than 2019 (FSC, 2020). For example, the online bank belonging to Taishin International Bank-"Richart" owned 2.368 million digital accounts. However, these digital accounts still depend on physical bank branches. It could be difficult for users to accept Internet-only banks in a well financial structure. We discuss the following question:

---

* Corresponding author. Tel.: +886-2-77380145
  E-mail address: avushou@mail.aeust.edu.tw

Research Question: What factors explain the Internet-only bank resistance?

The remainder of this paper proceeds as follows. The next section describes the Internet-only bank and push-pull model; section three shows the research model and hypotheses; section four presents the methodology; section five shows the results.

2. Literature review

Internet-only bank

An online bank refers to a conventional bank that provides financial services online. The online channels offer many conveniences to customers. Online banks can perform fund transfers, bill payments, and many financial services. However, Internet-only banks are similar to online banking in providing financial services through the Internet, but a little different.

The difference is significant in Internet-only banks without any physical branch. They provide all services online through Internet (Lee &Kim, 2020). Internet-only banks are expected to emerge various positive effects on the banking industry.

Push-Pull model (PP model)

The PP model was original from demographic studies. The PP model provides a comprehensive view from both the push effect in the original place and the pull effect in the new destination (Moon, 1995). The model was applied in several service switching contexts, including social media switching, airline switching, and MMORPG game switching (Hou &Shiau, 2020; Jung et al., 2017; Sun et al., 2017). Therefore, the PP model is used as the theoretical framework to apply on Internet-only bank resistance because the resistance is a result of migration evaluation from incumbent bank service to Internet-only bank.

3. Hypothesis

Push effects (low service quality)

Zeithaml and Berry(1985) point out that service quality is "the degree to which an organization meets customer expectations on a consistent basis". In the banking industry service quality includes face-to-face personnel services and other service channels such as ATMs or online banking system. Service quality is considered an important determinant of the company's customers (Lee &Kim, 2020). In Internet-only bank, mostly services provide through the Internet, the stability of the system and the processing speed of online customer service will affect the customer's perception of service quality. Thus, we hypothesize that:

H1: Push effects (low service quality) has a negative effect on Internet-only bank resistance.

Pull effects (convenience)

Convenience refers to the time and effort saved by customers while purchasing and using a service (Berry et al., 2002). The effort minimization aspect of comfort covers keeping cognitive, emotional, and

CENTERIS/PROJMAN/HCIST 2022

ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

physical activities that customers go through while purchasing and using a service (Jiang et al., 2013). Several studies provide evidence concerning the convenience effect on relationship marketing, such as customer complain, customer loyalty, and their tendency to switch service providers .

H2: Pull effects (convenience) has negative effect on Internet-only bank resistance.
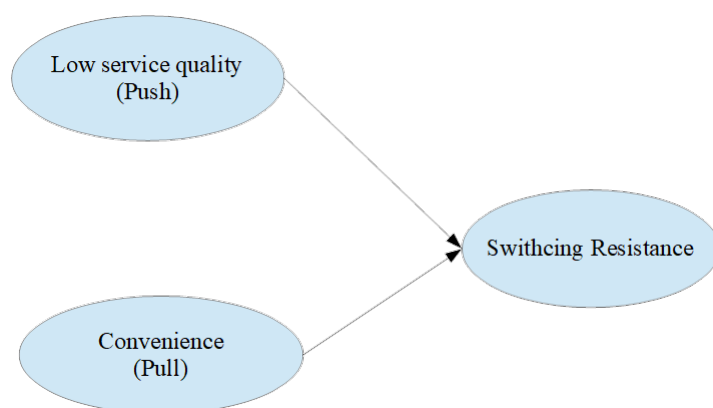
Fig. 1 - Research model

4. Methodology

The survey instrument was developed based on prior literatures. All questionnaires were modified slightly from the prior studies to suit the context of Internet-only banks. There are three constructs with 9 items.

Resistance measures using 3 items adapted by Hou and Shiau (2019). The low service quality was measured using four items from Hou and Shiau (2019). Convenience is measured using three items from Lu and Wung's (2021) scale.

The questionnaire was first reviewed by two experts in the banking industry to validate it for the specific context. Before starting the regular survey process, a pilot test was conducted with eight master students to evaluate the validity of the wording in the questionnaire.

Data was collected via an empirical field survey with subjective-selected subjects. We placed messages on the largest survey-related website in Taiwan: MySurvey, (http://www.mysurvey.com.tw). These messages ask for volunteers who had any online bank experience. The online survey hyperlink was sent to each respondent through e-mail because a gift certificate with a value of US$3 was sent to each respondent who filled out the questionnaire as an incentive. In this way, our research yielded 179 respondents.

5. Results

A two-stage approach was used to test the model. First, a test for Cronbach's alpha and convergent validity was made to examine the reliability and validity. Second, the theoretical model was tested by using PLS, a latent structural equations modeling technique a component-based approach to estimation. The PLS allowed latent constructs to be modeled either as formative or reflective indicators (Ringle et al., 2015).

The PLS results showed both the low service quality (push effect) of the incumbent has a negative influence on resistance. Opposite, the convenience (pull effect) of the Internet-only bank has a negative impact on resistance. Internet-only banks should know convenience is the critical construct for their service success and deploy the appropriate marketing strategies.

References

FSC. (2020). Digital deposit account business statistics. In Financial Supervisory Commission. https://www.banking.gov.tw/ch/home.jsp?id=591&parentpath=0,590&mcustomize=multimessage_view.jsp&dataserno=201911270001&dtable=Disclosure

Hou, A., &Shiau, W.-L. (2020). Understanding Facebook to Instagram migration: a push-pull migration model perspective. Information Technology & People, 33(1), 272–295. https://doi.org/10.1108/ITP-06-2017-0198

Jung, J., Han, H., &Oh, M. (2017). Travelers' switching behavior in the airline industry from the perspective of the push-pull-mooring framework. Tourism Management, 59, 139–153. https://doi.org/10.1016/j.tourman.2016.07.018

Lee, J. M., &Kim, H. J. (2020). Determinants of adoption and continuance intentions toward Internet-only banks. International Journal of Bank Marketing, 38(4), 843–865. https://doi.org/10.1108/IJBM-07-2019-0269

Moon, B. (1995). Paradigms in migration research: Exploring 'moorings' as a schema. Progress in Human Geography, 19(4), 504–524. https://doi.org/10.1177/030913259501900404

Ringle, C., DaSilva, D., &Bido, D. (2015). Structural equation modeling with the SmartPLS. Bido, D., Da Silva, D., & Ringle, C.(2014). Structural Equation Modeling with the Smartpls. Brazilian Journal Of Marketing, 13(2).

Sun, Y., Liu, D., Chen, S., Wu, X., Shen, X.-L., &Zhang, X. (2017). Understanding users' switching behavior of mobile instant messaging applications: An empirical study from the perspective of push-pull-mooring framework. Computers in Human Behavior, 75, 727–738. https://doi.org/https://doi.org/10.1016/j.chb.2017.06.014

Zeithaml, V. A., &Berry, L. L. (1985). A Conceptual Model of Service Quality and its Implication for Future Research (SERVQUAL). January. https://doi.org/10.2307/1251430

PROJMAN *papers*

A Novel model to adapt CMMI Level 2 by Assessing the Local SMEs of Bangladesh

Fariya Oyshi*, Anu Bonik, Md Osman Haruni Shin, Jawaad Rashid, Mohasina Akter, Mahady Hasan, Farzana Sadia

Independent University Bangladesh, Bashundhara R/A, Dhaka-1229, Bangladesh

Abstract

While software process improvement (SPI) aims at optimizing software processes to produce high-quality software, SPI efforts in software development are still inert in practice, especially in developing countries. In this work, we make an experimental investigation aiming at developing a model for applying SPI of CMMI level 2 practice based on the views and experiences of small and medium-sized software firms in Bangladesh. The primary goal of this study is to determine how commonly a given CMMI practice is adopted to build a new maturity model within specific exercises. We use questionnaire-based survey sessions as the main tool to collect data from 9 SMEs in Bangladesh. Practitioners were asked to choose and rank CMMI level 2 practices based on the five classes of evaluations. Afterward, based on CMMI Level 2 practices from the acquired data, we develop a maturity model for adopting SPI.The paper proposes a model to improve those particular practices to build successful CMMI-based SPI and increase the success rate of CMMI-based SPI initiatives.

Keywords: CMMI, SMEs; Practice Area; Specific Practice; Bangladesh.

A Review of Project Management Practices in EU-funded Horizon2020 Projects

Alberto De Marco[*], Giulio Mangano

Politecnico di Torino, Dept. of Management and Production Engineering Corso Duca degli Abrizzi 24, 10129 Torino (TO), Italy

Abstract

The current global economy is extremely competitive and it requires an efficient funding of public projects, especially when it comes to research and development. Project Management (PM) practices are intended to increase such an efficiency. The objective of this work is to explore the usage of PM methodologies and practices in projects funded by the European Union as part of the "Horizon2020" research framework program from 2014 to 2020. To this end, this research uses of a survey-based data retrieval to investigate the level of perceived PM maturity in Horizon 2020 projects. The results show that Project Managers involved in Horizon 2020 projects hold a high level of PM maturity, especially in the areas of cost management, communication and stakeholders management thus confirming that PM standards, which are imposed by the EU commission as a binding process, are effectively enforced. In conclusion, this work extends the results to provide useful feedback, suggestions, and opportunities for improvement to be implemented in future programs.

Keywords: Project Management; Project Management Adoption; Europe; H2020; Survey.

* Corresponding author
E-mail address: alberto.demarco@polito.it

A Singular Environment: Featuring a Framework for Integrated Project Management

Inês Reis[a], Pedro Ribeiro[b,*]

[a]University of Minho, Campus de Azurém, 4800-058 Guimarães, Portugal
[b] ALGORITMI Research Center, Univerity of Minho,Campus de Azurém 4800-058 Guimarães, Portugal

Abstract

There's always been a need to improve everyone's work process to ease the productivity and effectiveness of project management. However, this task entails many mechanisms, which might take a lot of time and cause the main priorities to be overlooked. That's when open-source environment solutions came. This article explores the need for being able to gather all subject changes in scope, time, cost, and quality, among others. For that were explored open-source environments and selected the one that's most suitable for gathering all characteristics, supported by the eight domains of the most recent version of Project Management Body of Knowledge in its 7th version. Furthermore, this environment also intends to stay updated by supporting future trends such as sustainability, agility, risk, requirements, and benefits management. Thereby, this tool gives a singular way of managing projects in a way that improves performance and increases higher success rates by providing accurate information.

Keywords: Open-source environment; Project management; Future trends.

* *Corresponding author.* Tel.: +351 253 510319.
E-mail address: pmgar@dsi.uminho.pt

Agile teams' assignment model for Scaling Agile

Vitor Anes[a,b,c,*], António Abreu[a,d], Ana Dias[a,b], João Calado[a,b,c]

[a]*Instituto Superior de Engenharia de Lisboa, R. Conselheiro Emídio Navarro 1, 1959-007 Lisboa, Portugal*
[b]*Instituto Politécnico de Lisboa, Estr. de Benfica 529, 1549-020 Lisboa, Portugal*
[c]*Instituto de Engenharia Mecânica (IDMEC), Instituto Superior Técnico, Universidade de Lisboa, Av. Rovisco Pais 1, 1049-001 Lisboa, Portugal*
[d]*Centro de Tecnologias e Sistemas (CTS)–Uninova, Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa, 2825-149 Caparica, Portugal*

Abstract

Adherence to the schedule for completion of a project is one of the basic requirements for the success of a management team. Failure to meet this schedule can have a negative impact on both the business side and the reputation of the company, this issue is a constant challenge in project management. This challenge becomes even greater with agile project management. Agile methodology has increasingly become the method of choice for project delivery. However, in this type of project, uncertainty increases in terms of execution time due to the uncertainty that arises from the agile characteristics that are so valued. Optimized assignment of agile teams based on their performance to project tasks can reduce this uncertainty and increase the probability of success. However, it appears that the tools available in the literature have very limited applicability to this problem.

In this paper, we present a model for agile team assignment that uses the Program Evaluation Review Technique (PERT) along with the effective risk model and the Monte Carlo model. An illustrative case study was used to illustrate the application of the proposed model. The results show that the project execution time is highly dependent on the performance of the agile teams and their respective assignment to the project tasks. In practice, the proposed model enables the determination of the execution time of a given agile project considering the performance of the respective teams.

Keywords: Agile; Scaling Agile; Agile teams assigment;PERT; Effective Risk; Monte Carlo; Project management.

---

* *Corresponding author.*
E-mail address: vitor.anes@isel.pt

An emerging qualitative study on Project management as a bridge between cognitive learning and employability

Erina Guraziu[a][*], Giovanna Del Gobbo[b]

[a]University of Florence, FORLILPSI, Via Laura, 48, Firenze, 50121, Italia
[b]University of Florence, FORLILPSI, Via Laura, 48, Firenze, 50121, Italia

Abstract

The paper presents one of the results of an innovative research on the training value of Project management. The research was realized in the field of the Ph.D. in Education and Psychology at the University of Florence.
The research has investigated the potentiality of Project management for the development of those transversal skills useful for employability. The main focus of the research has been the effects of learning Project management in formal contexts, as well as the embedded training value of Project management itself.
The paper focuses on learning enablers and learning benefits of Project management in tertiary education.

Keywords: Project management employability; transversal skills; sustainability citizens.

* *Corresponding author.* Tel.: a+393288127968; b+393881495874
E-mail address: aerina.guraziu@unifi.it; bgiovanna.delgobbo@unifi.it

An Integrated Multi-project Scheduling, Materials Ordering and Suppliers Selection Problem

Md. Asadujjaman[a,b,*], Humyun Fuad Rahman[a], Ripon K. Chakrabortty[a], Michael J. Ryan[c]

School of Engineering & Information Technology, University of New South Wales, Sydney, Australia
Department of Industrial & Production Engineering, Rajshahi University of Engineering & Technology, Rajshahi, Bangladesh
[c]Capability Associates, Canberra, Australia

Abstract

Conventionally, project managers schedule the activities first; later prepare for materials management, procurement, and supplier selection in project planning. This disjointed process leads in a loss of expected profit for the company owing to a lack of planning coordination. In this paper, a mixed integer programming model is developed for resource constrained multi-project scheduling, materials ordering (MO), and supplier selection (SS) problems to maximize the net profit of the organization. Since the resource constraint multi-project scheduling with MO and SS belongs to the class of problems that are NP-hard. Thus, a genetic algorithm-based memetic algorithm (MA) is proposed to solve the proposed model. The proposed MA utilizes the basic components of genetic algorithm (GA) like selection, crossover, and mutation with a local search. The proposed algorithm is tested on self-generated 16 instances with a range of 2 to 5 projects in a multi-project set with 30 to 90 activities in a project with 6 to 8 suppliers. The results revealed that the suggested MA generates better solutions than the GA by achieving projects higher net present value (NPV). The findings of this paper provide managerial insights for the project managers to secure organizations' profitability.

Keywords: Multi-project Scheduling; Materials Ordering; Procurement, Suppliers Selection; Memetic Algorithm; Forward-backward improvement.

---

* *Corresponding author.* Tel.: +61-480-136628.
E-mail address: jonikhan007@yahoo.com

Analysis of emotional intelligence in project managers: Scale development and validation

Cian Camplisson, Kathryn Cormican[*]

Enterprise Research Centre and LERO—The Irish Software Research Centre, School of Engineering, National University of Ireland, Galway, Galway, Ireland, H91 TK33

Abstract

There is a growing awareness of the positive effects that Emotional Intelligence (EI) has on Project Management (PM). Project Managers (PMs) with high levels of EI have been shown to positively affect project performance, therefore, PMs with high EI should be sought to manage projects. Despite its importance, understanding, measuring, and managing emotional intelligence is an arduous task. Organizations struggle to harness and leverage the benefits that EI is lauded to bring. While previous studies have identified the need for more proactive management practices, there are few practical guidelines available to managers to help them improve their performance as it relates to EI. This exploratory paper addresses this deficit and contributes new knowledge on emotional intelligence for project managers. Through an in-depth analysis of the existing literature, we developed an instrument that allows decision-makers to measure emotional intelligence. This instrument is in the process of validation and thus far, our results show that it is an accurate, reliable, and valid mechanism to measure project managers' emotional intelligence.

Keywords: Project Manager; Emotional Intelligence; Scale Development; Assessment.

* *Corresponding author.*
  E-mail address: kathryn.cormican@nuigalway.ie

Analysis of Project Management Tools to support Knowledge Management

Miguel Clementea[*], Luísa Domingues[a]

[a] ISCTE-Instituto Universitário de Lisboa, DCTI, Avenida das Forças Armadas 36, 1649-026 Lisboa, Portugal

Abstract

Knowledge Management is an essential element for the successful implementation of projects. Due to the temporary nature of the projects and the teams that participate in them, the transfer, integration, and management of knowledge among projects is vital to promote sharing best practices, and to avoid the repetition of previous mistakes, in order to increase the probability of success for the projects and the organization. For this reason, Project Management tools can play a significant role in supporting Knowledge Management. The goal of this paper is to analyze and evaluate the project management tools of the Gartner Leader quadrant (2019 Gartner Magic Quadrant) regarding their potential for the Capture, Storage, Sharing and Application of knowledge, according to the artifacts in the PMBOK [1], and determine which are the best options. Gartner's leader tools were compared to Confluence, referenced as a great choice for knowledge and project document management. For the development of the artifact was used the Design Science Research (DSR) methodology. The application that obtained the highest score was Targetprocess.

Keywords: Project management; Knowledge management; Project management tools.

* *Corresponding author.* Tel.: +351926475120;
E-mail address: mmfce@iscte-iul.pt

Analyzing the Nature of Contractor Claims and Strategies for their Effective Management: A case of BuildServe in Botswana

Ssegawa, J.K * and Keakile, S.ᵃ.

ᵃDepartment of Civil Engineering, Faculty of Engineering and Technology, University of Botswana, P. Bag 0061, Gaborone,

Abstract

Though contractor claims are inevitable, the frequency of their occurrence and their impact on project cost, time or both, can be minimized with effective management by a client during the pre-contact and post-contract phases. The article discusses findings of a study that investigated the nature of claims and the level of effectiveness in managing them by an organisation code named, BuildServe. The latter manages building construction projects for the government of Botswana. A total of 32 projects, implemented in a five-year period (2015-19), were selected and yielded 79 construction claims for the study. A mixed-method approach was employed to analyze and understand their nature. Apart from project document review, experiences of project managers were solicited through interviews, a Delphi technique and a focus group discussion. Results indicated that a majority (61%) of the claims related to requests for extension of time with additional cost while the rest were purely requesting for extension of time (31%) or cost (8%). Furthermore, results indicated that on average the completion period was twice the contracted duration of which the awarded extension of time contributed half (49.8%) of the project delays, the other half is due to rejected (21.3%) and non-claimed delays (28.9%). In addition, majority (56%) of the claims were due to client breaches of contractual clauses while others were due to common law (19%) and quantum meruit (9%) breaches. Client breaches related to various delays (48%) and changes (22%) to project work. The results indicated that BuildServe needed to improve its claim management regime, an aspect confirmed by the by project managers' self-assessment who noted that first, there is a lack of institutionalization of project evaluation to harness lesson learned from past project implementation experiences. Second, there was also a need for restraint by the client especially in reducing project changes and delays on decisions or actions that affect project work. It is hoped that improving these areas will reduce avoidable claims and hopefully curtail project time and cost overruns.
Keywords: Claims, contractor, contract, construction, FIDIC, lesson learned, delays, disputes.

* *Corresponding author.* Tel: +267 355 4292; Fax: +267-3952305
E-mail address: ssegawaj@ub.ac.bw

Are software projects evaluated using software teams' success criteria? A systematic literature review

Robert Hans[a,*], Senyeki Marebane[b]

[a]*Computer Science Department, Tshwane University of Technology, Soshanguve South Campus, Pretoria 0152, South Africa*
[b]*Faculty of Information and Communication Technology, Tshwane University of Technology, Emalahleni Campus, Emalahleni, South Africa*

Abstract

As diverse as software project stakeholders are, so are their project needs and interests. Furthermore, the criteria to measure project success are based on the stakeholder groups' various needs. It is on the basis of these diverse measurement criteria that project success has become an elusive moving target. Despite this, the measurement and achievement of project success remains a critical milestone in project management for the satisfaction of stakeholders, including software project teams (SPTs). Several research studies have reported project success or failure from various stakeholders' perspective. However, recent studies have projected SPTs as the most neglected key stakeholder group by software project managers and researchers in the project management field. Given this backdrop, conducting a systematic literature review (SLR) research study to determine if there are empirical studies that have evaluated software project success from SPTs' perspective would be of interest to many in the field. According to the study's authors there is no study that has been conducted to determine this. The study found one (1) paper, which evaluated a project based on the SPTs' success criteria, thus showing a research gap and indicating the neglect of this group of stakeholders when it comes to establishing whether software projects meet their needs or not. This study recommends that empirical studies be conducted to close this research gap.

Keywords: software project; project success; project criteria; project teams; stakeholder;.

---

* *Corresponding author.* Tel.: +27(0)12-382-9721.
E-mail address: hansr@tut.ac.za

Autonomy to Project Manager: How to Design?

Annapureddy Rama Papi Reddy[a*]

[a]Indian Institute of Management Nagpur, Nagpur, 441108, India

Abstract

High-risk projects' success depends on a quick response to the on-the-ground manifestation of the risk, and this warrants that the project manager (PM) be given ample autonomy. This autonomy is expensive to the organisation, as it implies that the organisation loses economies of scale. Hence, organisations would prefer to give autonomy only when the project needs it. Additionally, the organisation must depend on the PM to assess the risks associated with the project as he or she has more on-the-ground information. Hence, the organisation must rely on the PM's judgement regarding the project's need for autonomy. This is an information asymmetry problem, and the organisation must design a contract which requires that the project manager reveal the true nature of the project. We derive the 'optimal menu' of contracts the organisation should offer the PM. Our analysis shows that if autonomy is designed to be experienced as *pain*, then the organisation need not pay any information rent to the PM.

Keywords: project manager autonomy; project risk; contracts; project performance.

* *Corresponding author.* Tel.: +00-000-000-0000
E-mail address: papi@iimnagpur.ac.in

BIM training course improving skills of Construction industry professionals

Alcinia Zita Sampaio[*]

University of Lisbon, Higher Technical Institute, Dep. Civil Engineering, Av, Rovisco Pais, Lisbon, Portugal
CERIS – Civil Engineering Research and Innovation for Sustainability, IST, Lisbon, Portugal

Abstract

The implementation of Building Information modelling (BIM) methodology in the construction industry has been covering a wide applicability with recognized benefits in designing, constructing and operating buildings. A recent short course organized in the University of Lisbon, actualized with the most relevant achievement based in master researches, was offered to professional of the industry, namely, architects and civil engineers coming from diverse engineering areas, environment, construction, maintenance, consult and patrimonial enterprises and also from public organizations like city councils. The proposed action covers the areas of construction (conflict analysis, planning and materials take-off), structures (interoperability, analyses and transfer of information between software) and the most recent Heritage Building Information Modelling (HBIM) perspective. The course aims to contribute to the dissemination of the potential of BIM in the areas of designing, construction and refurbishing of historical buildings. The participants followed the course with great interest and satisfaction, formulating several questions directed to the particular activity of each of the attendees.

Keywords: BIM, training course, up-to-date information, skill professional.

* *Corresponding author.* Tel.: +351 218 418 336
E-mail address: zita,sampaio@tecnico.ulisboa.pt

Challenges in the adoption of sustainable criteria in the Swedish property development industry

Ni Made Nindya Desivyana[a], Orestis Farmakis[a], Linda Cusumano[a,b], Rasmus Rempling[a,b,*]

[a]Chalmers University of Technology, Department of Architecture and Civil Engineering, Göteborg, Sweden
[b]NCC Sweden AB, Göteborg, Sweden

Abstract

The construction industry is facing an increased focus on sustainability and climate neutrality, causing property developers to implement new requirements into the procurement documents, which are also driven by the national agenda. This study explores the current state of sustainability practice among Swedish property developers and identifies the main obstacles to expand further the implementation of the sustainability criteria. How the property developers define and implement sustainability requirements has been assessed through qualitative semi-structured interviews, focusing on sustainability certification systems, Life Cycle Assessment (LCA), and social sustainability. The results show usage of sustainability certification systems for marketing purposes and high awareness and practice of LCA, even though the accuracy of LCA was questioned. This study also identified guideline gaps for circular economy and social sustainability measurements, which could relate to low initiatives from the certification systems.

* *Corresponding author.* Tel.: +46-317-722-012.
E-mail address: rasmus.rempling@chalmers.se.

Circular Economy Development both in the Czech Republic and the World

Martin Marek [a*,] Zdeněk Krejza [b]

[a]Institute of Structural Economics and Management, Faculty of Civil Engineering, Brno University of Technology, Veveří 331/95, 602 00, Brno Czech Republic
[b]Institute of Structural Economics and Management, Faculty of Civil Engineering, Brno University of Technology, Veveří 331/95, 602 00, Brno Czech Republic

Abstract

The effort to achieve a balance between industrial development, environment, human health and economic growth in the world represents a driving engine of the latest strategies for resource usage and carbon footprint reduction, which include the application of the Circular Economy (CE) concept. The central idea of the CE concept is to increase the value of resources within a closed system to enable the use of a minimum number of natural resources while providing sustainable economic growth. The aim of this paper is to map the history and evolution of the CE concept to highlight its current application. Historical literary sources and scientific studies were used to map the CE concept evolution while policy instruments provided information mainly on current development. The overview indicates both success and failure of the CE projects over time listed by regions. Successful applications of the CE in the Czech Republic have been identified. The results provide useful information for further research seeking to define the CE concept in practical terms and consider potential opportunities that arise during its implementation.

Keywords: economy; circular; Czech Republic; waste; history; construction waste;.

* *Corresponding author.*
E-mail address: Martin.Marek3@vut.cz

Co-determination and participation in project management. Experiences from the construction of a hospital building in Norway.

Tina Åsgård[a*], Heidi Breistrand Bringsvor[b], Lene Jørgensen[a]

[a]*Western Norway University of Applied Sciences (HVL), Postboks 7030, N-5020 Bergen, Norway*
[b]*Helse Fonna HF, Postboks 2170, N-5504 Haugesund, Norway*

Abstract

Changing the physical structure of a workplace has long-lasting organizational consequences. When managing building projects of this type, it is crucial to involve stakeholders in a way that ensures project success. This study uses a stakeholder perspective and examines how co-determination and participation among hospital employees was managed in the process of extending a hospital building in Norway.

Based on input from stakeholder theory, the analysis focuses on the question of whether the employees and their representatives were subjected to *management of stakeholders* or *management for stakeholders*. Project documents have been analyzed in order to detect who was involved in the decision-making process during the planning of the project, and in what way.

The findings show that individual employees, union and safety representatives took part in the decision-making process, thus, corresponding well with a *management for stakeholders*-approach. However, their stakeholder interests were not fully integrated and assessed in all parts of the process, and the project goal of creating a good place to work was only to a limited degree followed up in practice. Hence, it appears that they were mostly subjected to *management of stakeholders* during the process despite their formal participation and representation in the decision-making process.

Keywords: change management; co-determination; construction; healthcare; Nordic model, stakeholder management.

* *Corresponding author.* Tel.: +47 55587651
E-mail address: tas@hvl.no

Compliance with Golden Rules of Fiscal Policy in Construction Companies

Eva Vitkova[a], Gabriela Kocourkova[a,*]

[1]*Brno University of Technology, Faculty of Civil Engineering, Veveri 331/95, 602 00 Brno, Czech Republic*

Abstract

The present-day situation is associated with less optimistic economic development. At the turn of 2019/2020, the world was struck by a coronavirus pandemic that affected both the economy of the entire country represented mainly by industries and the social level of the population. More than ever, corporate management adhered to the established business rules which include certain fiscal policy rules. These fiscal rules are theoretically referred to as the Golden Rules of Fiscal Policy. These Golden Rules of Fiscal Policy include 4 rules related to assets, sources of asset coverage, their longevity and the investment growth rate. The Golden Rules of Fiscal Policy apply in general to any business subject. However, this paper focuses solely on the construction industry. The aim of the paper is to find out, on a sample of construction companies operating in the Czech Republic, whether they comply with the Golden Rules of Fiscal Policy within their operation and compare these values to the national average. The sample of construction companies was chosen on the basis of carrying out the same activities, the same size in terms of the number of employees, amount of turnover and amount of assets, and operating in the same region of the Czech Republic. The national average of values under the Golden Rules of Fiscal Policy was determined from the statistical data published by the Ministry of Industry and Trade of the Czech Republic (MIT) on its website. Methods of both vertical and horizontal analyses, which represent the basic methods of financial analysis, were used to determine the values of individual Golden Rules of Fiscal Policy for construction companies.

Keywords: Construction Companies; Golden Rules of Fiscal Policy; Vertical Analysis.

* *Corresponding author.* Tel.: +420541148635;
  E-mail address: kocourkova.g@fce.vutbr.cz

Contractor selection for Project execution using multi-attribute decision making

San Cristóbal[*], J.R., Fernández, V., Dominguez, D. Salinas, S., Alvangonzález, R.

University of Cantabria, Spain

Abstract

Contractor evaluation and selection is one of the most important issues in implementing a project. In order to eliminate unqualified contractors having low capabilities to perform the project, it is necessary a method for contractor evaluation and selection not only based on the lowest bid but also in attributes describing their abilities to carry out the project. The evaluation process represents the initial stages that an owner should employ in order to gain further assurance of professional conduct from the contractors that seem capable of achieving the performance requirements of the contract being tendered. During the pre-qualification stage, not only qualitative attributes, such as technical experience or management capability, but also quantitative attributes, such as liquidity or debt ratios, that reflect the financial soundness of the contractor being evaluated, are used. In this paper a multi-attribute decision-making method combining cloud and utility theory is proposed in order to evaluate a group of six contractors.

Keywords: Contractor evaluation; Multi-Attribute; Cloud Theory; Utility Theory.

* *Corresponding author.*
E-mail address: jose.sancristobal@unican.es

CQ-motivation: the X-factor in Global Project Teams?

Neil C. Robinson[a][*]

[a]*Salford Business School, University of Salford, Manchester, United Kingdom*

Abstract

Global project teams (GPTs) have emerged in the 21st century as the primary construct by which complex and often high-stakes changes of global scale are planned and delivered. Data from the field of GPT practice includes the recurrent observation that some GPT practitioners seem to thrive in the cross-cultural context of the GPT, while others flounder. This research paper explores how cultural diversity influences motivation and performance within the GPT. It extracts themes of interest from a detailed literature review and further explores them in the context of a field study of 79 GPT practitioners in 21 countries. CQ-motivation emerges as a potent predictor of motivation and performance in the GPT. The study concludes that GPT team selection processes which actively leverage CQ-motivation, project manager ownership, and the prioritisation of attitude over functional skills, will be supportive of superior GPT performance.

Keywords: Global Project Management; Motivation; Cultural Intelligence; CQ; Cross-cultural.

* *Corresponding author.* Tel.: +61-482-911917.
E-mail address: neil.rob1@outlook.com

Critical Success Factors of University-Industry R&D Collaborations

Gabriela Fernandes[a,*,] José M. R. C. A. Santos[b], Pedro Ribeiro[c], Luís Miguel
D. F. Ferreira[a], David O'Sullivan[d], Daniela Barroso[e], Eduardo B. Pinto[c,e]

[a]*University of Coimbra, CEMMPRE, Department of Mechanical Engineering, Polo II, Coimbra, 3030-788, Portugal*
[b]*Centro de Investigação de Montanha (CIMO) & Laboratório para a Sustentabilidade e Tecnologia em Regiões de Montanha
(SusTEC), Instituto Politécnico de Bragança, 5300-253 Bragança, Portugal*
[c]*Centro Algoritmi, University of Minho, Department of Information Systems, Campus de Azurém, Guimarães, 4804-533,
Portugal*
[d] *National University of Ireland Galway, School of Computer Science, H91 TK33, Galway, Ireland*
[e]*ANI – Agência Nacional de Inovação, S.A., Edifício NET, Rua de Salazares, 842, 4149-002 Porto, Portugal*

Abstract

University-industry R&D collaborations (UICs) play a vital role in stimulating open innovation that leads to new products, processes, and services that creates value for customers and broader societal impact. UICs, however, commonly fail to meet these stakeholders' benefits. This study identifies thirty-four critical success factors (CSFs) for improving UIC success. The study includes a systematic literature review and a longitudinal UIC case study between Bosch Car Multimedia in Portugal and University of Minho, a multi-million Euro R&D collaboration from 2013 to 2021. The importance of the CSFs is discussed in the context of the UIC lifecycle. A survey among researchers and industry practitioners involved in R&D collaborative projects was completed to confirm the analysis of the empirical results. This paper provides UIC managers with CSFs, which, when addressed competently, can provide a basis for successful UIC projects and sustainable university-industry collaborations.

Keywords: Critical success factors, university-industry collaborations, projects.

* *Corresponding author.* Tel.: +351 239 790 790
E-mail address: gabriela.fernandes@dem.uc.pt

Defining the Relational Charter for Commercial Project Contracts

Jonathan Espach, Michaiel C. Bekker[*]

Graduate School of Technology Management, University of Pretoria, South Africa

Abstract

Contracting is an integral part of project management. The contract stipulates the legal and commercial relationship between the two engaging parties. The dynamics of this mutual, contractual agreement is contextualized in the principle-agent theory. In practice, the effectiveness of executing the contractual agreement is dependent on relationship management between the principal and agent, which does not necessarily form part of the formal agreement. This paper aims to identify variables that define the principle-agent relationship and formulization of that in a relational charter. A conceptual model is developed to assess the validity of the agency and relational variables and their interrelationship towards the formation of a relational charter. This paper provides insight into the literature review and conceptual model to be used in field research.

* *Corresponding author.* Tel.: +27 12 420 2822
E-mail address: giel.bekker@up.ac.za

Delivery planning as a method to increase control over design costs

Anders Walberg Nilssen[a*], Jørgen Kolberg[a], Asmamaw Tadege Shiferaw[a]

[a]Department of Mechanical Engineering and Technology Management, Faculty of Science and Technology, NMBU Norwegian University of Life Sciences, 1432 Ås, Norway

Abstract

Delivery planning is a method that determines which deliveries are expected to be delivered at any given time, and the dependency between different deliveries and stakeholders. This study aims to investigate whether the use of the delivery plan increases control over projects' design costs and how Key Performance Indicators (KPIs) are being used to increase the control over the project's design costs. It also identifies the benefits and disadvantages of early involvement of stakeholders in the planning process. The research is a qualitative case study with Livsvitenskapsbygget (LVB) project as the primary case. Supplementary data are collected through interviews from four Norwegian projects and one Dutch project. This study is limited to large construction projects and does not cover other types of projects.

The study has documented results that indicate that delivery planning increases control over a project's design costs. The results show that using delivery planning reduces the need for iterations and increases predictability. Similarly, the proactive use of KPIs in delivery planning is found to be beneficial in controlling project design costs. Furthermore, the study identifies the benefits and disadvantages of early-stage broad involvement of stakeholders in the design phase. The researchers underline the need for further research in this area, as it indicates that it will have a positive impact on the productivity of the construction industry.

Keywords: Delivery planning; design costs; Lean design; design management; Key Performance Indicators; interdisciplinary collaboration; early involvement.

* Anders Walberg Nilssen. Tel.: +47-900-380-13
E-mail address: anders.walberg.nilssen@nmbu.no

Development of an Assessment Model of Organizational Change Readiness by using Fuzzy Logic

Abdelouahab Errida[a,*], Bouchra Lotfi[b], Zaineb Chatibi[a]

[a]Hassan First University of Settat, Faculty of Sciences and Technology, Settat 26000, Morocco
[b]Hassan First University of Settat, National School of Applied Sciences, Berrechid 26100, Morocco

Abstract

The present research used a fuzzy logic approach to develop a model for assessing organizational change readiness. Based on an in-depth literature review, a conceptual model for change readiness was developed with four enablers, 13 criteria, and 51 attributes. To address the ambiguity in change readiness assessment, the fuzzy logic theory was used to calculate two core indexes: the fuzzy organizational change readiness index (FOCRI) and the fuzzy performance importance index (FPII). These indexes are computed to identify the level of organizational readiness for change and its weak attributes, therefore allowing managers to formulate a plan for the improvement of change readiness within their organizations.

The steps to be followed for assessing change readiness are presented in this paper. Also, a case study was used to illustrate the application of this model in the case of a change project that aimed to implement a project management methodology within a Moroccan construction company.

Keywords: Organizational change, Readiness for change, Change management, Fuzzy logic.

* *Corresponding author.*
E-mail address: a.errida@uhp.ac.ma

Digital maturity model for research and development organization with the aspect of sustainability.

Krzysztof Jacek Kupilas,Vicente Rodriguez Montequin[*], Javier García González, Guillermo Alonso Iglesias

Project Engineering Area, University of Oviedo, C7Independencia 13, 33004, Oviedo, Spain

Abstract

Many organizations are trying to assess how they progress on their digital transformation journey. One of the methods to assess this progress is to apply the concept of digital maturity. In this article authors describe how they discovered the need to develop a digital maturity model tailored to research and development organizations and share their experience from testing the first version of this model. Digital maturity can be assessed to determine the current state of the organization and to develop roadmaps helping organizations evolve and respond to market dynamics. The authors firmly believe that there is no responsible digitalization without considering the dimension of sustainability and therefore they included it in their maturity model. A digitally transformed company becomes more efficient, generates less waste, and uses fewer resources, which makes it more sustainable.

Keywords: digital maturity; digitalization; sustainability; R&D.

* *Corresponding author.* Tel.: +34-985104272; fax: +34-985104256.
E-mail address: montequi@uniovi.es

Digital Skills for Project Managers: A Systematic Literature Review

Mohamed Amine Marhraoui[*]

Euromed Business School, Euromed university, Fez
Morocco
a.marhraoui@ueuromed.org

Abstract

Nowadays, project managers are facing various challenges related to volatile and dynamic environment. They should be able to manage successfully changing requirements, budget constraints and multicultural teams across several countries. Due to Covid19 pandemic context, digital skills have become even more important in order to manage remote teams and to handle increasingly complex projects. In this paper, we've conducted a systematic literature review so as to explore the main digital skills which enhance project managers' efficiency. By analyzing the main extracted concepts from the papers resulting from our systematic literature review, we've concluded that adopting digital skills is as important as technical classic project management skills and soft skills. Also, we've performed a quantitative assessment of the 15 selected articles by using bibliometric tools. Indeed, our clustering analysis on the selected papers confirms the rise of digitals skills importance since the Covid19 pandemic. In light of the above, we believe that adopting and mastering digital skills is a requirement for current project managers in order to succeed in a changing and volatile environment. Digital skills will undoubtedly play a central role for project managers to stand out and thrive in this new normal.

Keywords: Project manager; digital skills; digital adoption; soft skills; technical skills.

* *Corresponding author.*
E-mail address: a.marhraoui@ueuromed.org

Economic Profitability of the Revitalization of Prefabricated Housing Estates in the Czech Republic

Lucie Vankova[a], Gabriela Kocourkova[a*], Zdenek Krejza[a], Barbora Pospichalova[a]

[a]Brno University of Technology, Faculty of Civil Engineering, Veveri 331/95, 602 00 Brno, Czech Republic

Abstract

Prefabricated housing estates represent an important urban, architectural and historical phenomenon in the Czech Republic. Most people prefer to live in prefabricated buildings because of their central location, good transport services and a lot of amenities in their vicinity. Owners or tenants of flats prefer prefabricated buildings after revitalization, as they are more affordable than new developments and at the same time do not have such high energy consumption costs as prefabricated buildings without revitalization. The paper aims to focus on the energy savings of a specific prefabricated building. The heating consumption and the resulting monetary savings are addressed. The aim of the research is the performance of economic and life cycle analyses of the building. Firstly, the original condition of the prefabricated building and the extent of the revitalization carried out in 2001 were specified. Secondly, an energy assessment of the apartment building was carried out, where the heating consumption before and after the revitalization of the apartment building was determined and the resulting heat savings for each year of the assessment were determined in the appropriate units (GJ, $kWh/(m^2/yr)$). Economic indicators and life cycle costs were determined based on the modelling of the heat price development and possible energy savings. Currently, there has been a huge increase in energy prices. The reason for the price increase is the current situation in the wholesale market, where the prices have been reaching extreme amounts for several months and their further development is difficult to predict. The energy crisis has deepened as a result of the geopolitical situation. Customers are expected to experience a further increase in the electricity and gas prices since the prices can increase by up to tens of per cent.

Keywords: Revitalization, economic profitability, prefabricated housing estate, life cycle costs.

---

* *Corresponding author.* Tel.: + 420 541148635; fax: +42054418631.
E-mail address: kocourkova.g@fce.vutbr.cz

Effective project management of 3rd party funding in European Union Horizon Industry4.0 projects: sharing experiences from two use cases

Nicholas Fair[a], Stefano Modafferi[a], Alexandros Nizamis[b], Usman Wajid[c*]

[a]IT Innovation, Faculty of Electronics and Computer Science, University of Southampton United Kingdom
[b]CERTH ITI, Greece
[c]Information Catalyst, United Kingdom,

Abstract

To reduce the risk and the required bureaucracy for accessing public funding, the EC has developed a mechanism to grant money to consortia to be used to fund to startups, SMEs and Midcaps to start, evolve or transition their offer to increase their competitivity in the market, in turn providing benefit for the entire European economy.
This paper presents the experience in managing what is actually 3rd party (or cascading) funding in two different European Innovation Action Projects in the manufacturing domain. The paper discusses the design and implementation phases and provides the detail on how to manage the processes to ensure fairness, efficiency, and effectiveness that is lacking from the EC's formal documentation.

Keywords: 3rd party funding management; cascading funding and best practices; European Research and Innovation projects; innovation support.

* *Corresponding author.*
E-mail address: usman.wajid@informationcatalyst.com

Engineer-to-Order Challenges and Issues: A Systematic Literature Review of the manufacturing industry

Carlos S. Fortes[a,b,*,] Alexandra B. Tenera[b,c], Pedro F. Cunha[a]

[a] Escola Superior de Tecnologia de Setúbal (ESTS), Instituto Politécnico de Setúbal, Campus do IPS, 2910-761, Portugal
[b]UNIDEMI, DEMI, NOVA School of Science & Technology (FCT), Universidade NOVA de Lisboa, Campus de Caparica 2829-516, Portugal
[c]LASI, Laboratório Associado de Sistemas Inteligentes, 4800-058 Guimarães, Portugal

Abstract

Companies in engineer–to–order (ETO) manufacturing environments that seek efficiency gains through adopting a mass customisation strategy meet significant challenges. The implementation of the mass customisation (MC) strongly focuses on transitioning from mass production. The purpose of this study is to identify current areas of concern and operational challenges when adopting mass customisation principles in ETO companies. A Systematic Literature Review (SLR) was carried to evaluate the challenges the Portuguese Industry faces in the moulding companies' sectors and how they are improving their ability to meet deadlines. The study will look at ways of boosting customer satisfaction by providing unique products at a relatively low cost. The study exposed issues of MC in ETO companies in general, it is critical to achieving more efficient use of resources, workflow, and innovative management methods and approaches to deal with the variability and complexity of this manufacturing system. The competitive pressure to achieve better efficiency and effectiveness in this type of organisation requires constantly searching for new concepts and tools that can be developed and applied. Furthermore, this paper explores the ETO companies' significant difficulties and the technical and scientific solutions used and proposed as its significant contribution, as well as a proposal for future research and development to increase ETO companies' resilience and performance level in managing their value chain and executing operations in response to customer requirements.

.
Keywords: Engineering-to-Order; Workflow; Issue; Efficient; Management; Deadlines; Problem; Fulfilment.

* *Corresponding author.* Tel.: +351-265790000 (ext.4212)
E-mail address: carlos.fortes@estsetubal.ips.pt

Entrepreneurship education through sustainable value creation – exploring a project introducing circular economy

Judit Johnstad Bragelien*, Kari Håvåg Voldsund

Western Norway University of Applied Sciences, Postboks 7030, 5020 Bergen, Norway

Abstract

Sustainability challenges expressed by The Sustainable Development Goals (SDGs) and transformation towards a more Circular Economy (CE) imply the needs for broad collaboration in innovation and entrepreneurship. CE is perceived by business suitable for contributing directly to achieving several of the SDGs. In entrepreneurship education (EE) a new educational approach is emerging towards problem-based learning (PBL) solving open-ended real-life issues. In this paper, a connection between sustainability, CE, and EE has been strengthened. We briefly explore an increased attention to sustainability and how CE overtime has been introduced in an educational setting where entrepreneurial learning and sustainable value creation can take place. The scope for investigation is a project with two courses at Western Norway University of Applied Sciences with partially common educational activities. Increased educational attention to sustainability arose in 2017-2018, during spring semester of 2019 a CE-test was conducted and fall 2019 CE were implemented and continued in 2020-2021. Engaging CE shows positive outcome, and the main findings are: (1) CE offer a common language and platform for real-life sustainability cases in EE; (2) CE- and sustainability-cases are demanding and call for simplification; and (3) Open-ended CE-cases imply need for external collaboration, and thus more structure. In summary the CE project suggests promising possibilities for experiential learning, sustainable value creation, and an opportunity for increased external orientation. A deeper understanding of CE is achieved. There is a need for further empirical examination.

Keywords: Entrepreneurship education; Sustainable development; Circular economy; Experiential learning; Project; Teamwork.

* *Corresponding author.*
E-mail address: jjb@hvl.no

Ethic Paths in Engineering Education

José Figueiredo*

CEGIST, Instituto Superior Técnico, Universidade de Lisboa, Portugal

Abstract

The main purpose of this research is to reflect on the role of emotion on learning processes, specifically on reasoning, learning, and improving our ethics behavior. We consider ethics as knowledge and ethics behavior as a practice supported on this knowledge. We use a narrative approach and present some stories that intend to be metaphors helping situate and clarify the context of concepts addressed. We conclude that we need to count on emotion in our learning strategies and that extends to how and why students learn. We need to play with emotion if we want to touch student's mind sets, student's core beliefs, and strengthen student's commitment. To effectively learn and develop ethical behaviors we need to identify situations, we need to care on motivation and experimentation, in order to rationalize and internalize knowledge. Above all, we need to invest in our emotions.

Keywords: Ethics, Tacit Knowledge, Emotional engagement.

* *Corresponding author.*
E-mail address: jdf@tecnico.ulisboa.pt

Evaluating project management (PM) readiness in construction companies: cases from Chile

Alfredo Serpell[a*,] Herbert Rubio[b]

[a]*Facultad de Ingeniería, Universidad del Desarrollo, Av. Plaza 680, Santiago 7610658*
[b] *Pontificia Universidad Católica de Chile, Av.Vicuña Mackenna 4860, Santiago 7820436*

Abstract

Project management (PM) competence is a very important ability for construction companies and for the successful realization of their projects. It has always been considered that, since construction is a project-based activity, most of construction companies would be well prepared to adopt and apply PM, mastering it. However, construction projects have many failures causing serious consequences to the organizations and most of these failures are related to project management deficiencies. Then, it is very important to achieve these PM capabilities, which requires a suitable organizational readiness for adopting PM, that is, the necessary cultural, environmental, and organizational conditions. This research addresses the organizational readiness of construction companies by proposing a framework to assess it, which is based on factors that are considered necessary to facilitate and assure the adoption of PM capabilities within an organization. These factors were identified through a literature review and an evaluation model was designed with them. This framework was applied to four domestic construction companies and one mining services company. The main result of the evaluation showed that these companies have a low level of organizational readiness, although they recognize the importance of adopting PM capabilities. In fact, they do not count with the appropriate conditions to promote and demand a formalization and standardization of the PM function at the organization. This condition produces that many project managers of these companies manage their construction projects based on their own knowledge and experience only, without a real PM organizational framework and support. Results obtained in this research allow companies to know how to evaluate their PM organizational readiness including their strengths, weaknesses, and opportunities for improving their current situation.

Keywords: Project management; application: organizational readiness; construction companies; evaluation.

---

* *Corresponding author.* Tel.: +569-8248-8157.
E-mail address: aserpell@udd.cl

Evaluation of preferences for concrete admixtures using statistical perception techniques in the procurement management for the Colombian construction market

Hernandez-Carrillo C G[*],[a], Sarmiento Rojas J A[a], Rueda Varon M J[b], Güiza-Pinzón, [a]F D, [a]Toloza-Gordillo L M

Universidad Pedagógica y tecnológica de Colombia, Tunja, Boyacá, 150001, Colombia
Universidad EAN, Bogotá D.C, : Carrera 11 No. 78-47, 110221, Colombia

Abstract

Construction is one of the largest production sectors in the world and its development impact on employment generation, dynamism of materials and development of essential infrastructure. This is consistent with the growing demands and diversifications in the supply chain, supported by knowledge economies, related to organizational learning and project management, together with the acquisition of new methodologies, within the framework of current technological development, deregulation and liberalization of markets. Therefore, it is necessary to include a marketing approach in purchasing management, supported by production, distribution and consumption processes in the growing competition for better service conditions in the supply chain of construction materials, especially cement, considered the most consumed manufactured material in the world and the increase of chemical additives, as support in new technological formulations in construction processes. Consequently, the present research provides an understanding of the markets related to procurement management and supply chain in the commercialization of chemical additives in the Colombian construction sector, through the use of statistical tools of perception like set analysis and multidimensional scaling to determine patterns of preferences in the valuation of brands, prices and applicability. This last one, considered the most required attribute by users in the supply chain of additives, which is related to the degree of preference and behavior of the construction processes. Hence, the use of statistical perception tools facilitates procurement and development management in the supply chain for additives or other market segments and the reduction of risk uncertainty in the formulation of construction projects.

Keywords: Procurement management; Conjoint-analysis; Colombia; Marketing; Multidimensional-scaling.

---

* *Corresponding author.* Tel.:57+ 3222683189
E-mail address: carlosgabriel.hernandez@uptc.edu.co

Exploring Causes of Delay in Payment from Parties involved in Road and Highway Projects in Thailand

Borvorn Israngkura Na Ayudhya[a*,]

Department of Civil Engineering, Rajamangala University of Technology Thanyaburi,Thanyaburi, Patumthani, 12110, Thailand[a]

Abstract

Delay in payment is considered to be one of the most periodically arisen problems in the construction industry. It harms time, cost, and quality. This paper presented a result of a survey which investigated causes of delay in payment of road and highway construction projects in Thailand. Parties involved in construction-borne failure identified the causes of delay in payment and their severity through a questionnaire survey. The delay in payment causes were categorized into 4 main groups (owner, contractor, consultant and architect) which was based on parties-borne failure. The questionnaire listed of 41 factors and sought to identify the significance of major delay in payment factors and determine their impact on road and highway construction projects. The total of 120 responders was asked to weight the degree on seriousness via a questionnaire survey. The survey concluded that top five severity indexes in causing a delay in payment were delays in progress payment, the financial status of owners, poor qualification of the contractors' technical staff, delays in issue approval documents and failure in applying for claims.

Keywords: Risk; Delay; Payment; Road; Highway.

* *Corresponding author.* Tel.: +6681-838-1112
E-mail address: borvorn.i@en.rmutt.ac.th, ayudhya2003@yahoo.com

Exploring Measures to Promote Learning and Unlearning in Projects.

Bassam Hussein[*]

The Norwegian University of Science and Technology, NTNU
Department of mechanical and Industrial Engineering
Norway

Abstract

Using a case study from the oil and gas sector, this paper attempts to identify the measures used by the project organization to foster a mindsett of learning and unlearning to improve project performance. The findings suggest that the focus was on two dimensions. Firstly, to facilitate knowledge seeking and knowledge sharing by encouraging the team members to recognize the dependency between tasks as well as encouraging team members to acknowledge own limitations. Secondly, by fostering a mindsett of unlearning by encouraging the teams to question the established truths and rules and to seek to identify new ways of doing things. Findings from this study may also suggest that the practice of setting common goals for performance improvements on regular basis is not only helpful in creating sense of purpose and unity, but it also creates more appreciation to the role of learning and unlearning in the project.

Keywords: Project-Based Learning; Learning; Knowledge; unlearning; Project Management.

* *Corresponding author.*
E-mail address: bassam.hussein@ntnu.no

Exploring the relationship between personal and work characteristics of project managers and psychological safety in virtual teams

Michael D. Dzandu[*], Ineala Theophilus, Dania Issa

School of Applied Management, Westminster Business School, University of Westminster, 35 Marylebone Road, London, NW1 5LS, UK.

Abstract

One of the organisational and employees' responses to the COVID-19 pandemic is a shift to virtual working models including the management of projects and project teams in virtual environments. However, little is known about the effect of personal and work characteristics on the psychological safety of project management professionals. This study explores the relationship between the personal and work characteristics of project managers on their psychological safety in virtual teams. Data for the study is collected from 104 project management professionals in the United Kingdom. SPSS is used to analyse and test a series of hypotheses. The study confirmed the significant relationship between the personal and work characteristics of the project managers and their psychological safety. The study provides an overview of the role of diversity, equality and inclusion on psychological safety among project managers; and proposes future research directions to understand and contribute to the psychological wellbeing of project managers working in virtual teams.

Keywords: Psychological safety; project managers; personal characteristics; virtual team.

---

* *Corresponding author.*
E-mail address: dzandum@westminster.ac.uk

External quality assurance of cost estimates: Empirical evidence of cost performance from the Norwegian public sector

Helene Berg[a*], Ole Henning Nyhus[b]

aNorwegian Defence Research Establishment (FFI), Kjeller, Norway
bNorwegian University of Science and Technology (NTNU), Trondheim, Norway

Abstract

Cost overruns in public projects are well-documented in the literature, but practical guidance on reducing the extent and magnitude of overruns is rare. In the year 2000, Norway introduced a governance regime that includes mandatory external quality assurance (QA) of cost estimates. Previous studies have indicated that external QA has improved cost performance – the ability to complete projects within agreed budgets. However, cost performance without external QA has not been studied in detail. The objective of the paper is to compare the cost performance of projects in which cost estimates are produced by the responsible agencies alone and projects that have been scrutinized by external consultants specializing in the field of cost estimation and risk analysis (QA projects). The authors also compare how cost estimates are developed in different sectors. They use a dataset of 1,704 projects from the Norwegian public sector for 2000–2021 and find that quality assurance of cost estimates was practiced also for smaller projects under the threshold for formal QA. Furthermore, the results show that the mean cost overrun across projects in the dataset was smaller than reported in several previous international studies. The authors' main findings are firstly, there is no statistical evidence of a difference in cost overruns between QA and non-QA projects. Secondly, cost overruns vary between different parts public sectors, and over time there was a tendency toward lower cost overruns for non-QA projects. Overall, there is no statistical evidence to indicate that cost overruns in QA projects were smaller than in non-QA projects. Thirdly, there was a small development with lower cost overruns over time for the non-QA projects. Together with the finding of practices of quality assurance for smaller projects, the authors raise the question of whether the QA scheme has contributed to learning effects.

Keywords cost performance, cost overrun, external quality assurance, public projects.

* *Corresponding author.* Tel.: +47 95793084
E-mail address: Helene.berg@ffi

Factors Affecting the Adoption of Emerging Technologies in Last-Mile Delivery in the Retail Industry

Ra-ees Ismail[a*], Osden Jokonya[a]

[a]*University of the Western Cape, Department of Information Systems, Bellville Campus,
7535 Cape Town, South Africa*

Abstract

Researchers concur that last-mile delivery is the most difficult part of the logistic business. The objective of the study is to explore factors that affect the adoption of emerging technologies in last-mile delivery in the retail industry. The study conducted a systematic literature review of qualitative secondary data from peer-reviewed articles published from 2014 to 2019 on factors that affect the adoption of emerging technologies in last-mile delivery in the retail industry. A quantitative content analysis was used to analyse the secondary data. The technology, organisational and environmental (TOE) theoretical framework was a lens analyse secondary data from literature factors that affect the adoption of emerging technologies in last-mile delivery in the retail industry. The results show that availability was the dominant technological factor that affect the adoption of emerging technologies in last-mile delivery within the retail industry. The results suggest that retail organisations tend to adopt emerging technologies based on their availability. The organisation's strategies were the dominant organisational factor were the dominant factor that affect the adoption of emerging technologies in last-mile delivery within the retail industry. The results suggest that retail organisations tend to adopt emerging technologies if they have organisational strategies. The results suggest competition plays a major role in retail organisations adopting emerging technologies in last-mile delivery. The study contributes to the existing body of knowledge on the adoption of emerging technologies that can solve the problem of high costs in last-mile delivery.

Keywords: Industry 4.0, Emerging Technologies, Last-mile Delivery, TOE Framework, Retail Organisations, Adopted Technologies, Supply Chain, Logistics.

* *Corresponding author.*
E-mail address: ojokonya@uwc.ac.za

Forecasting Project Success through Project Team Trust:

Brazilian Empirical Study

Marcela Castro[ab*,] Bouchaib Bahli[c], Ronnie Figueiredo[ad], Andre Barcaui[e]

a NECE - Research Center in Business Sciences (UBI), 6200-209-Covilhã, Portugal
b Universidade Europeia, Lisboa- 1500-210, Portugal
c Ryerson University, Toronto-M5B2K3, Canada
dCentre of Applied Research in Management and Economics (CARME), Polytechnic of Leiria, Leiria- 2411-901, Portugal
e Universidade Federal do Rio de Janeiro, Rio de Janeiro -22290-240,Brazil

Abstract

The objective of this study is to analyze the effect of project team trust in project manager on project success and team job satisfaction. The survey method was used to collect data from 101 project team professionals. Data analysis was performed using R software. The results reveal that team trust in a project manager positively influences project success as well as job satisfaction. Organizations can take project manager trustworthiness into account when recruiting and training project managers and throughout the project planning and execution life span.

Keywords: Project management; trust; project success; job satisfaction; *empirical* study .

* *Corresponding author.*
E-mail address: profamarcelacastro@gmail.com

Functions of Project Steering Committees in Large Capital Projects

Shajal Drake[a,] Michiel C Bekker[b*]

[a/b]Graduate School of Technology Management, University of Pretoria, South Africa

Abstract

Large Capital Projects (LCPs) have a significant impact on the growth and development of local and international economies. Their failure stagnates progress, is not sustainable and cripples the economy and society in which they exist. This research study investigated the effective functioning of a Project Steering Committee (PSC) as a pivotal component to project management. Based on the findings of the literature review, the research model consists of four PSC function categories: (i) configuration, (ii) competency, (iii) decision authority, and (iv) communication. A 5-point Likert scale survey was used, and the results from 46 respondents within the South African industry was analyzed.

The results concurred with previous studies that PSCs' knowledge of Structured Corporate and Project Governance is essential for the efficient functioning of a steering committee. Contrary to the expectations of experienced project practitioners, Communication Management ranked relatively low in importance. Whilst there was consensus on the ratings of the PSC competencies, the variance noted can be attributed to factors such as the project experience of participants, the type and location of the project, and the PSC construct in different organizations. This can indicate that there is no single PSC attribute, but a combination of technical and interpersonal skills, necessary for effective PSC functioning.

Based on the results, it is recommended that the roles and responsibilities of the PSC are confirmed and understood by project stakeholders early in a project to ensure clear guidance and authority.

Keywords: Project Governance; Project Leadership; Steering Committee.

---

* *Corresponding author.*
E-mail address: giel.bekker@up.ac.za

Goodwill as a Part of Marketing Strategy in Construction Companies in the Czech Republic

Radek Dohnal[a,*,] Dana Linkeschová[a], Alena Tichá[a]

[a]*Faculty of Civil Engineering BUT, Czech Republic*

Abstract

Goodwill indicates the value of the intangible assets of a company, such as good customer relationships, company brand name, or experienced employees. It reflects the market position of the company, quality and, above all, tradition. The quality and longevity of their products reflect the desirable reputation in the eyes of consumers. Goodwill can be distinguished in two ways: purchased and inherent. The purchased goodwill is created by the company's activities. However, it is not reported in the company accounting because it is not reliably measurable. The value of the inherent goodwill can be quantified as the difference between the purchase price and the book value of the company being purchased. Its recognition is mainly applied in mergers and acquisitions. However, its accurate and reliable quantification is relatively difficult. The value of a company can be affected by economic changes through business policy influenced by marketing strategy. The presented article examines the value of the purchased Goodwill and the company's marketing strategy focused primarily on the construction industry.

Keywords: Goodwill, Marketing, Construction companies, Brand Value Added.

* *Corresponding author.*
E-mail address: dohnal.r@fce.vutbr.cz

Introduction to an agile framework for the management of technology transfer projects

Alexandra Martin[a,*]

ªUCL Business Ltd, 90 Tottenham Court Road, London, W1T 4TJ

Abstract

Technology transfer offices play a valuable role in protecting and commercialising intellectual property developed at universities, for social and economic benefit around the world. University College London (UCL) Business Ltd is a technology transfer office that commercialises technology arising from the world-renowned research at UCL.

PRINCE2 and agile approaches are amongst the popular choices of project management methodologies, however current frameworks are rigid and do not work very well within the technology transfer space, specifically in the biotechnology sector, due to the unpredictable nature of the projects. More organisations are adopting a flexible approach to delivering projects and becoming more agile in their management style. In a translational environment specifically, having a flexible response to change is highly encouraged. Current agile frameworks such as Scrum and Kanban, work extremely well within the IT and engineering-based projects, however for technology transfer projects (TTPs) they are slightly out of scope or too rigid in their methodology. An alternative agile framework is proposed to better suit the biotechnology sector and academic-research environment. This focuses on the breakdown of the project plan in separate work-packages, to manage the deliverables in separate development cycles using a system that splits the management into three gears based on the type of work and the length of time required to reach the deliverables within the project plan. This allows for the management of projects in stages against the original project plan, which in turn de-risks the project in stages. This framework is proposed as an alternative project management tool for biotechnology TTPs within a technology transfer office as well as the biotechnology industry.

Keywords: project management; technology transfer projects management; agile environment in research; technology transfer office.

---

* *Corresponding author.* Tel.: +44(0)20 3549 5658
E-mail address: a.martin@uclb.com

Management of R&D projects in the early phases of the project life cycle – empirical research

Agata Klaus-Rosińska, Wojciech Pliński [a,*]

[a]Faculty of Management, Wroclaw University of Science and Technology, Wybrzeże Wyspianskiego 27, 50-370 Wroclaw, Poland

Abstract

The paper deals with the subject of R&D project management in the early phases of project life cycle. A multiple holistic case study was conducted, where the selected research subjects were representatives of research and development institutes, industrial companies and universities. Interviews with them concerned the ways in which R&D projects are managed. On the basis of conversations with respondents and literature review, recommendations and good practices were established in terms of R&D project management in the early stages of the life cycle, i.e. initiating and planning.

Keywords: R&D projects; project life cycle.

* *Corresponding author.* Tel.: + 48 71 320 32 80
E-mail address: agata.klaus-rosinska@pwr.edu.pl

Measuring the societal impacts of university-industry R&D collaborations

Maria Cohen[a]*, Gabriela Fernandes[b], Pedro Godinho[a]

[a]University of Coimbra, CeBER, Faculty of Economics, Av. Dias da Silva, 165, Coimbra, 3004-512, Portugal
[b]University of Coimbra, CEMMPRE, Department of Mechanical Engineering, Polo II, Coimbra, 3030-788, Portugal

Abstract

Given the growing interest in understanding the social dimension of R&D investments better, approaches for measuring the societal impact of university-industry R&D collaborations (UICs) are called for. Several studies claim that such collaboration directly impacts innovation and, consequently, economic growth. In recent years, several papers have sought to assess the impacts of these collaborations. However, the interest seems to be focused on two of its main stakeholders: companies and universities. Few studies integrate university, industry and society outlooks on societal impact. Based on systematic literature review, this paper aims to provide a conceptual framework for the key elements that should be considered when measuring the societal impact of UICs, contributing to a theoretical understanding of the subject.

Keywords: University-Industry; Societal Impact; R&D projects.

* *Corresponding author.*
E-mail address: uc2020159014@student.uc.pt

Model to improve an ERP implementation based on agile best practice: A Delphi study.

Werner H. Salas [*]

Postgraduate Unit of the Faculty of Systems Engineering and Computer Science, National University of San Marcos, Lima, Perú

Abstract

Enterprise Resource Planning (ERP) is a business system that supports most of the critical processes of a company. It helps maintain a unified and reliable repository of information for decision-making. Implementing an ERP is a complex project, which implies a high level of effort and investment. Although the methodologies provided by the leading ERP providers are beneficial, there is still a high failure rate in the implementation.

Many authors have analyzed the factors and causes of these implementation failures. There is also research to propose new implementation models that replace the existing ones. However, there is little research on existing methodologies incorporating new concepts from other disciplines to improve them.

In this research, we propose a model that complements the current methodologies and uses the best practices in project management and software engineering directly related to the issues found in the literature. We submitted it to a group of experts on the subject to validate the model based on the Delphi method.

Keywords: ERP, Enterprise Resource Planning, Project Management, Agile, Best Practices.

* *Corresponding author.* Tel.: +51-989175851.
E-mail address werner.salas@unmsm.edu.pe

Modeling the Risk of an Organizational Development Portfolio

Camilo Micán[ac*,] Gabriela Fernandes[b], Madalena Araújo[c]

[a]Universidad del Valle, School of Industrial Engineering, Cll 13 # 100-00, Cali 760034, Colombia
[b]University of Coimbra, CEMMPRE, Department of Mechanical Engineering, Polo II, Coimbra 3030-788, Portugal
[c]University of Minho, ALGORITMI, campus Azurém, Guimarães 4800-058, Portugal

Abstract

Project portfolios have been seen as a structured way to implement business changes based on the organizational strategic goals. In this regard, portfolio risk could be related with the risk factors impact on strategic objectives. However, risk factors related to the project portfolio do not directly impact strategic objectives; their strategic impact is related to how the portfolio delivers value to the organization. This paper describes a risk assessment implementation conducted in an organizational development project portfolio case study, showing how the project portfolio risk is linked with the strategic goals. This was accomplished based on a proposed conceptualization for project portfolio risk assessment (PPRA). The risk assessment was conducted considering interdependencies between risk factors and how risk factors derived from both project and portfolio levels impact primarily on projects within the portfolio. And then, considering how the risk factors prior impact is transferred from projects to portfolio outcomes and, in turn, to strategic objectives. The risk assessment results allowed to identify the most influential risk factors for the portfolio case study, representing an essential input for designing the risk response plan.

Keywords: Project portfolio risk; risk assessment; organizational development portfolios.

* *Corresponding author.*
E-mail address: camilo.mican@correounivalle.edu.co

PMBOK 6th meets 7th: How to link both guides in order to support project tailoring?

Filipe Amaro*, Luísa Domingues

Avenida das Forças Armadas, Edifício I, Reitoria 1649-026 LISBOA Portugal

Abstract

Project Management is evolving more rapidly than ever. Driven by the progress in new technologies and the emergence of agile methodologies, organizations such as the Project Management Institute (PMI) reviewed their Project Management Standards to reflect on this phenomenon. In its latest edition, the Project Management Body Of Knowledge 7th (PMBOK), gather the largest number of evolutionary and a disruptive approach based on Principles and focuses on emerging trends such as tailoring, to enhance value delivery through project results. Nevertheless, the PMI states that this new release does not invalidate previously published versions of PMBOK. However, the coexistence of these two perspectives may initially be an unclear subject for managers and teams, used to a process-oriented.

This research studied the relationship between PMBOK 6th and PMBOK 7th and the importance of their connection applied to project tailoring and value creation, through a model that relates concepts from PMBOK 7th (Methods, Models and Artifacts and Performance Domains) and the PMBOK 6th (Processes).

Keywords: Project Management; Tailoring; PMBOK.

* *Corresponding author.*
E-mail address: favao@iscte-iul.pt

PPP in the Portuguese Health Sector: Contractual compliance assessment

Nuno J. P. Rodrigues[*]

Adj. Professor, Instituto Politécnico de Gestão e Tecnologia, V. N. de Gaia, Portugal. https://orcid.org/0000-0002-4248-028X

Abstract

Since 2001, in Portugal, constant reforms in hospital management have convoyed the transformations in the management models applied to public administration, aiming to ensure a higher quality of services and, concurrently, a more significant economic efficiency by applying the best contract management practices. This study aims to analyze, for the period between 2012 and 2021, the contract management evaluation of the PPP model in the Portuguese hospitals. It was used a mixed research approach based on multiple case studies and archival research. As main results, it was found that: i) production levels of the four PPP hospitals complied with the contractual stipulations; and ii) the State is inefficient in fulfilling its role as supervisor of the services provided throughout PPP management model and is unable to analyze the results obtained by the PPP project lifecycle. This study concluded that over the last 10 years, the Portuguese state should had taken advantage of all the experience gained from the four PPP projects and applying this experience to the PMH hospitals. Not only has the state failed to perform the tasks of supervising and monitoring the PPP model in an effective manner, which has prevented it from acquiring new competencies in terms of management, but it has also failed to adjust the level of service required of the PMH hospitals to that required of the PPP hospitals.

Keywords: Public management hospitals; Public-private partnerships; Contract Management; Health Production.

* *Corresponding author.* Tel.: +351 967952268
E-mail address: nuno.rodrigues@islagaia.pt

Prioritizing stakeholders to boost collaborative R&I projects benefits: an analytic network process approach

José M. R. C. A. Santos[1*,] Gabriela Fernandes[2]

[1]Centro de Investigação de Montanha (CIMO) & Laboratório para a Sustentabilidade e Tecnologia em Regiões de Montanha (SusTEC), Instituto Politécnico de Bragança, 5300-253 Bragança, Portugal
[2]University of Coimbra, CEMMPRE, Department of Mechanical Engineering, Polo II, Coimbra, 3030-788, Portugal

Abstract

This paper presents a methodology developed to prioritize stakeholders of a collaborative research and innovation (R&I) project in the circular bioeconomy area, towards enhancing its benefits from a multi-perspective point of view. The concept of R&I project benefits was broken down into criteria, evaluating different attributes related to the project outputs and outcomes, the project management processes, and the social, environmental and economic dimensions. The devised methodology is based on a combination of the analytic network process multicriteria decision making method and the key benefit categories from the P5 standard for sustainability in project management. The P5 standard has been shown to adequately frame the benefits to stakeholders of R&I projects in the topic of circular bioeconomy. The key benefits identified by the experts relate to the categories "society and costumers" and "consumption". The following stakeholders should have priority in the development of the project stakeholder management plan: research team members, leaders at the consortium organizations, project management team members, and environmental NGOs. Future research will include a longitudinal study of the perceived stakeholder and benefit categories priority over time.

Keywords: stakeholder management; project benefits; R&I impact; analytic network process; research management; university-industry collaborations.

---

* *Corresponding author.* Tel.: +351-273-330-832.
  E-mail address: josesantos@ipb.pt

Project Management Maturity Models: Proposal of a Framework for Models Comparison

Léa Domingues[a,*], Pedro Ribeiro[b]

University of Minho, Campus de Azurém, 4800-058 Guimarães, Portugal
ALGORITMI Research Center Univerity of Minho,Campus de Azurém 4800-058 Guimarães, Portugal

Abstract

With the evolutions of projects, it is necessary that companies understand the importance of project management, since this idea allows them to plan and monitor a project properly, through a set of knowledge, techniques, and tools. However, the implementation of project management alone is not enough. It is necessary that there is a continuous improvement in project management and an increase in maturity that accompanies the changes and needs of companies. These improvements and increases in maturity level are possible with the application of maturity models in project management. When well used, they allow companies to understand where they fail and where they need to improve. And if the measures taken from the models are applied, companies benefit positively in the delivery of the intended results, on time and on budget. As well as, in standing out compared to other companies in the market. Therefore, this study proposed a framework to compare project management maturity models. It allows the consideration of a set of variables when choosing a model. The results show that the Prado PMMM is typically the most suitable model for evaluation.

Keywords: Project management; Maturity in project management; Maturity models; Comparison of Project Management Maturity Models.

* *Corresponding author.* Tel.: +351 936 294 848
E-mail address: a83568@alunos.uminho.pt

Project Managers soft skills influence in knowledge sharing

Inês Avença[a*,] Luísa Domingues[a], Helena Carvalho[b]

[a]*Instituto Universitário de Lisboa (ISCTE-IUL), ISTAR, Lisboa, Portugal*
[b]*Instituto Universitário de Lisboa (ISCTE-IUL), CIES-IUL, Lisboa, Portugal*

Abtract

Technological evolution allowed a more significant focus on software development projects however, these always showed high failure rates [1] [2]. Project manager role has also gained increasing importance. In the last decade, several studies concluded a positive link between project managers' skills, such as communication, leadership and problem-solving skills, with project success. With the technological evolution and the increasing information availability and knowledge, the knowledge management role in a project environment has become indispensable. However, employees' lack of time or resistance is considered a barrier to knowledge sharing [3]. A survey was developed and delivered to development team members. The results obtained allowed us to conclude that the project manager's leadership positively influences team members' knowledge sharing in information systems. It was also concluded that the project manager's leadership positively influence knowledge sharing through socialization processes and face-to-face conversations, which refers to tacit knowledge sharing.

Keywords: Project Manager, Soft skills, Knowledge Management, Knowledge Sharing

* *Corresponding author.*
E-mail address: isaao@iscte-iul.pt

Project ownership in public-private partnership (PPP) projects of Norway

Mohammad Azarian[a,*,] Asmamaw Tadege Shiferaw[a], Ola Lædre[b], Paulos Abebe Wondimu[c], Tor Kristian Stevik[a]

[a] *Department of Mechanical Engineering and Technology Management, Faculty of Science and Technology, NMBU Norwegian University of Life Sciences, 1432 Ås, Norway*
[b]*Department of Civil and Environmental Engineering, Faculty of Engineering, NTNU Norwegian University of Science and Technology, 7491 Trondheim, Norway*
[c]*Norwegian Public Roads Administration (NPRA), Construction Division, 7037 Trondheim, Norway*

Abstract

Decisions regarding contractual arrangements and selecting a procurement method are two major aspects of Public-Private Partnership (PPP). Given project ownership as one of the core elements of contractual arrangements, this study employs Binary Logistic Regression (BLR) method to statistically investigate any potential link between project ownership and project size. BLR is a beneficial approach to examine type and significance of the connection between a dependent variable (project ownership) and a set of independent variables (investment size and contract duration). Utilizing a list of PPP projects in Norway, the results indicate that project ownership bears no connection with contract duration. However, the growth of investment size increases the probability of private ownership, except for road construction projects which are public-owned projects with large capital costs. Further studies regarding the implications of project ownership, e.g., risk, sustainability, are highlighted as the future directions in this context.

Keywords: Public-Private Partnership; Project Ownership; Contractual Arrangements; Binary Logistic Regression.

* *Corresponding author.*
E-mail address: mohammad.azarian@nmbu.no

Protecting Occupational Health and Safety in Construction Companies in the Czech Republic

Martin Nový[a*], Jana Nováková[a]

[a]Brno University of Technology, Faculty of Civil Engineering, Veveří 331/95, 602 00 Brno, Czech Republic

Abstract

Currently it is the third year when the global COVID-19 pandemic is having a negative impact on the lives of individuals, on the activities of economic entities of all sizes and on the economies of countries around the world. Following the partial calming in this area, a crisis linked to the war in Ukraine hit Europe in early 2022. This has a negative impact on economic production and the associated decline in the standard of living. The prices of materials, products and transport are rising, causing a sharp increase in construction prices in the construction sector. Protecting the occupational health of workers and providing a safe environment for their work form an essential part of all construction projects. This article deals with the research into occupational health and safety on construction sites in the Czech Republic. The research described in this article was conducted in several successive steps. In the first step, a research design was drawn up, in the second step data collection was carried out, and in the third step data analysis and compilation of results were carried out. Qualitative approaches to data collection and analysis, namely in-depth interviews and the coding method, were used in the companies under research. Open-ended questions relating to respondents' opinions, experience and overall perceptions of the issues were developed in the preparatory phase of the research. The aim was to obtain credible answers to the questions raised. The research lasted for six months and involved 19 medium and large companies from the Czech Republic. The purpose of the research described in this article was to find out the situation focusing on providing the health and safety of workers during the implementation of construction. The costs of implementing the necessary measures in this field were also investigated.

Keywords: occupational health protection; occupational safety; cost of measures; research in construction companies in the Czech Republic .

* *Corresponding author.* Tel.: +420 541 148 631
E-mail address: novy.m@fce.vutbr.cz

Ratio Project Planning: cost optimization projects in the production phase

Diogo Machado[a], Anabela Tereso[b*,] Paulo Afonso[b]

[a]*Master's in Industrial Engineering and Management, University of Minho 4804-533 Guimarães, Portugal*
[b]*ALGORITMI, Department of Production and Systems, University of Minho 4804-533 Guimarães, Portugal*

Abstract

Nowadays, cost reduction, without compromising the quality and functionality of products, is a strategic issue for most companies. Therefore, companies must have adequate cost management systems and be prepared to implement cost reduction plans in order to maintain the desired levels of profitability. Many companies perform cost reduction initiatives in the form of a project, involving the necessary departments and employees to work towards a specific target cost or cost reduction goal. This research is on product cost optimization projects applied by companies that follow a lean approach. The studied company, a first-tier supplier of the automotive industry, developed a cost reduction methodology to be applied in the production phase named Ratio Project Planning (RPP). This methodology was analysed from a project management perspective. To turn it more effective and efficient, a dashboard that includes the performance indicators regarding RPP was developed and implemented. This tool supports decision-making, allowing real-time monitoring and better management of the whole process.

Keywords: Cost Management; Kaizen Costing; Project Management; Ratio Project Planning; VSDiA.

* *Corresponding author.*
E-mail address: anabelat@dps.uminho.pt

Recommendation method for customized IT project management

Ariel I. La Paz[a]*, Rodrigo I. López[ab]

[a]*Department of Management Control and Information Systems, University of Chile, Diagonal Paraguay 257, Santiago, 8330015, Chile*
[b]*Department of Computer Science, Pontificia Universidad Católica de Chile, Av. Vicuña Mackenna 4860, Santiago, 7820436, Chile*

Abstract

The project management in the area of Information Technologies (IT) has not proven to yield the results expected, as the failure rates have been documented as higher than success. One explanation for such results comes from the huge variants of what is called an IT project, so that there is no single method or "silver bullet" that can serve as an effective tool in all situations. Recognizing the complexity of IT projects and the particularities of organizations implementing IT, the present article revises the literature in ITPM complexity, and proposes a customizing method to choose tools and techniques for IT project management. The article's main purpose is the introduction of a construction logic of a method that collects data for the application of a content-based filtering technique to produce recommendations of bundled tools, based on project characteristics and organizational contexts.

Keywords: IT project management; Content-based filtering; Recommender systems.

* *Corresponding author.*
E-mail address: lapaz@fen.uchile.cl

Science education through project-based learning: a case study

Carolina Santos[a,b,*], Eliza Rybska[c], Michal Klichowski[d], Barbara Jankowiak[d], Sylwia Jaskulska[d], Nuno Domingues[e], Diana Carvalho[f,g], Tânia Rocha[f,g], Hugo Paredes[f,g], Paulo Martins[f,g], João Rocha[a,b]

a National School of Public Health- NOVA University of Lisbon, Avenida Padre Cruz, Lisbon 1600-560, Portugal
b Comprehensive Health Research Centre, NOVA University of Lisbon, Lisbon, Portugal
c Faculty of Biology- Adam Mickiewicz University, Uniwersytetu Poznańskiego 6, Poznan 61-614, Poland
d Faculty of Educational Studies- Adam Mickiewicz University, Szamarzewskiego 89, Poznan 60-568, Poland
e Instituto Politécnico de Lisboa- Instituto Superior de Engenharia de Lisboa, Rua Conselheiro Emidio Navarro 1, Lisbon 1959-007, Portugal
f Institute for Systems and Computer Engineering, Technology and Science, Rua Dr. Roberto Frias, Porto 4200-465, Portugal
g University of Trás-os-Montes e Alto Douro, Quinta de Prados, Vila Real 5001-801, Portugal

Abstract

Partnerships for Science Education (PAFSE) is a case study of project-based learning applied to real-world problems connected with public health and sustainable development. The EU-funded project organizes science education activities at low secondary level engaging students and school stakeholders (universities, research centres, start-ups, enterprises, governmental organisations, NGOs) in health promotion and disease prevention actions that benefit the health and well-being of the community. Projects leaded by schools are addressed within educational scenarios co-created with partners interested in STEM education and developed under a relevant public health issue through their continuous engagement in open schooling approach.

Keywords: Project-based learning; inquiry-based learning; public health education; open schooling; project management; scientific evidence.

* *Corresponding author.* Tel.: +351 9645-842-64.
E-mail address: c.santos@ensp.unl.pt

Shipbuilding Engineer-To-Order Supply Chain: a Systematic Literature Review

Tarek Fatouh[a,b*], Nazaré Rego[b]

[a] Arab Academy For Science, Technology and Maritime Transport (AASTMT), Alexandria, Egypt
[b] Escola de Economia e Gestão, Universidade do Minho, Campus de Gualtar, 4710 - 057 Braga, Portugal

Abstract

This study aims to describe the state-of-art of the literature on engineer-to-order (ETO) supply chain in shipbuilding industry and identify related research gaps and directions for future research. Shipbuilding is a representative ETO industry: once a customer order is received, production involves designing and manufacturing, and requires complex engineering work. Research in ETO industries, such as construction, machinery, and capital goods-received significant attention from researchers during the last decade. However, there was a scarcity in research addressing ETO in shipbuilding industry; therefore, this study consists of a systematic literature review to contribute to ETO body of knowledge by highlighting recent research orientations, methodologies, and technological trends, and guide stakeholders in the shipbuilding industry and ETO researchers through reporting systematic literature review results and recommendations for future research.

Keywords: Engineer-to-Order; Systematic Literature Review; Shipbuilding; Supply Chain Management.

* *Corresponding author.* Tel.: +201032646688
E-mail address: tareknader@aast.edu

Stakeholder engagement as a determinant of the governance in projects

Ronielton Rezende Oliveira[a,*], Gabriela Fernandes[b], Daniel Jardim Pardini[a]

[a]*FACE, Faculty of Business Sciences, FUMEC University, 30.310-190, Belo Horizonte, Minas Gerais, Brazil*
[b]*University of Coimbra, CEMMPRE, Department of Mechanical Engineering, Polo II, Coimbra, 3030-788, Portugal*

Abstract

The role of governance in projects regarding the characteristics of strategy, organizations, and people can help in the understanding of project effectiveness. Trust and control are two key mechanisms for carrying out governance in projects. This article presents a new systematic and integrative literature review protocol to study the connections between the theoretical approaches, agency and transaction costs, with governance in projects, taking into account stakeholder engagement. We chose the literature review and integrative review methods to present our conceptual framework, which suggests that governance by trust improves project effectiveness.

Keywords: Project Management; Governance by Trust; Transaction Costs; Agency Costs; Organization.

* *Corresponding author.* Tel.: +55-31-3269-5230
E-mail address: ronielton@fumec.edu.br

Study on project management in Portugal within the scope of the Portuguese Project Management Observatory

Catarina Miranda[a], Anabela Tereso[b*], A. Manuela Gonçalves[c], Paulo Sousa[b], Pedro Engrácia[d]

[a]*Master's in Engineering Project Management, University of Minho, 4800-058 Guimarães, Portugal*
[b]*ALGORITMI, Department of Production and Systems, University of Minho, 4800-058 Guimarães, Portugal*
[c]*Centre of Mathematics, University of Minho, 4800-058 Guimarães, Portugal*
[d]*APOGEP, Praça Rocha Martins 4C, 1600-756 Lisboa, Portugal*

Abstract

The Portuguese Project Management Observatory (PPMO), an initiative of the Portuguese Association of Project Management (APOGEP), is being developed by the University of Minho in partnership with other 17 Higher Education institutions. The main objectives of this research were to understand the tools and techniques most and least used by organizations, the use of agile methodologies, the maturity of each Project Management area, and success dimensions. The method selected for this study was a survey applied through an online questionnaire directed to Portuguese organizations. The results show that the most used Tools and Techniques are Kick-off Meeting, Progress Meetings, Project Work Description, Gantt Chart, and Activity List; and the least used are Monte Carlo Analysis, Decision Tree, Project Management Software for Simulation, Conferences for Bidding, and Parametric Estimation. Statistically significant differences were found between the use of various Tools and Techniques and factors such as gender, age, current position, education level, and activity sector. Agile methodologies are used in a large part of the respondents' organizations, however, no correlation was identified between the use of agile methodologies and the accomplishment of scope, time and cost of projects. The process identified as having the highest maturity is Definition of Activities in the Project Schedule Management area, followed by Project Execution in the Project Integration Management area, and the Schedule Development in the Project Schedule Management area. Customer Satisfaction is the KPI most used.

Keywords: Agile Methodologies; Portugal; Portuguese Project Management Observatory; Project Management; Survey.

* *Corresponding author.* Tel.: +351 919544996
E-mail address: anabelat@dps.uminho.pt

Successful IT projects – A multiple case study of benefits management practices

Helene Berg[a,*,] Kjetil Holgeid[b], Magne Jørgensen[c], Gro Holst Volden[d]

[a]*Norwegian Defence Research Establishment (FFI), Kjeller, Norway*
[b]*Department of Informatics, University of Oslo, Oslo, Norway*
[c]*Simula Metropolitan Center for Digital Engineering, Lysaker, Norway*
[d]*Department of Civil and Environmental Engineering, Norwegian University of Science and Technology, Trondheim, Norway*

Abstract

Delivering project benefits for users and society is a key aspect of success in public IT projects. The traditional success measures, such as time and cost, only tell parts of the story. Furthermore, one of the main challenges in public IT projects is the inability to produce benefits. The objective of the study is to give evidence-based advice in order to contribute to better benefits management. This objective is achieved through increased knowledge about practices within two central aspects: identification and planning of benefits, and how benefit management is practiced during the execution phase of IT projects. The authors collected information about 23 public IT projects both through interviews with project personnel and by reviewing project documents. These information sources were then analyzed, using mainly qualitative methods. It was found that most projects had some form of a cost-benefit analysis, but the quality and comprehensiveness of the analyses varied. Furthermore, the interview results suggested that the later use of the cost-benefit analysis in benefit management during the project was less important for benefit management, and that the main purpose of the analysis was to ensure approval of the business case. When asked about benefit management practices during the execution phase of the projects, the interviewees' answers were divided almost equally between "important" and "not important." This applied to both the general practice of benefit management and the use of the benefit plan. Personnel with clear responsibility and sufficient authority to realize benefits was one of the most frequently mentioned features that contributed to the realization of benefits. For the later termination phase and evaluation phase, the findings revealed that projects used few resources to evaluate and document realized benefits. In conclusion, the study revealed both awareness and a focus on benefit management practices in the projects represented in the dataset, but also shortcomings. Based on the results, the authors include a set of five practical recommendations for better benefits management.

Keywords benefit management, software, IT projects, cost-benefit analysis.

---

* *Corresponding author.* Tel.: +47 95793084
E-mail address: Helene.berg@ffi

Tailoring: a case study on the application of the seventh principle of PMBOK 7 in a public institution.

Marcelle Cury Rodrigues [a,b,*], Luísa Domingues [a,b], João Pedro Oliveira[a,b,c]

[a]Instituto Universitário de Lisboa (ISCTE-IUL), Lisboa, Portugal
[b] Information Sciences, Technologies and Architecture Research Center (ISTAR-IUL), Lisboa, Portugal
[c] Instituto de Telecomunicações (IT), Lisboa, Portugal

Abstract

In the 7th edition of PMBOK the *Tailoring* process is legitimized as an essential ally in project management, since it makes several adjustments throughout the project's life cycle to provide the best possible environment to achieve the deliverables and the value added to the organization. *Tailoring* as a principle further highlights the unique nature of each project and the need to carry out this process continuously. Based on a unique case study, the beginning of the management functions in a sector of a public organization is discussed, as well as the adaptations made to optimize the workflow and productivity in the deliverables. From this investigation results the proposal of a framework adapted to the needs of the institution, as a starting point for the professionalization of project management.

Keywords: Tailoring; PMBOK7; Project Management; Public Institutions.

* *Corresponding author.*

E-mail address: marcelle.cury@gmail.com

The connection between incentives and success criteria in the governance of projects

Kristin Nordvik[a],*

[a] Norwegian Defence Material Agency, Grew Wedels plass 1, 0151 Oslo, Norway.

Abstract

This paper attempts to find evidence for suboptimal behaviour caused by suboptimal incentives in the governance of public projects. The paper uses data from two internal sources within the Norwegian Defence Material Agency. The data suggests that the agency's projects respond to the incentives put forward by the success criteria, and this led to suboptimal behaviour. Further, the paper uses principal-agent theory to investigate how to explain the Norwegian Defence Material Agency's actions and how to rectify the problem.

Keywords: incentives, success criteria, project, governance.

* *Corresponding author.*
E-mail address: kristin.nordvik@hotmail.com

The use of BIM-based tools to improve collaborative building projects

Alcinia Zita Sampaio[*,] Vitor Fernandes, Augusto Gomes

University of Lisbon, Higher Technical Institute, Dep. Civil Engineering, Av, Rovisco Pais, Lisbon, Portugal
CERIS – Civil Engineering Research and Innovation for Sustainability, IST, Lisbon, Portugal

Abstract

The Building Information Modelling (BIM) methodology emerges as a concept with potential to reduce the fragmentation of the working mode in the construction industry, bringing a comprehensive integration perspective, reduced risk and making it possible to study the entire life cycle of an enterprise using a virtual and centralized information model. The selected case study considered in the research, supports the demonstration of the main benefits in using the methodology and software associated in the design and construction of a building. In a complete project, various disciplines are normally involved, including architecture, structure, water supply and drainage systems, electrical installation and excavation works. Other related task are also normally elaborated over the project information, namely, formwork of the structural elements, quantity-take-off of materials and planning the construction process. Concerning a study case, all these activities were supported on the virtual model generated with all the required disciplines, and complemented with the additional required actions. The objective of the work is to demonstrate the multivalences of the innovative methodology when applied on the developments and coordination of projects in construction. The present study also promotes the use of BIM-based tools within the integration and collaboration within a project team. The study contributes positively to the dissemination of the innovative methodology in the construction sector namely in manage and coordinate a BIM multi-project.

Keywords: Construction, 3D BIM, 4D BIM, quantity-take-off, coordination, integration.

* *Corresponding author.* Tel.: +351 218 418 336
E-mail address: zita.sampaio@tecnico.ulisboa.pt

Uncertainty management in the design phase of road projects

Rouzbeh Shabani[a]*, Tausif Ahmed Ishtiaque[a], Agnar Johansen[a], Olav Torp[a], Danyal Farsani[b]

[a]Norwegian University of Science and Technology, Høgskoleringen 1, 7491 Trondheim,Norway
[b]Universidad Finis Terrae, Av.Pedro de Valdivia, 1509 Providencia, Chile

Abstract

Uncertainty management in the project's design phase is perceived to be one of the important stages before the project execution. Studies on uncertainty management could influence projects' objectives such as cost, time, and quality. With the importance of the design phase, there is less research in the project's design phase which tries to know important uncertainties and measures for managing them. Multiple case study approaches were adopted for doing this research. Data was collected through a narrative search, a document study, and interviews. Data analysis of cases showed that there are different uncertainties with various origins in each case and strategies for tackling them were different. In both cases, owners mainly focused on the strategic and contextual uncertainties mostly and contractors focused on operational uncertainties and they transfer strategic or contextual uncertainties to the owner. In both cases, mitigation strategy has been applied mostly for tackling uncertainties, and acceptance strategy has not been observed in cases. The project's complexity, the contract's collaboration form, and the actors' role are factors that influence the uncertainty management strategies in projects. This study revealed the differences and similarities in the two cases from uncertainty factors and uncertainty management strategy based on qualitative evaluation.

Keywords: Uncertainty factors, design phase, uncertainty origins, uncertainty management strategies;.

* *Corresponding author.* Tel.: +47 92523919.
E-mail address: rouzbeh.shabani@ntnu.no

Use of the Internet of Things in the Construction Industry and Facility Management: Usage Examples Overview

Yulia Shvets[a, *], Tomáš Hanák[a]

[a]Brno University of Technology, Faculty of Civil Engineering, Veveří 95, Brno 602 00, Czech Republic

Abstract

Internet of Things (IoT) represents an important area that is evolving rapidly in the context of digitalization efforts related to the Construction 4.0 era. This paper deals with the Internet of Things applications within the construction industry in selected phases of the facility's life cycle, namely the construction and operational phases. In particular, relevant examples of its use were collected, discussed and supplemented with several review papers on a given topic. Results of the analysis show that the potential of the Internet of Things usage is wide and varied in connection with the complexity of the construction projects and the long-term service life of the facilities. The concepts of the Internet of Things usage in the above-mentioned life cycle phases are mostly different focusing e.g., on quality, health and safety issues within the case of construction phase or smart concepts and energy management during the operational phase. Furthermore, one common theme was identified for both investigated phases of the life cycle, namely the interconnection of Building Information Modelling and the Internet of Things. It can be expected that the importance of such interconnection will continue to rise as construction projects implemented with the support of the Building Information Modelling become more and more common in the future.

Keywords: building, Building Information Modeling, construction project, Internet of Things, life-cycle.

* *Corresponding author.*
E-mail address: 233036@vutbr.cz

What factors contributes to success in an event project? A case study of the learning experiences of students in a Project Management course.

Hilde Nordahl-Pedersen[*][a], Kari Heggholmen [b]

[a]*Hilde Nordahl-Pedersen, School of Business and Economics, The Arctic University of Norway, Havnegata 5, 9480 Harstad, Norway.*
[b]*Kari Heggholmen, Institute of Economics and Business Administration, Western Norway University of Applied Sciences, Inndalsveien 28, 5063 Bergen, Norway.*

Abstract

As part of the 2022 Norwegian Skiing Championship, the students at Harstad Business School, UiT the Arctic University of Norway, conducted a successful project event called 'Sidetrack' to provide fun and enjoyment for the public and the participants. Our study is based on qualitative interviews with eight students to reveal their learning experiences in relation to factors that contributes to the 'Sidetrack' project event being a success. The findings show that in the initial phase of the project it`s important to create support and commitment to the project idea. The implementation of well-planned idea and concept workshop and a report from the process, formed the basis for the activities to take place and are key factors for the success of the 'Sidetrack' project event. A further important success factor is the establishment of a clearly defined project organization with a project manager, deputy manager and group leaders for each area of work, where group members can choose tasks and roles based on their experience, knowledge, and skills. The results of the 'Sidetrack' project are dependent on factors like good infrastructure that enables effective information and communication flow and regular meetings for status reports, reflection, learning and further progress within and between project groups, related to a well thought out project plan. Common goals and good information, communication and interaction among the project members are factors that created committed, high-performing teams, which also contributed to the 'Sidetrack' project`s success.

Keywords: Project Event; Success Factors; Idea and Concept Workshop; High Performing Team.

* *Corresponding author.*
E-mail address: Hilde.Nordahl-Pedersen@uit.no

Which contractor competencies are valuable for the client in the pre-construction phase?

Nadina Memić[a], Allen Tadayon[b], Paulos A. Wondimu[a,c], Ola Lædre[a], Ole Jonny Klakegg[a]

[a]*Norwegian University of Science and Technology (NTNU), 7491 Trondheim, Norway*
[b]*Oslo Metropolitan University (OsloMet), 0130 Oslo, Norway*
[c]*Norwegian Public Roads Administration (NPRA), 0667 Oslo, Norway*

Abstract

Large and complex construction projects have a new, increasing need to engage contractors in the pre-construction phase. New technology, cost- and time saving execution methods along with sustainability goals require solutions that the traditional project delivery models where contractor is involved at a later stage, are insufficient solutions as their ability to influence the outcome decreases. The purpose of this study is to examine the main competencies the client needs from the contractor in the preconstruction phase. Semi-structured interviews were conducted, along with 4 workshops and literature studies. Top ten technical competencies were identified, namely design, cost, planning, risk, regulations, materials, constructability, geotechnical knowledge, site planning & preparation, and HSE. According to the respondents, the ten competencies could be grouped in three categories; innovative approach, previous experience and a neutral group.
As these groups are somewhat contradictory, it can indicate the cautious approach to ECI.

Keywords: ECI, contractor, technical competence, pre-construction phase.

ProjMAN *posters*

Is there a way of awarding public contracts in the field of road transport more efficiently?

Petr Fiala[a], Zdeněk Dufek[a]*

[a]Faculty of Civil Engineering, Brno University of Technology, Veveří 331/95, 602 00 Brno, Czech Republic.

Abstract

The aim of this article is to outline innovative ways of managing road transport and public project procurement and the economic aspects of road transport. The most common problem that occurs in practice are the high costs that need to be spent on the maintenance or even total reconstruction of the roads, primarily due to procrastination of regular repairs of infrastructure during the construction life cycle.

Keywords: public procurement, effective procurement, infrastructure, construction life cycle

1. Introduction

Repairs and maintenance of infrastructure almost always involve public tenders financed from public funds. In connection with this public procurement proceedings and the procedures themselves have to be set up so that the required repairs and maintenance comply with the principles of efficiency, ideally throughout the entire life cycle of the construction project.

2. Current situation in the Czech Republic, legal regulation

In the Czech Republic, where an increase in the intensity of transport is recorded every year*, the growth of transport density undoubtedly impacts on the condition of the roads. Consequently, the need for maintenance and repairs of the existing infrastructure or even the construction of new road segments grows every year, in order to relieve the impact on the infrastructure. Thus, it is necessary to address these processes comprehensively and in an organized and effective manner already during the entry phase of public procurement.

---

* Mdcr.cz. Results of the National Transport Census 2020. Ministry of Transport of the Czech Republic, January 2022.

In the Czech Republic, infrastructure is regulated pursuant to the provisions of Act on Road Transport.[*] These provisions set forth that owners of roads are responsible for the management of their roads, i.e., the control of their condition, repair and maintenance, both in cases of an emergency and preventively, in order to avoid more severe damage. Since roads are primarily owned by the state or other state organizations, we are dealing here with the public sphere where public tenders for maintenance, repairs and construction are subject to the provisions of Act on Public Procurement.[†] As the aforesaid indicates, the increase in transport density and the current requirements of the Act on Public Procurement have a significant effect on the volume of procurement procedures in the Czech Republic.

Currently, public tenders for the repair of roads are only held when the deterioration of the road condition is so bad that a repair is absolutely necessary to ensure safe use of the road. In practice, this approach is unsatisfactory as it is ultimately more expensive and does not adequately meet the requirement of maintaining a certain quality standard of the roads throughout their life cycle. The causes of this practice can be seen, for example, in the lack of conceptual management, omission of the necessary documentation and failure to procure timely funding or even shortage of funding.

3. Optimal method of awarding public contracts

Suitable solution seems to be a procedure where the administration of road transport is conceived as one complex process consisting of partial tasks. The process itself would then be based on awarding a public contract for the construction of a road, including subsequent maintenance and repairs stretched over a time horizon of several years. This process should eliminate the overall quantity of public contracts related to transport, as separate public tenders for each individual repair would not be necessary. One of the benefits is the reduction of administrative paperwork. Furthermore, this method would be less time-consuming, as repeated public tenders could be spared. Moreover, this process might motivate contractors to deliver work at the highest quality possible to make it more sustainable which would not require as much repair and maintenance in the future.

---

[*] Act No. 13/1997 Coll., on Road Transport, as amended
[†] Act No. 134/2016 Coll., on Public Procurement, as amended

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

4. Proposed calculation of point evaluation

The calculation of the point evaluation of the individual contractors' bids for selecting the economically optimal bid should be done using the following formulas that take into account the offer price, as well as the offer of better quality of the road, compared to the minimum classification level required by the contracting authority for the given project.[*]

By using the calculation formula below, the contracting authority obtains information on the amount of costs that the specific participant would spend on increasing the quality of the projected road, which the participant would undertake to deliver and maintain throughout the duration of the public contract.

$$\mathbf{ZFN = (KLmin - KLnab) \times CZZK}$$

where

- ZFN – higher financial costs for the maintenance of the road in connection with higher quality offer, in CZK.
- KLmin – average classification of the road as defined by the contracting authority throughout the duration of the public contract (i.e., for 10-15 years), expressed in numbers 1-5 as per individual classification of degradation levels as per TP 87.
- KLnab – average classification of the road offered by the contractor for the entire duration of the pubic contract ((i.e., for 10-15 years), expressed in numbers 1-5 as per individual classification of degradation levels as per TP 87.
- CZZK – average price for higher classification of the road by one degree, compared to the classification required by the contracting authority, for the entire duration of the public contract (i.e., for 10-15 years), in CZK.

The second formula is a conversion to a percentage value expressing what part of the expected value of the public contract set by the contracting authority represents the higher financial costs on the part of the contractor to sustain the higher quality of the road offered.

$$\mathbf{PZN = \frac{ZFN}{PH}}$$

---

[*] Pjpk.cz. Designing the maintenance and repair of non-rigid roads – Technical Conditions 87. Ministry of Transport of the Czech Republic, Department of Road Infrastructure, July 2022.

CENTERIS/PROJMAN/HCIST 2022
ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

where

- PZN – average percentage of the estimated value of the public contract spent on maintaining the better quality of the road offered by the contractor, in decimal notation.
- PH – the expected value of the public contract for the entire duration of the contract (i.e., for 10-15 years) while maintaining the required road classification level, In CZK.
- ZFN – increased financial costs spent on maintaining the road in connection with the offer of higher quality, in CZK.

The third formula shows the point evaluation of the submitted bid. This formula takes into account the preference for higher quality of the road over a lower price for minimum standard.

$$\mathbf{BH \ = \ NC - (PZN \ \times NC)}$$

where

- BH – overall point evaluation of the bids or bid prices for the purposes of bids evaluation, in CZK.
- NC – the contractor's price for road repair and maintenance throughout the entire of the contract (i.e., for 10-15 years) as quoted in his bid, in CZK.
- PZN – the average percentage of the expected value of the public contract spent on maintaining a higher quality of the road, as offered by the contractor, in decimal notation.

5. Conclusion

From the technical and economic perspective, the above method of public contract procurement appears to be optimal. However, it is obvious that implementing it will be a problem for several reasons, e.g. there is a long-standing practice based on the lowest bid price criterion regardless of future construction life cycle costs. We can only hope that the contracting authorities will prefer more effective ways of public contract procurement in the sphere of infrastructure coming years, so that these contracts would put less burden on financial budgets, will be less time-consuming and the roadways would be kept in optimal condition.

Acknowledgements

References

[1] Mdcr.cz. Results of the National Transport Census 2020. Ministry of Transport of the Czech Republic, January 2022.

[2] Act No. 13/1997 Coll., on Road Transport, as amended

[3] Act No. 134/2016 Coll., on Public Procurement, as amended

[4] Pjpk.cz. Designing the maintenance and repair of non-rigid roads – Technical Conditions 87. Ministry of Transport of the Czech Republic, Department of Road Infrastructure, July 2022.

HCIST *papers*

(In)equity in primary health care teleconsultations: an exploratory study

Emília Simões[a], José Crispim[a,b*], Nazaré Rego[a]

[a]Escola de Economia e Gestão, Universidade do Minho, Campus de Gualtar, 4710-057 Braga, Portugal
[b]NIPE, Universidade do Minho, Campus de Gualtar, 4710-057 Braga, Portugal

Abstract

As part of the transition to digital health, it is expected that teleconsultations between general practitioners or primary care nurses and patients will be increasingly used. This study aims to understand which of the social determinants of health (SODH) and equity indicators referred in the literature can be used in a primary health care teleconsultation environment. The research methodology followed was based on the Delphi method. The results highlight the existence of different perceptions on the concept of equity and some lack of awareness about it by primary health care health professionals. Therefore, an effort should be made to educate and train health professionals on issues related to equity and, in particular, in the context of teleconsultations. The future adoption of a performance assessment system that includes identified SODH determinants and equity indicators in teleconsultation will favor the registration, monitoring, and improvement of aspects related equity in the teleconsultation by primary health care centres.

Keywords: Equity indicators; Primary health care; Social determinants of health; Teleconsultation.

* *Corresponding author.* Tel.: +351-253604565
E-mail address: crispim@eeg.uminho.pt

A Big Data Approach to Explore Medical Imaging Repositories Based on DICOM

Milton Santos[a], Nelson Pacheco Rocha[b,*]

[a]IEETA, Health School Sciences, University of Aveiro, Aveiro, Portugal
[b]IEETA, Department of Medical Sciences, University of Aveiro, Aveiro, Portugal

Abstract

Medical imaging repositories based on the DICOM format such as Picture Archiving and Communication Systems have a huge potential from a big data perspective. The study reported by this paper aimed to verify on how the big data lifecycle processes, from production to consumption might be implemented to take advantage of the DICOM standard and respective data sources. After identifying the different processes (i.e., data collection, integration, filtering, anonymization and enrichment, and knowledge extraction) the study demonstrate their implementation using an open-source application able to access the DICOM metadata independently of the medical imaging modalities and equipment manufacturers.

Keywords: Big Data; DICOM; Data Lifecycle.

* *Corresponding author.* Tel.: +351234427110.
E-mail address: npr@ua.pt

A comparative study of CNN and U-Net performance for automatic segmentation of medical images: application to cardiac MRI

Wafa Baccouch[a,*,] Sameh Oueslati[a], Basel Solaiman[b], Salam Labidi[a]

[a]*University of Tunis El Manar, Higher institute of Medical Technologies of Tunis, Research laboratory of Biophysics and Medical Technologies Tunis 1006, Tunisia*
[b]*Image & Information Processing Department (iTi), IMT-Atlantique, Technopôle Brest Iroise CS 83818, 29238 Brest Cedex France*

Abstract

Medical image segmentation is one of the most challenging tasks in medical image analysis which aims to extract effective information and improve the level of clinical diagnosis. In last decades, automatic segmentation based on Deep Learning (DL) models such as U-Net and CNN architectures have been widely used to automatically extract organs or lesions contours in order to overcome manual segmentation limitations. In this paper, we performed a comparative study between CNN and U-Net performance for medical image segmentation applied to cardiac-MRI segmentation using U-Net from short-axis MRI images of ACDC database. The adopted architecture was trained and tested with and without data augmentation. The obtained results show a strong agreement between the labelled masks and the predicted ones with a mean DSC that reached 97,9% and a mean Hausdorrf Distance (HD) that reached 5.318 mm. A quantitative comparison was made on two levels. The first one is an intra-comparison made between the adopted model and methods based on the same architecture and having been trained and tested using the same database which proved that our method reached the highest performance and can be considered as a promising tool for medical image segmentation. The second one is an inter-comparison made between U-Net and CNN performance which proved that U-Net is more suitable for carrying out this task since it takes less time for training as it does not have a fully connected layer and offers a fairly significant similarity to ground truth compared to CNN.

Keywords: Medical image segmentation, U-Net, CNN, Right Ventricle, Left Ventricle, data augmentation, cardiac-MRI.

* *Corresponding author.*
E-mail address: wafa.baccouch@etudiant-istmt.utm.tn

A design-thinking approach to identifying needs in a Danish healthcare setting

Neil Arvin Bretaña[a,b*], Ea Høg Utoft[c], Sys Zoffmann Glud[a]

[a]BioMedical Design Novo Nordisk Foundation Fellowship Programme, Aarhus University, Aarhus, Denmark
[b]UniSA Allied Health & Human Performance, University of South Australia, Australia
[c]Radboud University, Nijmegen, Netherlands

Abstract

The Danish healthcare system is often hailed as a pioneer in quality health services and initiatives. However, there are still gaps in this system despite an impressive effort by stakeholders. To address this, it is essential to identify and specify unmet needs in this space. The biodesign process of innovation is a well-documented multi-disciplinary approach used to identify unmet healthcare needs and produce sustainable solutions fit for society. Adopting this concept, the BioMedical Design Novo Nordisk Foundation Fellowship programme has been established in Denmark to create value for the Danish healthcare system. This program follows the process of needs-finding, needs screening, concept generation, concept screening, strategy development, and business planning. In this study, we report the application of the needs-finding step in action at a public hospital in regional Denmark over a 2-month period. A total of 57 observations were recorded, resulting to the identification of 109 needs in this setting. Future work should follow through the next steps in the biodesign process beginning with needs screening to prioritise areas requiring urgent action. This study advocates for an inclusive and interdisciplinary approach to improvement and innovation in the Danish healthcare system.

Keywords: Innovation; Biomedical design; Healthcare; Collaboration; Design-thinking.

* Corresponding author
E-mail address: Neil.Bretana@unisa.edu.au

A machine learning approach for mapping and accelerating multiple sclerosis research

António Lopes[a,*], Bruno Amaral[b]

[a]Iscte – Instituto Universitário de Lisboa, Lisboa, Portugal
[b]Lisbon Collective, Lisboa, Portugal

Abstract

The medical field, as many others, is overwhelmed with the amount of research-related information available, such as journal papers, conference proceedings and clinical trials. The task of parsing through all this information to keep up to date with the most recent research findings on their area of expertise is especially difficult for practitioners who must also focus on their clinical duties. Recommender systems can help make decisions and provide relevant information on specific matters, such as for these clinical practitioners looking into which research to prioritize. In this paper, we describe the early work on a machine learning approach, which through an intelligent reinforcement learning approach, maps and recommends research information (papers and clinical trials) specifically for multiple sclerosis research. We tested and evaluated several different machine learning algorithms and present which one is the most promising in developing a complete and efficient model for recommending relevant multiple sclerosis research.

Keywords: machine learning; recommender systems; multiple-sclerosis; artificial intelligence; research information.

* *Corresponding author.*
E-mail address: alsl@iscte-iul.pt

A New Approach for Native Myocardial T1 mapping using a standard Single-shot MRI pulse sequence technique.

Mariem Dali[a], Narjes Benameur[b], Salam Labidi[a, b, *]

[a]University of Tunis El Manar, Higher Institute of Medical Technologies of Tunis, Research Laboratory of Biophysics and Medical Technologies, 1006 Tunis, Tunisia
[b]University of Tunis El Manar, Higher Institute of Medical Technologies of Tunis, Research Laboratory of Biophysics and Medical Technologies, 1006 Tunis, Tunisia

Abstract

Cardiovascular magnetic resonance (CMR) diagnosis of acute myocarditis (AM) requires contrast injection in Late Gadolinium Enhancement (LGE). Native T1- mapping has been suggested as a potentially helpful technique in connection to the quantitative assessment of cardiac anomalies. This was demonstrated utilizing particular sequences, which are manufacturer-specific and not practicable on all machines. In this study, we propose to evaluate the capability of a standard, single-shot sequence in the clinical context to distinguish between healthy myocardium and diffuse disease. For this, 30 patients (22 participants with no cardiac involvement and 8 patients with verified cardiac involvement based on echocardiographic criteria and Troponin levels) received CMR (3-T) with LGE imaging. This analysis revealed that cardiac T1 times were significantly higher in patients with myocarditis (1516± 29ms), myocardial infarction (1596± 98ms), and pericardial effusion (1217± 12ms) than in healthy subjects (1117± 15ms). Furthermore, in roughly 2 minutes, our model reconstruction allows for single-shot myocardial T1 maps with great spatial resolution, precision, accuracy, and consistency. As it underlined the importance of T1 mapping in clinical application improvement and its contribution to direct assessment of cardiac system anomalies

Keywords: Cardiovascular magnetic resonance (CMR); Myocarditis; Myocardial T1 mapping; Relaxation time T1; Single Shot.

* *Corresponding author.*
E-mail address: mariem.dali@etudiant-istmt.utm.tn

A novel blockchain-based architectural modal for healthcare data integrity: Covid19 screening laboratory use-case

Sabri BARBARIA[a*], Halima MAHJOUBI[a], Hanene BOUSSI RAHMOUNI[a,b]

[a] Laboratory of Biophysics and Medical Technologies, Higher Institute of Medical Technologies of Tunis (ISTMT), University of Tunis El Manar, Tunisia
[b] The Computer Science Research Centre, the University of the West of England, Bristol, UK

Abstract

In this paper, we are proposing a blockchain-based architectural model to ensure the integrity of healthcare-sensitive data in an AI-based medical research context. In our approach, we will use the HL7 FHIR standardized data structure to ensure the interoperability of our approach with the existing hospital information systems (HIS). Indeed, structuring the data coming from several heterogeneous sources would enhance its quality. In addition, a standardised data structure would help establish a more accurate security and data protection model throughout the process of data collection cleansing and processing. Hence, we designed our architecture to be interoperable with all FHIR-based HISs to add a trust layer to the current medical research process. In this paper we are to achieve our goal, we will combine continua healthcare IoT architecture and Hyperledger fabric architecture. Our trust layer model is composed of four components: (1) an architecture that integrates with the HL7 FHIR data exchange framework, which extends an open protocol that supports efficient standards-based healthcare data exchange (2) a blockchain layer to support access control and auditing of FHIR health records that are stored in the data exchange network databases; (3) a distributed architecture consisting of multiple trusted nodes ensure privacy protection for health data; and (4) an application programming interface (API) will be available for use by the network.

Keywords: Healthcare data integrity,FHIR Rest API,Blockchain,IoT, architecture model;.

---

* Corresponding author.
E-mail address: sabri.barbaria@istmt.utm.tn

A proposal for a set of attributes relevant for Web portal data quality: The Brazilian Rare Disease Network case

Filipe Andrade Bernardi[a,b*], Domingos Alves[b], Mariane Barros Neiva[b], Diego Bettiol Yamada[b], Vinicius Costa Lima[b], André Vinci[b], Giovane Thomazini[b], Rui Rijo[b,c], Têmis Maria Felix[d]

[a]Bioengineering Postgraduate Program, University of São Paulo, São Carlos, Brazil
[b]Ribeirao Preto Medical School, University of Sao Paulo, Ribeirao Preto, Brazil
[c]Polytechnic Institute of Leiria
[d]Medical Genetics Service, Porto Alegre Clinics Hospital, Porto Alegre, Brazil

Abstract

Despite widespread growth in the use and complexity of web portals, insufficient attention is paid to their quality. Thus, this paper aims to describe the validation process of the Brazilian Network of Rare Diseases Portal and identify a set of data quality attributes required for psychometric evaluations that will support the portal implementation. This protocol describes a cross- sectional study of mixed nature divided into three steps: A usability evaluation, a Delphi consensus, and an electronic service quality assessment. Also, the RE-AIM model will be applied at various stages of evaluative research. We hope the improvement carried out during the validation of RARAS can contribute to the dissemination of knowledge in the area and include, based on scientific knowledge and clinical experts, offering clear, attractive, and accessible information for the population. A research gap exists in determining components of integrated e-service quality, usability, and user experience evaluation model in general, and for rare disease web portals, in particular. Users of the RARAS Portal need to get validated content and the required reliable online services without doing exhaustive searches or visiting multiple sources, with the main focus on e-service quality.

Keywords: Rare Diseases; Data Quality; Implementation Science; Software Validation; User-Centered Design.

---

* *Corresponding author.*
E-mail address: filipepaulista12@usp.br

A quasi-static biomechanical model of the human myocardium based on Cardiac Magnetic Resonance images

Rania Awadi[a,*], Narjes Benameur[a], Tesnim Kraiem[b], Labidi Salam[a]

[a]*University of Tunis El Manar, The Higher Institute of Medical Technologies of Tunis, Research Laboratory of Biophysics and Medical technologies, Tunis 1006, Tunisia*
[b]*University of Tunis El Manar, National Engineers School of Tunis, Laboratory of Applied Mechanics and Engineering, LR-11-ES19, Tunis 10002, Tunisia*

Abstract

The left ventricle (LV) has an important mechanical part in pumping blood throughout the body and it is generally sensitive to the failure. Heart failure is one of the world's leading causes of death and has reached the epidemic rate. For the study of heart failure, there are several diagnostic methods, but computational biomechanical models of human myocardium would be a practical tool in diagnostics and patient specific treatment planning. These models help in classifying myocardium pathologies. In this paper, we developed a quasi-static biomechanical model of the LV for healthy subjects based on Cardiac Magnetic Resonance (CMR) acquisition. Estimation LV strain is done using Finite Element (FE) software Abaqus and clinical assessment measured from 20 healthy subjects, such as End Systole (ES) and End Diastole (ED) volumes, ED wall thickness and wall thickening. We acquired LV End Systole strain component is within one standard deviation of the measurements made in the equatorial region of LV. The results of this study suggest that the proposed FE model of LV describes the physiological function of the heart and can differentiate between normal and pathological cardiac function.

Keywords: Human Left Ventricle ; Cardiac Magentic Resonance Imaging ; biomechanical model ; Finite Element; Strain ; heart failure .

[*] *Corresponding author.*
E-mail address: rania.awadi@istmt.utm.tn

An Apriori Algorithm-Based Association Rule Analysis to detect Human Suicidal Behaviour

Md. Mehedi Hassan[a], *Asif Karim[b*,] Swarnali Mollick[c], Sami Azam[d], Eva Ignatious[e], A S M Farhan Al Haque[f]

[a]*Computer Science and Engineering North Western University, Khulna, Bangladesh, mehedihassan@ieee.org*
[b]*College of Engineering, IT and Environment, Charles Darwin University, NT, Australia, asif.karim@cdu.edu.au*
[c]*Computer Science and Engineering Northern University of Business and Technology, Khulna, Bangladesh, swarnalimollick.07@gmail.com*
[d]*College of Engineering, IT and Environment, Charles Darwin University, NT, Australia, sami.azam@cdu.edu.au*
[e]*College of Engineering, IT and Environment, Charles Darwin University, NT, Australia, eva.ignatious@cdu.edu.au*
[f]*Department of Electronic Systems, Aalborg University Copenhagen, Denmark, Ahaque21@student.aau.dk*
* Corresponding author. E-mail address: asif.karim@cdu.edu.au

Abstract

Suicide is a major cause of death. It is also a complex public health issue and often preventable with timely intervention. Overall, the rate of suicide is increasing for various reasons. In our study, we use an association rule analysis to find the most important rules to predict suicidal behavior from an available data set. One of the most powerful machine learning algorithms available for identifying associations within databases is the Apriori algorithm. We used this algorithm to analyze association rules of suicidal behavior using a dataset of 1250 instances and 27 impactful features. These include daily activities, family background, and answers to mental questionnaires and have been analyzed to find combinations that are associated with suicidal behavior. The study has resulted in some key rules for human suicidal behavior. The Apriori method has been used to identify the eight most significant rules with the support of 0.25 and the confidence of 0.90.

Keywords: Suicide; Suicidal Behaviour; Behaviour Analysis; Association Rule Mining; Apriori.

* Corresponding author.
E-mail address: asif.karim@cdu.edu.au

An expert system for lesion detection in wireless capsule endoscopy using transfer learning

Andrea Caroppo[a*,] Pietro Siciliano[a], Alessandro Leone[a]

[a]*National Research Council of Italy, Institute for Microelectronics and Microsystems, Via Per Monteroni c/o Campus Ecotekne Palazzina A3, Lecce 73100, Italy*

Abstract

Wireless Capsule Endoscopic (WCE) is a powerful diagnostic tool that has proven especially useful in imaging the small intestine. Currently its use is limited due to the production of a considerable number of images whose analysis is an extremely time-consuming process. The present work presents the design and implementation of a novel computer-aided diagnosis system for automatic classification of images acquired by the capsule into image with and without lesion. Our expert system is based on the concept of transfer learning which reuses features of pre-trained neural networks needing little data. Two pre-trained deep convolutional neural (ResNet50 and Inception V4) were used for feature extraction. Then, the selected features are combined using the minimum Redundancy Maximum Relevance technique. For the final classifier layer, specific machine learning classifiers that have shown promising results in previous medical images studies were compared. The experiments performed on two standard benchmark datasets demonstrated that our expert system outclass the single deep learning architectures, with an average accuracy in detection lesions of 98.09 % on KID Dataset 2 and 94.48 % on MICCAI 2017. The best results in terms of accuracy and training time were obtained using Support Vector Machine as classifier.

Keywords: DICOM; Wirelesse Capsule Endoscopy; Lesion Detection; Deep Learning; Transfer Learning .

* *Corresponding author.* Tel. + 39 0833 422531.
E-mail address: andrea.caroppo@cnr.it

An information system for monitoring tuberculosis cases: implementation research protocol using RE-AIM for a health region in Brazil

Nathalia Yukie Crepaldi[a*], Vinicius Costa Lima[a], Filipe Andrade Bernardi[a,b], Domingos Alves[a,c]

[a]Ribeirão Preto Medical School, University of São Paulo 14049-900, Ribeirão Preto, Brazil
[b]Bioengineering Postgraduate Program, University of São Paulo 13566-590, São Carlos, Brasil
[c]Department of Social Medicine, Ribeirão Preto Medical School, University of São Paulo 14049-900, Ribeirão Preto, Brazil

Abstract

Tuberculosis is an infectious bacterial disease and one of the biggest public health problems in the world despite being curable. Research is still needed that considers operational aspects of treatment and control of its spread. Considering this scenario, the need to develop software that provides real-time information about the patient's path along health information systems for clinical decision-making is fundamental. Because of this, a region made up of 26 municipalities will implement a computerized system to monitor tuberculosis cases, the SISTB. However, the implementation of new technology can result in the creation of new functions and cause changes in the existing ones. Implementation research can be used as an approach where evidence can be provided to guide the use of digital technology in tuberculosis care. The RE-AIM framework provides a model to inform this research. Thus, this work aims to report the protocol of a study to evaluate the implementation of a health information system to assist in the monitoring of tuberculosis treatment, using the RE-AIM. The implementation will be carried out in 5 phases: i) define the locations that will receive the intervention; ii) prepare people to receive the intervention iii) train key people; iv) adapt the SISTB and/or the training according to the discussions in the previous phase; v) follow up and monitor the support of the technology. The data collected for the evaluation will come from the database of the implemented system, questionnaires, and training meetings. The forecast for the study conclusion is the end of 2023. As a result, we hope that the SISTB implementation will increase the positive outcomes of tuberculosis patients' treatment.

Keywords: tuberculosis; health information system; implementation research; RE-AIM.

* *Corresponding author.*
E-mail address: nathaliayc@gmail.com

Applying the Nominal Group Technique for the Conceptual Validation of ehealth Solutions

Ana Filipa Rosa[a], Ana Isabel Martins[b], Margarida Cerqueira[b], Milton Santos[c], Anabela G. Silva[b], Nelson Pacheco Rocha[a],[*]

[a]*Institute of Electronics and Informatics Engineering of Aveiro, Department of Medical Sciences, University of Aveiro, Aveiro, Portugal*
[b]*Center for Health Technology and Services Research - CINTESIS@RISE, Health Sciences School, University of Aveiro, Portugal*
[c]*Institute of Electronics and Informatics Engineering of Aveiro, Health Sciences School, University of Aveiro, Aveiro, Portugal*

Abstract

The development of ehealth applications is a complex task, not only in technological terms, but also in the understanding of both the users' needs, expectations and contexts, and the business models. Therefore, initial conceptual validations might be essential to verify whether the proposed solutions are adequate, sustainable, and worth to be developed. The study reported by this paper applied the nominal group technique to verify the potential suitability and sustainability of a diverse set of ehealth applications to support older adults. The study identified a set of transversal advantages (i.e., promotion of active and healthy, integrated care, and healthcare equity) and barriers (i.e., contextual, personal, and development and deployment barriers. As a conclusion, the nominal group technique was adequate for the conceptual validation of the proposed ehealth solutions and provided comprehensive information about issues that must be carefully considered during the development of these solutions to assure their viability and to reduce research waste.

Keywords: ehealth; Nominal group technique; conceptual validation, ehealth advantages; ehealth barriers.

* *Corresponding author.* Tel.: +351234247292.
E-mail address: npr@ua.pt

Audio delivery of health information: An NLP study of information difficulty and bias in listeners

[a]Arif Ahmed[*,] [a]Gondy Leroy, [a]Han Yu Lu, [b]David Kauchak, [a]Jeff Stone, [a]Philip Harber, [a]Stephen A. Rains, [a]Prashant Mishra, [a]Bhumi Chitroda

[a] The University of Arizona, Tucson 85721, U.S.A
[b]Pomona College, 333N College Way, Claremont 91711, U.S.A

Abstract

Health literacy is the ability to understand, process, and obtain health information and make suitable decisions about health care [3]. Traditionally, text has been the main medium for delivering health information. However, virtual assistants are gaining popularity in this digital era; and people increasingly rely on audio and smart speakers for health information. We aim to identify audio/text features that contribute to the difficulty of the information delivered over audio. We are creating a health-related audio corpus. We selected text snippets and calculated seven text features. Then, we converted the text snippets to audio snippets. In a pilot study with Amazon Mechanical Turk (AMT) workers, we measured the perceived and actual difficulty of the audio using the response of multiple choice and free recall questions. We collected demographic information as well as bias about doctors' gender, task preference, and health information preference. Thirteen workers completed thirty audio snippets and related questions. We found a strong correlation between text features lexical chain, and the dependent variables, and multiple choice response, percentage of matching word, percentage of similar word, cosine similarity, and time taken (in seconds). In addition, doctors were generally perceived to be more competent than warm. How warm workers perceive male doctors correlated significantly with perceived difficulty.

Keywords: Health information; Health literacy; audio information delivery; Text features; Natural Language Processing; NLP.

---

* *Corresponding author.*
E-mail address: arifahmed@arizona.edu

Bibliometric mapping of the research trends on software architecture for e-Health systems

Caroline Luiz Gonçalves[a], Luciana Pereira[a], Alessandra Cristina Santos Akkari[a]*

[a]Graduate Program in Engineering and Innovation Management, Federal University of ABC (UFABC), Santo Andre, Brazil

Abstract

The association between technology and social development is particularly important in the health field, pointing to research in e-Health to optimize health services. This paper aimed to carry out a bibliometric mapping of software architecture for e-Health systems, so an exploratory and descriptive study was performed, with a quantitative approach and based on secondary data from ISI Web of Science. The bibliometric indicators showed 127 different papers in 97 sources, with 16.92 citations per paper and a collaboration index of 4.18 with higher scientific productivity from Europe and North America. Scattered networks of co-citation of the sources and co-occurrence of the keywords were identified, pointing to three main approaches in the research theme, including (i) a managerial view of e-Health systems based on the development of frameworks; (ii) data privacy in health services; (iii) and application of digital technologies, especially Big Data, IoT, Cloud Computing, and Blockchain as corroborated by the word cloud. In addition, for the evaluation of the countries that have the largest number of scientific production and to assess the most used keywords, a descriptive statistical analysis was performed to organize the dataset and to obtain the measures of centrality, dispersion, and frequency. This paper contributes to direct the discussion about software architecture and its multifaceted aspects in the health field, guiding architects and practitioners in their e-Health projects.

Keywords: e-Health; software architecture; health system; bibliometrics.

* *Corresponding author.* Tel.: +55 11 4996-0001.
E-mail address: alessandra.akkari@ufabc.edu.br

Care Cycle to Prevent and Treat a Breast Tumour: Where is The Opportunity for Technology to Cut Health Costs?

Beatriz Pinto[a]*, Patrícia Gomes[b], Cláudia Cardoso[c]

[a] 2Ai – School of Technology, CICF, School of Management, Polytechnic Institute of Cávado and Ave, Barcelos, Portugal
[b] CICF, School of Management, Polytechnic Institute of Cávado and Ave, Barcelos, Portugal
[c] School of Management, Polytechnic Institute of Cávado and Ave, Barcelos, Portugal

Abstract

One of the main challenges of current health systems is the improvement of the services provided without increasing the existing costs or decreasing costs without worsening the quality of the provided care services. Given the complexity of current health care services, the accurate calculation of the actual costs is an arduous task, which requires knowledge of the various elements involved in the health care cycle provided to a patient with a certain medical condition. With this investigation, we aim to study the care cycle provided to a patient, from breast tumour prevention to treatment. Through this study we seek to understand, within the current care cycle provided, where there are opportunities for technology to help reduce the costs currently existing. To achieve this research objective, we performed a documental analysis of articles, books, and other sources of information on medical procedures performed by a patient with a breast tumour. Based on this analysis, the result obtained was a better understanding of the care cycle, which encompasses the different stages and elements involved in the possible process carried out in the case of a breast tumour. With this investigation, it is possible to systematize different phases of this care cycle and perceive the opportunities for intervention to increase its efficiency, namely with the use of communication and image technologies. This preliminary study provides knowledge and the basis to prepare the survey that will be applied to physicians responsible for breast cancer units around Europe, as well as the perception of the existing opportunities to introduce technology to help to reduce the current costs.

Keywords: breast cancer; care cycle; health systems; health costs; technology;.

* *Corresponding author.* Tel.: (+351) 253 802 500; fax: 253 821 111.
E-mail address: bpinto@ipca.pt

Caregiver Segmentation Using The Integration of The Modified Burden Dimensions and Fuzzy C-Means

Nabillah Rahmayanti[a,*], Retno Vinarti[a], Arif Djunaidy[a], Anna Tjin[b], Jeng Liu[c]

[a]*Information Systems Department, Faculty of Intelligent Electrical and Information Technology,
Institut Teknologi Sepuluh Nopember (ITS), Indonesia.*
[b]*Trinity College Dublin, The University of Dublin, Trinity Centre for Global Health, 7-9 Leinster Street, South, Dublin 2, Ireland.*
[c]*Tunghai University Department of Sociology No.1727 Section 4, Taiwan blvd, Xitun District, Taichung City, Taiwan.*

Abstract

The increasing demand for Indonesian female caregivers to Taiwan, raises issues related to caregiver burden. In this study, a segmentation analysis of 299 questionnaire data that consisted of Zarit Burden Interview (ZBI) instrument and four dimensions: personal strain, role strain, dependency, and guilt (PRDG) was conducted to find selection pattern strategies of prospective caregivers based on their characteristics. The results of confirmatory factor analysis (CFA) indicated the need to add "social life" as a new dimension (S+PRDG) representing the caregivers' social problems, while the results of multiple regression analysis indicated three most influential characteristics of a caregiver: number of children, education level, and work location. The segmentation analysis was carried out using Fuzzy C-Means on the modified PRDG model which is (S+PRDG) and resulted two best segments that have a fuzzy silhouette index value of 0.61. From the analysis of these two segments, the resilient caregivers were those in the second segment with the characteristics such as having children, having level of education up to junior high school, and working in the capital city of Taiwan.

Keywords: Indonesian female caregiver; Caregiver segmentation; Fuzzy C-Means; S+PRDG model.

* *Corresponding author.* Tel.: +6281232249491
E-mail address: bellasnabillah@gmail.com

Chat2Quit – Support Platform for Smoking Cessation

Filipa Fonte[a], Carlos Grilo[a,b], Roberta Frontini[d,e], Sofia Jacinto[f], Sara Simões Dias[c,d]

[a]*School of Management and Technology, Polytechnic of Leiria, Leiria, Portugal*
[b]*CIIC – Computer Science and Communication Research Centre, Polytechnic of Leiria, Leiria, Portugal*
[c]*School of Health Sciences, Polytechnic of Leiria, Leiria, Portugal*
[d]*ciTechCare - Center for Innovative Care and Health Technology, Polytechnic of Leiria, Leiria, Portugal*
[e]*CIEQV - Life Quality Research Centre, Polytechnic of Leiria, Leiria, Portugal*
[f]*University of Bern, FHNW*

Abstract

Tobacco consumption is a leading cause of preventable death and, despite decades of research, smoking cessation is still a challenge. The number of smokers who attempt to quit smoking every year is high, but only 2-3% remain abstinent after 12 months. Smokers wanting to quit should have the help of healthcare professionals. However, only 1 in 20 who attempts to quit is supervised by a professional. Mobile phone technology has the potential to provide personalized smoking cessation support. Motivational messages and behavioral-changes methods used usually in face-to-face smoking cessation consultations can be modified for delivery via mobile phones. The content can be customized to be patient-centered and tailored for the age, gender and education group of the quitter. This paper presents a platform to support smoking cessation composed by a mobile application to be used by users trying to quit smoking, and a web application to be used by researchers to analyze data regarding the app users' tobacco cessation process. The app follows the transtheoretical model by Prochaska and DiClemente, allowing users to define and be aware of their wishes (what motivates them to stop smoking), barriers that hinder the quitting process and implementation plans and strategies to help them overcoming obstacles.

Keywords: smoking cessation, support platform, android app.

ChevroCrypto – Blockchain Cryptographic File System Prototype

Filipe Alves[a,*,] Nuno Mateus-Coelho[a,c], Manuela Cruz-Cunha[a,c]

[a]IPCA – Polytechinc Institute of Cávado and Ave, Barcelos, 4750, Portugal
[b]LAPI2S – Laboratory of Privacy and Information Systems Security, Porto, 4000, Portugal
[c]2AI – School of Technology, Polytechinc Institute of Cávado and Ave, Barcelos, Barcelos, 4750, Portugal

Abstract

The Internet of Things technologies are progressively being incorporated into the different difficulties that occur and ensuring data protection from these systems is becoming increasingly vital. There are various technologies available to help developers with data protection but comprehending worldwide obligatory regulations as well as a comprehensive set of key qualities that should be addressed while carrying out projects is required. This project was created to help developers who may lack knowledge, are unfamiliar with the region, and want a high level of security in their system.

Keywords: Iot, data protection, developers, security-.

* *Corresponding author.*
E-mail address: a12730@alunos.ipca.pt

Classifying and discovering genomic sequences in metagenomic repositories

Jorge Miguel Silva[a,*], Joao Rafael Almeida[a,b,*], Jose Luís Oliveira[a,*]

[a]DETI/IEETA, University of Aveiro, Portugal
[b]Department of Computation, University of A Coruña, Spain

Abstract

The taxonomic and functional composition of microbial communities from environmental, agricultural, and therapeutic settings is increasingly being studied using metagenomic methodologies in large-scale genomic applications. This has led to exponential growth in the field and has impacted on healthcare, pharmacology and biotechnology. However, with the current methodologies, it is sometimes difficult to obtain conclusive identification of an organism. In addition, the growth of the metagenomic field has led to the creation of large amounts of data held by different hosts, which characterize data differently and make analysis difficult. Therefore, correct data aggregation and classification improve and facilitate the discovery of repositories of interest. This paper tackles these issues by proposing a methodology for organism identification, data aggregation and content characterization, visualization and selection. We propose a three-step pipeline for organism identification that uses compression-based metrics, an aggregation mechanism for content characterization, and a web database catalogue for data exposition and visualization.

Keywords: Taxonomic Classification; Organism Identification; Compression; Web Portal; Data Aggregation; Genomic Catalogue.

*Corresponding author.
E-mail address: {jorge.miguel.ferreira.silva, joao.rafael.almeida}@ua.pt

Clinical Pathways and Hierarchical Clustering for Tuberculosis Treatment Outcome Prediction

Verena Hokino Yamaguti[a*]; Alberto Freitas[c]; Anderson Chidi Apunike[a]; Rui Pedro Charters Lopes Rijo[b]; Domingos Alves[a]; Antonio Ruffino Netto[a]

[a]*University of São Paulo, Ribeirão Preto, Brazil*
[b]*Polytechnic Institute of Leiria, Leiria, Portugal*
[c]*CINTESIS@RISE, FMUP, University of Porto, Porto, Portugal*

Abstract

Clinical pathways are chronological event series that happen throughout a patient's treatment. They can be extracted from the Electronic Health Record medical information and this can be used to correlate the pathway to possible healthcare outcomes. This can be applied to a wide variety of diseases to point pathways related to bad outcomes. These pathways can be audited and patients that start to follow such patterns can be put in special observation and care. Tuberculosis (TB) is one of the leading causes of death through infectious disease and its control is based on search for cases, accurate and premature identification, and treatment. The use of the aforementioned method can help in disease control and premature identifications of bad outcomes for ongoing treatments. Therefore, the current study goals are: 1) identify the existing clinical pathways; 2) group these pathways using hierarchical clustering; 3) create a classification model based on the generated clusters to predict bad outcomes. The dataset used consisted of 277,870 TB treatment cases from the state of São Paulo collected through TBWEB, a information system for monitoring and follow-up of TB cases. All cases with ongoing treatment were excluded from the study and the resulting dataset was splitted in training and test samples. To reduce bias due to imbalance the undersampling technique was applied to the training dataset resulting in a final sample size of 90,184. The test dataset had a size of 52,639 cases. Both datasets had 16 attributes describing the patient diagnosis and drug scheme evolution through the treatment. All attributes unique values were mapped and a representation character was assigned to each one. Later, these representation characters were concatenated in the chronological order of the events and diagnosis creating a representational string for the clinical pathway. The resulting pathways of the training dataset were used to build the clusters which were later used to build the classifier to predict the treatment outcome based on the test dataset clinical pathways. The final model overall accuracy is at 0.829. The model showed a significant improvement of accuracy from previous studies and had similar or better performance than others in the literature. We believe this model can be implemented to a informational system to further improve treatments management and tuberculosis control.

Keywords: Tuberculosis; Clinical pathways; Process mining; Public health; Clustering; Machine Learning.

* *Corresponding author.* Tel.: +55-16-98805-6756; fax: +55-16-3602-1526.
  E-mail address: verena.yamaguti@usp.br

Cognitive Rehabilitation: A Comparison Model of a Digital Environment based on Serious Games and the Traditional Methods

Helena Isabel Marques Gonçalves[a]*, Firmino Oliveira da Silva[b]

[a]ESMAD – Escola Superior de Media, Artes e Design, IPP, Vila do Conde, Portugal
[b]ISLA – Research Center – Instituto Politécnico de Gestão e Tecnologia, Gaia, Portugal

Abstract

Technological innovation contributes to a personalised and integrated approach in education, journalism, communication, management, marketing, and above all, in healthcare. Facing the increasing number of new patients and the shortage of health specialists, the emergence of innovative technologies has brought the fields of health and technology closer together. This research aims to study digital environments in the context of neurocognitive rehabilitation, for the care of patients with deficits in cognitive functions, supported by Serious Games (SG). Typically, neurological patients suffer from cognitive deficits in executive, visuospatial, attention and/or memory functions. In this context, SG prefigure an appropriated tool that combines healthcare and rehabilitation, which allows the connection of healthcare specialists with a platform, as the connection of patients with life and disease companions with potential for collaboration and recording the evolution of the rehabilitation process. Aiming to identify the characteristics and requirements of SG in exposing neurological patients to a safe technological environment that simulates rehabilitation activities supported by SG (developed and oriented to their specificities), but also to make a comparison with traditional methods (TM). A model of comparison between the two paradigms was elaborated, which allowed the collection of requirements and characteristics for future developments. In conclusion, SG are not strictly better than traditional treatment (TT) methods in this context, but the elaborated comparison tends to point out that SG are sovereign to TM in improving training and producing quality data (in safety) for analysis, which allows the total rehabilitation process to be better conducted.

Keywords: Serious Games; Health; Neuro-Cognitive Rehabilitation; Traditional Methods.

---

* *Corresponding author.* Tel.: +351-915-559-049.
E-mail address: hegoncalves2022@gmail.com

DashGen: Development of a Computational Tool for Flexible

Visualization in Complex Primary Health Care Databases in

the Brazil Public Health System

Flavio de Barros Vidal[*], Aleteia Patricia Favacho Araujo, Raphael Paula Leite Muller, Jorge Henrique Cabral Fernandes

Department of Computer Science, University of Brasilia, Brasilia, Distrito Federal, Brazil

Abstract

The Unified Health System (SUS) has accumulated, over its more than 30 years of history, a vast amount of data and information on a massive number of health actions. However, the immense fragmentation present in its information systems reduces their effectiveness for guiding decision-making processes. The DashGen tool seeks to fill this gap and enable a simplified and transparent approach to integrating and exploiting public data related to Primary Health Care. DashGen allows the production of flexible visualizations of complex databases, including sophisticated analyses, promoting advancement in access to information including new ways of understanding health databases.

Keywords: Information systems, Decision-making processes, Complex databases, Health databases.

[*] *Corresponding author.*
Email address: fbvidal@unb.br (Flavio de Barros Vidal)

Deep Learning Approaches for HAR on Activities of Daily Living using IMU Sensors in Smart Glasses

Sakorn Mekruksavanich[a], Ponnipa Jantawong[a], Anuchit Jitpattanakul[b,*]

[a]*Department of Computer Engineering, School of Information and Communication Technology, University of Phayao, Phayao, 56000, Thailand*
[b]*Intelligent and Nonlinear Dynamic Innovations Research Center, Department of Mathematics, Faculty of Applied Science, King Mongkut's University of Technology North Bangkok, Bangkok, Thailand*

Abstract

In the latest days, study into the development of intelligent technologies has proven valuable, contributing to attempts to improve the quality of human existence. Smart glass is one of the intelligent wearable devices that can be used for various purposes, including healthcare monitoring, fall detection, sleep tracking, and human activity recognition (HAR). Smartphones and smartwatches are the primary wearables utilized in sensor-based HAR to collect human motions for training recognition models based on physical movement. These wearable tools, nevertheless, are more intrusive than smart glasses. Using IMU sensor data acquired via smart glasses, we investigate deep learning algorithms for detecting people's activities of daily living (ADL). This work proposes a hybrid deep neural network that automatically extracts spatial-temporal information from raw data to enhance identification performance. We performed tests to evaluate deep learning models using a publically available benchmark dataset, UCA-EHAR, which included IMU sensor data from multiple ADL from smart eyewear. The recommended CNN-LSTM model achieved the best effectiveness with the highest F1-score of 93.20%, as determined by experimental findings.

Keywords: smart glasses; deep learning; human activity recognition; IMU sensor.

* *Corresponding author.* Tel.: +66 2 555-2000.
E-mail address: anuchit.j@sci.kmutnb.ac.th

Deep Learning-based Model for Human Activity Recognition using Biosensors embedded into a Smart Knee Bandage

Sakorn Mekruksavanich[a], Ponnipa Jantawong[a], Anuchit Jitpattanakul[b],[*]

[a]Department of Computer Engineering, School of Information and Communication Technology
University of Phayao, Phayao, 56000, Thailand
[b]Intelligent and Nonlinear Dynamic Innovations Research Center, Department of Mathematics
Faculty of Applied Science, King Mongkut's University of Technology North Bangkok, Bangkok, Thailand

Abstract

Today, biosensors are effectively utilized in illness detection, prevention, rehabilitation, patient medical monitoring, and personal health promotion. The advancement of biosensing technology offers rigorous methods for measuring an individual's motor function, which contributes significantly to restoring motor function. An smart knee bandage was recently designed to analyze and decode diverse biosignals recorded by knee bandage-integrated biosensors. This research aims to examine human activity recognition (HAR) using biosignals gathered by a smart knee bandage. To accomplish this, a deep residual neural network was established for biosensor-based HAR. For performance assessment, we utilized a significant public biosensor dataset known as the CSLSHARE dataset, which gathers electromyography (EMG), electrogoniometer (EGM), and inertial measurement unit (IMU) signals of individuals completing 22 simplex and complicated everyday tasks. Five-fold cross-validation was used to train and assess deep learning models. According to our findings, integrating features derived from the EMG, EGM, and IMU signal produced the maximum accuracy of 91.60% and the highest F1-score of 92.13%.

Keywords: biosensors; human activity recognition; electromyography; smart knee bandage.

* *Corresponding author.* Tel.: +66 2 555-2000.
E-mail address: anuchit.j@sci.kmutnb.ac.th

Dementia Prediction Using Machine Learning

Sara Dhakal[a], Sami Azam[a], Khan Md. Hasib[b], Asif Karim[a,*], Mirjam Jonkman[a], A S M Farhan Al Haque[c]

[a]College of Engineering, IT and Environment, Charles Darwin University, NT, Australia
[b]Department of Computer Science and Engineering, Ahsanullah University of Science Technology, Dhaka, Bangladesh
[c]Department of Electronic Systems, Aalborg University, Copenhagen, Denmark

Abstract

Dementia is a chronic and degenerative condition, which has become a major health concern among the elderly. With ever-continuing cases of dementia, it has become a very challenging task in the 21st century to provide care for patients with dementia. This paper proposes a framework for the prediction of dementia using the data collected from the OASIS (Open Access Series of Imaging Studies) project which was made available by the Washington University Alzheimer's Disease Research Centre. Different techniques have been implemented for data imputation, pre-processing and data transformation to create suitable data for training the model. Machine learning approaches like Adaboost (AB), Decision Tree (DT), Extra Tree (ET), Gradient Boost (GB), K-Nearest Neighbour (KNN), Logistic Regression (LR), Naïve Bayes (NB), Random Forest (RF), and SVM (Support Vector Machine) has been used for a combination of features. These techniques have been applied to the full set of features and features selected from Least Absolute Shrinkage and Selection Operator (LASSO) techniques. A comparison between the accuracy, precision, and other metrics based on the results of the classification algorithms has been provided. The experimental results show that the highest accuracy of 96.77% was obtained by Support Vector Machine (SVM) with full features. The proposed methodology is promising and if developed and deployed can be helpful for the rapid assessment of Alzheimer's Disease (AD).

Keywords: Alzheimer's Dementia, Health Informatics, LASSO, Machine Learning;.

* Corresponding author.
E-mail address: asif.karim@cdu.edu.au

Demonstration and Evaluation of the Digital Health Innovation Interoperability Framework

Tim Scheplitz[a*]

aTechnische Universität Dresden, Forschungsgruppe Digital Health, Dresden, 01062, Dresden

Abstract

The relevance and role of interoperability currently change due to the unique characteristics of Digital Health Innovations (DHI) and the ongoing demand for defragmentation in Health Information Systems (HIS) landscapes. Efforts towards novel data-centered value propositions, inter-organizational care scenarios, and inter-sectoral collaborations force innovators to parallelly manage to realize the innovative idea and pave the path to seamless integration into complex target environments. Thus, the construct of interoperability shifts from a technical requirement's position to a socio-technical concept that provides guidance for DHI management. This research contributes to the discourse about the reconceptualization of interoperability for DHI. It builds upon a recently proposed Digital Health Innovation Interoperability Framework (DHIIF) and presents, first, a demonstration of its use within an ongoing DHI project on Digital Phenotyping and, second, a small-scale evaluation via an online expert survey. This paper provides the DHIIF's justification and confirms its utility as a conceptual fundament for DHI practice and HIS research.

Keywords: Digital Health Innovation, Health Information Systems, Interoperability, Framework.

* *Corresponding author.*
E-mail address: tim.scheplitz@tu-dresden.de

Diabetic Retinopathy Grading using Blended Deep Learning

Fernando C. Monteiro[a,b*]

[a]Research Centre in Digitalization and Intelligent Robotics (CeDRI),
[b]Laboratório para a Sustentabilidade e Tecnologia em Regiões de Montanha (SusTEC),
Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300-253 Bragança, Portugal

Abstract

Diabetic retinopathy is a complication of diabetes that is mainly caused by the damage of the blood vessels located in the retina. Retinal screening contributes to early detection and treatment of diabetic retinopathy. DR has five stages, namely healthy, mild, moderate, severe and proliferative diabetic retinopathy. Computer-aided diagnosis approaches are needed to allow an early detection and treatment. Several automated deep learning (DL) based approaches have been proven to be a powerful tool for DR grading. However, these approaches are usually based on one DL architecture only which could produce over-fitted results. Another identified problem is the use of imbalanced datasets. In this paper, we proposed a blended deep learning approach obtained by training several individual DL models, using a 5-fold cross-validation technique and combining their predictions in a final score. This blended model highlights each individual model where it performs best and discredits where it performs poorly, increasing the robustness of the results. The experiments were conducted on a balanced DDR dataset containing 33310 retina fundus images equally distributed for the DR grades. An explainability algorithm was also used to show the efficiency of the proposed approach in detecting DR signs.

Keywords: Diabetic retinopathy grading; blended deep learning; retina fundus images; retinopathy levels.

Forecasting inventory for the state-wide pharmaceutical service of South Australia

Rachel Rushton[a], Olivia Lorraine[a], Junia Tiong[b], Masud Karim[a], Rowena Dixon[c], Winifred Greenshields[c], Richard Marotti[c], Neil Arvin Bretaña[d*]

[a]UniSA Online, University of South Australia, Adelaide, Australia
[b]UniSA STEM, University of South Australia, Adelaide, Australia
[c]SA Pharmacy, SA Health, Adelaide, Australia
[d]UniSA Allied Health & Human Performance, University of South Australia, Adelaide, Australia

Abstract

Forecasting pharmaceutical stock inventory is a complex problem affecting the healthcare industry across the globe. South Australia is no different. This prompted SA Pharmacy to collaborate with a team of researchers at the University of South Australia to explore ways of projecting inventory for their state-wide services. In this paper, we utilised industry-supplied time-series data to train prediction models using linear regression, exponential smoothing, Holt Winters Seasonal Additive, and Holt Winters Seasonal Additive + damped algorithms. Among these models, the study identified the Holt Winters Seasonal Additive + damped algorithm is the best performing based on an RMSE of 408. We developed a dashboard to consolidate this data and visualise organisational metrics related to optimizing pharmaceutical stock inventory for SA Pharmacy. This study presents our findings and our pharmaceutical dashboard.

Keywords: data science, modelling, pharmacy, health informatics, inventory forecast.

* Corresponding author
E-mail address: Neil.Bretana@unisa.edu.au

GISSA intelligent chatbot experience –

How effective was the interaction between pregnant women

and a chatbot during the COVID-19 pandemic?

Raquel Silveira[a,b]; Cláudia Pernencar[c]*; Fábio de Sousa[b]; Kamila Gomes[d]; Deivith Oliveira[e]; Inga Saboia[f]; Cristiane Mourão[a]; Odorico Monteiro[a]; Ivana Barreto[a]

[a] Fundação-Oswaldo Cruz-Ceará

[b] Instituto Federal de Educação do Ceará – IFCE

[c] ICNOVA—Instituto de Comunicação da NOVA, Faculdade de Ciências Sociais e Humanas da Universidade Nova de Lisboa, Lisboa, Portugal

[d] Universidade Federal do Ceará

[e] Universidade Estadual do Ceará

[f] Universidade Federal do Ceará – Instituto UFC Virtual

Abstract

The COVID-19 increased the importance of patient's continuous assessment of health outcomes. In 2021 WHO proposed some Digital Health guidelines arguing that health systems should consider the use of emergent technologies in health care services. This health environment is providing intelligent systems to guide patients in self-care. One example of that is the chatbot which is, a conversational agent that have been assuming an important role in how to improve health knowledge, reducing the incidence of diseases and avoiding new ones. Pregnant women are a profile where the self-care referred before is a critical issue. Prenatal services reveal to be an important part of the care process where most complications for that women happen. This article aims to comprehend how pregnant women interact with a conversational agent and how relevant this Digital Health tool is for primary health care services. The study presents the process and results of a systematic literature review about the user experience with of a chatbot in pregnant women self-care context; a summary of GISSA intelligent chatbot development including the use of technologies such as DialogFlow; and the process and results of GISSA usability evaluation in research field. Results show that a small amount of articles was gathered and the chatbot as a tool is a relevant opportunity for primary care health services in Brasil.

Keywords: Conversational Agents, Chatbot, COVID-19, DialogFlow, Digital Health, Pregnant women, Natural Language Processing, User Experience.

---

* Corresponding author *e-mail address:* claudiapernencar@fcsh.unl.pt

Glaucoma Detection using Convolutional Neural Networks for Mobile Use

Meltem Esengönül[a,b*], António Cunha[b,c]

[a] University of Applied Sciences Technikum Wien, Höchstädtpl. 6, Vienna, 1200, Austria
[b] University of Trás-os-Montes e Alto Douro, Quinta de Prados, Vila Real, 5000-801, Portugal
[c]INESC TEC – INESC Technology and Science, Porto, 4200-465, Portugal

Abstract

Glaucoma is an optic nerve disease that can also be caused by Diabetes due to the increase in the intraocular pressure. When the disease is not detected in time, it can cause severe vision loss. Through the use of artificial intelligence this process can be automated. In order to reach as many people as possible, mobile technologies can be used for where ophthalmologists are scarce. In this paper, several aspects of Glaucoma detection systems based on Convolutional Neural Networks are examined and analyzed for mobile use in order to discover the key factors for most effective detection systems. Findings demonstrate that dataset variability, dataset size and training time are important factors for mobile use with lighter models based on MobileNet.

Keywords: Glaucoma, Artificial Intelligence, Deep Learning, Convolutional Neural Networks, Mobile Use.

* *Corresponding author.*
E-mail address: meltem.esengonul@gmail.com

Heuristic Evaluation of the Usability of a Mechanical Ventilator Interface through a Simulator

Ruben Silva[a], Ana Carolina Lima[b], Evismar Andrade[c], Ana Isabel Martins[d,*],
Nelson P. Rocha[e]

[a] ISMAT Higher Institute Manuel Teixeira Gomes, Rua Dr. Estevão de Vasconcelos 33a 8500-724 Portimão, Algarve, Portugal
[b] COPELABS, University of Lusofona Campo Grande 376, 1749-024 Lisboa
[c] Electrical & Electronic Engineering, School of Engineering, National University of Ireland, University Rd, Galway
[d] CINTESIS@RISE, University of Aveiro Campus Universitário de Santiago 3810-193 Aveiro Portugal
[e] IEETA, Department of Medical Sciences, University of Aveiro, Campus Universitário de Santiago 3810-193 Aveiro Portugal

Abstract

Determining the usability of mechanical ventilator interfaces is vital in ensuring correct usage under critical procedures that can place patients' health in danger. Heuristic evaluation has been used to evaluate usability in many different areas, including medical devices. The objective of this study is to evaluate the usability of a mechanical ventilator using the heuristic evaluation method. The evaluation of a mechanical ventilator simulator (Drager's Evita V500) was performed using the Heuristic Evaluation System Checklist (HESC). Three evaluators took part in the experiment in assessing the usability through HESC. The results show that of the 292 checklist sub-heuristics included in the HESC Checklist, 127 were compliant (had no flaws), 75 were not compliant (had flaws) and 95 were not applicable. The results point out that the mechanical ventilator interfaces should be improved to avoid human error due to usability issues. The results also show that heuristic evaluation generates a large quantity of objective information, which provides an exhaustive identification of aspects that should be improved.

Keywords: Usability, Ventilator, Heuristic Evaluation, Medical devices, Human-Computer Interaction.

---

* *Corresponding author.* Tel.: +00 351 234 401 558.
E-mail address: anaisabelmartins@ua.pt

Image thresholding approaches for medical image segmentation - short literature review

Sandra Jardim[a*,] João António[b], Carlos Mora[a]

[a]*Smart Cities Research Center – Ci2, Polytechnic Institute of Tomar, Quinta do Contador, 2300-313 Tomar, Portugal*
[b]*Techframe – Sistemas de Informação, SA, Rua Almeida Garrett, 83A, Buzano, 2785-338 São Domingos de Rana, Portugal*

Abstract

Medical image analysis is an invaluable tool in medicine. Different imaging modalities provide an effective means for mapping images that can feed machine and deep learning models which can significantly contribute to increase knowledge of diseased anatomy for medical research, being an important component in diagnosis and treatment planning. Accurate segmentation of medical images is a key step in the use of Artificial Intelligence as a tool to support physicians. Although there are many approaches to medical image segmentation, thresholding is one of the simplest methods that can be used, being of great interest to the scientific community. Over the years, several approaches to segmentation of medical images based on threshold methods have been proposed, which have evolved both in computational complexity, with shorter processing times, and in efficiency and accuracy of results. This manuscript summarizes the most common threshold-based approaches for medical image segmentation and discuss some of the methods and algorithms proposed in recent years, analyzing their advantages, disadvantages, and limitations.

Keywords: medical imaging; segmentation; thresholding.

* *Corresponding author.* Tel.: +351 249 328 100; fax: +351 249 328 186.
E-mail address: sandra.jardim@ipt.pt.

Implementation of clinical alerts using a Terminology Server with SNOMED CT in Graph Databases

Elizabeth Silva[a],[*,] Daniel Machiavello[b], Marcelo Bondarenco[c]

[a]SMQS, elizabeth.silva@smqs.com.uy, Salto, Uruguay
[b]SMQS, dmaki44@gmail.com, Salto, Uruguay
[c]SMQS, mbondarenco@smqs.com.uy, Salto, Uruguay

Abstract

This paper described the application of a terminology server (TS) within a health institution in Uruguay, whose architecture is based on SNOMED CT and graph databases (NoSQL). The aim of this project is to apply the use of terminological service from a clinical, statistical, managerial, decision support and research perspective, among others, without compromising performance. Particularly, this article exposes the use of the TS as support for alert systems associated to diabetes mellitus patients.

Keywords: Systematized Nomenclature of Medicine, Vocabulary, Graph databases, Decision support, Alerts.

* *Corresponding author.*
E-mail address: elizabeth.silva@smqs.com.uy

Informed Consent Form Automated Validation, The Brazilian Rare Disease Network Case Proposal

Mariane Barros Neiva[a*,] André Luiz Teixeira Vinci[b], Diego Bettiol Yamada[b], Filipe Andrade Bernadi[a], Giovane Thomazini Soares[b], Vinicius Costa Lima[b], Domingos Alves[b], Têmis Maria Félix[c]

[a]Universidade de São Paulo, São Carlos, SP, Brasil. Brazil
[b]Universidade de São Paulo, Faculdade de Medicina de Ribeirão Preto, Ribeirão Preto, SP Brazil
[c]Hospital de Clinicas de Porto Alegre: Porto Alegre, RS, BR Brazil

Abstract

The informed consent form (ICF) is required for all observational studies involving human subjects in Brazil. Besides the existence of e-Consent technologies, Brazilian guidelines issued by the Ministry of Health, the ICF must be obtained in the physical form in face-face services. Furthermore, the Brazilian Network of Rare Diseases (RARAS) project was proposed in a context marked by a scarcity of structured data on Rare Diseases (RD). One of the main objectives of RARAS is to understand and expose the RD scenario in Brazil. Since one of the stages in the RARAS project requires data collected from a patient's interview, the ICF is mandatory. Therefore, the importance of completeness of participants' process aroused the need of the technical team of RARAS to propose a protocol to automate the validation of scanned physical ICFs. The purpose is based on applying image preprocessing methods and a deep learning model. Regarding previous results in the literature, the expected outcome is to achieve around 90% accuracy in the classification of ICF for the RARAS project.

Keywords : Informed consent; Automated signature detection; Pattern recognition; Rare disease.

* *Corresponding author.*
E-mail address: marianeneiva@usp.br

Intelligent Identification of Hate Speeches to address the increased rate of Individual Mental Degeneration

Lamima Tabassum Ava[a], Asif Karim[b*,] Md. Mehedi Hassan[c], Fahad Faisal[d],
Sami Azam[e], A S M Farhan Al Haque[f], Sadika Zaman[g]

*[a] Computer Science and Engineering, Bangladesh University of Business and Technology Dhaka, Bangladesh,
17182103281@cse.bubt.edu.bd*
[b] College of Engineering, IT and Environment, Charles Darwin University, NT, Australia, asif.karim@cdu.edu.au
[c] Department of Computer Science and Engineering, North Western University, Khulna, Bangladesh, mehedihassan@ieee.org
*[d] Department of Computer Science and Engineering, Daffodil International University, Dhaka, Bangladesh
fahad.cse@diu.edu.bd*
[e] College of Engineering, IT and Environment, Charles Darwin University, NT, Australia, sami.azam@cdu.edu.au
[f] Department of Electronic Systems, Aalborg University Copenhagen, Denmark, ahaque21@student.aau.dk
[g] Department of Computer Science and Engineering, North Western University, Khulna, Bangladesh, sadikazaman@yahoo.com

Abstract

Hate speech is a public statement that demonstrates resentment or provokes disturbance towards a person or group often based upon race, age, religion, sexual orientation, minority group, psychical disability, political belief, etc. Such an act is a leading cause of mental degeneration in individuals observed throughout the world. We have witnessed an upsurge in the spreading of hateful speech through videos in recent times due to increased social media usage. Researchers are working on this issue because it has become more frequent on several social media platforms, and it leads to low self-esteem and has significant negative impacts on human life. In this work, we focus on collecting data from such videos as nowadays people are sharing numerous videos of this negative nature on platforms like Facebook and YouTube. The audio data of these videos were then converted into text to build the dataset, and we applied some classifier models to our dataset. In this paper, we utilized a transfer learning Bidirectional Encoder Representations from Transformers (BERT) model that gives state-of-the-art outcomes. More precisely, we fine-tuned our model based on transfer learning to evaluate BERT's capacity to capture hostile contexts inside YouTube videos. We examined Fine–Tuning BERT; with different learning rates and listed the outcomes. We train the BERT by freezing all the hyperparameters but with various random seeds to evaluate our suggested Fine-tuning approach. Compared to previous methodologies that used our dataset, our proposition fared better in terms of accuracy and execution time.
Keywords: Hate Speech; MP4 to Text; BERT; NLP; Random Seed; Hyperparameter.

---

* *Corresponding author.*
E-mail address: asif.karim@cdu.edu.au

Interoperability approach for Hospital Information Systems based on the composition of web services

Lydie Simone KONE/TAPSOBA[a,*], Yaya TRAORE[b] Sadouanouan MALO[a]

[a]Algebra, discrete Mathematics and Informatics laboratory (LAMDI), Bobo-Dioulasso
[b]Mathematics and Informatics laboratory (LAMI), Ouagadougou

Abstract

Nowadays, many health centers use Hospital Information Systems (HIS) for the daily management of center activities such as patient data management. In Burkina Faso, many HIS are used for patient data management but these systems cannot cooperate because the data sources are often heterogeneous. In order to guarantee a better diagnosis in patient management, physicians need to access these data sources in a unique way through queries. For better analysis of a patient's situation, the health worker may want to access multiple data sources that do not belong to the same health center. This is only possible if the HIS involved interoperate. In a previous work, we proposed an interoperability architecture based on semantic web services. This solution has the advantage of not modifying the current organization of health centers. Indeed, for a complex query, a composition of web services is a solution to satisfy different needs. In this paper, we detail our approach for composing semantic web services. In our approach, the functionalities of each HIS application will be implemented by a web service semantically annotated by an ontology. An ontology-based mediation service is used to enrich the physician query and the MiniCon algorithm to create a composite web service. The composite web service is executed to return the requested data.

Keywords: Web service composition, Hospital Information System, Interoperability, ontology.

* *Corresponding author.*
E-mail address: tapslyd@gmail.com

Introducing Digital Technologies for Remote Care in Norway and China: The DigiRemote Project

Hong Li, Torbjørg Træland Meum, Miria Grisot

University of Oslo, Blindern, Oslo 0316, Norway

Abstract

In this paper, we report from research on a digital technology solution for remote care, which consists of a patient monitoring portal for healthcare professionals and a mobile application for patients with a set of integrated measuring devices. The same solution has been implemented in different hospitals in Norway and China, within the scope of a research project called DigiRemote. At the current stage of the project, the focus of the research is placed on uncovering the challenges that have emerged in the implementation process in relatively large-scale pilot studies in Norway and China. We report several issues found during the early stages of the implementation in the two countries. The aim of the research is to understand and improve the implementation and use of a new type of remote care service adapted to different cultural, institutional, and technical contexts.

Keywords: Remote care; digital technology; early-stage implementation; case study.

Investigating conversational agents in healthcare:

Application of a technical-oriented taxonomy

Kerstin Denecke[1*,] Richard May[2]

[1]Bern University of Applied Sciences, Quellgasse 21, 2502 Biel, Swotzerland
[2]Harz University of Applied Sciences, Friedrichstrasse 54, 38855 Wernigerode, Germany

Abstract

Conversational agents (CA) are increasingly applied to realize health applications that collect patient data, provide information or even deliver health interventions. We developed a taxonomy focusing on technical characteristics of health CA with the purpose of creating a reporting guideline towards health CA and of building technical-oriented archetypes. The taxonomy comprises 18 dimensions which can be grouped into four perspectives. In this work, we wanted to find out whether the taxonomy is complete and can be applied appropriately by researcher to describe the technical characteristics of their health CA. Through a literature review, we identified 103 unique health CA for which publications have been published in 2021 and 2022. We contacted the corresponding or first authors of those papers asking for providing the information along our taxonomy for the CA described in their paper. For this purpose, our taxonomy was transformed into a questionnaire. To study applicability and understandability of the taxonomy, we also extracted the requested information from the papers using the taxonomy and compared the results to those of the participants. 95 E-Mails could be delivered. 26 persons out of 95 replied to our request resulting in a return rate of 27.3%. Results show that the majority of CA is simple in terms of CA personality; visualized as avatar or without embodiment. Systems are mainly rule-based, domain-specific and support one language. We recognized several differences between replies given by the participants and what has been extracted from the publications on the CA by us. We conclude that in order to apply the taxonomy as reporting guideline clear definitions must be given for the single characteristics. Some additional characteristics have to be added.

Keywords: conversational agents; health chatbots; taxonomy; technology.

 * *Corresponding author.* Tel.: +41 32 321 67 94.
 E-mail address: kerstin.denecke@bfh.ch

Key Performance Indicators for value-based reimbursement in Radiology: a Review.

Ana Moreira[a]*,José Crispim[a,b]

[a]Escola de Economia e Gestão, Universidade do Minho, Campos de Gualtar, 4710-057 Braga, Portugal
[b]NIPE, Universidade do Minho, Campos de Gualtar, 4710-057 Braga, Portugal

Abstract

Value-based reimbursement is increasingly discussed in association with efforts to develop modern healthcare systems value-based. Relevant information (clinical, economic) should support the reimbursement systems that mirror the actual cost and benefits of a healthcare service. The reimbursement model should be understandable by decision makers and commensurate with the hospital information system (HIS). HIS should be aligned with the clinical and administrative data collection required to support the characterization of the care episode and allow a calculation of the benefits and costs incurred. The significant amount of information that HIS can gather results in an information overload that healthcare managers and professionals hardly can simplify. KPIs are crucial measurement tools capable of compiling and aggregating such information's. Radiology departments are highly technology-related service, operator-dependent, involving multiple stakeholders and considered as an adjunct to quality care, but not a primary contributor to value. Current radiology reimbursement levels are based on the same over the past 20 years criteria. Given the complexity and the inadequate criteria the first stage for new reimbursement models development, the aim of this study, is the identification of appropriate metrics to be used to monitor and evaluate the quality of services provided. The identified 160 metrics were aggregated and synthetized according to the radiology value chain in seven categories in a total of 56 value KPI's.

Keywords: Value-based reimbursement; Radiology; KPIs; HIS.

* *Corresponding author.* Tel.: +351-253604565
  E-mail address: moreira.asofia@gmail.com

Medication recommendation in cancer treatment based on cell line similarity

Diogo Pimenta[a*,] Mónica Teles[a], Fernando Belfo[ab], António Trigo[ab]

[a] Coimbra Business School - ISCAC, Polytechnic Institute of Coimbra, Quinta Agrícola, Bencanta, 3045 – 231 Coimbra, Portugal [b]Centro Algoritmi, University of Minho, Campus Azurém, 4800-058 Guimarães, Portugal

Abstract

The possibility of performing the sequencing of the human genome has revolutionized the field of biology and medicine itself, paving the way to personalized medicine. In the case of cancer, which is a disease caused by mutations in DNA, the study of genome brings some advantages, because through the study of the functioning of the human organism and the mutations caused by tumor, this makes it possible to explore the effectiveness of a significant number of treatments through medication for certain cell lines derived from various oncological problems. Bioinformatics has some powerful tools that help in the acquisition, storage, analysis, and visualization of genomic data. The research underlying this article was based on the analysis of biological data and established as its main objective the test of the premise that the most effective medications for a particular cell line are those that have been shown to be most effective in cell lines that are visually similar. A sample of 100 images of cell lines was used, and the medications used on each cell line were compared and the above premise was validated, concluding that the similarity in DNA between cell lines allows similar treatments to be recommend.

Keywords: bioinformatics; genomics; cancer.

* Corresponding author.
E-mail address: a2019107256@alumni.iscac.pt

Methodology for Predictive Cyber Security Risk Assessment (PCSRA)

Daniel Jorge Ferreira[a,d,*,] Nuno Mateus-Coelho[b,d], Henrique S. Mamede[c]

[a]Universidade de Trás os Montes e Alto Douro, Vila Real, Portugal
[b]IPCA – Polytechnic Institute of Cavado and Ave, Barcelos, Portugal
[c]INESC TEC, Universidade Aberta, Lisbon, Portugal
[d]LAPIS2S – Laboratory of Privacy and Information Systems Security, Porto, Portugal

Abstract

With the current impulse of Cyberattacks, data becomes of central importance. There are many challenges in how they are used that also need to be discussed. Defining the suitable cybersecurity incident response model is a critical challenge that all companies face today. With a high number of incidents that happen daily and for which there is not always an adequate response due to the lack of predictive models based on data (evidence), there is a significant investment in research to identify the main factors that can cause such incidents, in and consistently trying to have the most appropriate answer, and ultimately, boosting responsiveness and success. At the same time, there are several different methodologies to assess the risk management of organizations and their level of maturity. The capability assessment is intended to enable organizations to understand better the fundamentals that need to be laid down to deliver cybersecurity successfully. There is, however, a gap in determining an organization's degree of proactive responsiveness to successfully embracing cybersecurity and an even more significant gap in assessing it from a risk management perspective. This work proposes a model to assess this capacity.

[*] *Corresponding author.*
E-mail address: danielferreirapessoal@gmail.com

MMG Signal Analysis for Muscle Performance Assessment

Tasneem Hazem*[a,] Hassan Soubra, Hisham Othman

Faculty of Media Engineering and Technology, German University in Cairo, Cairo 11511, Egypt

Abstract

Skeletal muscles' activity can be measured via electromyography (EMG) and mechanomyography (MMG): neural drive and muscle state information influence both signals. Hence, both EMG and MMG can be utilized to investigate neuromuscular physiology in different aspects. In this paper, using the mechanomyogram (MMG) signal, a Digital Signal Processor (DSP) model was created in Simulink to study and evaluate muscle performance. DSPs allow the conversion of real-world phenomena into digital data for computerized analysis and manipulation. The MMG signal, which represents a low frequency vibrational signal recorded when a muscle is contracted, is used as an input by the runtime simulator to evaluate muscle performance. As a result, the DSP simulator will not only display graphs and values that represent muscle strength, but it will also allow for greater flexibility in treatment modalities and provide significant support for the anticipated therapeutic and functional treatment outcome of Neuromuscular Electrical Stimulation (NMES) rehabilitation intervention of disabled people.

Keywords: DSP; Signal processing; Simulink; Matlab; Runtime Simulation; Mechanomyoghram; MMG parameters extraction; MMG sensor; Muscle performance; NMES; Muscle strength; Muscle fatigue.

---

*Corresponding author.
E-mail address:* tasnem.hazem@gmail.com

Network analysis of publications on studies of Parkinson Disease

Fuad Aleskerov[a], Olga Khutorskaya[b], Vuacheslav Yakuba[b], Anna Stepochkina[c], Ksenia Zinoveva[c*]

[a] National Research University Higher School of Economics, Institute of Control Sciences of Russian Academy of Sciences, 20 Myasnitskaya Str., 101000 Moscow, Russia
[b]Institute of Control Sciences of Russian Academy of Sciences, 65 Profsoyuznaya Str., 117997 Moscow, Russia
[c]National Research University Higher School of Economics, 20 Myasnitskaya Str., 101000 Moscow, Russia

Abstract

More than 10 million people worldwide are suffering from Parkinson Disease (PD). We analyse publications on studies of PD over the period from 2015 to 2021. We have collected about 70 thousand papers from 4912 different journals. After the data preprocessing 39811 publications and 3292 journals are left.
Methods of centrality analysis have been applied to identify the most significant publications and journals in the field. Classical and new centrality indices have been evaluated for the whole period and for each year. It can be noticed that changing the parameters makes it possible to extract groups of specialized journals and fields of study, which intensively cite each other.

Keywords: Parkinson Disease, citation network, network analysis, centrality indices.

* *Corresponding author.* Tel.: 7-4956211342.
E-mail address: kzinoveva@hse.ru

Patient centered care in primary health care teleconsultations: an exploratory study

Mariana Reis[a], José Crispim[a,b*], Nazaré Rego[a]

[a]Escola de Economia e Gestão, Universidade do Minho, Campus de Gualtar, 4710-057 Braga, Portugal
[b]NIPE, Universidade do Minho, Campus de Gualtar, 4710-057 Braga, Portugal

Abstract

With the current evolution of health digitalization driven by the COVID-19 pandemic, it is expected that teleconsultations - specifically, synchronous audio consultations (by telephone) or video-based (video calls) between health professionals (Doctors and Nurses) and patients - will be more used in Primary Health Care. The provision of health care through teleconsultations must be evaluated by the quality management of health organizations to ensure that the needs of patients are met. For this reason, this study was carried out under the objective of identifying indicators to create a culture of Patient-Centered Care (PCC) in teleconsultations in Primary Health Care. The methodology followed was based on the Delphi method. The research aimed to analyze the suitability of 48 indicators (organized in Donabedian's quality dimensions) to assess the implementation of PCC in Primary Health Care. Despite all indicators were viewed as very important, the disparity in responses was significant. Future research should extend this study by involving other groups of experts (like academics who study the subject and members of patient associations).

Keywords: Patient centered care; Primary health care; Quality indicators; Teleconsultation.

* *Corresponding author.* Tel.: +351-253604565
E-mail address: crispim@eeg.uminho.pt

Practical recommendations for staff rostering justified by real-world optimization

Kimmo Nurmi[a*], Jari Kyngäs[a], Nico Kyngäs[a]

[a]Satakunta University of Applied Sciences, Satakunnankatu 23, Pori, 28130, Finland

Abstract

Staff rostering is a difficult and time-consuming problem that every company or institution that has employees working on shifts or on irregular working days must solve. The main goal is the performance of staff on financial efficiency. Other important goals include fairer workloads and employee satisfaction. Furthermore, the staff rostering optimization should address the health, safety, and well-being of the employees. The Finnish Institute of Occupational Health, which operates under the Ministry of Social Affairs and Health, published their latest recommendations for shift work in 2019. The recommended values for more than ten individual factors are well justified. However, problems arise when all these recommendations should be satisfied together in real-world staff rostering. We show the gap between the ideal recommendations, theoretical expectations and the everyday reality. We publish our five most important practical recommendations for shift work that researchers should consider when they implement staff rostering algorithms. The PEASTP metaheuristic is used for optimization test runs.

Keywords: staff rostering; workforce optimization; practical recommendations; metaheuristics.

* *Corresponding author.* Tel. +358 44710 3371.
E-mail address: cimmo.nurmi@samk.fi.

Preliminary Results to Predict Tuberculosis Outcomes Applying Traditional and Automated Machine Learning Models

Ana Clara de Andrade Mioto[a,b,*], Mariana Tavares Mozini[b], Renan Barbieri Segamarchi[b], Giovane Thomazini Soares[b], Pedro Emilio Andrade Martins[b], Victor Cassão[a], Luís Gustavo Barichello Ferrassini[c], Newton Shydeo Brandão Miyoshi[b], Domingos Alves[b] and Lariza Laura de Oliveira[b]

[a]Bioengineering Postgraduate Program, University of São Paulo, São Carlos, Brazil
[b]Ribeirão Preto Medical School, University of São Paulo, Ribeirão Preto, Brazil
[c]University Center Barão de Mauá, Ribeirão Preto, Brazil

Abstract

Tuberculosis (TB) remains one of the most lethal infectious diseases in the world and, despite being preventable and curable, kills 4,500 people daily, according to the World Health Organization (WHO). Brazil, being a country heavily affected by TB, works to improve social intervention programs, since the decrease in the patients vulnerability seems to have a positive effect for the cure of TB. The Brazilian public health system records data on TB treatment that can guide actions and interventions. In this context, machine learning (ML) algorithms have been used successfully to analyze health and medicine (H&M) datasets. An emerging area of ML called Automated Machine Learning (Auto-ML) was tested in this analysis to predict the following TB results: good and bad outcomes. Our results indicate that it is possible to build reasonable ML models with the available data.

Keywords: Tuberculosis; Bad Outcomes; Machine Learning; Automate modeling.

[*] Tel.: +55 16 99235-9934;
E-mail address: anaclara.mioto@usp.br

Procurement of artificial intelligence for radiology practice

Line Silsand[a,*], Gro-Hilde Severinsen[b], Line Linstad[c], Gunnar Ellingsen[d]

[a,b,] Norwegian Centre for E-health Research, O.O.Box 35, 9038 Tromsø, Norway
[d]UiT The Arctic University of Norway, P.O.Box 6050, 9037 Tromsø, Norway

Abstract

The development of artificial intelligence (AI) technology for radiology has accelerated in the past decade, but its deployment in radiology practices has been slow. We take a sociotechnical approach and suggest that the limited use of AI in radiology practices can be attributed to a recurring tension between planned and emergent change. The paper contributes with a conceptualization and understanding of the tension during the procurement of AI for radiology. To balance this tension, we suggest that health organizations need to redefine the concept and scope of traditional procurement projects, with well-defined goals and project time. Instead, we propose that health organizations need to conceptualize their procurement and implementation projects of AI technology as evolving change processes. The study is based on an interpretive research approach and informed by the Information Infrastructure framework. Empirically, we study the procurement of AI solutions for radiology at a large health trust in Norway.

Keywords: Artificial intelligence; Procurement; Planning; Information infrastructures.

* *Corresponding author.*
E-mail address: line.silsand@ehealthresearch.no

Reorganisation of the internal storage and distribution logistics in a hospital

Luís André Rocha[a,b,*], Nazaré Rego[b]

ᵃHospital da Senhora da Oliveira – Guimarães, Rua dos Cutileiros, 4835-044 Guimarães, Portugal
ᵇEscola de Economia e Gestão, Universidade do Minho, Campus de Gualtar, 4710-057 Braga, Portugal

Abstract

This study involved the analysis and improvement of the internal distribution and storage at Hospital da Senhora da Oliveira – Guimarães, a 500-beds general hospital in the north of Portugal. The study evolved around an action-research strategy that comprised five sequential and interconnected phases. Initially, the internal supply chain of the hospital was analysed with a special focus on ward warehouses (WW) and data about the logistics processes of the WW were gathered. Following, a prototype WW to test a set of innovative solutions aimed at dealing with the difficulties identified in the previous phase was developed. The proposed improvements were analysed and then implemented in the WW of a health care department, which lead to a new data collection about the performance of the logistics processes. The implementation of the proposed solutions resulted in a reduction of the time spent collecting, debiting and storing materials of 55% to 66%. It was also possible to reduce the error rate in these processes by 93%. When the proposed solutions are expanded to the whole hospital, in a year, it will be possible to save 4,819 hours in WW logistics processes (that can be dedicated to provide care to patients) and to avoid 115,843 errors.

Keywords: ward warehouse; healthcare logistics; lean healthcare; material management system.

* *Corresponding author.* Tel.: +351 910 335 151.
E-mail address: luisandrerocha@hospitaldeguimaraes.min-saude.pt

Scaling laws and spatial effects of Brazilian health regions: a research protocol

Giovane Thomazini Soares[a], Diego Bettiol Yamada[a], Filipe Andrade Bernardi[b],
Mariane Barros Neiva[c], Luis Pedro Lombardi Junior[d], André Luiz Teixeira Vinci[a],
Ana Clara de Andrade Mioto[b], Domingos Alves[a*]

[a]*Ribeirão Preto Medical School, University of Sao Paulo, Av Bandeirantes 3900, 14049900, Ribeirao Preto/SP, Brazil*
[b]*Bioengineering Postgraduate Program, Av Trabalhador Sao-Carlense 400, 13566590, Sao Carlos/SP, Brazil*
[c]*Institute of Mathematics and Computer Sciences, Av Trabalhador Sao-Carlense 400, 13566590, Sao Carlos/SP, Brazil*
[d]*Institute of Mathematics, Statistics and Scientific Computing, State University of Campinas, Rua Sérgio Buarque de Holanda 651, 13083859, Campinas/SP, Brazil*

Abstract

The literature has already consolidated the importance of health regions for Brazilian public health. Complexity properties strongly mark such regions. In this context, there are abundant indications that health regions should be analyzed with approaches linked to the sciences of complexity. One of these approaches, the estimation of scaling laws, can describe important properties of socio-spatial elements. However, no studies estimate the scaling laws of Brazilian health regions. This research protocol can remedy this limitation, proposing the estimation of scaling laws of the previously mentioned regions, mainly considering variables relevant to Brazilian public health. Still, this paper can substantially mitigate other relevant limitations of usual research that estimate scaling laws of socio-spatial elements. These mitigations, which provide advances in the literature on estimating scaling laws, are given by the proposal of modeling (if necessary) spatial effects and estimating scaling laws for the entire population of the socio-spatial elements. According to the theory, the expected results are non-linear scaling laws, which will likely vary with space and time and coexist with relevant spatial effects. From such laws and effects, it will be possible to accurately characterize the performance of each health region through Spatial and Scale Adjusted Metropolitan Indicators and unravel spatio-temporal properties, stabilities, and instabilities of sets composed of health regions. The expected findings of this paper can help rearrange health regions and improve the quality of information used in Brazilian public health planning.

Keywords: Scaling laws; Spatial effects; Research protocol.

* *Corresponding author.* Tel.: +55(17)-997151212.
E-mail address: giovane.thomazini@hotmail.com

Software Framework and Graph-based Methodology for Optimal Patient Appointment Planning

Zoltán Süle[a], János Baumgartner[a], Dániel Leitold[a], Tibor Dulai[b], Ákos Orosz[a], Ágnes Vathy-Fogarassy[a*]

[a]*University of Pannonia, Department of Computer Science and Systems Technology, Egyetem str. 10, Veszprém, H-8200, Hungary*
[b]*University of Pannonia, Department of Electrical Engineering and Information Systems, Egyetem str. 10, Veszprém, H-8200, Hungary*

Abstract

Increased demands on healthcare make it more and more important to schedule the appointments of the patients' treatments and care optimally. The optimised patient scheduling may decrease the patients' waiting times, reduce the length of the treatments, and utilise healthcare resources more effectively. However, as the patient scheduling problems differ significantly, it raises the question of how a general patient scheduling problem can be formulated and solved independently from the application areas. This study suggests a general way to define and solve the patient scheduling problem. The proposed method utilises the standard elements of the Fast Healthcare Interoperability Resource standard to define the input elements of the patient scheduling problem, then automatically converts the task to a process optimisation problem and solves it using the P-graph methodology. The proposed method can be applied to solve any patient scheduling problem, and it does not require a specific mathematical description and formulation defined for each problem separately.

Keywords: patient scheduling; Fast Healthcare Interoperability Resource (FHIR); process graph; decision support system; optimisation; standardised development.

* *Corresponding author.* Tel.: +36 88-624-000
E-mail address: vathy.agnes@mik.uni-pannon.hu

Sou +: Reducing health inequities in rural populations with knee osteoarthritis

Lara Campos [a,*,] Bárbara Cardoso [a], Miguel Galego [a], Ana Teresa Machado [a],
Diogo Marques [a], Carolina Santos [a,b,c]

[a]*National School of Public Health, Universidade NOVA de Lisboa, Avenida Padre Cruz, Lisbon 1600-560, Portugal*
[b]*NOVA National School od Public Health, Pubic Health Research Center, Universidade NOVA de Lisboa*
[C]*Comprehensive Health Research Center – Universidade NOVA de Lisboa*

Abstract

Knee osteoarthritis (OA) is a highly prevalent and disabling condition, specially in rural areas, due to the economic, social and environmental determinants that impact health and disability in these regions. Furthermore, in terms of accessibility to services, rural areas are at a disadvantage in comparison with urban areas, where accessing services beyond the basics is within reach. Due to barriers associated with isolation, residents in rural areas face greater difficulties in having an appointment with healthcare professionals and even the recognition of the need to seek this care, due to the long-standing consequences of the diagnosis. Exercise and education programs represent core interventions for the management of knee OA and digital technologies have been used to disseminate these programs, with favorable outcomes. Nevertheless, individuals that live in rural areas may have difficulty in accessing these kinds of programs, which can increase segregation and inequity in healthcare. Sou⁺ aims to create a solution that engages patients, social entrepreneurs, healthcare professionals, health institutions and the community in the mission of successful implementation of an innovative program for patients with knee osteoarthritis in rural areas.

Keywords: Knee osteoarthritis; rural; exercise and edcuational programs; commnunity; e-Health.

[*] Corresponding author
E-mail address: lgg.campos@ensp.unl.pt

Students' attitudes towards searching, evaluating, and sharing Covid-19 related information

Kalinka Kaloyanova[*,] and Ioannis Patias

University of Sofia "St. Kliment Ohridski", Faculty of Mathematics and Informatics, 5 James Bourchier blvd., 1164, Sofia, Bulgaria

Abstract

The COVID-19 pandemic caused by the SARS-CoV-2 virus challenged our everyday life and habits developed in our work and living environment. The highly contagious disease has led the whole world to unprecedented business, humanitarian and human challenges. But, as always, any risk can be recognized as a new opportunity. Thus, people around the world have redefined their understanding of health and well-being. However, it is important to recognize that people across the world and in different industries will continue to take advantage of this large-scale experiment caused by the pandemic and may choose to rethink established concepts, habits, and policies. This paper aims to explore students' Covid-19 digital health literacy (HL) at the Faculty of Mathematics and Informatics, Sofia University "St. Kliment Ohridski". A standardized questionnaire and scale were used, which aims in providing the ability to compare the results with other students from other countries, and specialties. The results so far show students reported high levels of digital HL, and an ability to use various sources of information. Our students have strong skills in searching for information; use reasonable criteria to perceive the information, but face some issues when sharing information on social media. The collected results can be used as an instrument to evaluate the current state and propose steps for the future improvement of lifelong learning priorities, both for students and the general public.

Keywords: Covid-19; health literacy; digital competencies.

* *Corresponding author.* Tel.: +35928161594
E-mail address: kkaloyanova@fmi.uni-sofia.bg

The Fast Health Interoperability Resources (FHIR) Standard and Homecare, a Scoping Review

João Pavão[a], Rute Bastardo[b], Milton Santos[c], Nelson Pacheco Rocha[d,*]

[a]*INESC-TEC, Science and Technology School, University of Trás-os-Montes and Alto Douro, Vila Real, Portugal*
[b]*UNIDCOM, Science and Technology School, University of Trás-os-Montes and Alto Dou-ro, Vila Real, Portugal*
[c]*IEETA, Health School Sciences, University of Aveiro, Aveiro, Portugal*
[d]*IEETA, Department of Medical Sciences, University of Aveiro, Aveiro, Portugal*

Abstract

The scoping review reported by this article aimed to analyze the state of the art of the use of Fast Health Interoperability Resources (FHIR) in the development of homecare applications and was informed by the following research questions: (i) what type of homecare applications benefit from the use of FHIR?; (ii) what FHIR resources are being implemented?; (iii) what publicly available development tools are being used?; and (iv) how privacy and security issues are being addressed? An electronic search was conducted, and 27 studies were included in the scoping review after the selection process. The results show a current interest in using FHIR to implement: i) applications to provide interoperable measurement devices for home monitoring; (ii) applications to remotely collected Patient Reported Outcome Measures (PROM); (iii) Personal Health Records (PHR); and (iv) specific applications for self-management. According to the results, the FHIR resources being implemented are quite diverse and contribute for the challenge of handling the variability caused by diverse healthcare processes. However, the use of publicly available development tools (e.g., SMART on FHIR or HAPI) is not yet generalized. Moreover, just a small number of studies reported the validation of the implemented resources using publicly available FHIR validators. Finally, in terms of privacy and security issues, different approaches were identified: authentication and authorizations mechanisms, end-to-end encrypted messaging mechanisms, and decentralized management and audit trail based on blockchain technologies.

Keywords: Homecare; Interoperability; FHIR; Fast Health Interoperability Resources; Scoping Review.

---

* *Corresponding author.* Tel.: +351234247292.
E-mail address: npr@ua.pt

The occupational risks and health effects resulting from exposition to cytotoxic drugs preparation

Ana Gonçalves[a], Rui A. F. de Oliveira[a,*,] Paula Odete Fernandes[b]

[a]*Instituto Politécnico de Bragança; Campus de Santa Apolónia, 5300-253, Bragança, Portugal*
[b]*Applied Management Research Unit (UNIAG), Instituto Politécnico de Bragança; Campus de Santa Apolónia, 5300-253, Bragança, Portugal*

Abstract

Health professionals dealing with cytotoxic drugs are exposed to occupational hazards, which need to be controlled and reduced to the lowest possible level. The research intends to analyse the effect on the health of the manipulators and the main risks exposition in the preparation of cytotoxic drugs. To achieve this aim, a quantitative analysis was carried out based on data collected through the application of a survey developed for cytotoxic drugs manipulators in Portuguese Oncology institutions. The main results show some symptoms for general manipulators, the occurrence of accidents in the past and more training is required as important. The number of accidents is not connected with more training needs and proceedings lack of knowledge by manipulators. The research intends to contribute to the manipulation of cytotoxic drugs by health professionals, proposing the necessity of better and good practices implemented and organised throughout the CTX manipulation process that must be transversal between different oncology institutions.

Keywords: Occupational Cytotoxic Drugs; Risks; Manipulator health.

* *Corresponding author.* Tel.: +351273303103; fax: +351 273 325 405.
E-mail address: pof@ipb.pt

Towards a beneficial management of personal health records

Christian Kop[a*,] Gerhard Leitner[a], Peter Schartner[a], Volodymyr Shekhovtsov[a], Claudia Steinberger[a], Eleni Zografou[a]

Daniela E. Ströckl[b], Christoph Voutsinas[b]
Herbert Groiss[c], Johannes Hölzl[c], Markus Irrasch[c]
[a]Universität Klagenfurt, Universitätsstraße 65 - 67, 9020 Klagenfurt, Austria
[b]Carinthian University of Applied Sciences, Institute of Applied Research on Ageing, Primoschgasse 8 - 10, 9020 Klagenfurt, Austria
[c]Groiss Informatics GmbH, Strutzmannstraße 10, 9020 Klagenfurt, Austria

Abstract

Documenting and managing their health can be very important for elderly people or people with chronic diseases. The main goal of the AYUDO project is to develop an integrated personal health record as the core of a system that supports these individuals in documenting and analyzing their health and provides them with innovative user interfaces. This paper presents the main results of the AYUDO project, focusing on the following challenges: What kind of health data exist and can be considered, how can the user experience be optimized, and how can interoperability with the user's digital home environment be optimally supported? We therefore present the AYUDO prototype, how it addresses these research questions, and show first evaluation results.

Keywords: Personal Health Record, Voice Assistant, Active Assisted Living (AAL), Context Based Middleware.

* *Corresponding author.* Tel.: +43 463 2700 3735.
E-mail address: christian.kop@aau.at

Unsupervised analysis of COVID-19 pandemic evolution in brazilian states: Vaccination Scenario

Victor Cassão[a*,] Domingos Alves[b], Ana Clara de Andrade Mioto[a], Mariana Tavares Mozini[b], Renan Barbieri Segamarchi[b], Newton Shydeo Brandão Miyoshi[b]

[a] São Carlos School of Engineering, University of São Paulo
[b] Ribeirao Preto Medical School, University of São Paulo

Abstract

Brazil is one of the countries with the worst response against the pandemic scenario of coronavírus. At the beginning we were on average with 4000 deaths in a 24 hours period. In the course of this situation, large amounts of health and medicine datasets were being generated in real time, requiring effective ways to extract information and discover patterns that can help in the fight against this disease. And even more important is to monitor the progress of prophylactic measures and whether they are being effective in reducing the spread of the virus. Thus, the aim of this study is to analyze how the coronavirus has different ways to evolve in each Brazilian state with the influences of the vaccination process. To achieve this goal, the time series Clustering Technique based on a K-Means variation was applied, with the similarity metric Dynamic Time Warping (DTW). We produced this study using the data reported by the Ministry of Health in Brazil, referring to deaths per 100k inhabitants and all vaccination data available. Our results indicate an unevenly occurring vaccination and the need to identify other associated patterns with human development indices and other socio-economic indicators, being this the first analysis developed in the country, under the goals above.

Keywords: Time Series Clustering; Dynamic Time Warping; Unsupervised Analysis; Covid-19, Vaccination.

* *Corresponding author.* Tel.: +55 16992873393.
  E-mail address: victorcassao@usp.br

Using Mixed Reality and Machine Learning to Assist Caregivers in Nursing Home and Promote Well-being

Carlos R. Cunha [a,*], André Moreira [a], Luís Pires [a], Paula Odete Fernandes [a]

[a] *Applied Management Research Unit (UNIAG), Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300-253 Bragança, Portugal*

Abstract

The aging phenomenon in many of the developed countries all over the world, combined with the increase in life expectancy, has led to an increase in the number of elderly people resorting to nursing homes. In this context, the role of the caregiver is now a focus of increasing importance. The idea of well-being combined with health and the provision of highly personalized quality care, requires a reengineering of the current concept/space of a nursing home. In this domain, Mixed Reality and Machine Learning have shown enormous potential to design new approaches to Information Systems to support caregiver activity. This redesign should be based on the empowerment of the caregiver and the facilitation of a more immersive support system for their activity and more suitable for a job that is in the field and not in the office, enabling them in real time with decision support information. This article, after an introduction to the reality of aging and the concept of the nursing home, makes a review of the state of the art of what has been the introduction of technology in nursing homes. As a contribution, this work proposes a model based on the combined use of Mixed Reality and Machine Learning, capable of redesigning the way caregivers are helped by empowering them.

Keywords: Mixed Reality; Machine Learning; IoT; Model; Well-being; Nursing Home; Health.

* *Corresponding author.* Tel..: +351 964 592 216
E-mail address: crc@ipb.pt

Virtual Reality Haptic Device for Mental Illness Treatment

Leonel D. Deusdado[a], Alexandre F. J. Antunes[a*]

aResearch Centre in Digitalization and Intelligent Robotics (CeDRI), Polytechnic Institute of Bragança (IPB), Campus de Santa Apolónia, Bragança 5300-253, Portugal

Abstract

Schizophrenia is a mental disorder that alters mental functioning and can cause hallucinations, mental disorientation, and a variety of other symptoms, which results in a separation of schizophrenics from society. Despite the fact that the condition has been known about for a long time, there is still an urgent need for research and testing to develop better therapies.

Virtual reality (VR) has had interesting outcomes when used to treat illnesses, and it is gradually emerging as a viable technical choice for the healthcare sector due to its immersion, which offers better and more intense user experiences. Once linked to a serious game, it can introduce the user to a number of situations that, when combined with medical assistance, aid in their rehabilitation and treatment.

The use of haptic devices enhances VR immersion by enabling users to comprehend virtual environments with greater nuance, which increases their level of believing in the new environment they are in. When used in conjunction with VR, it can improve the efficacy of the treatment, making its use viable for the treatment of psychic diseases.

The goal of this research is to develop haptic vest interactions using a three-dimensional virtual testing scenario to support and improve the use of VR for rehabilitation and therapy for schizophrenia. The established functionalities can be applied to a further serious game with the same focus.

Keywords: Schizophrenia; Rehabilitation; Health care; Virtual reality; Haptic device; Serious game.

* Leonel D. Deusdado. ORCID: 0000−0002−9944−4386.
  E-mail address: leodeus@ipb.pt
* Alexandre F. J. Antunes. ORCID: 0000−0001−6988−8237.
  E-mail address: alexandrejarosz@ipb.pt

Virtual Reality in Depressive and Anxiety Symptomatology – Contributions to REVIDA project from a mobile app mapping

Marília Ruívo[a], Roberta Frontini[b,c], Cláudia Pernencar[d,e]*

[a] ESAD.CR - School of Arts and Design, Polytechnic of Leiria, Caldas da Rainha, Portugal
[b] ciTechCare - Center for Innovative Care and Health Technology, Polytechnic of Leiria, Leiria, Portugal
[c] CIEQV - Life Quality Research Centre, Polytechnic of Leiria, Leiria, Portugal
[d] LIDA—Arts and Design Research Lab, Polytechnic Institute of Leiria, Leiria, Portugal
[e] ICNOVA—NOVA Institute of Communication, NOVA School of Social Sciences and Humanities, Universidade NOVA Lisboa, Lisbon, Portugal

Abstract

The worldwide prevalence of mental health diseases is alarming. 792 million individuals have a mental disorder such as anxiety or depression. Treatment varies among the types of illness. They can be expensive and, in order to be effective, must address a combination of psychotherapy and medications. The drugs used for treating symptoms present a risk of negative side effects. Studies have shown the benefits of other co-therapies such as physical exercise. In this case, the ability to simulate reality can strongly increase the introduction of other psychological therapies and treatment results can be improved through new immersive experiences. Virtual Reality Exposure Therapy has demonstrated its effectiveness by allowing patients to gradually face fearful stimuli or stressful situations. Recent studies showed that the use of Virtual Reality is effective and safe for mental health. Particularly, in the scenario of how Virtual Reality simulation could increase empathy and behaviour change. This article presents a preliminary study of the REVIDA project: It aims to investigate through Benchmarking and SWOT Analysis the possible integration of Virtual Reality in mental illness monitoring in Portugal. Results show that there exist several new opportunities for using Virtual Reality technology in mental health and wellbeing.

Keywords: Benchmarking; Design Process; Mental Health; SWOT Analysis; Virtual Reality.

* Corresponding author
E-mail address: claudia.pernencar@ipleiria.pt

Web-tool for optimizing locations of health centers

Pasi Fränti[a,*], Radu Mariescu-Istodor[b], Awais Akram[a]

[a]*University of Eastern Finland, Joensuu, Finland*
[b]*Karelia University of Applied Sciences, Joensuu, Finland*

Abstract

Coronary heart disease patients must reach a hospital within 90 minutes from the start of myocardial infarction to avoid the risk of death. Current hospital locations are optimized for the overall health care system and may not be the best possible for these patients. For this reason, we have constructed a web tool for optimizing the facility locations to study how well they serve for the coronary heart disease patients. In this paper, we explain how the system has been constructed, how it can be used, and show the results using patient data in Finland. Results show that the number of patients at risk could theoretically be reduced to 1% with optimized locations but at the cost of increasing the average travel time.

Keywords: Health care information systems; facility optimization; clustering; coronary heart disease; web tools.

* *Corresponding author.*
E-mail address: pasi.franti@uef.fi

HCIST *posters*

Computer simulation for nurse staffing in an outpatient clinic

Sung J. Shima,*, Arun Kumarb, Roger Jiaoc

aSeton Hall University, 400 South Orange Ave, South Orange, NJ 07079, USA
bRMIT University, 124 La Trobe St, Melbourne VIC 3000, Australia
cGeorgia Tech, 801 Ferst Dr, Atlanta, GA 30332, USA

Abstract

Using computer simulation, this study attempted to assess the efficiency of outpatient consultation process in a hospital clinic and to recommend the optimal number of nurses at which patient wait times could be reduced and nurses could be optimally utilized.

Keywords: Computer Simulation; consultation process; nurse staffing

1. Introduction

This paper describes a field study undertaken at a hospital clinic. Using computer simulation, the study attempted to assess the efficiency of outpatient consultation process in the rheumatology, allergy, and immunology (RAI) clinic in terms of patient wait times and utilization of nurses involved in the process and to recommend the optimal number of nurses in the clinic.

2. Literature Review

Computer simulation involves modeling processes. These models are used to study how a system reacts to conditions that are not easily applied in real-world situations and to examine how the working of a system can be altered by changing individual parts of the system. The power of simulation is realized when it is used to study complex systems such as healthcare systems with complex interactions among various components and processes. While various applications of computer simulation are used in healthcare, they can be classified into two groups: (1) applications to healthcare systems at various levels of communities, regions, or the nation, and (2) applications to specific operations, processes, or services in healthcare. The first group includes applications intended to study the provisions of mental

* Corresponding author. Tel.: +1-973-761-9236; fax: +1-973-761-9217
E-mail address: sung.shim@shu.edu

health, public health, health reform or healthcare workforce, often with policy implications, e.g., Fani et al [1]. The second group, which is relevant to the case study of this paper, includes applications intended to improve facility design, staffing and scheduling, and the reduction of patient wait times and operating costs, e.g., Chen et al [2]. The case study described below attempts to extend this line of studies by considering the patient wait times and nurse utilization in the outpatient consultation process in a clinic.

3. Methods

The RAI clinic treats outpatients in the areas of arthropathies, connective tissue diseases, soft tissue rheumatism, rheumatic diseases, drug, food and insect venom allergies, anaphylaxis, urticaria and angioedema, allergic rhinitis and asthma, atopic eczema, and investigations.

The simulation model for the RAI clinic involves the following entities, resources, and locations. An entity refers to an object or person that a simulation model processes. There is one type of entities (patients) in the simulation model for the RAI clinic. A location represents a fixed place where entities are routed for processing or some other activity or decision. The simulation model for the RAI clinic has four types of locations (registration counters, consultation rooms, diagnostic laboratories, and payment counters). A resource is a person, piece of equipment or some other device used for one or more of the following functions: treating and moving entities, assisting in performing tasks for entities at locations, and performing maintenance on locations or other resources. There is one type of resources (nurses) in the simulation model for the RAI clinic.

The outpatient consultation process in the RAI clinic consists of four stages in a sequence: first at registration counters, second for consultation by doctors, third for diagnostic (blood and urine) testing, and forth at payment counters. For the simulation in this study, we used historical data collected from the hospital for one month. Inter-arrival times of patients in the RAI clinic were found to be exponentially distributed with mean value of 2.31 minutes. The RAI clinic treated 123 patients on average daily. More patients were treated on Monday, Wednesday, and Friday than on the other days. Also, more patients were treated in the morning than in the afternoon except on Thursday. There were three off-peak periods of the day: 08:00 – 08:59, 11:00 – 13:59, and 15:59 – 17:30. There are two distinct peak periods of the day: 09:00 - 10:59 and 14:00 – 15:59.

During the off-peak hours, one nurse was at the registration stage, four nurses were at the consultation stage, two nurses were at the diagnostic test stage, and one nurse was at the payment stage. During the peak hours, two nurses were at the registration stage, four nurses were at the consultation stage, two nurses were at the diagnostic test stage, and two nurses were at the payment stage.

We constructed the simulation model of this study using Arena™ simulation software. The simulation model was run for five independent replications. The simulation results are based upon the

CENTERIS/PROJMAN/HCIST 2022

ISBN 978-989-54617-4-5 E-book edition 2022 by SciKA

Book of industry papers, poster papers and abstracts of the
CENTERIS 2022 – Conference on ENTERprise Information Systems /
ProjMAN 2022 – International Conference on Project MANagement /
HCist 2022 – International Conference on Health and Social Care Information Systems and Technologies

average results of the five independent replications. In validating the simulation model, we calculated the confidence intervals of the simulation outputs at 95% ($\alpha = 0.05$) confidence level and compared them with the actual values obtained from the RAI clinic. In addition, we verified the architecture of the simulation model with the clinic staff before the simulation runs and showed the simulation results to the clinic staff after the simulation runs to ensure that the simulation results are reliable.

4. Findings

We ran the simulation model first with the current nurse staffing and then with a varying number of nurses at each stage in the process to find the most optimal number of nurses at which patient wait times could be reduced and nurses could be more optimally utilized. The simulation results with the current nurse staffing show that the patient wait time is 132.67 minutes during off-peak hours and 118.97 minutes during peak hours. The simulation results with a varying number of nurses at each stage show that the shortest patient wait time is 100.37 minutes when two nurses are at the registration stage, five nurses are at the consultation stage, three nurses are at the diagnostic test stage, and one nurse is at the payment stage. The second shortest patient wait time is 122.13 minutes when one nurse is at the registration stage, five nurses are at the consultation stage, three nurses are at the procedure stage, and one nurse is at the payment stage.

The simulation results show that the RAI clinic can reduce the patient wait time significantly by adding one nurse to the registration stage, adding another nurse to the diagnostic test stage, and reallocating one nurse at the consultation stage. Also, the simulation results in this scenario show that the utilization of nurses can reach to 80 percent, which is considered as being acceptable in the field. In the context of the process in the RAI clinic, nurses are considered as being utilized while they are present at any location in the process, and otherwise, they are considered as being idle.

5. Conclusion

The simulation results show that there are opportunities for improvement in the patient wait times in the RAI clinic. Based upon the simulation results, we recommended the optimal numbers of nurses needed the RAI clinic, at which the patient wait times and the utilization of nurses could be balanced. Taken together, the results of this study demonstrate that computer simulation can be an effective tool supporting decisions on staffing for various processes in hospital clinics. The results would be helpful to those who consider using computer simulation to improve healthcare and similar processes.

Acknowledgements

References

[1] Fani, D. C. R., Tabetando, R., Henrietta, U. U., Francois, S., 2022. The Impact of Government Spending and Food Imports on Nutritional Status in Nigeria: A Dynamic OLS Application and Simulation. International Journal of Food and Agricultural Economics 10(1), pp. 55-75.

[2] Chen, M., Wu, K., T, Y., J, B. C., 2021. Data Analysis of Ambient Intelligence in a Healthcare Simulation System: A Pilot Study in High-End Health Screening Process Improvement. BMC Health Services Research 21, pp. 1-13.